New England Fishery Management Council
5 Broadway, Saugus, MA 01906-1036
Tel (781) 231-0422 • Fax (617) 565-8937

FRAMEWORK ADJUSTMENT 11

to the

ATLANTIC SEA SCALLOP FISHERY MANAGEMENT PLAN

and

FRAMEWORK ADJUSTMENT 29

to the

NORTHEAST MULTISPECIES FISHERY MANAGEMENT PLAN

To re-open portions of the Groundfish Closed Areas
for scallop fishing

Prepared in consultation with the National Marine Fisheries Service and the Mid-Atlantic Fishery Management Council

Initial framework meeting: February 25, 1999
Final framework meeting: April 14, 1999
Submitted by NEFMC:

1.0 Table of Contents

1.1 List of Tables

1.2 List of Figures

2.0 INTRODUCTION

2.1 Background

2.1.1 Summary of Existing Closures

During December 1994, three large areas of Georges Bank (Figure 1) were closed via Emergency Action to all gear capable of catching groundfish. The Council requested this action by the Secretary of Commerce to protect the depleted groundfish stocks on Georges Bank. The Council followed this temporary action up with a permanent change to the Northeast Multispecies FMP via Framework Adjustment 9.

The basis for excluding scallop vessels from the groundfish closures was that they were "known to catch significant amounts of yellowtail flounder", and were "reported to have the ability to catch other groundfish when concentrated as for spawning, and that the dredge disturbs the bottom and disrupts the spawning activity." The Environmental Assessment for the Emergency Action estimated that the foregone scallop revenue was $21.9 million for 725 scallop trips in the closed areas (Table 1). This economic impact was thought to overestimate the true impacts because of the "possibility that many scallop vessels may have recently redirected their efforts to areas in southern New England and the Mid-Atlantic region due to the severe condition of the scallop resource in the Georges Bank area."

Table 1. Foregone pounds and value for scallop vessels fishing in the groundfish closed areas. Source: Environmental Assessment for an Emergency Action to implement protective measures in the Northeast Multispecies Fishery prepared by NMFS-Gloucester; March 6, 1995.

Area	Foregone Landings (million lbs.)	Foregone Revenue (million dollars)	Trips affected
Closed Area I	1.1	4.5	126
Closed Area II	2.7	11.7	377
Nantucket Lightship Area	1.4	5.8	222
Total	5.2	21.9	725

NMFS closed two areas in the Mid-Atlantic via Emergency Action in response to a Council request to protect newly recruited scallops (Figure 2). This action was also taken because of the depleted resource conditions in the Mid-Atlantic and as a way to protect some areas where small scallops were abundant. The Council included this temporary closure in Amendment 7 to the Atlantic Sea Scallop FMP and it will last until March 1, 2000.

2.1.2 Meetings and Opportunity for Public Comment

Prior to and during the development of Framework Adjustment 11/29, the Council held the following meetings. Efforts to gain access for scallop vessels in the groundfish closed areas actually began over a year before the initiation of the framework adjustment on January 25, 1999. The meetings where access to the groundfish closed areas was a primary and specific agenda item are listed for completeness. Following the formal framework initiation by the Council in January, numerous Council committee, plan development team (PDT), advisory, and scientific meetings were held to discuss issues and concerns, to develop recommendations, and to specify management alternatives. These meetings are summarized in the following table.

Prior to initiation of the framework adjustment	
Date	**Meeting**
October 17, 1997	Scallop and Groundfish Plan Development Teams
June 17, 1998	Scallop Advisors
July 28-29, 1998	Scallop Oversight Committee
January 8, 1999	Scallop Plan Development Team
January 25-26, 1999	Scallop Plan Development Team
After initiation of the framework adjustment by the Council	
Date in 1999	**Meeting**
January 27-28	**Council initiates Framework Adjustment 11/29**
February 4	Habitat Oversight Committee and Advisors
February 8	Scallop Advisory Committee
February 9	Scallop Oversight Committee
February 11	Scallop Plan Development Team
February 11	Multispecies Oversight Committee
February 12	Gear Conflict Oversight Committee
February 23	Scientific and Statistical Committee
February 24-25	**Initial Framework Meeting – New London, CT**
March 9	Habitat Oversight Committee and Advisors
March 16	Multispecies Plan Development Team
March 17-19	Scallop Plan Development Team
March 22	Multispecies Oversight Committee and Advisors
March 29	Enforcement Oversight Committee
April 2	Multispecies Plan Development Team
April 5	Habitat Oversight Committee and Advisors
April 8-9	Scallop Oversight Committee
April 14-15	**Final Framework Meeting – Providence, RI**

Consistent with the Council's framework adjustment procedures in the Atlantic Sea Scallop and the Northeast Multispecies FMPs, two formal framework meetings were also held. Both were held at a regularly scheduled Council meeting, the initial meeting on February 24, 1999 in New London, CT and the final meeting on April 14-15, 1999 in Providence, RI. Notices and agendas for both meetings, as well as all committee meetings, were published in the Federal Register and distributed to the Council's extensive interested party mailing list.

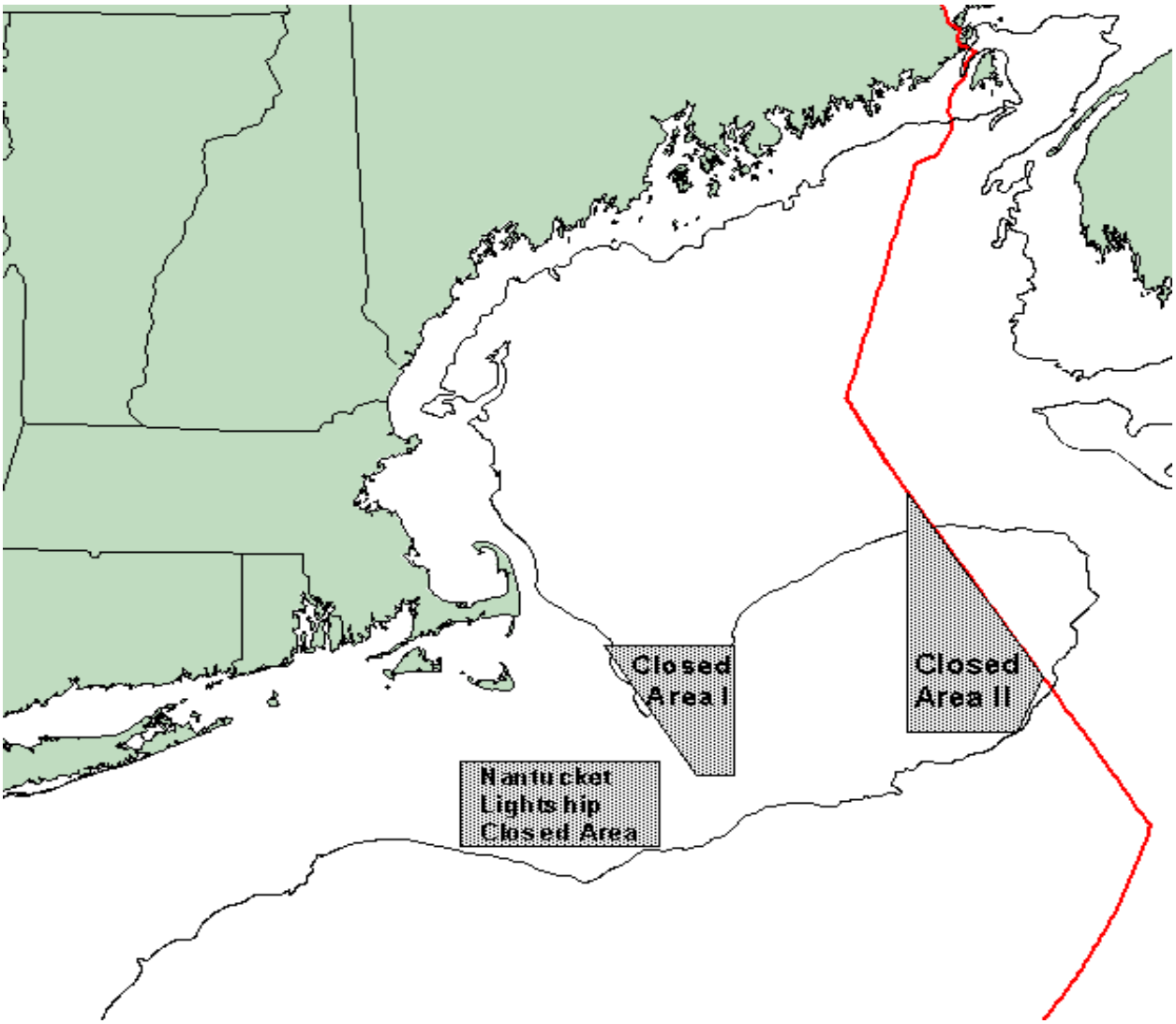


Figure 1. Location of groundfish closed areas closed to scallop vessels during December 1994.

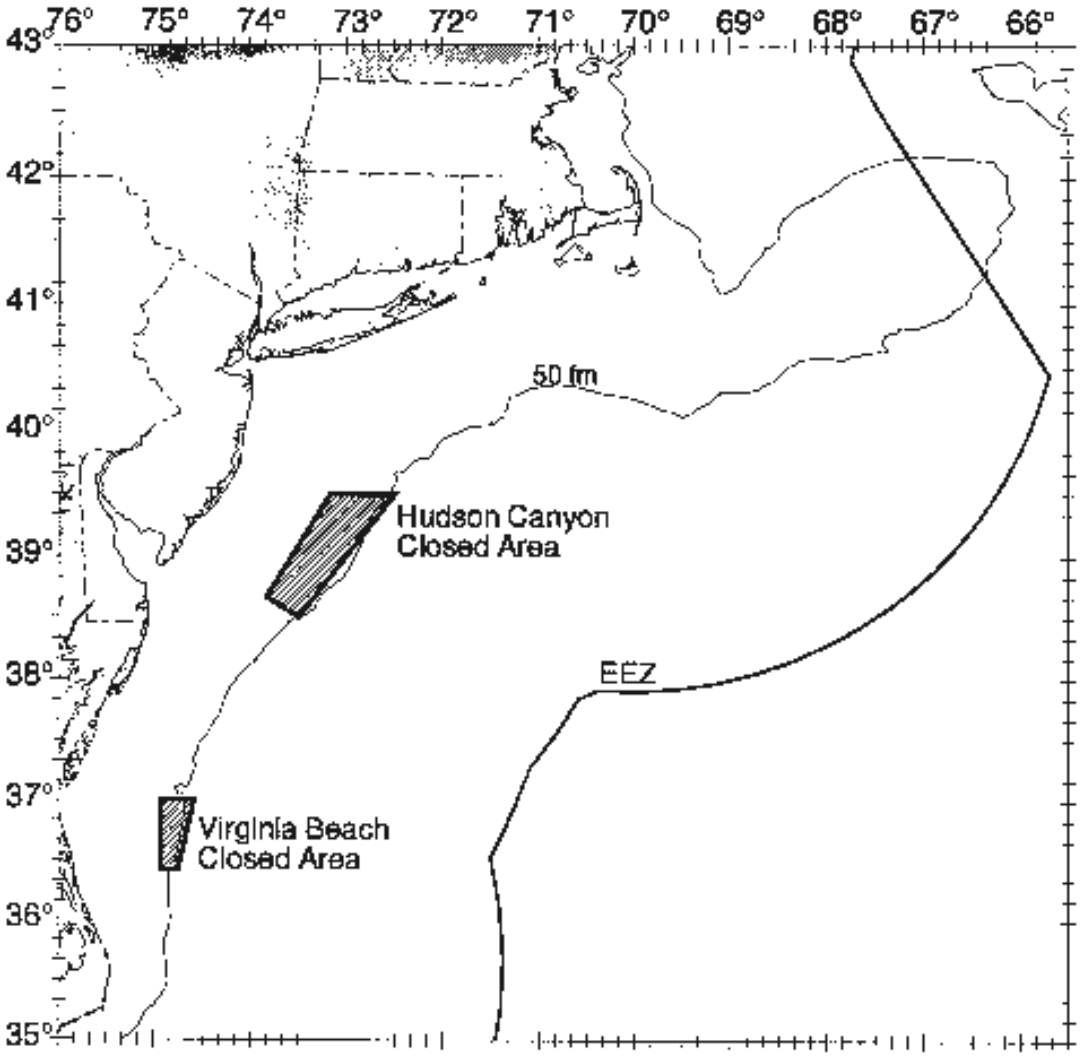


Figure 2. Location of scallop closed areas in the Mid-Atlantic closed during 1998 by emergency action.

3.0 PURPOSE AND NEED

The intent of this action is to allow the scallop fishery to benefit from the significant buildup of stock biomass that has occurred since the groundfish closed areas became off limits to scallop vessels. Between 1994 and 1998, scallop biomass in the three closed areas increased by 15-20 times. The biomass in Closed Area II increased by 8.5 times (Figure 3). The scallop biomass is expected to increase another 23 percent by August 1999, based on the size of scallops, growth, and natural mortality. This action is also intended to reduce fishing effort in other scallop areas where the stock is dominated by small scallops. Considerable fishing effort that now occurs in the open areas will shift to the re-opened closed areas, where scallop size is much larger. The net effect will be to reduce the number of scallops caught by the fishery and therefore reduce fishing mortality.

A previous shift (related more to stock conditions than changing regulations) in scallop fishing effort to the Mid-Atlantic and large catches of yellowtail flounder that threaten rebuilding, reasons for the Council and the Secretary of Commerce to exclude scallop vessels from the Georges Bank closed areas, are less apropos to the present conditions. The scallop resource in the Mid-Atlantic is no longer attracting scallop fishing effort from Georges Bank. At that time, scallop biomass on Georges Bank was low and scallop biomass in the Mid-Atlantic was high due to strong recruitment in 1994. The strong Mid-Atlantic year class in 1994 is now gone (removed by high fishing effort) and biomass on Georges Bank has recovered to historically record levels. As a result, failure to access the groundfish closed areas will significantly increase costs to scallop vessels fishing where scallop biomass is low and waste the opportunity to catch scallops where biomass is high. Fishermen are again reporting many small scallops in the Mid-Atlantic which are also at risk of heavy fishing pressure, unless some of the fishing effort can be transferred to areas of large scallops.

Similarly, the groundfish stocks on Georges Bank are recovering. Fishing mortality for yellowtail flounder, the primary groundfish stock most vulnerable to scallop dredges, is well below the target set by Amendment 7 to the Multispecies FMP. According to the projections in the SAW 28 report, the catch of yellowtail flounder associated with status quo fishing mortality is 4,000 mt less than the catch associated with the Amendment 7 fishing mortality target. Yellowtail flounder are moreover projected to rebuild to B_{MSY} by 2000, even at the target fishing mortality rate.

