

**Figure 27.** Relationship between day-at-sea tradeoffs, scallop trip limits, and number of allocated trips for scallop fishing in Nantucket Lightship Area, Closed Area I, and Closed Area II. The stacking of the trips allocated is in the same order as the day-at-sea tradeoffs.

## Methods

### Status quo

Under status quo conditions (no access<sup>41</sup>), the model predicts that landings of 12,623 mt of landings<sup>42</sup> would occur for vessels using 26,994 days-at-sea with a 120 day allocation for full-time vessels. This analysis, like the one for Framework Adjustment 11, assumes that all vessels with active limited access permits (not including Confirmation of Permit Histories) fish like similarly-permitted vessels in the 1998 fishing year, but accounting for a reduction for 120 days in 2000 from 142 days in 1998 (see Section 4.1.4 of the SAFE report, NEFMC 1999b). Since no day-at-sea tradeoffs apply, the days-at-sea actually fished is equal to the total days-at-sea accumulated.

<sup>41</sup> No access is considered to be status quo, because Framework Adjustment 11 expires on December 31, 1999.

<sup>42</sup> The landings predicted by the depletion model are based on production constraints that are not included or as influential in either the empirical estimates for LPUE (Section 6.2.6.1.7) or the biological projections (Section 6.2.6.2 in Framework Adjustment 12; NEFMC 1999c).

With an average projected meat count of 27.0 scallops per pound predicted in 2000 by the biological projections (Section 6.2.6.2 in Framework Adjustment 12, NEFMC 1999c), these landings are equivalent to 827 million scallops (Table 31). The total bottom time, accounting for tow duration (average 60 minutes), gear processing time (average 15 minutes per tow), and steam time to and from port, is estimated to be 18,716 days (i.e. 449.184 hours).

### **Trip limit and trip allocation alternatives**

The depletion model results for area access (8,000 to 18,000 lbs. scallop trip limit) assume that all eligible vessels fish the entire amount of allocated trips and that if sufficient unused days are available that the vessels use those days to fish or account for the higher accumulation of days (i.e. tradeoff). In Closed Area II, the model assumes that only 174 full-time and 4 part-time vessels take trips into the area, otherwise the model assumes that all eligible vessels (i.e. 328 vessels, Table 9 in Framework Adjustment 12; NEFMC 1999c) fish in the closed area for the allotted number of trips (Table 25). Each of the options shown in Table 31 were solved iteratively so that the predicted number of scallops caught with access equaled the total number of scallops caught without access, within the rounding error associated with a integer day-at-sea tradeoff.

Table 31 gives summary results for each of the five scallop trip limit options, ranging from 8,000 to 18,000 pounds of scallops per trip. The Council selected this range of options because a lower scallop possession limit was thought to be uneconomic for most full-time scallop vessels and higher scallop possession limits would not allow each limited access vessel to take at least one trip, without exceeding the TAC. A second consideration for determining this range is product quality. Long trips that land more than 18,000 pounds of scallops are likely to have product quality problems. More detailed results and input parameters by area is given in Appendix I. A more thorough description of the model is given in Section 8.1.1.4 of Framework Adjustment 11 (NEFMC 1999a).

### **Results**

Except for the 18,000 pound option, with no trips into Nantucket Lightship Area<sup>43</sup>, the average size of scallops caught for the entire resource declines from 27.0 in the open areas of Georges Bank and the Mid-Atlantic to about 23 meats per pound. The landings from the closed areas reduce the average size of scallops caught throughout the resource. The biological projections (Table 12 in Framework Adjustment 12; NEFMC 1999c) predict that the average meat count for exploitable scallops will be 17.7 in Nantucket Lightship Area and Closed Area I and 22.7 in the southern part of Closed Area II (option 1). Because no trips to the Nantucket Lightship Area can be allotted for the 18,000 lbs. trip limit option (Table 25), the average size decreases to 24 meats per pound (Table 31)<sup>44</sup>.

Due to the larger average size for 784 to 811 million scallops caught, the landings (“Cumulative scallop catch in Table 31) from closed area access are about 12 to 14 percent higher than the status quo. Total yield for the 18,000 lbs. option declines to 9% above status quo due to the absence of yield from the Nantucket Lightship Area. For the 8,000 to 15,000 lbs. trip limit options, the landings estimates from the closed areas range from 6,231 to 6,896, or roughly 75 percent of the TAC (8,750 mt; Table 24).

The predicted landings are about 75 percent of the TAC because of the way trips are allocated. By choosing a trip limit common to all three areas and dividing the trip limit into the TAC for each area, a

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<sup>43</sup> The TAC is insufficient to allocate one trip to all 328 eligible vessels with an 18,000 lbs. trip limit. If all 328 vessels fish and land 18,000 lbs. each, the TAC would be exceeded.

<sup>44</sup> The expected participation by vessels would exceed the Nantucket Lightship Area TAC with one trip and a scallop possession limit of 18,000 or more pounds.

non-integer number is rounded down to determine a trip allocation for an area (3.4 trips for Closed Area II, for example is rounded down to 3 trips). Across all three areas, the aggregate landings would therefore be less than the aggregate TAC. Raising the trip limits or the trip allocations by 25% could allow the scallop landings to exceed the TAC for one or two of the three areas, on the other hand.

The day-at-sea tradeoff (days actually fished compared to days accumulated for a closed area trip) increase from 1.44 to 1 with an 8,000 lbs. trip limit to 2.13 to 1 for an 18,000 lbs. trip limit. This is similar to the results for Framework Adjustment 11 (Table 25; NEFMC 1999a) where the tradeoff increased with increasing trip limits. Conversely, the total days accumulated by vessels fishing in the closed areas actually is highest with the lowest (i.e. 8,000 lbs.) trip limit. The balance is caused by the additional steam time and total day-at-sea accumulations with more trips with the smaller trip limit.

Overall, the total days accumulated is 16% higher than the status quo, due to the assumed utilization of unused days to account for the day-at-sea trade-off when unused days are available to the vessel. Day-at-sea actually fished, on the other hand, decline between 2 to 9 percent, depending on the trip limit, tradeoffs, and number of allocated trips (Table 31). Total dredge bottom time (calculated as the number of tows that can be taken in 24 hours given the predicted catch rate and shucking capacity with a seven man crew), declines from 17 to 28 percent.

Of all the estimated effects, the measure of dredge bottom time is probably the most appropriate to use for estimating net effects on bycatch and habitat. The difficulty in interpreting this statistic is that there is no way of quantifying precisely from where the transferred effort emanates. If all the effort came from areas that had equal or higher yellowtail flounder concentrations, for example, it would be easy to show conservation neutrality. Some of the effort, however, will be transferred out of the Mid-Atlantic where fewer yellowtail flounder exist<sup>45</sup>. Likewise, if all the effort came from areas having equal or more sensitive habitat, then it would be easy to demonstrate conservation neutrality.

Total bycatch is finally estimated in the same way that scallop catch is estimated, i.e. applying the experimental fishery catch rates to the total predicted fishing effort, modified by the constraints on production. Only the results of yellowtail flounder in Table 31 are expressed in total biomass for all three areas. Cod, haddock, monkfish, and barndoor skates are estimated in pounds of Closed Area II, but in numbers for Nantucket Lightship Area and Closed Area I. The totals for these species therefore are only an index for comparison between alternatives presented in Table 31. The estimates for all other bycatch species are for Closed Area II only, since bycatch information for the Nantucket Lightship Area and Closed Area I experimental fisheries were not available in time for this analysis.

The predicted yellowtail flounder bycatch ranges from 602 to 707 mt, less than the recommended TACs. The ratio of yellowtail flounder weight to scallop meat weight is between 9.4 and 13.5 percent, in line with the observations from Closed Area II. The experimental fishery bycatch rates in Nantucket Lightship Area and Closed Area I were consistent with observer data from Closed Area II, giving similar ratios for all three areas. Since the experimental fishery catch rates in Closed Area II were adjusted to be consistent with observer data in the 1999 fishery, the bycatch rates predicted here are lower than those (0.62) predicted in Framework Adjustment 11.