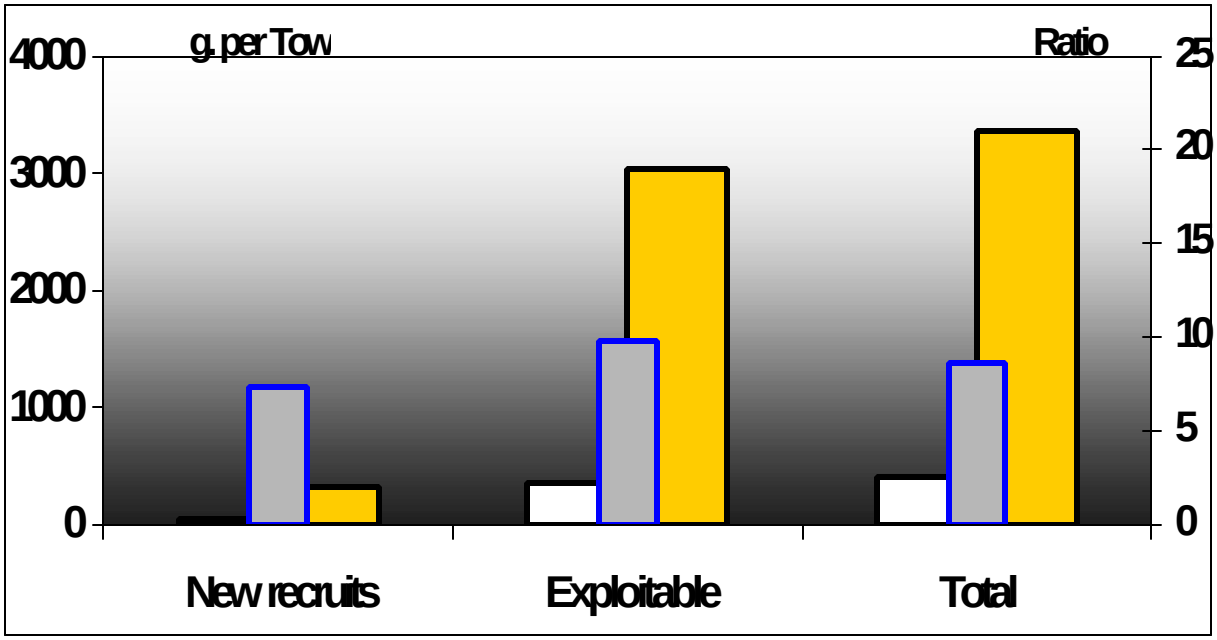


Figure 3. Change in biomass of recruits and exploitable scallops for Closed Area II from 1994 (left bar) and 1998 (right bar). The hatched bar indicates the ratio of the biomass in 1998 to the biomass in 1994. Recruitment increased about six times compared with 1994 while the biomass of exploitable scallops increased by 8.5 times.

4.0 ISSUES OF CONCERN

4.1 Sustainability

The goal the Council adopted in Amendment 7 to the Atlantic Sea Scallop FMP is to rebuild the resource to levels capable of producing maximum sustainable yield (MSY) and then fish the stock at a level that will produce MSY from that point forward. Scallop biomass in the groundfish closed areas (Closed Area I, Closed Area II, and the Nantucket Lightship Area) has increased to 7.9 kg/tow, very close to the biomass target for the Georges Bank stock of 8.2 kg/tow (Figure 4). In addition, there are four distinct year classes, ages 2 to 5, which are abundant due to the low fishing mortality since the closure. In contrast, the high scallop mortality in the open areas significantly reduces the abundance of 4-year-old scallops and 5-year-old scallops are nearly absent (Figure 5).

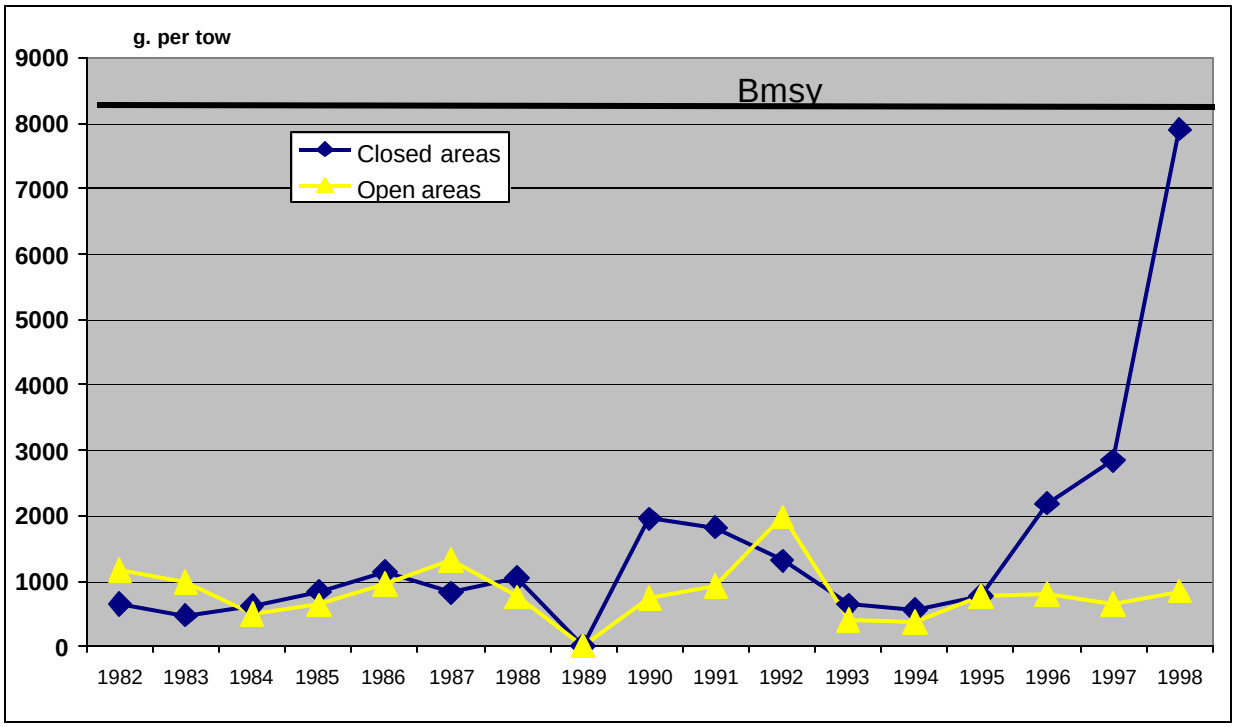


Figure 4. Mean meat weight per tow from the NMFS scallop survey (1982 to 1998), stratified into closed and open areas of Georges Bank.

Since the stock biomass in the closed areas is near MSY conditions, the Council's goal for the closed areas is to harvest scallops at a rate that will produce MSY, consistent with the overall goal for the total resource. Since growth and natural mortality for scallops in the closed areas appear to be similar to the estimates for the entire resource, the scallops should be fished at a level that will not exceed the overfishing threshold, F_{max}. The Overfishing Definition Review Panel as a proxy for F_{MSY} recommended this reference point. The exploitation pattern for the fishery where large scallops occur is unknown, so the value of F_{max} for the Georges Bank stock is appropriate. This value is 0.24, or about a 20 percent exploitation rate. If the fishery in the re-opened closed areas is able to avoid catching three-year old scallops (by changes in culling practices or through selective area closures), the value of F_{max} could increase.

Although the exploitation rate within portions of the three closed areas may by locally higher than F_{max}, scallops in the closed areas are considered to be one stock and therefore the exploitation rate on the stock will not exceed 20 percent. If only portions of the closed areas are re-opened by this action are available and the fishing mortality reaches F_{max}, it implies that more areas would have to re-open in future years to maintain a maximum sustainable yield from the closed areas.

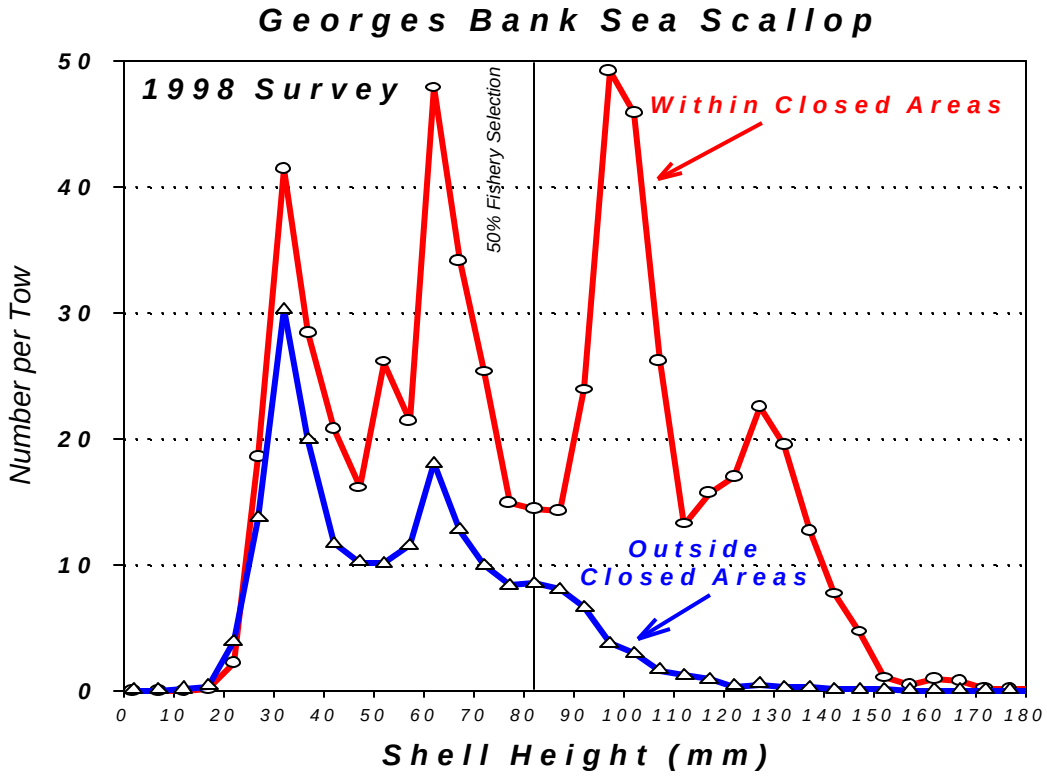


Figure 5. Size frequency of shell heights of scallops captured by the NMFS scallop survey in 1998, comparing the size distribution within the open areas to the size distribution in the three groundfish closed areas.

4.2 Conservation neutrality

The target fishing mortality rate for 1999 is 0.83. Conservation neutrality means that fishing mortality for the scallop resource should not rise above the annual mortality target set by Amendment 7. Also implied in the day-at-sea management system is that a day-at-sea is equivalent to some unit of fishing mortality. Since this action contemplates the fishery will catch larger scallops (Figure 6), it is anticipated that landings would increase but the number of scallops caught would remain the same or possibly decline.

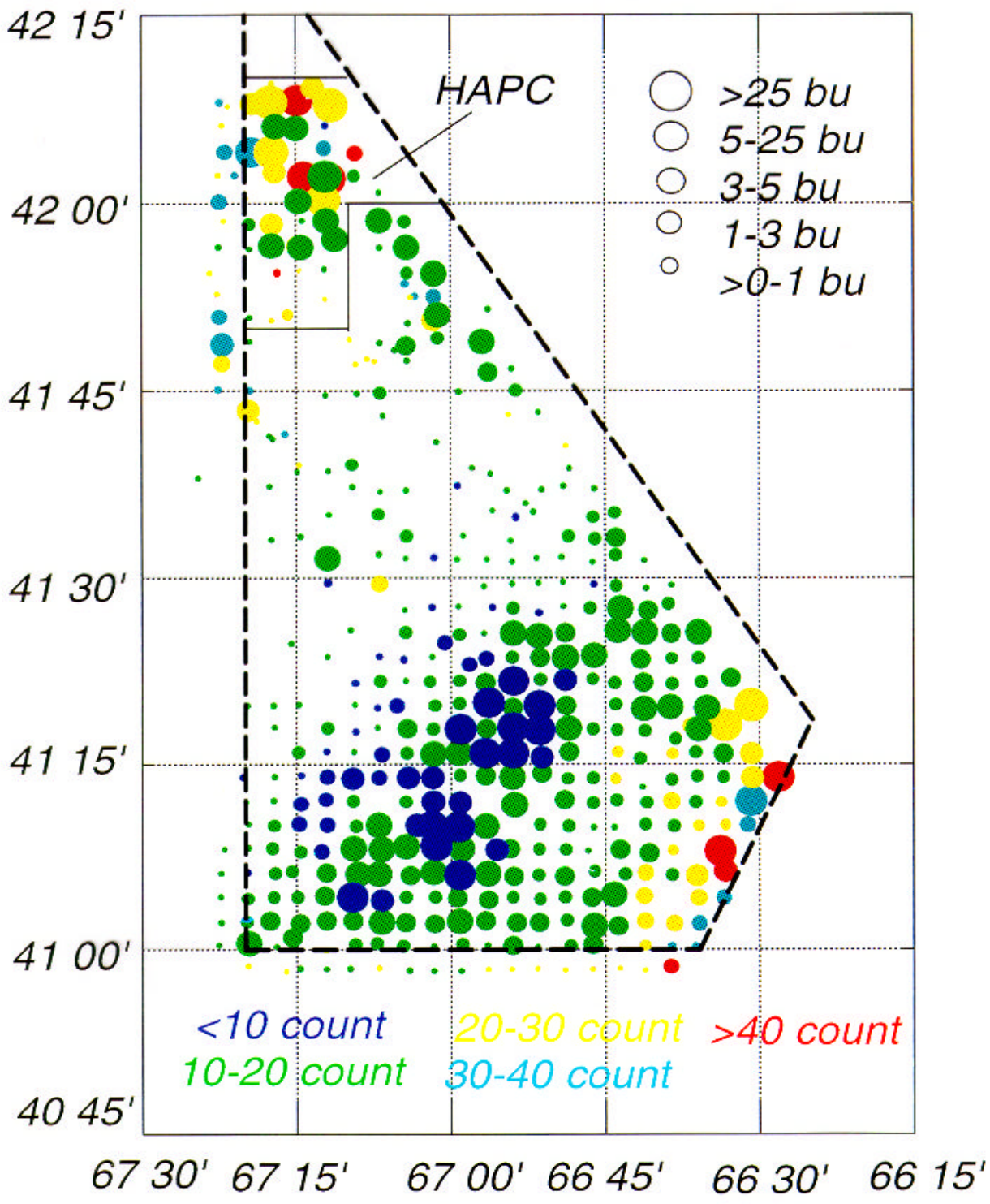


Figure 6. Distribution and volume of scallops of various meat counts captured by commercial vessels during the CMAST experimental fishery in August to October 1998.

Production limits on board the vessel (i.e. shucking capacity) is expected to cut the actual time that fishing gear is on the bottom, compared with the fishing activity in the currently open areas where

dredges usually catch fewer scallops than can be processed by the vessel and crew. This decreased fishing time is expected to reduce fishing mortality on the entire stock (inside and outside the closed areas), but the dense beds of scallops within the closed areas could increase dredge efficiency. The increase efficiency could translate into higher total fishing mortality on the stock if the total number of days actually used to fish remains the same. To counteract this potential change in efficiency, the framework adjustment includes a provision to accumulate more days-at-sea than those actually used when efficiency is high and the vessel reaches the trip limit in a short period of time.

4.3 Stock rebuilding

The annual fishing mortality targets were set by Amendment 7 to rebuild the biomass to the FMP targets by 2008. As long as fishing mortality remains below the annual targets, the action should not jeopardize the Amendment 7 rebuilding program, especially if the fishery reduces its catch of small, fast growing scallops to target large, slow-growing scallops. The higher productivity of young scallops (at least in terms of growth) would promote rebuilding faster than if the closed areas did not re-open.

4.4 Groundfish bycatch and bycatch of other species

Many of the stocks of groundfish on Georges Bank are overfished and are being rebuilt by the actions taken under the Multispecies FMP. Although some rebuilding has occurred, most stocks have not yet approached B_{MSY}. Projections indicate that cod and haddock, two primary stocks managed by the Multispecies FMP, are well below the B_{MSY} targets and may decline unless recruitment increases soon. Yellowtail flounder, another primary stock, is projected to exceed B_{MSY} by 2000 if fished at or below target levels. Fortunately, cod and haddock are not very vulnerable to capture by scallop dredges, at least during the season proposed by this action. Allowing access to smaller portions of the groundfish closed areas could help to limit bycatch of finfish.

Other species of concern include winter flounder, summer flounder, and monkfish. Since the distribution of these stocks occurs largely outside the closed areas, the net impact of the shift in scallop fishing effort is uncertain. Another management measure that would help minimize the impacts is to increase the twine top mesh to allow more small fish to escape. Preliminary studies show that larger twine top diamond mesh significantly reduces the catch of flounders.

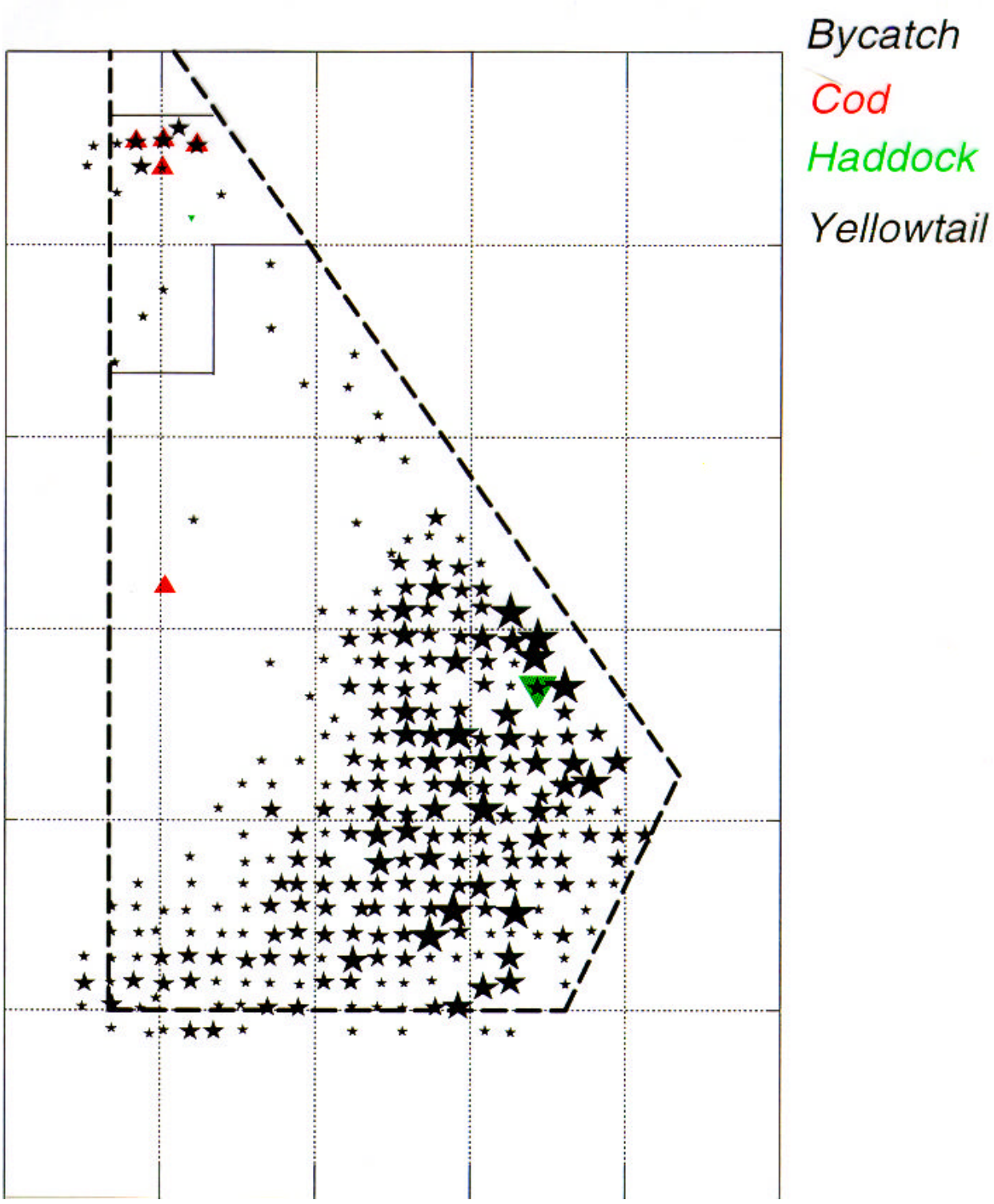


Figure 7. Distribution of cod, haddock, and yellowtail flounder catches in the CMAST experimental scallop fishery during August to October 1998. The dashed lines show the outline of Closed Area II. The maximum number of fish per tow were cod – 2; haddock – 16; and yellowtail flounder – 253. The size of the markers is proportional to the number of fish observed in a standard 10-minute tow.

4.5 Habitat impacts

The following issues were identified by the Essential Fish Habitat Technical Team to assist with evaluating methods to allow access to the closed areas for scallop fishing. The primary issues are framed in general terms, as questions in order to identify the information needed to evaluate and assess the likely habitat impacts associated with scallop fishing. While it is not expected that all the questions can be answered during the development of the Framework 11, identification of these issues now may help in the development of a data and information gathering process. Data gathered now and during implementation of the framework adjustment will be of much assistance during the development of a later scallop area management amendment.

1. What habitat types within the current closed areas would be subject to opening?

- 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. 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.). 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. Prey abundance may also be increased in areas of higher complexity and functional value.

- There are different impacts associated with different bottom types and the bottom types differ among the closed areas. The habitat impacts would be different if the scallop 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 dredging activity differs considerably. For example, a recent meta-analysis of gear impact research found that the number of individuals in gravel areas was reduced by 48% following disturbance by bottom-tending mobile fishing gear, while the number of individuals in sand areas was only reduced by 5%. 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%.

- The rates of habitat recovery from the disturbances associated with scallop fishing are another very 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. 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 will only recover in the absence of disturbance. One of the problems is that we really do not know the recovery rates of many types of habitats. Current studies in the closed areas are making progress to this end, but we need to continue this work in order to quantify the recovery rates of many types of habitats.

2. What proportion of the current closed areas would be subject to opening?

- The frequency and intensity of gear use is one of the most significant factors in determining the magnitude of adverse impact. Per unit of effort, the frequency and intensity of scallop fishing will be higher if less area is available than if more area is available, as the allowed effort will be concentrated in smaller areas. If more area is open, however, more habitat will be subject to the adverse impacts associated with scallop fishing, so one could not presume that opening more area somehow minimizes the adverse impacts associated with scallop fishing.

3. How much effort would be allowed in the current closed areas?

- The effort that would be allowed in the closed areas could be controlled since both the number of vessels and the number of days-at-sea are currently regulated. The number of vessels and the days-at-sea they could use in the closed areas is an important concern in assessing the likely impacts associated with scallop vessel access to the closed areas. Fewer vessels fishing fewer days-at-sea will have less of an impact in the closed areas than more vessels fishing more days-at-sea.

- If some other mechanism is used to manage scallop access to the closed areas (e.g., trip limits, vessel quotas, TACs), some method must be develop to estimate the fishing effort that would be associated with this system. You can not analyze the likely habitat impacts of removing some amount of scallops without knowing the effort required to harvest that amount.

4. How does the amount of effort to be allowed in the closed area relate to dredge time on the bottom?

- It is presumed that, on average, a days-at-sea can be equated to a certain number of tows of a certain length. The average length and number of tows per days-at-sea is an important consideration in evaluating the likely impacts associated with scallop vessel access to the closed areas. If, for instance, each of some number of scallop vessels granted access is allowed five days-at-sea in the current closed areas, and each days-at-sea can be equated to three tows of approximately one kilometer in length, this would be expected to contribute less adverse impact to the habitat of the closed areas than if each days-at-sea was equivalent to ten tows of approximately two kilometers in length.

- It is also important to remember, however, that the number of tows and the length of the tows will increase as more scallops are harvested.

5. What is the tradeoff (balance of effort) for access to the current closed areas?

- It is presumed that in order to gain access to the current closed areas for some number of days-at-sea, current scallop permit holders will have to give up some number of days-at-sea used outside of the current closed area. While this ratio will have no effect on the adverse impacts on the habitat within the closed areas, it could have an effect on the net adverse impacts on the habitat of the region, if it reduces the overall effort in the region. For instance, if there is a one-for-one tradeoff for days-at-sea in the closed areas compared to days-at-sea outside of the closed areas (i.e., a scallop vessel gets five days-at-sea in the closed areas and only loses five days-at-sea outside of the closed areas), then it is very unlikely that there would be any net benefit to the habitat of the region since there would not necessarily be any reduction of effort. If, on the other hand, a multiple of days-at-sea in the closed areas is used as a tradeoff (i.e., for every one of five days-at-sea within the closed areas, a scallop vessel gives up four or five days-at-sea outside the closed areas), then there may be a net benefit to the habitat of the region by reducing the overall effort of the scallop fleet.

- This is, however, a very difficult question to answer. Not only do we need to know the direct tradeoff, but we need to know the relationship between a days-at-sea outside of the closed area and dredge time on the bottom. In other words, if a days-at-sea within the closed areas equates to an average of three tows of approximately one kilometer of length, and a days-at-sea outside of the closed areas equates, on average, to ten tows of approximately three kilometers of length, and each days-at-sea used within the closed areas costs a scallop vessel four or five days-at-sea outside of the closed area, then we can begin to calculate an overall reduction of dredge time associated with access to the current closed areas. If this reduction of dredge time is significant, there may be a net benefit to the habitat of the region associated with the scallop management plan proposed.

- There is another component to this issue, however, involving the location and habitat type from where the effort shifting into the closed areas is coming. The above calculations tell us how much less effort would be used outside of the closed areas, but we also need to know where these effort reductions will occur. We then need to assess the relative value of the habitat that is likely to see a reduction in effort and compare that to the relative value of the habitat (within the closed areas) that will see an increase in effort. These habitats would need to be compared to determine if there would be any net benefit to the habitat of the region associated with the proposed scallop management measures. A decrease in effort in a large area may not offset an increase in effort in a small area if the functional value is not equal. At the same time, however, a reduction in effort in valuable areas of hard-bottom habitat may more than offset an increase in effort in areas of relatively sandy or soft-bottom habitat.

- It is important to remember that areas that may 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 scallop fishing) would 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 areas such as the Great South Channel, we would not be eliminating fishing effort in these areas.

6. What is the relative value of the habitat that is likely to face an increase of fishing pressure, compared to the habitat that is likely to see a decrease in fishing pressure?

- The relative "value" of habitats can be considered in a couple of different ways. Structurally, habitats of higher complexity are thought to be of higher relative value than habitats of lower complexity. Thus, areas with primarily gravel or boulder substrate would be considered to be of higher relative value than areas with primarily sand substrate. Another way to consider habitat value is to look at the number of species for which a given area has been designated as EFH. Some areas may be considered EFH for multiple species, while other areas may be considered EFH for only one, or no, species. Areas considered EFH for multiple species could be considered to be of higher relative value than areas considered EFH for fewer species. The relative value of these areas must be considered in determining the overall impacts associated with allowing scallop vessels access to the current closed areas. Any benefits to some habitats from a reduction in fishing effort may be offset by increases in fishing effort on habitats of relatively higher value.

7. What are the other components, if any, of the proposed scallop management plan that allows access to the current closed areas?

- If the proposed plan includes a system of rotational management or proposes to close other areas to scallop fishing, this system would have to be analyzed to determine the likely benefits or costs to the habitat of the region and specifically the habitat of the current closed areas compared to the habitat of the proposed closed areas. It may prove to be advantageous to protect some areas of high scallop

abundance to serve as "seed" or "spawning" areas. Scallops are thought to be able to live up to 20 years, with increasing fertility as they age. Protecting some areas of high abundance, and therefore the habitat that supports these scallops, may promote higher levels of reproduction and recruitment.

- If, for instance, this proposal includes using a system of rotating temporary open areas surrounding a permanently closed area, we would examine the habitat of the areas proposed to be temporarily open compared to the area proposed to be permanently closed. The length of time that any one area would be considered open, compared to the length of time that it would be closed is also an important consideration in understanding the likely impacts to habitat from such a plan.

- If the proposal does not recommend any rotational area management system, but does recommend some areas be closed in return for access to the current closed areas, the relative value, amount, and status of the newly proposed closed areas must be determined for comparison with the habitat of the areas that will be opened.

- It is also important to remember that any new areas that might be proposed to be closed to scallop dragging would still face pressure from other forms of fishing, including other bottom-tending mobile fishing gears (e.g., otter trawls). So, in effect, an area that is currently closed to all forms of bottom-tending mobile fishing gear would be opened in return for closing some area(s) to only one type of bottom-tending mobile fishing gear. The habitat recovery observed in the current closed areas could not be expected to occur in new scallop management areas without a concomitant restriction of other fishing gears in the area.

8. What gear will be allowed in the current closed areas?

- Certain gear types may have less adverse impact on habitat than other gear types. For instance, a scallop dredge utilizing a light construction may have less of an adverse impact on habitat, per unit of effort, than larger, heavier dredges that are designed to work on hard bottoms. It is important, therefore, to understand what gear types could be allowed in the closed areas. It may be preferable, from the perspective of minimizing the effects of fishing on habitat, to require the use of the light construction, or "tender", dredge inside the closed areas where the abundance of scallops and relatively soft bottom make this type of fishing gear practical.

- The relationship of the gear to the effort required to attain some level of landings is an important consideration in comparing gear types. For instance, dredge time on the bottom could be significantly higher for the light construction dredge than with the traditional dredge. Using the "tender" dredge may not present an overall benefit to the habitat of the area if the effort would be significantly higher to gain the same return. If, however, the effort is comparable across gear types, a light construction dredge may be preferable, as there would be less adverse impact overall associated with this gear type.

4.6 Gear conflict

Since the exclusion of mobile fishing gear from the three groundfish closed areas in 1994, lobster fishermen have taken the opportunity to fish for lobsters where they could not before due to interactions with mobile gear. As a result, there is a greater potential for interactions when vessels using mobile gear, like scallop dredges, are allowed back into the groundfish closed areas. Fortunately, the distribution of

lobsters (and most likely lobster gear) occurs in different areas of Closed Area II (Figure 8) than the most likely areas to be targeted by scallop vessels.