In general the level of bycatch increases with the scallop trip limit until the scallop trip limit (and associated trip allocations and day-at-sea tradeoffs) reaches 12,000 lbs. The predicted bycatch then declines for the 15,000 and 18,000 lbs. trip limit options. Why and how this response curve looks the way it does depends on a complex mix of factors taken into account by the model. Taking into account

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<sup>45</sup> A Mid-Atlantic stock of yellowtail flounder occurs around Hudson Canyon, but the regional average is less than the average bycatch of scallop vessels fishing in New England.

the uncertainty about stock biomass and changing seasonal distributions, however, these estimates are roughly equivalent to each other.

**Table 31.** Estimated catch and effort for various trip allocations and trip limits to achieve conservation-neutrality.

	Status quo	Non-preferred alternatives					Proposed
	No access	Trip limits, trip allocations, and day-at-sea counting options					action
Trip limit	-	8,000	10,000	12,000	15,000	18,000	10,000
Allocated trips per vessel							
Nantucket Lightship Area		2	1	1	1	0	1
Closed Area I		2	2	1	1	1	2
Closed Area II		4	3	3	2	2	3
Day-at-sea tradeoff - Nantucket Lightship Area	-	8	10	12	15	-	10
Day-at-sea tradeoff - Closed Area I	-	7	9	11	14	18	10
Day-at-sea tradeoff - Closed Area II	-	10	12	14	17	21	10
Days accumulated in closed areas	-	16,030	14,788	14,531	14,697	12,732	12,732
Days shifted from open areas to closed areas	-	11,757	10,515	10,258	10,424	8,459	8,459
Day accumulated in open areas	26,994	15,237	16,479	16,736	16,570	18,535	18,535
Days-at-sea accumulated	26,994	31,267	31,267	31,267	31,267	31,267	31,267
Change from status quo		16%	16%	16%	16%	16%	16%
Actual days-at-sea used	26,994	26,407	25,924	25,655	24,818	24,514	26,431
Change from status quo		-2%	-4%	-5%	-8%	-9%	-2%
Tradeoff ratio	1.00	1.44 : 1	1.57 : 1	1.63 : 1	1.78 : 1	2.13 : 1	1.51 : 1
Total dredge bottom time (days)	18,716	13,415	14,306	14,613	14,049	15,608	14,670
Change from status quo		-28%	-24%	-22%	-25%	-17%	-22%
Cumulative scallop catch (mt) - open areas		8,672	9,276	9,400	9,320	10,246	9,534
Cumulative scallop catch (mt) - closed area access		6,896	6,487	6,231	6,417	4,882	6,463
Cumulative scallop catch (mt)	13,875	15,568	15,764	15,631	15,737	15,128	15,997
Change from status quo		12%	14%	13%	13%	9%	15%
Cumulative scallop catch (millions)	827	784	802	811	803	809	817
Change from status quo		-5%	-3%	-2%	-3%	-2%	-1%
Average meat count - all areas	27.0	22.8	23.1	23.5	23.1	24.3	23.2
Yellowtail flounder bycatch (mt)		671	686	707	602	659	683
Ratio to scallop catch in closed areas		9.7%	10.6%	11.3%	9.4%	13.5%	10.6%
Winter flounder bycatch (mt) - Closed Area II		347	320	403	309	326	320
Four-spot flounder bycatch (mt) - Closed Area II		152	140	177	136	143	140
Windowpane flounder bycatch (mt) - Closed Area II		532	490	617	474	500	490
Goosefish (aka monkfish) bycatch (mt) - Closed Area II	4,951	6,492	6,652	7,113	6,351	6,957	6,743
Change from status quo		31%	34%	44%	28%	41%	36%
Red hake bycatch (mt) - Closed Area II		38	35	45	34	36	35
Silver hake (aka whiting) bycatch (mt) - Closed Area II		28	25	32	25	26	25
Cod bycatch (abundance index)		14	20	10	12	17	20
Haddock bycatch (abundance index)		40	38	45	35	38	38
Barndoor skate bycatch (abundance index)		382	372	428	342	372	371
Lobster bycatch (mt) - Closed Area II		341	311	391	305	311	311
Large mesh multispecies catch (lbs.) per trip - Closed Area II		5,537	6,947	8,459	9,908	10,828	6,945

#### 6.2.6.1.11 Triggering a Suspension of the Closed Area Scallop Fishery

The threat that the accumulating total catch of scallops or yellowtail flounder bycatch might induce NMFS to suspend the closed area scallop fishery has the same biological and economic effects as a quota. This provision would encourage fishermen to take their allocated trips as rapidly as possible to avoid losing out because the fishery closed before they took their trip. This measure would also encourage fishermen to catch and land the maximum amount of scallops they could on each trip before the fishery potentially closed. It would increase the incentive to deckload scallops and cheat on the scallop trip limit, possibly by transferring scallops at sea. These effects would, in turn, cause the fishery to close earlier than it would have had there not been a possibility to suspend the fishery earlier than planned.

In this case, the fishery's reaction to the threat of an early suspension of the fishery could cause vessels to land scallops as early in the season as possible, probably causing scallop prices to decline more than they otherwise would and decreasing the benefits of allowing the scallop fleet to fish for the large scallops within the closed areas. Another feedback mechanism, the knowledge by fish dealers that the landings have to be made in a short period of time, could cause the vessels to receive even less for their scallops than the general market dictates.

In addition to the economic and safety concerns that this measure causes, there are many uncertainties about the amount of scallops that will actually be landed for a given amount of fishing effort. This uncertainty arises because of the continuing disagreement about the dredge efficiency estimates. As a result, the potential causes of higher landings than expected are intractable from poor compliance with the restrictions, without other sources of confirming information.

### **6.2.6.2 Impacts on Habitat and Essential Fish Habitat (EFH) Assessment**

A comprehensive description of the physical environment and assessment of the impacts to habitat resulting from fishing practices is presented in the Council's omnibus essential fish habitat (EFH) amendment (Amendment 9 to the Sea Scallop FMP and Amendment 11 to the Northeast Multispecies FMP). In relation to current scallop fishing effort allowed by the Sea Scallop and Northeast Multispecies FMPs, the alternatives and actions proposed in this framework adjustment are not expected to increase the total adverse impacts on essential fish habitat associated with scallop fishing in the US EEZ. The following discussion and analysis support this conclusion.

#### **6.2.6.2.1 Proposed Action**

All proposed measures are intended to allow controlled access to the current groundfish closed areas on Georges Bank, known as Closed Areas I and II and the Nantucket Lightship Closed Area (NLSA), for scallop fishing during the 2000 - 2001 sea scallop fishing year. The purpose and need for the proposed action are explained in Section 3.0. Overall, the proposed measures will have two major effects from a scallop stock management perspective: (1) to allow access to the large biomass of sea scallops that currently exist within Closed Areas I and II and NLSA; and (2) reduce fishing pressure on heavily fished areas outside of the closed area. From a habitat perspective, the most obvious impact is the addition of fishing effort into currently closed areas where the habitat within these areas is currently protected from all potential adverse impacts associated with bottom-tending mobile fishing gear. The habitat of the reopened areas will see increases in impacts due to fishing activity; however, the increases in fishing activity in the currently closed areas will be accompanied by a decrease in fishing activity in other currently open areas. Thus, we would expect a decrease in impacts in currently open areas due to reduced scallop fishing activity.

Different habitat types serve different ecological functions and are considered to have different functional values. Bottom types of higher complexity are generally believed to have higher functional value to the ecosystem than those of low complexity (NEFMC Omnibus EFH Amendment). More complex habitats generally exhibit some form of structure, either in the form of the bottom type itself (e.g., rock or boulder piles) or due to some biogenic structure associated with it (e.g., sponges, bryozoans, tunicates, mussel beds, clay pipes, etc.) (Auster and Langton 1999). The principal function provided by the structure associated with these complex habitats is predator avoidance, which increases the survival rate of demersal species (juveniles especially) and contributes to higher recruitment (Kaiser et al. 1999). Prey abundance may also be increased in areas of higher complexity and functional value (Kaiser et al. 1999).