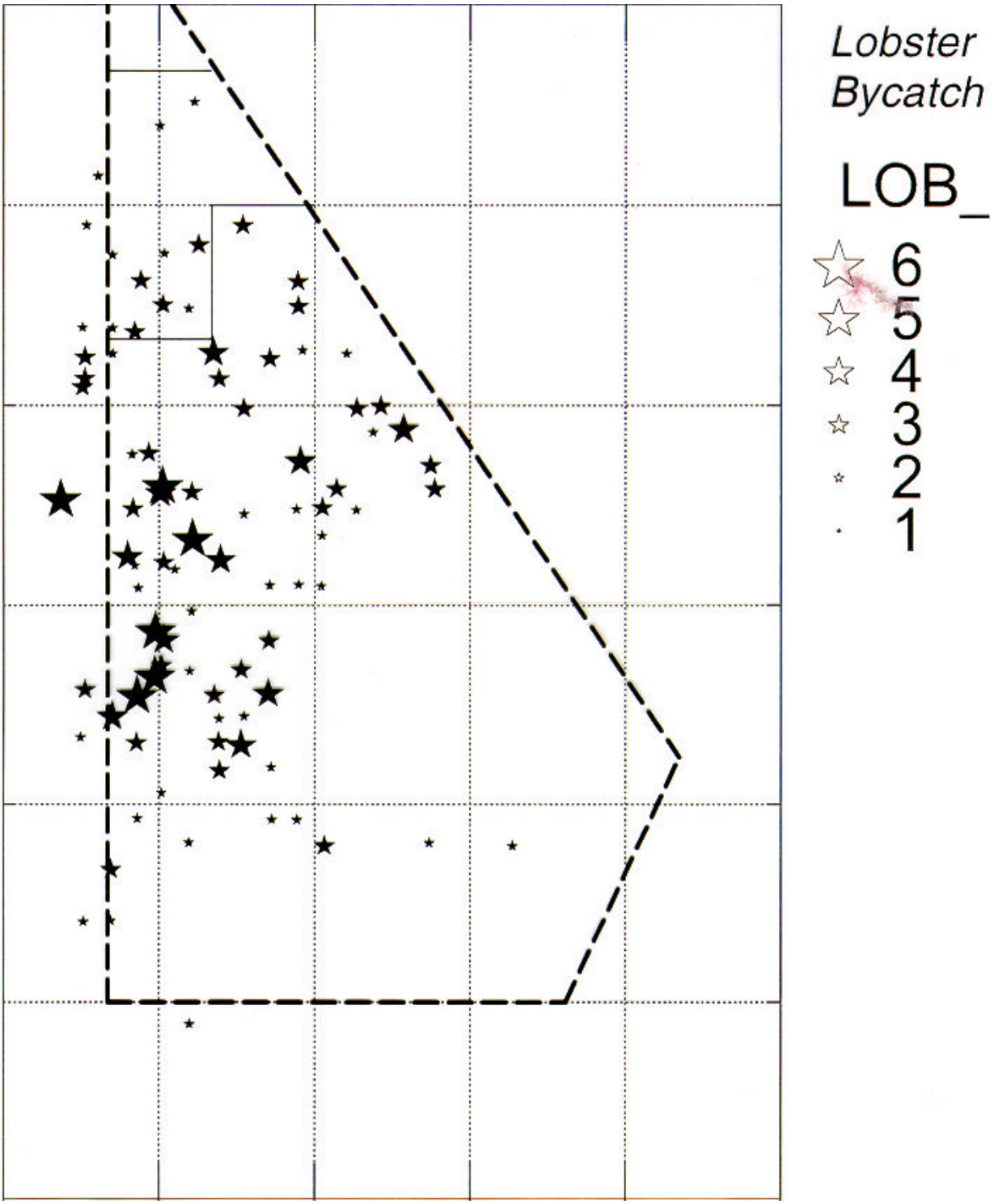


Figure 8. Distribution of lobster catches in the CMAST experimental scallop fishery during August to October 1998. The maximum number of lobsters in a tow was 16.

4.7 Compliance and enforcement

Opening portions of the three groundfish closed areas increases the opportunity to illegally enter the area to target groundfish or to avoid the rules (e.g. trip limits) for scallops to control the catches from the re-opened closed areas. This action, therefore, poses a potential threat to promoting groundfish rebuilding through closed areas and to ensuring that scallops are not over-exploited, depending on the management measures included in the framework adjustment.

Conversely, the Council can limit the potential for non-compliance and increased enforcement costs by a few simple management measures. Requiring all scallop vessels in the closed areas reduces the opportunity for them to make unauthorized trips into the closed areas to target scallops. A demarcation line, well to the west of the closed areas, that defines where the Georges Bank scallop trip limit applies reduces or eliminates the incentive to transfer scallops at sea, thereby avoiding the trip limit. Finally, any vessel in the re-opened closed areas could be subject to a trip limit (currently 300 pounds) that discourages targeting groundfish and is relatively easy to enforce.

5.0 PROPOSED ALTERNATIVES and QUALITATIVE IMPACTS

The Council is proposing to change the regulations governing the Sea Scallop and Multispecies FMPs to allow restricted access for scallop fishing vessels to parts of Closed Area II and the Nantucket Lightship Area (NLSA). First established to implement seasonal closures to protect spawning cod and haddock, these areas were closed year around to groundfish, scallop, and other fishing gear by Emergency Action in December 1994 to promote rapid rebuilding of depleted groundfish stocks. While the groundfish stocks are still recovering, the Council is proposing to allow limited scallop fishing in parts of these areas to take advantage of the high scallop biomass.

The following sections outline the options in two management alternatives that the Council considered. The potential impacts are described, to the extent possible. The measures contained in the alternatives would apply to one or both of the proposed framework actions: Framework 11 to the Atlantic Sea Scallop FMP and Framework 29 to the Multispecies FMP. Section 6.2 describes the expected impacts of the alternatives based on quantitative estimates or qualitative evaluation where quantitative data are absent.

These framework adjustments will allow access to the groundfish closed area(s) during the times specified in this framework action, and will not continue beyond February 29, 2000. The Council's intends to develop an amendment to the Sea Scallop FMP that will include a more structured approach to rotational area management. The Council schedule calls for implementation of the amendment by the beginning of the next fishing year, beginning March 1, 2000. This future plan amendment will replace this proposed framework action with a management system that includes periodic access to closed areas for catching larger scallops and increasing yield. Access to the groundfish closed areas may or may not continue beyond the 1999 fishing year under a future rotational area management system.

This action is intended to provide short-term economic relief to the scallop industry as it faces declining day-at-sea allocations, coupled with a depleted resource. There are few large scallops in the Mid-Atlantic and in the open areas of Georges Bank. Any fishing effort in those areas will therefore concentrate on small scallops that are just recruiting to the fishery, reducing any gains that might occur if these small scallops would be allowed to grow. Access to the groundfish closed areas could reduce fishing effort in the Mid-Atlantic and other portions of Georges Bank, since it would often be less profitable than fishing in the areas with higher catches of scallops.

5.1 Proposed Action

The framework adjustment proposes to temporarily open portions of Closed Area II for a limited scallop fishery. The following sections describe the proposed action and the management measures that would apply to scallop fishing in portions of Closed Area II. Re-opening portions of Nantucket Lightship Area was rejected by the Council for this framework adjustment and the rationale for this decision is described in Section 5.3.

Scallop vessels that are eligible to access the closed area(s) would be able to fish for scallops in portions of Closed Area II. Closed Area II, shown in Figure 1, was originally closed by the December 1994 Emergency Action to protect overfished groundfish stocks, including cod, haddock and yellowtail flounder. This action prevented the scallop fishery from accessing an historically-important scallop

resource area that is open to the Canadian scallop fishery on the portion of Georges Bank within Canadian authority. During 1994, this was not a critical issue because of the low scallop abundance and biomass on Georges Bank. Scallop biomass has increased by 16 times the 1994 level, primarily in this favorable scallop habitat due to the near zero fishing mortality.

The management measures proposed for the closed area scallop fishery are defined by the target scallop TAC (4,300 mt[1]) which determines the number of trips that may be allocated and the scallop possession limit for each trip, taking into account the number of vessels that would be eligible to participate. Since many eligible vessels are unlikely to participate, this is a risk-adverse and adaptive approach. Under participation by eligible vessels could allow a mid-season adjustment to the trip allocation and the scallop possession limit, based on the number of vessels that actually participate. The initial allocations are three trips for full-time and part-time scallop vessels and one trip for occasional scallop vessels. The initial scallop possession limit, to be in effect until at least October 1, 1999, will be 10,000 pounds of scallop meats.

Each trip into the closed area will trigger the accumulation of a minimum of 10 days-at-sea against the vessel's allocation, regardless of trip length. If the trip lasts longer than 10 days, due to distance from port, the actual number of days-at-sea will accumulate. Vessels may not remain in Closed Area II or the scallop demarcation area for longer than 10 consecutive days. If the vessel leaves these areas during a closed area trip, it may not return or continue fishing in other areas. This higher rate of day-at-sea accumulation is a conservation measure to ensure that the program is conservation neutral and achieves the objective of shifting fishing effort from areas with small scallops (in currently open areas) to areas with large scallops (in currently closed areas).

A second target TAC will ensure that the proposed action does not jeopardize the approved rebuilding schedule for yellowtail flounder. The scallop catch and yellowtail flounder bycatch will be closely monitored and the proposed action authorizes the Regional Administrator to suspend the closed area scallop fishery if the target yellowtail flounder TAC will be exceeded.

Other measures are proposed to ensure compliance with the proposed action, promote monitoring of the fishery, and ease the law enforcement burden. A very important part of the proposed action is a scallop TAC set aside to provide funds for the high level of observer coverage required to monitor the fishery and for funding innovative research during the closed area fishery.

The management measures contained in the proposed action are described in Section 5.1 and summarized in the table below.

Table 2. Summary of management measures in the proposed action.

Eligibility	All limited access scallop permits are eligible General category scallop permits are not eligible Net boats must use dredges, but may continue to use nets in other areas	Section 5.1.1
Target TACs	4,400 mt scallop TAC 1% set aside to fund observers; 1% set aside to fund research 387 mt yellowtail flounder TAC	Section 5.1.2
Season	July 1 to December 31 Could start as early as June 15 Could be suspended when the yellowtail flounder bycatch	Section 5.1.2

[1] This does not include the two-percent TAC set aside for funding observers and research.

	TAC is exceeded	
Area restriction	Closed Area II, south of 41°30' North latitude	Section 5.1.3
Scallop Demarcation Area	East of 67°40' West longitude	Section 5.1.4
Gear restrictions	Scallop dredges with 10-inch mesh twine tops in Closed Area II and the scallop demarcation area Scallop dredges must use 8-inch twine tops in all other areas throughout the range	Section 5.1.5
Effort limits	Three trips for full and part-time vessels One trip for occasional vessels Additional allocations of trips possible through a mid-season adjustment Vessels may not remain the Closed Area II or the scallop demarcation area for more than 10 days Each closed area trip accumulates at least 10 days-at-sea	Section 5.1.6
Scallop possession limit	10,000 pounds of scallop meats 50 US bushels of shell stock	Section 5.1.7
Possession limits for bycatch	500 pounds of regulated multispecies Unlimited landings of all bycatch if the closed area trip is observed and the proceeds are donated to charity	Section 5.1.8
Reporting requirements	Vessels must have an operational VMS onboard Vessels may be required to make daily reports of catch and/or effort via email messaging Vessels must make vessel trip reports and may be required to submit supplementary data	Section 5.1.9
Observer coverage	Minimum 25 percent of closed area trips Vessels may be required to pay for observer costs through authorized increases in scallop landings	Section 5.1.10
Industry-funded research	Additional scallop landings to fund authorized research projects	Section 5.1.11
Enforcement provisions	Activation code added to VMS program Vessels may be required to declare its intention to fish on a closed area trip prior to departure Buffer-zone: Vessels may not re-enter Closed Area II or the scallop demarcation area once it has exited the area Vessels may not fish in other areas on a closed area trips Landings must be unloaded at a single location	Section 5.1.12

5.1.1 Eligibility (Framework 11)

All vessels with scallop limited access permit and days-at-sea allocations will be eligible to fish under the program to access the closed areas. This would include vessels that did not fish during 1998 and vessels re-activating history permits. Inactive vessels or history permits are eligible to fish in the re-opened areas to ensure equitable access for all legal scallop vessels.

Permit-holders with "Confirmation of Permit Histories" (CPH) may not fish with two permits on one vessel in any given year. In other words, if a person owns Vessel A and also possesses a CPH for

Vessel B (a vessel no longer owned), the owner of Vessel A may not fish both Vessel A's scallop days-at-sea and Vessel B's scallop day-at-sea history on Vessel A during the same year. This policy is consistent with the rules that prevent owners of multiple vessels from stacking permits onto one vessel and preventing the use of more than one vessel's days-at-sea on a single vessel.

Inactive vessels with limited access scallop permits could be fishing for other species in New England or other regions and would not therefore be using scallop days. History permits, on the other hand, could be transferred to a replacement vessel to fish for scallops. There is no justifiable reason to exclude either of these types of vessels from fishing within the re-opened areas.

There are 313 vessels that have limited access scallop permits and these vessels will be allocated 29, 472 days-at-sea for the 1999 fishing year beginning March 1. In addition, there are 52 confirmation of permit histories that could be reactivated during the year by applying for a replacement vessel permit. For the 10-day trips proposed by this framework adjustment, there would be 3,427 possible trips by eligible vessels.

Table 3. Number of eligible vessels with full-time, part-time, and occasional scallop limited access permits as of February 11, 1999.

Category	Vessel Permits	Confirmation of Permit Histories	Total Eligible Vessels	1999 Day-at-sea allocation	Maximum 10-day trips
Full time	226	32	258	120	12
Part time	39	17	56	48	5
Occasional	48	3	51	10	1
Total	313	52	365	29,472	3,427

5.1.1.1 Net boats may fish in Closed Area II with dredges and continue using trawls in all other areas open to scallop fishing – status quo

The status quo would allow scallop trawl vessels to use dredges within the re-opened closed areas (Section 5.1.5) without jeopardizing their authority to use trawls to fish for scallops in other areas. Vessels that are currently authorized to use trawls to fish for scallops have a permit to use trawls, based on their past fishing history. Section 648.51(f) prohibits the use of trawl nets to fish for scallops, unless a vessel has a letter of authorization. A vessel is eligible for a letter of authorization if:

- it had already been issued a letter of authorization,
- it had not fished with a dredge more than 10 trips between January 1, 1988 and December 31, 1994, inclusive, or
- it replaces a vessel that had a letter of authorization

Although these vessels may not be capable of fishing for scallops with standard dredges, there is no requirement to use only two 15-foot dredges within the closed area, a common practice for scallop dredge vessels. The regulations only limit the combined width of dredges. To fish for scallops in the closed area, net vessel fishermen may decide to fish with a single dredge or with smaller dredges.

Rationale: This provision clarifies the intent of the Council to allow participation by the scallop trawl vessels in the closed area, but only when these vessels use a scallop dredge. Using scallop trawls in the re-opened areas could increase groundfish bycatch concerns (due to larger swept area), since scallop trawl

vessels could, according to the Sea Scallop FMP, legally use less than the 6-inch mesh required by the Multispecies FMP.

This option most clearly avoids any objections that might arise out of National Standard 4 concerns. Consistent with the above section, scallop vessels that use trawls to fish for scallops will be eligible to fish in the re-opened areas, but they could only use a scallop dredge in the re-opened area. If using trawls to fish for scallops in any way jeopardized the vessel's letter of authorization, the vessel might not be able to revert to using trawls once they began using dredges.

5.1.1.2 Vessels with General Category Permits

If fishing in an exempted fishery[2] or during a multispecies day-at-sea, vessels with a general category scallop permit will not be eligible to fish in the re-opened closed areas. Vessels with general category scallop permits, however, will be able to retain up to 400 pounds of scallop meats in the demarcation area, even during the closed area fishery. Vessels without limited access or general category permits will be able to retain and land up to 40 pounds of scallop meats, consistent with current regulations.

Rationale: General category scallop permits were intended to accommodate a small amount of scallop bycatch associated with some fishing activities and small-boat inshore fisheries that target scallops. The Scallop FMP currently allows vessels with this open access scallop permit to retain and land no more than 400 pounds of scallop meats. Since the implementation of Amendment 4, some vessels have used this opportunity to use small dredges near shore to target scallops. Because Closed Area II and the NLSA are offshore and are closed to discourage groundfish catches, there is no reason to allow access to the re-opened areas to either type of vessel. If the vessel with a general category scallop permit is using it to land scallop bycatch, the vessel is fishing for other species, contrary to the need for this action. If the vessel is targeting scallops, it will be uneconomic to fish for scallops so far from shore. Additionally, there would be no mechanism to account for days used (Section 5.2.9.1.2) that would apply to vessels with limited access scallop permits, if they fished in the re-opened areas under the 400-pound trip limit. Since any type of vessel may obtain a general category scallop permit, allowing any vessel with a general category permit to fish within Closed Area II would unreasonably increase enforcement and administrative costs.