Different habitat types also respond differently to disturbance from fishing-related activities. There are different fishing-related impacts associated with different bottom types and the bottom types differ among the region where scallop fishing currently occurs and the areas proposed to be reopened to scallop fishing. The habitat impacts of the proposed action would be different if scallop fishing effort was concentrated in the gravel areas of the northern edge of Closed Area II compared to the relatively sandy areas of the central and southern portions of Closed Area II. The vulnerability of these two areas to disturbance from scallop fishing activity differs considerably. For example, a recent meta-analysis of gear impact research found that the number of organisms in gravel areas was reduced by 48% following disturbance by bottom-tending mobile fishing gear, while the number of organisms in sand areas was only reduced by 5% (J. Collie, University of Rhode Island, personal communication). Similarly, the number of species present in gravel areas was reduced by 32%, while the number of species present in sand areas was reduced by 14% (J. Collie, University of Rhode Island, personal communication).

The most significant impact associated with bottom-tending mobile fishing gear, including sea scallop dredges, is the smoothing, or flattening, of substrate bedforms (Auster and Langton 1999). In sandy sediments, this gear is associated with the flattening of sand ridges and the removal of some epifauna and infauna (Auster and Langton 1999). The extent of these impacts is dependent on the frequency and intensity of gear use (Auster and Langton 1999). In more complex habitats, such as rock and gravel substrates, this gear is associated with the scraping and smoothing of gravel mounds and turning over of rocks and boulders (Auster and Langton 1999). Epifauna present in these habitats are often removed or crushed (Auster and Langton 1999).

The rates of habitat recovery from the disturbances associated with scallop fishing are another important consideration. In general, high energy habitats (e.g., shallow areas with relatively strong currents and wave action) are thought to recover quicker than low energy habitats (e.g., deep areas with relatively mild currents and little wave action) because the biologic communities are adapted to those environments (DeAlteris et al. 1999). The biologic communities in relatively low energy environments tend to be long-lived and slow-growing (e.g., corals and sponges). The communities that form the biogenic structure in these areas take a long time to recover and may only recover in the absence of disturbance (Sainsbury et al. 1997).

There may be a benefit to the habitat of the region derived from the shift of fishing effort from the current scallop fishing grounds to the groundfish closed areas. This shift in fishing effort is expected to drastically reduce the frequency and intensity of scallop fishing gear use throughout the region by reducing the bottom time needed to harvest a given amount of sea scallops and reducing the number of days actually fished compared to the regulated number of DAS allocated to each scallop vessel.

Current estimates suggest that there will be a 22% reduction in bottom time needed to harvest the same amount of sea scallops within the current closed area as compared to status quo (i.e. no access to closed areas). One mechanism used to track sea scallop fishing effort is the amount of time a scallop dredge is on the bottom, and this 22% reduction in bottom time translates into a reduction of effective fishing effort. The increased availability of sea scallops in the groundfish closed areas increases mortality as a function of the amount of time fished. As a result of the framework adjustment's goal of conservation neutrality<sup>46</sup> for sea scallops, the closed area access program reduces effective fishing effort on other species (unless they are likewise more abundant in the closed areas), increases the catch of

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<sup>46</sup> Unlike Framework Adjustment 11 to allow a scallop fishery in Closed Area II during 1999, the Council defined conservation neutrality as no net increase in scallop mortality, i.e. the number of scallops caught, compared to status quo. In Framework Adjustment 11, conservation neutrality was defined as no net increase in the number of days fished by the scallop fleet, since the primary control on fishing mortality is the annual day-at-sea allocations. Framework Adjustment 13 is estimated to result in a two-percent decline in days fished.

scallops (because the vessels catch larger scallops), while keeping scallop fishing mortality constant (i.e. the scallop vessels catch the same number of scallops that they would have had there been no access to the groundfish closed areas). Section 6.2.6.1.10 explains these results in more detail.

In the Closed Area II scallop exemption fishery (summer and fall of 1999), there was an average tradeoff of two DAS for every day fished. From data provided by NMFS, 187 vessels made a total of 644 trips to Closed Area II while the area was open (Source: NMFS - <http://www.nero.nmfs.gov/ro/doc/gb111599.htm>). Since vessels were charged 10 DAS for all trips to the Closed Area less than or equal to 10 days in duration and the actual number of DAS for all trips longer than 10 days, 6,463 DAS were accumulated by scallop vessels fishing in the closed area. Actual trip length varied, with a few trips taking as little as 1 or 2 days or as many as 12 or 13 days. Most trips took between 3 and 6 days, with a median of 4 days and a mean of 5.3 days. The total number of days fished was approximately 3,395, or roughly half of the number of DAS used. The effect of the reduction in bottom time per unit of scallops harvested in the closed area in combination with the reduction of actual days fished per DAS used is to reduce overall the amount of scallop fishing effort in the region. An overall reduction in fishing effort is a documented strategy to minimize potential adverse impacts on EFH from fishing activity (see Amendment 9 to the Sea Scallop FMP and Amendment 11 to the Northeast Multispecies FMP).

It is important to remember that areas that would see an increase in effort (i.e., the current closed areas) currently face no impacts from bottom-tending mobile fishing gear, while the areas that would see a decrease in effort from reduced scallop fishing may continue to face impacts associated with other types of bottom-tending mobile fishing gear (e.g., otter trawls). While it may be desirable to reduce effort in valuable and sensitive areas such as the Great South Channel, the measures proposed in this framework action would not be eliminating all fishing effort in these areas.

The frequency and intensity of gear use is one of the most significant factors in determining the magnitude of adverse impact (Auster and Langton 1999). Closed areas and reductions in fishing effort are two mechanisms known to minimize the adverse impacts on habitat associated with fishing practices by reducing the frequency and intensity of fishing gear use either in a particular area or throughout the entire region (see Amendment #9 to the Sea Scallop FMP and Amendment #11 to the Northeast Multispecies FMP). Ideally, these reductions would be focused on the sensitive habitats of the Gulf of Maine and Georges Bank that have been designated as EFH by the Council. Measures that do not directly reduce fishing effort, but rather manage how the effort is distributed among the fishing industry or the size class of fish targeted by the industry, such as permit declarations or mesh size restrictions, are not expected to have a direct effect on the habitat of the region.

#### *Effort Limits and Scallop Possession Limits:*

For each of the maximum three, two or one trips (depending on area) into the current closed area proposed to be allocated to each scallop fishing vessel, ten DAS would be used in the currently open area regardless of trip length (unless the trip is longer than ten days in which case the actual number of days will be used). This measure has the potential to reduce the overall effort in the scallop fishery. Due to the relatively high concentrations of sea scallops observed in the closed areas during the 1998 and 1999 experimental fisheries, it is expected that it will take considerably less than the full ten DAS for each vessel to attain the trip limit. As stated above, the total number of days actually fished in Closed Area II in 1999 was approximately 3,395, or roughly half of the number of DAS used (6,463). In effect, each scallop vessel that fishes in the reopened areas will give up a number of potential DAS. The DAS that are, in effect, "given up" will translate into an overall reduction of fishing effort.

Implementation of a trip limit would not be expected to have a direct effect on the habitat of the region. The trip limit could have an indirect effect on the habitat of Georges Bank by reducing the effort associated with each trip, assuming that fishing effort ceases as soon as the trip limit is reached and does not continue with the intent of some form of "high-grading."

#### *Scallop TAC's:*

While not expected to have a direct effect on the habitat of the region, the TAC's serve as defacto effort controls by creating an upper limit on the amount of fishing effort that can occur within the current groundfish closed areas.

#### *Area Access Options:*

##### Closed Area II

The Council has proposed reopening only that portion of Closed Area II that lies south of 41° 30' north latitude. South of 41° 30' north latitude, the bottom is mostly comprised of relatively flat sand in a moderate to high energy environment that is thought to recover relatively quickly from disturbance due to fishing activity (Valentine and Lough 1991; DeAlteris et al. 1999). North of 41° 30' north latitude, the bottom is comprised of areas of large sand "waves" and hard bottom habitats such as the gravel pavement along the northern edge of Georges Bank (Valentine and Lough 1991). These bottom types both take relatively longer to recover from disturbance due to fishing activity than do flat sandy areas (Auster and Langton 1999). By proposing to reopen only that section of Closed Area II south of 41° 30' north latitude, the most sensitive habitats of Closed Area II remain closed and protected from any adverse impacts to fish habitat associated with scallop fishing activity. The expected impacts to the habitat of Closed Area II that is proposed for reopening to scallop fishing are minimal, given the bottom types within the area and the relative quickness with which these areas are thought to recover from impacts due to fishing activity.