Within the demarcation area, vessels with general category permits could legally fish for other species and have a legitimate scallop bycatch. Continuing the current regulations for these vessels in the demarcation area would satisfy National Standard 9 concerns, without jeopardizing the enforceability of the scallop possession limit that will apply to limited access scallop vessels on a closed area trip.

5.1.2 Target Total Allowable Catch (TAC)

5.1.2.1 Scallop Target TAC (Framework 11)

The TAC for scallops in Closed Area II is 4,400 mt (9.68 million pounds of scallop meats). Two percent of the TAC, or 100 mt (220,000 lbs.) will be set aside, one percent for industry-funding of research and one percent to defray the cost of observers. Thus, the target scallop fishery TAC for Closed Area II is 4,300 mt (9.49 million pounds of scallop meats). This target is used to determine the allocation

[2] Including the Gulf of Maine exemptions specified in §648.80(a)(10).

of closed area trips and the scallop possession limit for each trip. It also will be used as the basis for making in-season adjustments to the trip allocation and the scallop possession limit.

Table 4. Scallop Closed Area II TAC for 1999 with a two-percent observer and research set aside.

	Biomass (lbs meat weight)	Biomass (mt meat weight)
Total Allowable Catch	9,680,000	4,400
One percent observer set aside	110,000	50
One percent research set aside	110,000	50
Annual Fishery Target TAC	9,490,000	4,300

Rationale: The Council chose an intermediate TAC value (Section 5.2.2), accepting the Plan Development Team's (PDT) recommendation against choosing the high TAC and accounting for the risks that the PDT identified (Section 6.2.6.3) associated with choosing the high or the low TAC values. The intent of choosing a target TAC is to allow the scallop fishery to catch an amount of scallop equivalent to a maximum sustainable yield from the closed areas. According to the overfishing definition, this is approximately 20 percent of the total stock biomass.

Several approaches to estimate biomass for Closed Area II, based on the 1998 experimental fishery data, produced different results and the Council's Scientific and Statistical Committee could not resolve the differences or identify a preferable estimate. The biomass estimates were highly influenced by the estimates of dredge efficiency from data collected during depletion studies. The model discrepancies arose primarily from different interpretations of the amount and intensity of the area sampled by the depletion samples. The mean dredge efficiency estimates ranged from 16 to 40 percent and the biomass estimates were 35,000 to 14,000 mt, respectively[3].

In addition to new estimates with more depletion experiments, the PDT was subsequently presented with an analysis of the potential bias in the Leslie-Davis biomass estimates (giving low dredge efficiency estimates and high biomass estimates), and a new statistical analysis that gave an intermediate estimate of dredge efficiency (23%) and total stock biomass. While there were reservations about using the low dredge efficiency estimate to determine total stock biomass, the PDT gave no definitive recommendations to exclude some dredge efficiency results. SAW 29 will peer reviewing the methods very soon. The PDT did, however, advise that, "A TAC [6,900 mt] based on 16% efficiency appears to be risky when compared with the historic landings time series."

Given the objective of allowing the fishery to catch the maximum sustainable yield from the closed areas and the Council's choice of keeping Closed Area I and the Nantucket Lightship Area closed for this fishing year, the Council chose the highest TAC that was scientifically acceptable. While this target could exceed a sustainable yield for Closed Area II (assuming the high dredge efficiency/low biomass estimates are accurate), the Council recognizes that future harvests might come from the other two closed areas, especially if the industry is able to demonstrate that it can avoid bycatch of yellowtail flounder and other overfished groundfish species. All three areas are found within the Georges Bank scallop stock area and the scallop biomass in these other closed areas appears to be equal or greater than the scallop biomass in Closed Area II. It is therefore unlikely that the target TAC for Closed Area II will exceed the sustainable yield for the Georges Bank stock, even if biomass is as low as 14,000 mt and exploitation of scallops in the area reaches 31 percent (4,400/14,000).

[3] Lower dredge efficiency results in a higher biomass estimate because theoretically more scallops would have been in the path of the dredge.

The Council increased the intermediate TAC option by one percent to accommodate and provide funding for the 25 percent minimum observer requirement (Section 5.1.10). Initially rounded to 4,300 mt with an assumed dredge efficiency of 25 percent, the Council chose to increase the total TAC for scallops in Closed Area II by one percent. Rounded to the nearest 100 mt, this increased the total scallop TAC for Closed Area II to 4,400 mt, but the target annual fishery TAC remained at 4,300 mt, leaving a difference of 100 mt to be set aside for funding the additional observer coverage (Section 5.1.10) and industry-funded research (Section 5.1.11).

5.1.2.2 Seasonal Restriction (Frameworks 29)

Closed Area II, South of 41°30' North latitude (see Section 5.1.3) will be open to fish for scallops on or before July 1, 1999, but no earlier than June 15, 1999, and through December 31, 1999. This means that access by scallop vessels to portions of Closed Area II should occur between July 1, 1999 and December 31, 1999, inclusive. Recognizing the interest of industry to access the area as soon as possible, the portion of Closed Area II for scallop fishing could open as early as June 15, 1999.

Rationale: Confining access during this season would avoid disrupting spawning aggregations of overfished groundfish stocks that spawn primarily during the spring and early summer months. If the benefits of an early opening outweigh the costs of potentially higher groundfish bycatch before the spawning aggregations disperse, Closed Area II could open for scallop fishing as early as June 15, 1999. Opening Closed Area II prior to July 1, 1999 would reduce the need for scallop vessels to fish offshore during hurricane season (August through October) and would also allow access when scallop meat yield is highest. During the fall months, scallop meat yield tends to decline compared to earlier in the year.

5.1.2.3 Target Yellowtail Flounder TAC and Triggered Area Closure (Framework 29)

The target TAC for Georges Bank yellowtail flounder catches (i.e. landings and dead discards) from scallop vessels fishing in Closed Area II is 387 mt. If at any time, information or data indicate that the total yellowtail flounder bycatch will exceed or is projected to exceed the target yellowtail flounder TAC, the Regional Administrator may suspend the closed area scallop fishery by publishing a notice in the Federal Register.

Rationale: Georges Bank yellowtail flounder is one of the primary, overfished stocks of groundfish governed by the Multispecies FMP. Since this is a critical stock, this measure ensures that the scallop fishery bycatch of yellowtail flounder does not jeopardize or delay the existing yellowtail flounder rebuilding program. The Council determined that the Amendment 7 targets were still operative and consistent with the Sustainable Fisheries Act and National Standard 1.

The yellowtail flounder bycatch is expected to be 1,952 mt if all active vessels fish in Closed Area II, assuming no change in fishing behavior or gear modifications relative to the 1998 experimental fishery conditions. This action, on the other hand, requires that dredges have twine tops with 10-inch, rather than 8-inch, mesh. Industry has also advised that it will be possible to significantly reduce their finfish bycatch through operational adjustments. These adjustments include fishing in areas within Closed Area II where yellowtail flounder are less abundant, slowing the vessel and dredge speed while fishing, and letting the dredge set still on the bottom a few minutes before haul back. While the target yellowtail flounder TAC is only 20 percent of the expected yellowtail flounder bycatch, the Council

anticipates that a significant portion of the scallop TAC can be harvested before the fishery catches this much yellowtail flounder provided that the necessary adjustments are made by industry.

5.1.3 Area Restrictions (Frameworks 11 and 29)

5.1.3.1 Option 1: Re-open the portions of Closed Area II, south of 41°30' North latitude

Scallop vessels that are eligible to access the closed area(s) would be able to fish only south of 41°30' North latitude when they fish within Closed Area II. This area is shown as the southern portion of Closed Area II in Figure 9.

Table 5. Boundary of the portion of Closed Area II for scallop fishing.

Point label[4]	North latitude	West longitude
CII1	41°00'	67°20'
CII2	41°00'	66°35.8'
G5	41°18.6'	66°24.8' (US/Can)
SC1	41°30'	66°34.8 (US/Can)
SC2	41°30'	67°20'
CII1	41°00'	67°20'

Rationale: This option was recommended by the Council's Habitat Committee to avoid damage to fragile sand ridges that provide protection for juvenile finfish. Some of these sensitive areas occur outside the Habitat Area of Particular Concern (HAPC) and north of 41°30' North latitude. The average catch of scallops during the experimental fishery within the boundaries of this option was 26 lbs. of scallop meats per 10-minute tow, with an average meat count of 18 scallop meats per pound. The average catch of yellowtail flounder was 23 pounds. For every 10 pounds of scallops, there were 8.8 pounds of yellowtail flounder caught during the experimental fishery within the boundaries of this option.

5.1.4 Scallop Demarcation Area (Framework 11)

5.1.4.1 Option 1: Closed Area Trip Demarcation Area

Any vessel on a scallop day-at-sea within the demarcation area, described below, will be considered to be on a closed area trip and the regulations for fishing for scallops in Closed Area II (scallop possession limit, automatic 10 day-at-sea accumulation, 10-day maximum trip length, 10-inch twine top mesh, etc.) also apply. Any vessel[5] that is not on a scallop day-at-sea (including vessels with limited access scallop permits) can retain up to 400 pounds of scallop meats if it has a scallop general category scallop permit or 40 pounds of scallop meat if it does not have a general category scallop permit.

The demarcation area and the closed area regulations for scallop vessels will expire when scallop vessels are again prohibited from fishing within Closed Area II, either on December 31, 1999 or when the

[4] Only points SC1 and SC2 are new. Other points are labeled to correspond to points of reference in existing regulations.

[5] Assuming the vessel is legally fishing in an exempted fishery or during a multispecies day-at-sea.

closed area scallop fishery is suspended for exceeding the yellowtail flounder target TAC (Section 5.1.2.3). The boundaries of the demarcation area are described in Table 6 and shown in Figure 9.

Table 6. Boundary of the scallop demarcation area.

Point label[6]	North latitude	West longitude
DA1	40°24’	67°40’
DA2	40°24’	EEZ
DA3	40°26.5’ (US/Can)	EEZ
G5	41°18.6’	66°24.8’ (US/Can)
CII2	41°00’	66°35.8’
CII1	41°00’	67°20’
DA2	42°12’	67°20’
DA3	42°12’	67°40’
DA1	40°24’	67°40’

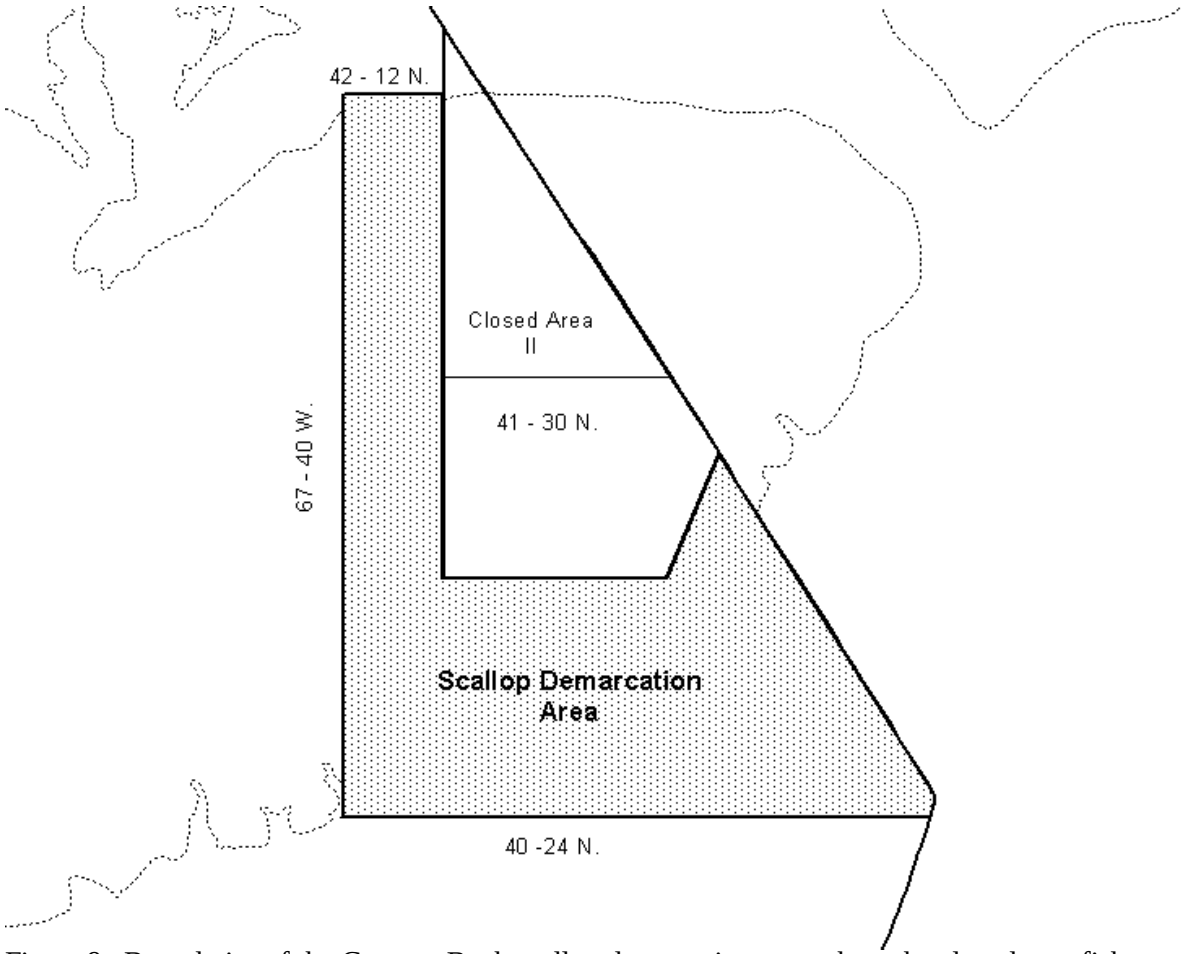


Figure 9. Boundaries of the Georges Bank scallop demarcation area where the closed area fishery regulations apply to any vessel fishing during a scallop day-at-sea. Closed area trips may be

[6] Only points DA1, DA2, and DA3 are new. Other points are labeled to correspond to points of reference in existing regulations.

taken in the scallop demarcation area and in the portion of Closed Area II that lies south of 41°30' North latitude.

Rationale: The main purpose of the demarcation area is to reduce the potential for transferring scallop catches at sea or fishing within the closed area during short periods between times when the vessel's location is determined by the VMS system.

Without the demarcation area, two vessels could fish right to each other, one with a scallop possession limit and the other with no limit on the amount of scallops that could be on board. While the demarcation area simply moves this problem further west, vessels fishing within the demarcation area have a lower incentive to transfer its scallops to another vessel fishing nearby. At its closest point, the boundary of the demarcation area is about 20 nautical miles from the boundary of the area re-opened for scallop fishing. It would therefore take about one to two hours for two vessels to meet in the demarcation area, enough time for the VMS to document that the vessel on a closed area trip had left the area, terminating the trip and accumulating ten days-at-sea. Re-entering the Closed Area would be prohibited, or at the very least, trigger an accumulate another 10 days-at-sea.

Another effect of the demarcation area is to reduce scallop fishing effort in adjacent areas with smaller scallops and high bycatch of Georges Bank yellowtail flounder.

5.1.5 Gear Restrictions (Framework 11)

All vessels on a scallop day-at-sea for a closed area trip (fishing in Closed Area II or in the scallop demarcation area) must use a scallop dredge that conforms to §648.51 (Gear and Crew Restrictions) and has a twine top with diamond mesh no smaller than 10-inches (25.40 cm). This mesh may be hung on the square or the diamond within the area of the dredge occupied by the twine top. The mesh will be measured using the same methods for the current 5½-inch twine top, as described in §648.51(a)(2)(iii). This requirement will no longer apply to the scallop demarcation area upon suspension or expiration of the closed area scallop fishery.

All other vessels on a scallop day-at-sea, fishing in any other area must use a scallop dredge that conforms to §648.51 and has a twine top with diamond mesh no smaller than 8-inches (20.32 cm). This mesh may be hung on the square or the diamond within the area of the dredge occupied by the twine top. The mesh will be measured using the same methods for the current 5½-inch twine top, as described in §648.51(a)(2)(iii).

Vessels that fish for scallops in the Gulf of Maine Scallop Dredge Fishery Exemption Program [§648.80(a)(10)] may continue to use dredges with 5½-inch mesh twine tops, consistent with current scallop and multispecies regulations.

Rationale: The purpose of this measure is to reduce groundfish and other finfish bycatch and take advantage of recent research that shows a significant reduction of bycatch, especially for flatfish, with insignificant reductions of scallop catch when scallops are large. Increasing the twine top mesh requirement in the demarcation area and the open scallop areas will mitigate the projected increase in finfish bycatch from scallop fishing in Closed Area II.

The larger twine top mesh is expected to produce significant reductions for many species, especially flatfish like yellowtail flounder, winter flounder, and windowpane flounder. On the other hand,

a larger twine top is not expected to significantly reduce monkfish and adult roundfish catches. Catches of summer flounder and possibly skates could be reduced as well, benefiting those species and reducing the opportunity of plugging the dredge bag. Dredge bags that are clean and not plugged with fish have been reported to release more small scallops through and between the rings, improving size selection of the dredge.

The larger 10-inch mesh is important for the scallop demarcation area because it encompasses the distribution of Georges Bank yellowtail flounder, one of the primary, overfished groundfish stocks that is of concern. Any scallop fishing that occurs in the demarcation area will have lower yellowtail flounder catches than would occur otherwise, if the twine top mesh remained unchanged at 5½ inches. This catch reduction will offset the yellowtail flounder bycatch in Closed Area II, for added insurance that the closed area scallop fishery will not jeopardize yellowtail flounder rebuilding.

The 8-inch mesh has been proven to be beneficial in Closed Area II with insignificant loss of sea scallops. This framework adjustment will implement the 8-inch mesh throughout the range (outside Closed Area II and the scallop demarcation area), partly to offset the increased finfish bycatch expected within Closed Area II. Although there is no supporting data, the loss of scallops in areas where they are small could be higher than that within Closed Area II. In areas surrounding Closed Area II, however, significant reductions in scallop catches were observed for dredges with 12-inch mesh twine tops. Given this preliminary information for 12-inch mesh and the lack of data for 10-inch mesh, a 10-inch twine top is therefore inappropriate for the existing scallop open areas at this time.

Species in the Mid-Atlantic and Southern New England, like summer flounder, winter flounder, and skates, will benefit from this larger twine top mesh. Bycatch of these species was observed during the 1998 Closed Area II experimental fishery, which could be offset by increasing the twine top mesh in all areas.

Dredge vessels fishing for sea scallops under the Gulf of Maine Scallop Dredge Fishery Exemption Program or other fisheries that are exempt from the multispecies day-at-sea regulations have already been authorized to fish because they have demonstrated low levels of groundfish bycatch. This exemption, furthermore, requires the use of dredges with combined width no greater than 10.5 feet, further reducing the finfish bycatch compared to a standard scallop dredge. For these reasons, it is unnecessary to reduce the finfish bycatch in this exemption program by increasing the twine top mesh requirement.

5.1.6 Effort limits (Framework 11)

5.1.6.1 Trip Allocations

Each full-time and part-time scallop vessel will be authorized to fish three (3) trips within Closed Area II or within the demarcation area during the closed area scallop season. The Regional Administrator may make an in-season re-allocation of closed area trips no earlier than October 1, 1999, based on the number of vessels that participate and the number of trips taken, assuming that each trip catches the scallop possession limit. Vessels must have fished at least one trip before September 30, 1999 to receive additional trips.

Each occasional scallop vessel will be authorized to fish on one (1) trip east of the above demarcation line during the closed area scallop season. Occasional vessels would not be eligible for an

in-season re-allocation of trips, because the annual days-at-sea allocation only allows them to make one closed area trip that counts for 10 days-at-sea.

Rationale: The allocation of three trips, which will accrue a total of 30 days-at-sea, is expected to be conservation neutral (Section 8.1.1.2.1). This allocation will also allow a scallop possession limit that is sufficiently high to encourage vessels to fish for scallops in the closed area while not exceeding the target TAC for scallops in Closed Area II.

Allocations of more trips would require the Council to reduce the scallop possession limit to levels that might not be attractive, compared to scallop fishing for 10 days-at-sea in the existing open areas. Allocations of fewer trips would not be conservation neutral, because of the potential for vessels to use unused days-at-sea to fish in Closed Area II. The Council considered a broad range of trip allocations and scallop possession limits (Section 8.1.1.2.2).

5.1.6.2 Day-at-sea restrictions and tradeoffs

Vessels that report VMS positions within the demarcation area or within Closed Area II while on a scallop day-at-sea will automatically accumulate 10 days-at-sea or the actual time at sea, whichever is more.

A scallop vessel that fishes within the demarcation area or within Closed Area II and catches the scallop possession limit (10,000 pounds) in six days, for example, would accumulate 10 scallop days-at-sea for the trip. If the vessel took two days to steam to and from its homeport, the trip would 'cost' ten days-at-sea, even though the trip lasted only seven days. A vessel that took five days to steam to and from port (e.g. a vessel from VA) would accumulate 11 days-at-sea for the trip, since the trip lasted more than 10 days.

Rationale: Assessing 10 days-at-sea for a closed area trip is a conservation measure that makes up for the higher scallop catch rate in the closed area. Scallops are not only larger in the closed area, they are also more abundant. A scallop dredge will therefore catch more scallops (in number) per day-at-sea than if it fished in the areas now open for scallop fishing. To make up for this higher availability, a vessel will accumulate more days than the trip's actual duration, especially if it catches the scallop possession limit in a short time.

5.1.6.3 Maximum trip length

Vessels on a scallop day-at-sea will be prohibited from remaining east of the demarcation line for more than 10 days (240 hours) and once it leaves, the vessel will not be able to re-enter the area to the east of the demarcation line during the same trip.

Rationale: This restriction is necessary to prevent vessels from taking longer trips than they would automatically accumulate by fishing in the closed areas. Although the estimates indicate that the scallop vessels will be able to catch the scallop trip limit well before 10 days, this measure could also dissuade vessels from transferring their scallops to another vessel and continue fishing for longer periods.

5.1.7 Scallop possession limit (Framework 11)

5.1.7.1 Scallop meats

Vessels on a scallop day-at-sea may possess no more than 10,000 pounds of scallop meats on trips that had fished within the demarcation area or within Closed Area II. The Regional Administrator may make an in-season adjustment to the scallop possession limit no earlier than October 1, 1999, based on the number of vessels that participate and the number of trips taken, assuming that each trip catches the scallop possession limit.

Rationale: The scallop possession limit will ensure that the scallop fishery does not exceed the target scallop TAC for Closed Area II. Even if all 365 eligible vessels fish all three trips, the total possible scallop landings would be 4,700 mt, or nine percent above the target TAC. The Council does not expect all eligible vessels to fish and the actual catch by participating vessels will be considerably lower than the target TAC. The estimated total fishing effort, scallop catch, and bycatch are reported as Scenarios T11 (active scallop vessels only) and M12 (active and inactive vessels) within Table 25 and Table 38.

A wide range of trip allocations and trip limits were analyzed and evaluated. The choices are shown in Table 11 and the estimated impacts are given in Sections 8.1.1.2 and 8.1.1.3. Although lower trip limits (with more allocated trips) were estimated to be more profitable than fishing in the existing open areas, the Council opted for the highest scallop trip limit that would be conservation neutral. This approach gave the greatest assurance that eligible vessels would fish in Closed Area II and reduce their fishing effort in the open areas, where smaller scallops predominate.

There are significant impediments for Confirmation of Permit Histories (CPH) to be reactivated. The profits from only three closed area trips (roughly $180 to $200 thousand) may not be enough to justify the cost of reactivating the permit on a new or replacement vessel. Excluding CPHs, the vessels with permits assigned to a vessel could only land 4,000 mt, seven percent less than the target scallop TAC. It is also very unlikely that inactive vessels from the Mid-Atlantic will fish in the closed area. Any reactivation of a CPH is likely to be more than offset by non-participation of the 48 vessels that did not fish for scallops during the 1998 fishing year.

Since the price differential is small between large and small scallops and discard mortality is generally low, highgrading (i.e. discarding less valuable scallops) is not likely to occur or be a significant problem. It is also unlikely that scallop vessels will continue to fish after catching the scallop possession limit. Other than monkfish, there are no other species that are caught by scallop dredges and valuable enough to land. Flatfish (e.g. yellowtail, winter, and windowpane flounders) are regulated by the Multispecies FMP and landings will be limited to no more than 500 pounds. The expected catches of these species are greater than this low possession limit. The expected catch of monkfish (the other valuable species that are caught by scallop dredges) while fishing for scallops in the closed area is expected to approximate the monkfish possession limit, a limit that will be established when final rules for the Monkfish FMP are published.

5.1.7.2 Shellstock – 50 US Bushels

Any vessel will be prohibited from possessing more than 50 US bushels of shell stock when it calls out of the fishery, following any trip that occurs east of the Georges Bank scallop demarcation line (Section 5.2.4). For purposes of enforcing the scallop trip limit, 50 US bushels of shell stock shall be counted as 400 pounds of scallop meat.

Rationale: The purpose of this measure is to prevent vessels from catching more than the scallop trip limit allows and discarding the excess scallops in port. It will also ease the enforcement burden caused by the potential for partial offloadings as scallops are shucked in port. On the other hand, it is necessary to allow some landings of shell stock to satisfy a market for large, live scallops.

5.1.8 Possession Limits for Species Caught as Bycatch (Framework 29)

5.1.8.1 Regulated Multispecies

While portions of Closed Area II are open to scallop fishing, scallop vessels on a closed area trip (i.e. vessels with a VMS position report within Closed Area II or the scallop demarcation area) may retain and land up to 500 pounds of regulated species. On trips with a certified observer aboard (Section 5.1.10), the vessel may retain and land any amount of regulated species, but the revenue from the sale of more than 500 pounds of regulated species shall be donated to a bona-fide charity. The Regional Administrator is authorized and requested to make a mid-season adjustment to this possession limit and reduce regulatory discards to the maximum extent possible.

Rationale: This measure would increase the groundfish trip limit to accommodate the expected bycatch of large mesh regulated species. Raising the trip limit would avoid economic waste and partially address National Standard 9 concerns. Since some discarded fish survive, unreasonable increases in the trip limit could however increase mortality on overfished groundfish stocks and promote continued fishing when the scallop catch rates decline.

The expected bycatch of regulated species far exceeds the existing 300 pound possession limit. On the other hand, the Council wants to avoid creating an incentive for scallop vessels to fish in areas where the groundfish bycatch is high or to continue fishing for groundfish when the vessel reached its scallop possession limit. Increasing the regulated species possession limit from 300 to 500 pounds will decrease regulatory discards, but will not encourage fishing for groundfish or discourage efforts to avoid bycatch. If all 265 active vessels fish for scallops on their three allocated closed area trips, this adjustment would reduce regulatory discarding by 159,000 pounds.

5.1.8.2 Monkfish

The possession limit for monkfish will be the amount specified in the Monkfish FMP, once the plan's final rules are published.

Rationale: The expected bycatch of monkfish is expected to be less than the allowance (300 pounds tail-weight per day-at-sea) for scallop dredges, therefore adjustment is unnecessary.

5.1.9 Reporting Requirements (Framework 11)

5.1.9.1 Vessel monitoring systems (VMS)

All scallop vessels that fish in the re-opened closed areas will be required to have a functional VMS onboard. In addition to the current VMS-based reporting requirements, the Regional Administrator may require vessels that fish for scallops in the closed areas to make daily reports on the hail weight of scallops, yellowtail flounder, windowpane flounder, winter flounder, barndoor skates, and monkfish; the

total number of tows since the last daily report; and the area fished. This daily report must be made via the e-mail messaging capability built into the VMS units.

Rationale: The additional reporting requirements are necessary for NMFS to monitor the fishery and make in-season adjustments to the trip allocations or discontinue the closed area scallop fishery. Currently all full and part-time vessels are required to have a VMS onboard. It is anticipated that very few occasional vessels will want to fish in the re-opened closed areas due to the day-at-sea cost and due to the smaller size of most vessels with occasional limited access scallop permits. During 1999, occasional scallop vessel will receive 10 days-at-sea for the year. One trip to the re-opened closed areas would therefore cost them their entire annual allocation of days-at-sea.

5.1.9.2 Vessel Trip Reports (VTR)

In addition to the information that NMFS currently requires scallop vessels to submit on Vessel Trip Reports (VTR), the Regional Administrator is encouraged to require vessels on closed area trips to report the following detailed information:

Start and end time of each tow
Duration of tow
Latitude and longitude coordinates of each tow
Depth of tow
A description of the gear used
The number of crew members aboard the vessel
Subjective description of the habitat they are dredging
An estimated amount and size of scallops caught on each tow
Characterization (amount, size, and condition) of all bycatch for each species.

Rationale: More detailed information is needed to evaluate future area rotation strategies and the effects they will have on scallops, bycatch species, and habitat. There is very little information to assess how a full-scale commercial fishery will operate under a condition that is representative of a rebuilt scallop resource. Since conditions in Closed Area II are more in line with a rebuilt resource, this information is crucial for developing a rotational area management strategy, contemplated for Amendment 10. The model developed for this framework adjustment makes some very basic assumptions about fishing operations and the distribution of fishing effort relative to the resource (Section 8.1.1.4). On average, the model assumptions are acceptable for estimating overall impacts, but changes in fishing strategies and non-uniform fishing effort could cause different results. The above list of variables, collected for each closed area trip, would allow the Council to refine and modify this model to improve its predictive capabilities.

5.1.10 Observers (Framework 11)

One-percent of the target scallop TAC will be set aside (Section 5.1.2.1) to authorize additional landings on trips carrying a NMFS-approved observer. This TAC set aside will enable the Regional Administrator to authorize additional landings on observed trips to defray the observer costs. Any scallop landings on observed trips that exceeds the scallop possession limit will be counted against the TAC set aside for observers, rather than the target scallop TAC (Section 5.1.2.1).

At a minimum, observer coverage should occur on 25 percent of the scallop trips in the demarcation area (during the duration of the closed area program) or in Closed Area II. The Regional Administrator should take whatever steps are necessary to ensure 25 percent observer coverage, including

training of new observers, contracting with third parties, seeking other funding sources, authorizing fewer closed area trips, or even delaying the closed area scallop fishery.

NMFS may require any vessel fishing on a scallop day-at-sea within the demarcation area or Closed Area II to carry a NMFS-approved observer. The cost of carrying the observer will be borne by the vessel, unless otherwise authorized by the Regional Administrator. The Regional Administrator shall authorize such vessel, carrying an observer, to land an amount of scallops above the scallop possession limit to help defray the cost of carrying an observer. The observer will be paid through and by a means established by the Regional Administrator for paying observers for the closed area scallop fishery. The vessel is obligated to pay the observer costs regardless of whether the vessel lands or sells any scallops on the observed trip.