##### Closed Area I

The Council has proposed opening a portion of Closed Area I, bounded on the south by a straight line approximating the 43660 LORAN line and on the north by a straight line running along the deep side of the 50 fathom isobath. There is very little information available as to the substrate composition in this portion of Closed Area I, but based on the information that was available to the Council during the development of this framework adjustment, this area appears to be comprised of predominately sandy substrate, similar to the southern portion of Closed Area II (Poppe et al. 1989). Areas known to contain hard and complex substrates such as gravel and rock exist to the south of the area proposed for scallop fishing (Valentine et al. in prep.). These bottom types both take relatively longer to recover from disturbance due to fishing activity than do sandy areas. By proposing to open only that section of Closed Area I described above, the most sensitive habitats of the closed area remain closed and protected from any potential adverse impacts to fish habitat associated with scallop fishing activity.

Although the Council based its decisions on the best information available, there is some risk associated with the poor quality of benthic information for some portions of the proposed scallop access area (Section 5.1.1.3). The Council considered this risk and determined the risk to be justified, given the estimated biological and economic benefits described in Sections 6.2.6.1 and 0, respectively.

##### Nantucket Lightship Closed Area

The Council has proposed opening a portion of the Nantucket Lightship Closed Area (NLSA), bounded on the south by 40° 30' North latitude and on the west by a straight line approximating the 13900 LORAN line. Based on all information available to the Council during the development of this framework adjustment, the entirety of the NLSA is primarily comprised of relatively flat and sandy or other relatively soft bottom habitats (Poppe et al. 1989). The corner proposed to be opened was the only alternative considered by the Council, so no accommodations to minimize the potential adverse impacts to habitat were needed. There are reports of some small, patchily distributed areas of hard-bottom in this corner of the closed area, but these are not mapped accurately and reports vary widely as to their extent and location. The potential adverse impacts to the habitat of this area are expected to be minimal. Scallop vessels participating in the closed area access program have only been allocated one trip each in this area, so overall fishing effort in the NLSA is expected to be low.

Although the Council based its decisions on the best information available, there is some risk associated with the poor quality of benthic information for some portions of the proposed scallop access area (Section 5.1.1.2). The Council considered this risk and determined the risk to be justified, given the estimated biological and economic benefits described in Sections 6.2.6.1 and 0, respectively.

*Seasons:*

The seasonal nature of the proposed openings dictates that there will be time during the fishing year for the habitats of the closed areas reopened to scallop fishing to recover at least partially from any adverse impacts that result from scallop fishing activity in the closed areas.

*Suspension of Fishing in Reopened Area:*

The potential suspension of scallop fishing in the reopened areas because of a yellowtail flounder bycatch TAC would serve as a defacto effort control by creating an upper limit on the amount of fishing effort that can occur within the current groundfish closed areas. This measure would not be expected to have a direct effect on the habitat of the region, and may not have even an indirect effect if the yellowtail flounder TAC is not reached.

*Gear Restrictions (Twine Top Mesh Size):*

This proposed measure is not expected to have a direct effect on the habitat of the region.

*Reporting Requirements:*

This proposed measure is not expected to have a direct effect on the habitat of the region.

*Enforcement Provisions (Vessel Monitoring Systems / Trip Declaration):*

This proposed measure is not expected to have a direct effect on the habitat of the region.

*Eligibility Options:*

This proposed measure is not expected to have a direct effect on the habitat of the region. The effect of including access by vessels with general category vessels is unknown, relative to allowing the five-percent TAC set aside to be taken by limited access scallop vessels. To accommodate the general category vessel access, the Council reduced the scallop TAC by five percent. As a result, limited access vessels using larger, heavier dredges than those used by general category vessels would otherwise harvest

these scallops. The relative efficiency between these two commercial fishing gears has not been evaluated. If the habitat effects is proportional to the amount of scallops the vessels catch, then there is no net change in habitat effects to allow access by general category vessels. If, on the other hand, vessels using 10½-foot dredges have to tow longer to catch the same biomass of scallops that would otherwise be caught by a limited access vessel, then the habitat effects could increase. Given the higher precision, higher maneuverability, and lower horsepower of vessels using a smaller dredge, higher habitat impacts are unlikely to be the result, however.

*Yellowtail Flounder TAC's:*

This proposed measure is not expected to have a direct effect on the habitat of the region.

*Possession Limit for Bycatch:*

This proposed measure is not expected to have a direct effect on the habitat of the region.

*Observer Coverage:*

This proposed measure is not expected to have a direct effect on the habitat of the region.

6.2.6.2.2 Alternatives Considered and Rejected

*Effort Limits and Scallop Possession Limits:*

Compared to the trip allocations and possession limits proposed by the Council, the other alternatives considered but not selected by the Council were not expected to have any significant effect on the habitat of the region.

*Scallop TAC's:*

The other alternatives considered but not selected by the Council were not expected to have any significant effect on the habitat of the region.

*Area Access Options:*

Closed Area II

In addition to the proposed area option, the Council considered, but did not select, one alternative for reopening Closed Area II for scallop fishing. The non-selected alternative included all of Closed Area II south of the juvenile Atlantic cod habitat area of particular concern (HAPC). This alternative would have allowed scallop fishing in areas of Closed Area II that contain more complex habitat types than exist south of 41° 30' North latitude. The central portion of the closed area contains large "sand wave" features and the northern portion known as the "dog leg" (southeast of the HAPC) contains some hard bottom formations (Valentine and Lough 1991). The habitat impacts from scallop fishing in these areas, especially the hard bottom portions of the dog leg, would be much more significant than in the southern area chosen by the Council.

Closed Area I

In addition to the proposed area option, the Council considered, but did not select, two alternatives for opening Closed Area I for scallop fishing. The non-selected alternatives included all of Closed Area I north of either 41° 00' North latitude or 41° 07' North latitude. The 41° 00' alternative would have allowed scallop fishing in some of the area south of the 43660 LORAN line that contains hard-bottom and complex habitat (Valentine et al. in prep.). The adverse habitat impacts from scallop fishing in this area would be much more significant than in the northern area ultimately chosen by the Council. Based on the information available to the Council, there was no substantive difference from a habitat perspective between the option chosen by the Council and using 41° 07' North latitude as the southern boundary (Valentine et al. in prep.).

#### Nantucket Lightship Closed Area

There were no other alternatives considered by the Council relative to the NLSA, other than the no action alternative of not opening this area to scallop fishing.

#### *Seasons:*

In addition to the proposed seasons for the closed areas, the Council considered, but did not select, several alternative schedules for allowing access to the closed areas for scallop fishing. These alternatives were not expected to have any effect on the habitat of the region compared to the proposed seasons selected by the Council.

#### *Scallop Buffer Zone:*

Although the Council considered two alternatives for buffer zones, neither alternative was selected. Implementation of the Closed Area II external buffer zone alternative may have served as a type of temporary area closure. The same scallop fishing regulations for fishing within the closed area would apply to vessels outside of the closed area but within the buffer zone; thus, there would be little incentive or reason to fish in the external buffer zone given the higher scallop biomass within the closed area. This potential increase in the amount of area effectively closed temporarily to certain types of bottom-tending mobile fishing gear may have reduced some of the adverse impacts associated with these fishing gears within the boundaries of the buffer zone.

While surrounding areas may face an increase in fishing activity due to effort displacement by vessels not fishing in the current closed area, insufficient data prevent a quantitative analysis of the habitat impacts of effort displacement associated with the actions proposed. If a fraction of the fishing effort within the proposed scallop demarcation line is not displaced to other areas or seasons, the proposed measure may decrease the impacts on habitat. A more detailed description of the potential impacts on habitat is provided in Section 4.11 of Amendment 9, which specifically discusses the effects of effort displacement. Also, the relatively short duration of the fishing season for Closed Area II, and therefore for the external buffer zone, makes it unlikely that there would be sufficient time available for the habitat of the buffer zone to recover from the effects of fishing.

Implementation of the internal no-fishing zones within the boundaries of the portions of the closed areas proposed for opening to scallop fishing would have effectively reduced the amount of area actively fished. This additional area would have been protected from any adverse impacts associated with scallop fishing. The actual efficacy of this measure is difficult to predict, however, as the overall boundaries proposed for scallop fishing may have changed if the no-fishing zone was selected. The Council is confident that the areas proposed for scallop fishing will contain scallop fishing effort to the

areas of least sensitive bottom habitats. This measure was proposed as an enforcement measure, but analysis suggested the enforcement benefits would be minimal.

*Gear Restrictions:*

The other alternatives considered but not selected by the Council were not expected to have any significant effect on the habitat of the region.

*Reporting Requirements:*

The other alternatives considered but not selected by the Council were not expected to have any significant effect on the habitat of the region.

*Enforcement Provisions:*

The other alternatives considered but not selected by the Council were not expected to have any significant effect on the habitat of the region.

*Eligibility:*

The other alternatives considered but not selected by the Council were not expected to have any significant effect on the habitat of the region.

*Yellowtail Flounder TAC's:*

The other alternatives considered but not selected by the Council were not expected to have any significant effect on the habitat of the region.

*Possession Limits for Bycatch:*

The other alternatives considered but not selected by the Council were not expected to have any significant effect on the habitat of the region.

*Observer Coverage:*

The other alternatives considered but not selected by the Council were not expected to have any significant effect on the habitat of the region.

**EFH Assessment:**

This essential fish habitat (EFH) assessment is provided pursuant to 50 CFR 600.920 of the EFH Interim Final Rule to initiate EFH consultation with the National Marine Fisheries Service.

- A. Description of the proposed action -- See Section 5.1 for a description of the proposed action. The activity described by this proposed action, fishing for sea scallops, occurs throughout the U.S. EEZ. Thus, the range of this activity occurs across the designated EFH of all Council-managed species (see Amendment #9 to the Sea Scallop FMP and Amendment #11 to the Northeast Multispecies FMP). Fishing for sea scallops also occurs in areas designated as EFH for some species managed by the Mid-Atlantic Fishery Management Council (see Amendment # 12 to the Summer Flounder, Scup and Black Sea Bass FMP, the Spiny Dogfish FMP, Amendment #

12 to the Surfclam and Ocean Quahog FMP, and Amendment # 8 to the Atlantic Mackerel, Squid and Butterfish FMP). The range of this activity does not occur within the range of EFH of any species managed by the South Atlantic Fishery Management Council (see the Final Comprehensive Amendment Addressing Essential Fish Habitat of the South Atlantic Region).

- B. Analysis of the effects of the proposed action -- Although scallop dredges have been shown to be associated with adverse impacts to some types of bottom habitat (see Section 4.0 of Amendment 9 to the Atlantic Sea Scallop FMP), the proposed action should decrease total current levels of scallop fishing activity in the U.S. EEZ. The proposals to allow scallop fishing within the current groundfish closed areas (Closed Area I, Closed Area II and the Nantucket Lightship Closed Area) will have an adverse impact on the habitat of the specific portions of these areas proposed for opening. The reduction in fishing effort (8,459 out of 26,994 days at sea) throughout the rest of the area where scallop fishing currently occurs that results from the proposed openings should more than offset the limited increase in fishing effort in the closed areas. This reduction in fishing pressure will be realized through a combination of fewer days actually fished (due to the tradeoff in DAS for each trip to a closed area) and less time scallop dredges actually will be fishing on the bottom per unit of sea scallops harvested (due to the much higher scallop biomass and CPUE in the closed areas). Overall days actually fished are estimated to decline by about 500 days (including increases in effort from activation of unused days-at-sea) and total days fished (i.e. bottom time) is expected to decline from 18,716 to 14,670 days fished (Table 31), due to the higher scallop catch rate per hour fished.

In all three areas proposed to be opened for scallop fishing, the Council evaluated the habitat characteristics of the areas, limiting scallop fishing access to those portions of the closed areas believed to have the least sensitive and most resilient habitats. The areas from where scallop fishing will be diverted represent a variety of habitat types, including complex and sensitive bottom habitats in the Great South Channel area. The reduction of fishing pressure on these habitats should allow some recovery from the adverse impacts associated with bottom-tending mobile fishing gear, including sea scallop dredges.

All other measures proposed in this Framework Adjustment support and define the limitations and procedures for the limited scallop fishing access program into the current groundfish closed areas. These other measures (effort limits and scallop possession limits, TAC's, seasons, gear restrictions, yellowtail flounder bycatch provisions, etc.) are expected to have minimal indirect effect on the habitat of the region.

- C. Conclusions -- The action proposed under this framework should have at most a minimal adverse effect on the EFH of species managed by the New England, Mid-Atlantic or South Atlantic Fishery Management Councils. Because there are less than substantial adverse impacts associated with this action, an abbreviated consultation should be all that is required.
- D. Proposed mitigation -- A description of the alternatives considered and rejected by the Council is provided in Section 0.

### **6.2.6.3 Impacts on Endangered Species and Other Protected Species**

A description of potentially affected protected species (marine mammals, sea turtles and shortnose sturgeon), including those that are threatened and endangered or proposed to be listed as threatened or endangered was provided in Amendment 4 to the Atlantic Sea Scallop FMP. Impacts of the fishery and management measures were most recently reviewed in Amendment 7 and Framework Adjustment 11 and

12 to the FMP. Prior to those actions, they were discussed in the Environmental Assessment associated with the NMFS Interim Action to Implement Sea Scallop Protection Measures in the Atlantic Sea Scallop Fishery, dated February 1998.

Detailed information may be found in stock assessment reports prepared by NMFS pursuant to Section 117 of the Marine Mammal Protection Act (MMPA) for all marine mammal species in the U.S. Atlantic Ocean and in the Gulf of Mexico. The initial stock assessments were presented in Blaylock, *et al.* (1995) and are updated in Waring, *et al.* (1997). The most recent report, *U.S. Atlantic Marine Mammal Stock Assessments -- 1998* (Waring *et al.* 1999), contains only assessment reports for the Atlantic stocks. Information presented includes stock definition and geographic range, population size and productivity rates and known impacts. Information on sea turtle status is contained in the 1995 and 1997 status reviews of listed turtles prepared jointly by NMFS and the U.S. Fish and Wildlife Service (NMFS and USFWS, 1995).

#### 6.2.6.3.1 Threatened and Endangered Species

*Northern Right Whales* - The right whale population, which numbers less than 300 animals ranges from wintering and calving grounds in the southeastern U.S. to summer feeding grounds in New England, the northern Bay of Fundy and the Scotian Shelf. New England waters are a primary feeding ground. Principal prey items include copepods in the genera *Calanus* and *Pseudocalanus*, although they may feed on similar-sized zooplankton and other organisms. Feeding efficiency may depend on the ability of whales to find and exploit dense zooplankton patches. They are considered to be the most endangered whale in the world. Sources of mortality include ship strikes and entanglement in fixed fishing gear.

*Sea Turtles* - Loggerhead, leatherback and Kemp's ridley and occasionally green turtles are known to inhabit the action area and are susceptible to entanglement in dredges used in the sea scallop fishery. Given the available information, however, there is no reason to conclude that the fishery or the proposed action represents a major source of human-induced serious injury or mortality.

*Shortnose Sturgeon* - Although shortnose sturgeon have the potential to interact with scallop dredge gear, the possibility is remote given that they are benthic fish that mainly occupy the deep channel sections of large rivers.

#### 6.2.6.3.2 Species of Concern

*Harbor Porpoise* - Harbor porpoise are widely dispersed from New Jersey to Maine but are generally more abundant in the western Gulf of Maine and move northward to the Bay of Fundy in the summer. During any given season they may be found on Georges Bank. The most common cetacean species caught in commercial fishing gear in the northeast, this species is the subject of a TRP implemented by NMFS in December 1998. To reduce takes, the plan targets the Gulf of Maine multispecies gillnet and mid-Atlantic coastal gillnet fisheries. Requirements include the use of acoustic deterrents ("pingers") on nets, time/area closures and gear modifications.