In addition to the customary data that sea samplers collect, NMFS should also take steps to also collect the following information:

- detailed written and photographic records of all bycatch associated with scallop fishing in the closed areas
- the characterization of bycatch should include a classification of sediment information and associated macroinvertebrates
- finfish discard mortality data.

Rationale: A high level of observer coverage is needed because of the concerns over important impacts from scallop fishing in Closed Area II and the uncertainty about how a full-scale commercial fishery will operate under conditions characteristic of a rebuilt resource. These concerns include bycatch and bycatch avoidance, discarding, damage and recovery of habitat, and detailed scallop fishery data collection.

More specifically, standard data reporting alone will be insufficient to monitor the fishery and enable in-season adjustments or a suspension of the fishery. A large portion of the yellowtail flounder bycatch could be discarded, depending on the actual catches in the re-opened closed area, and the only reporting mechanism besides sea sampling observations would be the Vessel Trip Reports (VTR), submitted by the vessel operator. Since the Regional Administrator could suspend the fishery when the yellowtail flounder catch exceeds the target TAC (387 mt), the VTRs (a self-reporting system) could be highly suspect without a second method of augmentation or verification of the VTR data. The observer data could, moreover, be used by the Regional Administrator to adjust the reported discards for the amount of fish released alive, if the sea sampling observers note the condition of discards. The target TAC for yellowtail flounder is estimated in terms of stock removals, i.e. landings and dead discards. Live discards should not be counted against the 387 mt target yellowtail flounder TAC.

A second compelling reason to closely monitor the closed area scallop fishery with a high level of observer coverage is to quantify how a full-scale commercial fishery would operate under conditions that are characteristic of a rebuilt resource. Observers collect more detailed information, often on a tow-by-tow basis, than is possible via VTRs. This detailed information is crucial for identifying where and how the fishery operates within the re-opened closed area, so that the information can be applied to future openings of closed areas as part of a rotational area management strategy, contemplated by Amendment 10. Unlike the model used to estimate fishing time and catch from the proposed closed area fishery, scallop fishing will not have uniform effort across the closed area since it will be affected by scallop density, bycatch, vessel crowding, and other factors. The sea sampling data, coupled with VTRs, will be used to fine tune the model developed to estimate impacts of the closed area scallop fishery.

It is necessary to fund this intense data collection activity through a TAC set aside, because no other funding is available. Most of the funds for observers come from a Marine Mammal Program. Since

scallop dredges have few encounters with marine mammals, sea sampling scallop trips has a relatively low priority. Additional observer coverage is sometimes funded to take biological samples and record discards, but these scarce funds are used for other equally important fisheries like groundfish.

To enable some of the scallop landings to fund observers, the Regional Administrator may establish a mechanism for these proceeds to pay for observers and help defray the costs of carrying an observer. At six dollars per pound, the additional landings associated with a one-percent TAC set aside could provide nearly $600,000 to fund this activity. Since the Council anticipates that 696 trips could be taken by active scallop vessels, this fund could allow for up to $3,400 per observed trip at a 25 percent sampling frequency, more than enough to provide funds for the proposed sampling intensity.

It is inadvisable for the vessel to pay the observer directly, due to a potential conflict of interest. A fund for such purpose could be established, on the other hand, into which the proceeds from additional scallop landings could be deposited to allow the agency to defray the observer costs or pay for observers through a third-party contract.

5.1.11 Industry-funded Research (Framework 11)

One-percent of the target scallop TAC will be set aside (Section 5.1.2.1) to authorize additional landings on trips authorized to conduct industry-funded research. This TAC set aside will enable the Regional Administrator to authorize additional landings on authorized trips to defray the research costs. Any scallop landings on these authorized research trips that exceed the scallop possession limit will be counted against the research TAC set aside for observers, rather than the target scallop TAC (Section 5.1.2.1).

The Regional Administrator may authorize a vessel participating in an approved research project, carrying scientific personnel, to exceed the scallop possession limit and land additional scallops to help defray the cost of the research. These funds could be used, for example, to pay for gear modifications, additional fuel or ice, additional food for scientists, and other scientific gear or salaries for approved research. This research must be conducted in accordance with a research plan approved by the Regional Administrator. The Council may receive, evaluate, and recommend research proposals for funding under the TAC set aside provision, but the Regional Administrator must approve the research proposal and authorize the vessel to exceed the scallop possession limit. Research conducted on these trips must conform with the regulations for the closed area scallop fishery, except for the scallop possession limit and the limits on the number of crew aboard the vessel. Any other exemptions from the regulations would require an experimental fishery permit as provided in §648.12.

Rationale: The Council wants to encourage industry participation in these programs by compensating the vessels for the potential decreased efficiency and increased costs when participating in a research program. Since the extra catch will come out of the TAC, it will not cause overfishing and the benefits from re-opening the closed areas could be used to gather better information.

Examples of research that the Council would favor include using modified scallop gear on observed trips to identify ways to reduce bycatch and cause less habitat damage. Priorities include research on bycatch reduction, habitat impact, rotational fishing strategies, size selectivity and incidental mortality of scallops and other species. Also included as an example of preferred research are resource enhancement strategies in support of rotational fishing concepts.

Re-opening the closed areas for scallop fishing will provide an invaluable opportunity to understand how a commercial fishery will operate once the resource rebuilds, if adequate data is collected from the outset of the program. Under management rules established since Amendment 4 (e.g. gear restrictions, crew limits), there has not been a high abundance of large scallops to observe the effects of these management measures. In addition, there is an opportunity to conduct other research and experiments during the re-opening that could assess habitat impacts in areas that have been largely undisturbed for four years and to evaluate methods for reducing bycatch or increasing size selectivity of scallop fishing gear.

Other important research priorities

Some important research cannot be done onboard commercial vessels, so compensating vessels for their requirement to carry observers is not an option. Nonetheless, the Council recognizes the need to collect special information that would be important to the development of an area rotational strategy for sea scallops. NMFS is therefore encouraged to collect the following data during the closed area scallop fishery:

- Video and/or photo transects of the bottom within Closed Area II and the Nantucket Lightship area in areas both subject to scallop fishing and not subject to scallop fishing, before and after scallop fishing commences
- Intensive sampling on both sides of the boundary of Closed Area II and the Nantucket Lightship area this year and in subsequent years to gauge the effects of fishing on the resource
- Special sampling stations be used during this summer's scallop survey, selected to represent areas both opened to scallop fishing and not opened to scallop fishing
- Any other habitat information that may be possible to collect.

5.1.12 Enforcement Provisions (Framework 11)

5.1.12.1 Trip Declaration and Notification

An activity code will be incorporated into the VMS programming to indicate when a scallop vessel is on a closed area trip. A vessel may set an activation code for a closed area trip no more than the number of trips authorized for fishing within the closed area (Section 5.1.6.1). NMFS may trigger a closed area trip either when the vessel's VMS reports its first position within the demarcation area or within Closed Area II or when notified by the existing VMS email capabilities that the vessel will be taking a closed area trip. To simplify administration and enhance monitoring, NMFS may require email notification of a closed area trip prior to leaving the dock. No additional notification is required at the end of a trip, prior to landing.

Rationale: Enforcement must know when a vessel is or is not authorized to fish in the demarcation area or within Closed Area II. The activity code would enable law enforcement to quickly check if the vessel were authorized to be in the demarcation area or in Closed Area II. Without the activation code or some other means of authorization, it would be impossible to distinguish between a vessel that had already taken its allocated closed area trips and one that had not and is therefore authorized to fish in the demarcation area or in Closed Area II.

5.1.12.2 Vessel operation and landing

Vessels on a closed area trip may not fish for any species except within the demarcation area and within the open portions of Closed Area II. Partial unloadings of the catch at more than one dealer is also prohibited.

Rationale: Circumvention of the scallop possession limit will significantly undermine the conservation goals of the proposed action. Allowing scallop fishing on closed area trips outside of the demarcation area and Closed Area II would provide greater opportunity to transfer scallops at sea, thereby avoiding the scallop possession limit. The allocation of trips and the scallop possession limit are the primary management measures for controlling scallop catch and are intended to prevent the fishery from exceeding the target scallop TAC.

Partial unloadings could also reduce the effectiveness of the scallop possession limit to hold landings below the target TAC. Allowing landings of scallops at more than one dock or port would make it harder to track and monitor the landings from closed area trips.

5.1.12.3 Penalties for Closed Area Fishery Violations

Since many of the measures in the proposed action ensure that the FMPs meet their conservation goals for scallops, yellowtail flounder, and other groundfish, the Council considers violations of the closed area fishery management measures to be a very serious offense, particularly for intentional and willful violations. These type of violations include significant overages of the possession limits, transfers at sea, exceeding the crew limits, fishing with non-conforming gear, and fishing on more than the number of authorized trips. Penalties should therefore be commensurate with the seriousness of the violation, possibly including barring future access to areas that had been closed to rebuild scallops or other species

Rationale: There will be great economic incentives to break the rules for fishing in Closed Area II, largely due to the differences in the resource condition in the closed area compared to the existing open areas. This provision establishes the Council's intent about intentional and willful violations of the proposed action, allowing this intent to be taken into account when determining appropriate penalties.

5.2 Alternatives Considered And Rejected To Re-Open Portions Of Closed Area II For Scallop Fishing

The Council considered two alternatives to manage scallop fishing in Closed Area II, an alternative that would manage the closed area scallop fishery with trip allocations and scallop trip limits (described in Section 5.2.9), and a second alternative that would manage the closed area fishery with trip allocations and day-at-sea ratios (described in Section 5.2.10). The measures that apply to both management alternatives (Sections 5.2.9 and 5.2.10) include the following common management options:

Eligibility to fish in Closed Area II (Section 5.2.1),
Setting a target TAC, allowable seasons, and possibly suspending the fishery (Section 5.2.2),
Specifying the sub-areas that are open to scallop fishing (Section 5.2.3),
Setting a scallop demarcation line that would determine when days-at-sea accumulate at a higher rate than they do in the presently open areas (Section 5.2.4),
Establishing gear restrictions (Section 5.2.5),

Increasing the possession limit to reduce discarding of finfish bycatch (Section 5.2.6),
New reporting requirements to monitor the TACs and make in-season adjustments (Section 5.2.7),
Providing for observer or research costs (This provision was adopted and moved to Section 5.1.11).

Although portions of Alternative 1 (Trip Allocations and Scallop Trip Limits For Scallop Fishing in Closed Area II) were included in the proposed action (Section 5.1), the alternative included many management options that were considered and rejected by the Council. For completeness, the range of options in Alternative 1 are described and evaluated in Section 5.2.9. The impacts of the management options in Alternative 1 are analyzed and described in Sections 8.1.1.2 and 8.1.1.3. Alternative 2 (Days-At-Sea Allocations For Scallop Fishing in Closed Area II) to manage the closed area scallop fishery was rejected by the Council.

5.2.1 Eligibility (Framework 11)

5.2.1.1 Net boats – loss of eligibility to use trawls

Net boats would be able to fish with dredges in the closed areas, but would no longer be able to use nets to fish for scallops.

Rationale: The Council determined that dredges were the preferred method of fishing for scallops and Framework Adjustment 5 prohibited dredge vessels from using trawls to fish for scallops. The primary reason for this prohibition was to continue realizing the benefits of larger dredge rings and protect small scallops that were abundant in the Mid-Atlantic at that time (NEFMC 1995). This action was taken primarily due to research showing the better size selection characteristics of scallop dredges over scallop nets (DuPaul et al. 1988).

Instead of prohibiting all scallop vessels from using nets, Framework Adjustment 5 only prohibited vessels that had a proven ability to use dredges (shown by their historic fishing activity). Existing net boats were allowed to continue using nets to avoid forcing them to use unsafe fishing practices for their vessel capabilities.

Since Framework Adjustment 11 would allow only the use of scallop dredges in the closed areas (because of bycatch problems), any vessel using a dredge in a closed area would be capable of using dredges (the preferred scallop gear) in other areas as well. Existing net boats, even if currently unable to use dredges, could access the closed areas with a dredge by vessel replacement or re-rigging.

Another option for less seaworthy net vessels or net vessels with less horsepower is to tow only one dredge or two smaller dredges. If the net boat began using a single 10-foot dredge it could, in fact, qualify for the small dredge program and have a higher day-at-sea allocation if the vessel is originally classified as a part-time or occasional vessel. [50 CFR §648.51(e)]. Fishing in the small dredge program, however, requires that the vessel have no more than five people on board and the vessel would probably loose its authorization to use trawls to fish for scallops.

5.2.1.2 Vessels with general category permits – status quo

The status quo would allow vessels with general category scallop permits to target scallops in the re-opened closed area. These vessels could land up to 400 pounds of scallop meats per trip, equivalent to ten 40-pound bags.

Rationale: This option was rejected for three reasons. General category permits are open access, held by many vessels and available to all applicants. If in the unlikely event that it will be profitable to fish for 400 pounds of scallop meat from Closed Area II, it would be impossible to ensure that the target scallop TAC would not be exceeded. There are nearly 5,000 vessels with General Category permits and any additional vessels could obtain a permit.

Secondly, one of the goals of the framework adjustment is to relieve scallop fishing in the existing open areas and allowing vessels with General Category permits to access Closed Area II would not achieve this goal. Limited access scallop vessels will be charged with at 10 days-at-sea for each trip taken in Closed Area II, even though the vessels are expected to catch the scallop possession limit in less than 10 days. There would be no way to achieve this effect for vessels with general category permits, since there is no mechanism to limit their scallop fishing effort.

Allowing access to Closed Area II by general category vessels would moreover be inconsistent with the original intent for general category permits. The intent was to allow vessels to land a limited amount of scallops as bycatch and to accommodate some inshore scallop fisheries for vessels that would not qualify for a scallop limited access permit. No other fisheries that have a scallop bycatch currently occur within Closed Area II; therefore the bycatch allowance associated with a general category permit is unnecessary for the area addressed by this framework adjustment.

5.2.2 Target Total Allowable Catch (TAC; Framework 11)

A target TAC will be estimated that will allow the harvest of the maximum sustainable yield (MSY) from the biomass of scallops in the closed areas. To prevent localized depletion, the PDT recommended that the TAC should be calculated for each groundfish closed area individually. The TAC for each area will represent the amount of allowable catch for the fishing year from that area.

For the purposes of allocating trips to eligible vessels, the TAC for areas to be wholly or partially re-opened will be combined, since the catch would come from the same scallop stock. To allocate trips for a three-month period, the combined TAC will be divided equally between the calendar quarters when scalloping would be allowed in the closed areas. Any catches during the first quarter would be counted against the annual TAC and adjustments to the number of trips allocated to each vessel in subsequent quarters would take into account the remaining TAC. One-percent (1%) of the TAC will be reserved to encourage research and observed data collection (Section 5.1.10).

Two models were used to estimate dredge efficiency, a critical factor for estimating total biomass from the area swept by research tows. In Closed Area II, an intensive experimental fishery was conducted by CMAST and included depletion experiments to estimate dredge efficiency. In the simplest sense, if a second tow passes exactly over an area covered by a previous tow and catches no scallops, the dredge efficiency is 100 percent, not taking into account other factors that may prevent the second tow from catching scallops. If the catch of the second tow is half of the first and a third tow is half of the second, then dredge efficiency is 50%. Of course in the real world, no experimental fishery is that neat and two models were used to account for non-overlapping tows, scallop density, and patchiness. Added to this effort were different interpretations and measurements of actual ground fished, based on positions at the start and end of the tow. There is some disagreement over tow length because of different interpretations of whether the dredge fished on setting and haulback.