*Barndoor Skate* - On March 30, 1999, the Center for Marine Conservation petitioned the Secretary of Commerce to list the barndoor skate as an endangered species. Acting on behalf of the Secretary, NMFS will determine if the petition is warranted, and if so, will conduct a status review. The agency will make a decision to list or not, based on their finding. This issue is relevant to the Council because a relatively large number of barndoor skates (148) were taken as bycatch in the summer, 1998

cooperative NMFS/industry survey undertaken to determine sea scallop abundance in Closed Area II. (In a 1999 joint NMFS/industry dredge survey, 61 barndoor skates were taken in 132 ten-minute tows in the Nantucket Lightship Area and 114 were taken in 188 ten-minute tows in Closed Area I). The 1998 information provoked attention because this species of skate was once abundant in the central portion of its range, including Georges Bank and Nantucket Shoals, but has demonstrated a distinct decline over the last 30 years according to historic survey information provided by the Northeast Fisheries Science Center. The most recent surveys indicate a possible increase in barndoor skates in the southern portion of Georges Bank, a possible result of the year-round closure of Area II since 1994. Despite the encouraging news, scientists at a recent workshop held to discuss the status and conservation needs of the barndoor skate concluded that the population has decreased by 90-99 percent. Participants further stated that barndoor skates continue to persist in substantial numbers only on Georges and Browns Bank and in deeper waters off the Newfoundland Grand Banks.

#### 6.2.6.3.3 Impacts of Management Measures

*General* - It is important to note that the scallop fishery historically has not been associated with marine mammal bycatch. It is listed as Category III on the Marine Mammal Protection Act's *List of Fisheries for 1999* (with no documented marine mammal interactions). This listing, however does not account for sea turtles, which are vulnerable to both scallop trawl and dredge gear.

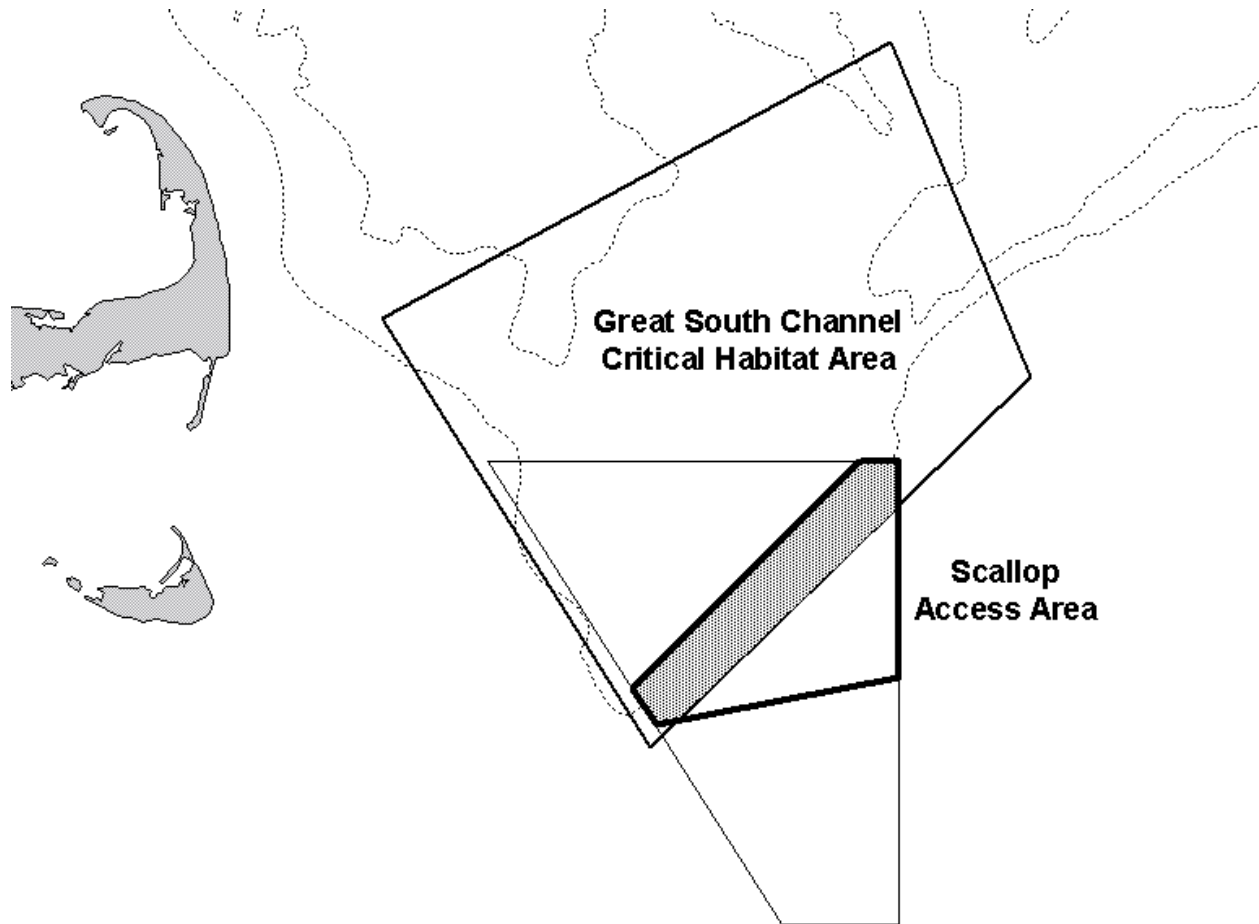
Despite exposure to the presence of scallop dredge and other mobile gear, encounters or serious injury to right and other species of large whales are rare and generally associated with fixed gear. Given this remote likelihood of right whale interactions with scallop dredge gear, overall the measures contained in this framework adjustment may affect, but are not likely to pose a major threat to this species. Similarly, neither the framework adjustment measures nor the fishery itself should affect or modify the measures contained in the Atlantic Large Whale Take Reduction Plan (TRP) or right whale critical habitat designated in the Great South Channel and Cape Cod Bay. As with right whales, harbor porpoise and other small cetaceans are unlikely to interact with scallop dredge gear because of its configuration, the manner in which the gear is deployed and the behavior of the animals.

This framework adjustment addresses issues related to temporarily opening portions of Closed Areas I and II, and the Nantucket Lightship Area for purposes of conducting a limited sea scallop fishery. Measures proposed and those considered and rejected address sea scallop dredge access and sea scallop and multispecies conservation issues. They are fully described in Section 0 of this document. Most of the measures, i.e. scallop and yellowtail flounder TACs by area, trip limits, a days-at sea tradeoff, possession limits for scallops and species taken as bycatch by trip, a 10-inch twine top requirement, TAC set-asides to fund observers and research and enforcement provisions, have little direct impacts on endangered, threatened and other protected species. Other measures or outcomes of the proposed action have either direct or indirect impacts and are discussed below.

*Area and Seasonal Restrictions* - The conduct of a limited sea scallop fishery in the groundfish closed areas does not overlap seasonally with concentrations of endangered species or other marine mammals, but a spatial overlap does exist between right whale critical habitat in the Great South Channel area and the Area I scallop fishery (Figure 28). Although the timing of their seasonal movements is variable, a significant portion of the northern right whale population aggregates in the Great South Channel from April through the end of June, with a peak in May. In the spring and summer months, fin, humpback and minke whales and white-sided dolphins also regularly feed in the region.

The scallop fishery for closed Area I is proposed for October 1 through December 31, creating a seasonal separation that could mitigate the potential risks of serious injury or mortality, however remote

the likelihood of such a scenario. Critical habitat itself should not be affected by an increase in scallop vessel activity, although potential indirect effects are unknown. In the case of scallop gear access to the other groundfish closed areas, the fishery proposed would be conducted in a limited area, with spatial and, in the case of right whales, seasonal separation from aggregations of animals.



**Figure 28.** Relationship between the Great South Channel Right Whale Critical Habitat and the proposed scallop fishing access within Closed Area I. The shading represents the area of overlap.

*Eligibility* - All vessels with scallop limited access permits and days-at-sea allocations would be allowed to fish in the closed area program, including net boats, but only if they switch to dredge gear. Under this scenario, overall scallop effort could increase, depending on the amount of participation by vessels that are currently inactive. Allowing vessels with general category permits to participate also could result in concentrated and increased effort in the closed areas and possibly greater potential threats to turtles if a large number of vessels enter the program. Alternatively, if scallop trawl vessels operating in the mid-Atlantic region elect to fish in the closed areas, potential interactions with sea turtles could decline. This could occur as a result of vessels switching from nets to dredges, gear that is less likely to interact with turtles, and to the Georges Bank and southern New England areas where turtles are less abundant than in the mid-Atlantic.

*Effort Limits* - Depending on the area, each participating vessel would be limited to one, two, or three trips during the open period. Each vessel would be assessed a minimum of 10 days-at-sea per trip. If participation by currently inactive vessels does not materialize, the assessment of 10 days-at-sea per trip per vessel could result in an overall effort reduction effort in the scallop fishery, thereby reducing potential risks to protected species. This effect may be enhanced by that fact that, because of the high CPUEs in the closed areas, most trips averaged about 6 days (in the 1999 Closed Area II scallop fishery). Scallop trips in open areas are, on average, 15-days long. Overall, gear could be in the water for less time, potentially reducing impacts to protected species such as turtles.

*Reporting Requirements* - An operational VMS and detailed daily reports on catch and effort and possibly other information would enable managers to better evaluate the impacts of this fishery on protected and other marine resources

*Observer Coverage* - Twenty-five percent observer coverage in the closed area fishery could also enhance the assessment of impacts on protected species in addition to providing valuable information about the scallop resource and the fishery.

#### 6.2.6.3.4 Conclusion

Based on the historic low level of documented takes in the sea scallop fishery, NMFS concluded previously that operation of this fishery and actions similar to proposed Framework Adjustment 13, may affect, but were not likely to jeopardize the continued existence of any threatened and endangered species. The management measures proposed in this framework should not alter that conclusion. Should activities associated with the Sea Scallop FMP change significantly or new information become available that alters this determination, the Council will reinstate consultation.

#### 6.2.6.4 Economic Impacts - Cost/benefit analysis of closed area access options

The economic impacts of closed area opening options are analyzed if the vessels will fish in the three closed areas, Closed Area I, Closed Area II, and the NLS area subject to proposed trip limits and DAS trade-offs:

- The economic results are estimated using the depletion model results for landings per DAS, actual DAS-used to land the trip limit, total landings and DAS-used in each area.
- The meat count is obtained from the biological projections.

The economic impacts of these options are compared to the status quo levels with no access to the closed areas.

##### 6.2.6.4.1 Proposed area access - Summary of results

The results of the economic analysis are summarized in the following table and in the following bullets:

Table 32. Summary of economic benefits.

	Proposed Action (access to the closed areas)	Status quo (no access to closed areas)	Change from status quo levels	Percentage change from status quo levels
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	<b>Proposed Action (access to the closed areas)</b>	<b>Status quo (no access to closed areas)</b>	<b>Change from status quo levels</b>	<b>Percentage change from status quo levels</b>
Landings (million pounds)	<b>35.3</b>	<b>27.8</b>	7.44	26.7%
Ex-vessel Price (\$/pound) (average of all areas)	5.01	5.45	(0.44)	-8.0%
Operational costs (\$ million)	30	31	(0.64)	-2.1%
Total Revenue (\$ million)	177	152	25.08	16.5%
Consumer Surplus (\$ million)	58	36	21.99	60.6%
Producer Surplus- opportunity cost of labor (\$ million)	127	101	26.14	25.9%
<b>Net Benefits (\$ million)</b>	<b>185</b>	<b>137</b>	<b>48.13</b>	<b>35.1%</b>
Employment (Crew*DAS)	185,017	188,958	(3,941.25)	-2.1%

- The proposed access to the Closed Area I, Closed Area II, and the NLS area is estimated to have positive impacts on scallop landings, revenues and net national benefits.
- The landings are estimated to increase from 27.8 million pounds to about \$35.3 million pounds with access to the closed areas.
- The ex-vessel prices are estimated to be lower, about \$5.01 per pound with access to the closed areas. Without access, the price will be higher, \$5.45 per pound.
- The total fleet revenues will increase about \$25 million with access to the closed areas.
- Consumer surplus will increase by about \$22 million.
- The increase in the producer surplus will be around \$26 million.
- The net national benefits will increase by \$48 million with access.
- The employment will decline with access to the closed areas by 2%.
- These results will be not valid, however, if vessels do not choose to fish in the Closed Area I, II or the Nantucket Lightship area, but continue fishing in the open areas to obtain higher revenues per day-at-sea. This would impose further costs in the long run, as the scallops in the open areas continue to be overfished.
- Due to the proposed days-at-sea trade-offs from fishing in the closed areas, the actual DAS-used by a full-time vessel will decline from 120 DAS (status quo) to 101 DAS (proposed access).
- The total revenue per full-time active vessel will stay about the same with access. The estimated operational costs per vessel will decline, however, from \$137,379 to \$115,360 since it will take less effort and days-at-sea to land the same amount of scallops in the closed versus the open areas (Table 33).
- As a result, a full-time average vessel will be able to break-even at 79 day-at-sea with the proposed access and will increase its profits from \$77,667 (status quo) to \$82,805 (access).
- The break-even-even figures are estimated for a vessel with a HP and GRT equal to the fleet average. Thus, some vessels in the scallop fleet will need more days-at-sea, and some will need less than shown in Table 33 to break-even from scallop fishing alone.
- The estimates would change if the landings per DAS, import prices, and a variety of other factors that affect operational (such as the cost of fuel) and fixed costs change.
- Therefore, the estimates should be used in comparing the alternatives with each other.

Table 33. Impacts on vessel revenues, profits and break-even day-at-sea for a full-time vessel.

<b>Proposed Action (access to the closed areas)</b>	<b>Status quo (no access to closed areas)</b>
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	Proposed Action (access to the closed areas)	Status quo (no access to closed areas)
DAS allocation per full-time vessel	120	120
Actual DAS-used per vessel	101	120
Revenue per vessel	672,868	672,954
Operational costs per Vessel	115,360	137,379
Profits	82,805	77,667
Break-even DAS	79	81

#### 6.2.6.4.1.1 Landings, prices and revenues by area

The scallop landings by area, landings per day-at-sea, and actual days-at-sea used in each area is estimated from the depletion model described in Section 6.2.6.1.10 of this document.

The ex-vessel prices are estimated from the annual price model presented in Section 5.3.1 of the SAFE report. According to this model, ex-vessel prices are a function of domestic landings, import prices, disposable income and meat count. Since the size composition of landings from each area is expected to be different, the average ex-vessel price will vary from one area to another. These variations from area to area are estimated in two steps as follows:

- In the first step, using the average meat count for all areas, and total scallop landings, an average price is estimated.
- In the second step, the difference in average meat count for each area from overall average meat count is calculated.
- In the final step, this difference is multiplied by price premium for each meat count as estimated from the ex-vessel price.

Estimated ex-vessel prices for landings from each area are shown in Table 34. Closed Area I and the Nantucket Lightship Area landings are estimated to have the highest prices, about \$5.62 to \$5.56 per pound, because the meat count is higher in these areas (14 and 15 per pound respectively), compared to Closed Area II (22.5) and open areas (27.5). These prices, however, do not take into account the seasonal variations.

Table 34. Average ex-vessel price per pound and meat count by area

	Closed Area II	Closed Area 1	NLS	outside	total or average
Meat Count	22.50	14.10	15.00	27.05	23.17
Scallop landings in million lbs	5.34	5.78	3.13	21.02	35.27
Ex-vessel Price	<b>5.06</b>	<b>5.62</b>	<b>5.56</b>	<b>4.75</b>	<b>5.01</b>

Table 35. Gross and net revenues per DAS (allocation).

	Closed Area II	Closed Area 1	NLS	outside
Number of trips	3	2	1	
Trip limit	10,000	10,000	10,000	
DAS trade-off	10	10	10	
Actual DAS-used per trip to land 10,000 pounds	7.6	5.7	6.6	8.1

	Closed Area II	Closed Area 1	NLS	outside
Landings per actual DAS-used (pounds)	1,356	1,746	1,523	1,239
Revenues per actual DAS-used (with no trade-off)	6,855	9,808	8,462	5,888
Net revenues (with no trade-off)	5,979	8,932	7,587	5,012
Average Gross revenue per accumulated DAS (dollars)	5,056	5,617	5,557	5,888
Average Net revenue per accumulated DAS (dollars)	4,410	5,115	4,982	5,012

Gross and net revenues are estimated using the depletion model results, the DAS-trade offs, number of trips and ex-vessel prices, and trip costs for each area. Net revenues per day-at-sea show gross revenue minus trip expenses. The results are summarized as follows:

- The gross and net revenues per actual DAS-used in the closed areas will exceed the revenues per day-at-sea that can be derived from the open areas. This result is due to the following two factors:
  - The price per pound for the scallops landed in the closed areas will be higher than the price per-pound due to larger size of scallop in those areas
  - The scallop landings per day-at-sea will be higher in the closed areas due to higher abundance of scallops in those areas compared to the open areas.
- The average revenues per accumulated DAS from Closed Area 1, 2 and the Nantucket Lightship Area will be lower, however, than the levels in the open area when total fleet effort reaches average estimated levels in each area. This is because, the landings per accumulated in the open areas will be 1,000 pounds at the given trip limit and DAS trade-offs, but estimated to be about 1,200 pounds/DAS in the open areas.
- The net revenue per DAS (gross revenue minus trip expenses per day-at-sea) will be higher in Closed Area I, however, than in the open areas.
- Therefore, it may be less economical for vessels to fish in the closed areas compared to fishing in open areas after an average fishing effort is spent in these areas. This may cause some vessels to shift their effort from the closed to the open areas after these levels are reached. The dynamics of the effort shifts between various areas could not be estimated, however. Effort shift to the open areas by many vessels may reduce the landings per days-at-sea from these areas at a faster rate than in the closed areas, again making more economical for vessels to fish in the closed areas. In other words, the gross and net revenues per day-sea at the average levels of effort do not provide sufficient information to predict the overall fishing activity in those areas. Additionally, as pointed out by some scallop fishermen, landing a similar amount of scallops in fewer days in the closed areas compared to the open areas may provide sufficient incentives for many vessels to continue fishing in the closed areas.
- For these reasons, the revenues and expenses per vessel, total fleet revenues, producer and consumer surpluses and net benefits are estimated if the majority of the full-time boats will shift their effort from open areas to the closed areas. In other words, the results are based on the assumption that the vessels will take three trips to Closed Area II, two trips to Closed Area I and one trip to the Nantucket Lightship Area, and consequently they will not be valid, if vessels find it more profitable to fish in the open than in the closed areas.

#### 6.2.6.4.1.2 *Producer and Consumer Surpluses and Economic Benefits*

Table 36 shows the economic impacts of the trip limit – area access options in terms of fleet revenues, costs, and net national benefits. Again, it was assumed that the vessels will also take three trips Closed Area II, two trips to Closed Area 1 and one trip to the Nantucket Lightship Area at the given trip limits and DAS trade-offs.

Table 36. Economic benefits.

	Proposed Action (access to the closed areas)	Status quo (no access to closed areas)	Change from status quo levels	Percent change from status quo levels
DAS per vessel	120	120		
Average Meat count	23.17	27.05		
Total fleet DAS-used	26,431	26,994		-2%
Total accumulated fleet DAS	31,267	26,994	4,273	16%
Landings per accumulated DAS	1,120	1,029		
Landings (million pounds)	35.3	27.8	7.44	26.7%
Ex-vessel Price (\$/pound) (average of all areas)	5.01	5.45	(0.44)	-8.0%
Operational costs (\$ million)	30	31	(0.64)	-2.1%
Total Revenue (\$ million)	177	152	25.08	16.5%
Consumer Surplus (\$ million)	58	36	21.99	60.6%
Producer Surplus-opportunity .cost of labor (\$ million)	127	101	26.14	25.9%
<b>Net Benefits (\$ million)</b>	<b>185</b>	<b>137</b>	<b>48.13</b>	<b>35.1%</b>
Employment (Crew*DAS)	185,017	188,958	(3,941.25)	-2.1%

Table 36 also shows the impacts in terms of changes from no access scenario. These impacts relative to the no access option can be summarized as follows:

- The ex-vessel prices are estimated to be lower, about \$5.01 per pound with access to the closed areas. Without access, the price will be higher, \$5.45 per pound. This is because of the increase in landings from 27.8 million pounds to about \$35.3 million pounds with access to the closed areas.
- The total fleet revenues will increase about \$25 million with access to the closed areas.
- The proposed access will have positive impacts on the consumer benefits. Consumer surplus will increase by about \$22 million.
- The producer surplus is measures as the difference of total revenues minus operating cost. The area access options will increase producer surplus by \$26 million compared to the status quo no access.
- The net national benefits will increase by \$48 million with the proposed access.
- The employment as measured by crew\*days-at-sea will decline as a result of access to the closed areas by 2% because of the reduction in actual days-at-sea used for fishing.
- These results will be not valid, however, if vessels do not choose to fish in the Closed Area I, II or the Nantucket Lightship Area, but continue fishing in the open areas to obtain higher revenues per day-at-sea. This would impose further costs in the long-run, as the scallops in the open areas continue to be overfished.

#### 6.2.6.4.1.3 Impacts on Vessels and Crew Shares

The 1999 Scallop Fishery SAFE report (NEFMC 1999b) includes extensive information on the vessels participating in the scallop fishery. Section 3.0 of the report provides information on the landings, revenues of the vessels by species, by gear sector, by major port, and state. A discussion of the day-at-sea utilization was provided in Section 3.2.3 and the processing and the marketing sectors in Section 3.2.5 of the SAFE report. Social factors were also summarized in Section 3.3 of the SAFE report.

The impacts of the areas access options on vessel revenues, profits and break-even DAS points are shown in Table 37 and summarized below:

- The total revenue per full-time active vessel will stay about the same with access to closed areas compared to no access despite an increase in landings from fishing in the closed areas. Lower ex-vessel prices under the area access option offset the increase in landings, keeping the revenues at a nearly constant level.
- The actual DAS-used by a full-time vessel will decline from 120 DAS (status quo) to 101 DAS (proposed access) since it will take less effort and days-at-sea to land the same amount of scallops in the closed versus the open areas. As a result, the estimated operational costs per vessel will decline, from \$137,379 to \$115,360.
- A full-time average vessel will be able to break-even at 79 day-at-sea with the proposed access and its profits will increase from \$77,667 (status quo) to \$82,805 (access), or by 5.9% because of the decline in its operational costs.
- The break-even-even figures are estimated for a vessel with a HP and GRT equal to the fleet average. Thus, some vessels in the scallop fleet will need more days-at-sea, and some will need less than the amount shown in Table 33 to break-even from scallop fishing alone.
- Including the monkfish revenues improves the break-even points, although not significantly, as shown in Table 46.
- Access to the closed areas will also increase crew shares by 5.8 percent if the same lay system (60 percent of gross revenues minus trip costs) is applied.
- The estimates would change if the landings per DAS, import prices, and a variety of other factors that affect operational (such as the cost of fuel) and fixed costs change.
- Therefore, the estimates should be used only to compare the alternatives with each other.
- The results presented in Table 46 will be not valid, if vessels do not choose to fish in the closed areas, but concentrated their efforts in the open areas.

Table 37. Vessel revenues, profits and break-even day-at-sea.

	<b>Proposed Action (access to the closed areas)</b>	<b>Status quo (no access to closed areas)</b>	<b>Change from Status Quo (%)</b>
<b>DAS allocation per full-time vessel</b>	120	120	
<b>Actual DAS-used per vessel</b>	101	120	
<b>Landings per accumulated (allocated) DAS</b>	1,120	1,029	
<b>Landings per average full-time vessel (Pounds of scallops)</b>	134,344	123,478	
<b>Ex-vessel price</b>	5.01	5.45	
<b>Revenue per vessel</b>	672,868	672,954	-0.01
<b>Operational costs per Vessel</b>	115,360	137,379	-16.03
<b>Trip Costs per vessel</b>	88,259	105,105	-16.54
<b>Crew Shares</b>	315,461	298,668	5.80
<b>Fixed Cost</b>	159,241	159,241	0.00
<b>Profits</b>	82,805	77,667	5.92
<b>Break-even DAS</b>	79	81	-1.90
<b>Monkfish revenues per DAS</b>	249	249	
<b>Break-even DAS including monkfish revenues</b>	72	72	