The Closed Area II exploitable biomass estimates from these three methods are shown in Table 7, with dredge efficiencies between 16 and 40 percent with a 1 nm tow length. Some early estimates of tow length were 0.8 nm, based on the vessel's actual position at the time the winch was braked to begin

towing to when the vessel began haulback. The Council's Scientific and Statistical Committee (SSC), however, advised that these early estimates failed to take into account when the dredge was actually fishing during set-out and haul-back. The SSC strongly recommended using the longer estimate that took into account the longer fishing time based on inclinometer readings.

Because the dredge efficiency factor is so influential, the total exploitable biomass estimate ranges from 25 to 63 million pounds of meat weight. For all areas within Closed Area II, biomass projections based on the size frequency of scallops, the expected growth in meat weight for each size range, and natural mortality, exploitable biomass is estimated to increase by 23 percent. Applying this increase to the 1998 biomass estimates, the biomass during August to October 1999 are estimated to be between 31 and 77 million pounds. The Scallop PDT did not have sufficient information to recommend the results from one model over the other on the basis of the model results alone. These models and their estimates were reviewed by the Council's Scientific and Statistical Committee on February 23, 1999, before the final framework meeting.

Table 7. Exploitable biomass estimates for Closed Area II based on CMAST experimental fishery data from August to October 1999.

Dredge efficiency estimate	**Patch model**	**Intermediate**	**Leslie-Davis**
Tow length (nm)	1.0	1.0	1.0
Dredge efficiency	40%	25%	16%
Swept-area biomass (million lbs.) - August 1998	25	40	63
Exploitable biomass in 1999 (23% increase)	31	49	77
Exploitable biomass in 1999 (mt)	14	22	35

This difference in biomass change can be estimated out on a smaller scale within the closed areas. Survey strata in Closed Area II with the largest scallops, for example, are not expected to increase in biomass from 1998 to 1999, and may even decline at higher natural mortality rates. This factor has been taken into account in estimating the biological and economic impacts (Sections 6.2.6 and 8.1.2

The fishing mortality rate that is expected to produce MSY for the resource is F_{max}, and approximately equals a 20 percent exploitation rate. Applying this exploitation rate to the combined exploitable biomass estimates in Table 7, gives the TACs for Closed Area II and reserve values (Table 8).

Based on the estimated Closed Area II TACs, the Scallop PDT advised against using the high and possibly the intermediate biomass estimate for specifying the TAC. Examination of these results and comparison to the historic landings since 1957 (Table 4 in Appendix I) indicates that the medium and high biomass estimates give TACs near or above the highest levels in the time series. During this period, US landings ranged between 662 (1996) and 10,660 (1961). Since scallops were at some time during the early portion of the time series at or above B_{MSY}, at some point the landings had to exceed MSY to bring biomass below B_{MSY}. Unreported landings, especially while the meat count was in effect, would bring the maximum landings more in line with the TACs calculated below.

Table 8. TAC and one-percent reserve for 1999 in Closed Area II.

	Patch model biomass estimate	Intermediate biomass estimate	Leslie model biomass estimate
Total Allowable Catch (lbs.)	5,990,000	9,584,000	14,975,000
Total Allowable Catch (mt)	2,700	4,300	6,800

1-percent research reserve (lbs.)	59,900	95,800	149,800
Annual Fishery TAC (lbs.)	5,930,000	9,488,000	14,825,000

5.2.2.1 Seasonal Restrictions (Frameworks 29)

The re-opened areas (Section 5.2.3) could allow scallop vessels to fish as early as June 15 and as late as December 31. Other options considered by the Council included the earlier PDT recommendation for scallop fishing only during August through November and allowing scallop fishing in Closed Area II no earlier than July 1, 1999.

Rationale: This action would avoid disrupting spawning aggregations of overfished groundfish stocks that spawn primarily during the spring and early summer months. Previous technical advice from the Groundfish and Scallop PDTs, however, indicated that scallop fishing only during August through November, inclusive, would minimize the impacts on groundfish spawning and bycatch.

5.2.2.2 Triggered Area Closure (Frameworks 11 and 29)

If at any time, information or data indicate that the total groundfish bycatch or the total scallop catch will exceed the target TACs, the Regional Administrator may suspend the re-opening of the closed areas to scallop vessels by publication of a notification in the Federal Register pending resolution of the issue.

The Council considered a yellowtail flounder target TAC, which would suspend the closed area scallop fishery, ranging from 129 to 1,344 mt. The most conservative alternative (129 to 387 mt) was based on an Amendment 7 ($F_{0.1}$ = 0.25) rebuilding target and estimated historical share (5-15%) of total yellowtail catch taken by the scallop fleet. An intermediate range (196 to 588 mt) was based on a rebuilding target (F = 0.35) consistent with Amendment 13 and estimated historical share (5-15%) of total yellowtail catch taken by the scallop fleet. The most liberal target TAC considered was 1,344 mt, based on an Amendment 13 rebuilding target (F = 0.35) and allocating 100 percent of the Georges Bank yellowtail flounder TAC increase (relative to an Amendment 7 target) to scallop vessels in the re-opened closed area. A more detailed description of the genesis and calculation of these alternatives is given in Section 6.2.6.5.

Rationale: While Georges Bank yellowtail flounder has been in a rebuilding program since Amendment 7 in 1995, Amendment 13 could allow additional yellowtail flounder catch in a 10-year rebuilding program, consistent with the control rule and the Sustainable Fisheries Act. On the other hand, Georges Bank yellowtail flounder is in the fifth year of a rebuilding program and remains several years away from achieving B_{MSY} with status quo fishing mortality. These target TACs span the full range of choices that were available, including delaying yellowtail flounder rebuilding even though Amendment 7 targets are still operative.

Significant changes in fishing strategies are expected to occur when scallop vessels fish in the closed areas to maximize their catch per day-at-sea. These changes could increase the scallop catch and groundfish bycatch well above anticipated levels. If this occurs, the additional catches could increase fishing mortality above the fishing mortality thresholds (F_{max} for sea scallops, $F_{0.1}$ for yellowtail flounder) and potentially jeopardize the rebuilding programs set by Amendments 7 for the Multispecies and Scallop FMPs. To prevent this potential outcome, the Regional Administrator would be authorized to discontinue the closed area scallop fishery.

5.2.3 Area Restrictions (Frameworks 11 and 29)

The following management options are under consideration by the Council. Closed Area I is not being considered for scallop fishing at this time, due to concerns about groundfish bycatch during any portion of the year.

5.2.3.1 Option 1: Re-open the portions of Closed Area II, south of 41°30' North latitude

The Council considered keeping the northwest corner of this area closed to scalloping, due to concerns about potential gear conflict between the lobster and scallop fisheries. This modification was recommended by the Council's Gear Conflict Committee. Scallops biomass in this area tends to be lower than within other portions encompassed by Option 1 and therefore there will be portions within Closed Area II, south of 41°30' North latitude, that will be available to the lobster fishery.

Rationale: The Council was also concerned about giving the scallop fishery the greatest possible latitude to fish where yellowtail flounder is less abundant. To make the closure enforceable, however, the area that would remain closed to avoid gear conflict would have to have square boundaries, cutting into areas that might have high biomass of scallops and low abundance of yellowtail flounder. Instead of keeping more areas closed to scallop fishing in Closed Area II, the Council gave a higher priority to avoiding yellowtail flounder bycatch

5.2.3.2 Option 2: Re-open portions of Closed Area II to reduce bycatch of yellowtail flounder and other species

The Scallop PDT identified an area with the highest concentrations of large scallops and the lowest concentrations of yellowtail flounder. The boundaries of this area are described in the table below. During last year's experimental fishery, the vessels averaged 32 pounds of scallop meat per 10-minute tow with an average meat weight of 12 scallops per pound. The average catch of yellowtail flounder was 18.2 pounds. For every 10 pounds of scallops, there were 6.3 pounds of yellowtail flounder caught during the experimental fishery within the boundaries of this option.

Table 9. Boundary of option 2 to allow scallop fishing in Closed Area II.

Point label	North latitude	West longitude
2A	41°00'	67°20'
2B	41°10'	67°20'
2C	41°30'	66°50'
2D	41°15'	66°50'
2E	41°00'	67°08'
2F	41°00'	67°20'

Smaller portions of Closed Area II within the area described above would open to scallop fishing for a period within the range chosen in Section 5.2.2.1. Early indications of bycatch were that the catch of yellowtail flounder by scallop dredges equaled the catch of scallop meats across all of Closed Area II. Since most of the yellowtail flounder in August to October were concentrated in the southern part of Closed Area II, the area described in the previous section would cause the weight of the yellowtail bycatch to possibly exceed the catch of scallops. Since there are only about 1,700 of yellowtail flounder

that could be caught without exceeding the target Amendment 9 TAC in 19997, the scallop fishery could not catch the scallop MSY value without jeopardizing the rebuilding program for yellowtail flounder.

Rationale: The impact analysis showed that the reduction in yellowtail flounder bycatch for this option was not expected to be as great as the experimental fishery data suggested. This outcome was expected because the scallops within the boundaries proposed by this option were larger in 1998 than in the other considered areas and because the model indicated that it would take longer for each trip to catch the scallop possession limit than for options that encompassed more area.

The smaller scallops within Closed Area II, but outside the area proposed by Option 2, are expected to grow more quickly than in areas with large scallops. It would therefore require less fishing time in 1999 to catch the scallop possession limit for other less restrictive area options than it would have in 1998. This effect narrowed the differences between the expected yellowtail flounder bycatch for the various options. Since Option 2 is smaller than Option 1, the scallop catch per day fished is expected to decline at a greater rate than for less restrictive options. This effect tends to increase the fishing time a vessel needs to catch the scallop possession limit and as a result increases bycatch. As a result, this effect also narrowed the differences between the yellowtail flounder catch rates that were observed in the experimental fishery for each area option.

For species other than yellowtail flounder, the impact analysis indicated higher bycatch for Option 2 than for Option 1 (Section 8.1.1.2), due to differences in species distribution. This higher bycatch, including overfished stocks of groundfish and monkfish, plus the additional flexibility in Option 1 for on site adjustments to avoid bycatch outweighed the benefits of the marginally lower yellowtail flounder bycatch for Option 2.

7 See Section 6.2.6.5 for a more thorough description of the available yellowtail flounder TAC, depending on the choice of target yellowtail flounder fishing mortality and assumptions about groundfish fishing effort and catch per unit effort.

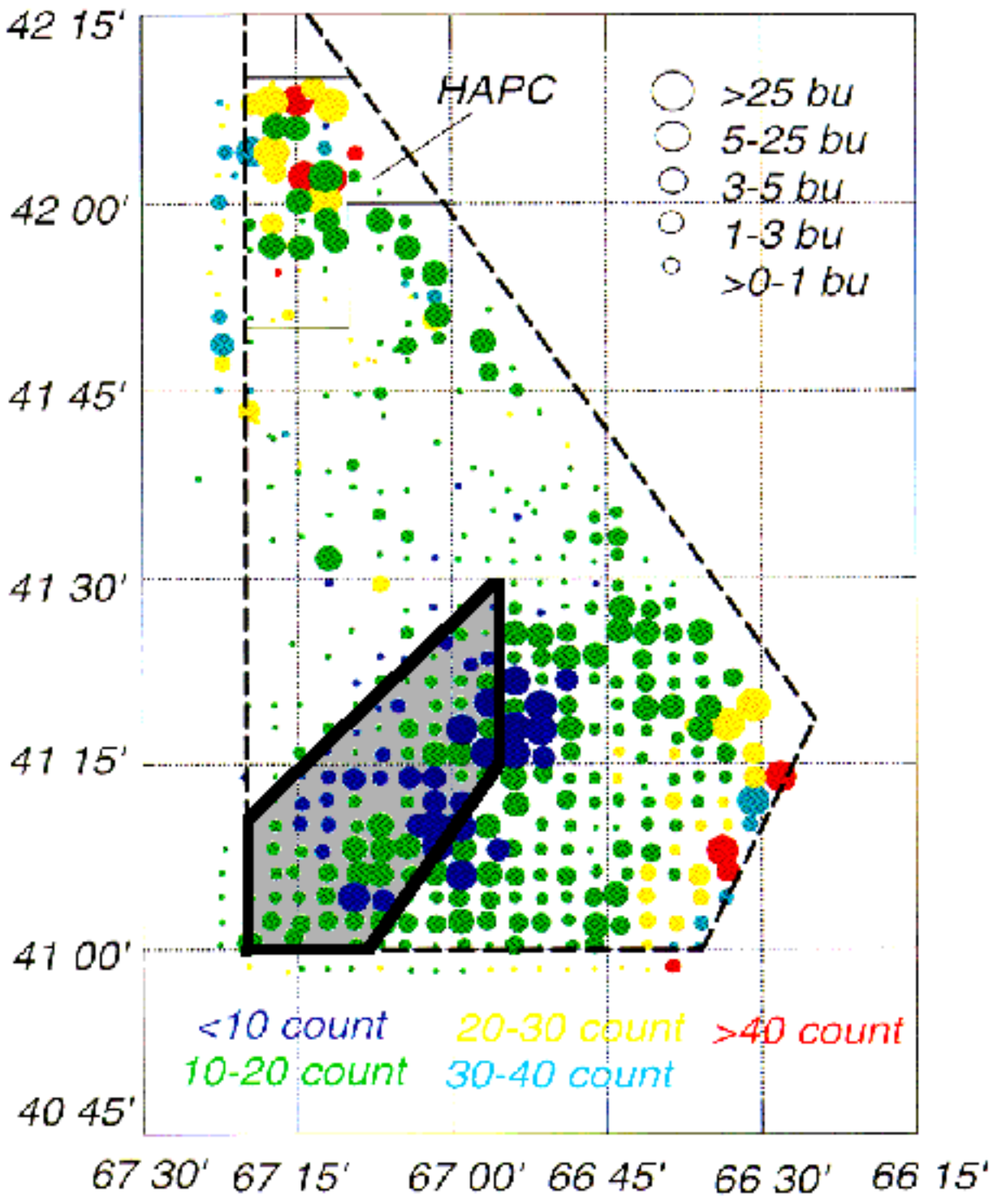


Figure 10. Boundaries of Closed Area II option 2 overlayed on top of the distribution of scallop catches from the CMAST experimental fishery in 1998. The proposed area to allow scallop fishing is within the heavy lines.

5.2.3.3 Option 3: Re-open portions of Closed Area II to reduce bycatch of yellowtail flounder and other species

Another option to reduce yellowtail flounder bycatch while maximizing the catch of scallops is described in the table below. This option is similar to option 2 because most of the scallop concentration occurs along a band running to the northeast, from the soutwest corner of Closed Area II. At the same time, the highest concentration of yellowtail flounder occurred, during the limited experimental fishery in the southeastern portion of Closed Area II. This option is a little larger than option II and contains square areas, rather than diagonal boundaries (Figure). The average catch of scallops during the experimental fishery within the boundaries of this option was 23 lbs. of scallop meats per 10-minute tow, with an average meat count of 12 scallops per pound. The average catch of yellowtail flounder was 16.5 pounds. For every 10 pounds of scallops, there were 6.9 pounds of yellowtail flounder caught during the experimental fishery within the boundaries of this option.

Table 10. Boundary of option 3 to allow scallop fishing in Closed Area II.

Point label	North latitude	West longitude
3A	41°00’	67°20’
3B	41°15’	67°20’
3C	41°15’	67°00’
3D	41°25’	67°00’
3E	41°25’	66°50’
3F	41°00’	66°50’
3G	41°00’	67°20’

Rationale: The impact analysis results were nearly identical for Options 2 and 3. The Council therefore rejected Option 3 for the same reasons given in Section 5.2.3.2 for Option 2.

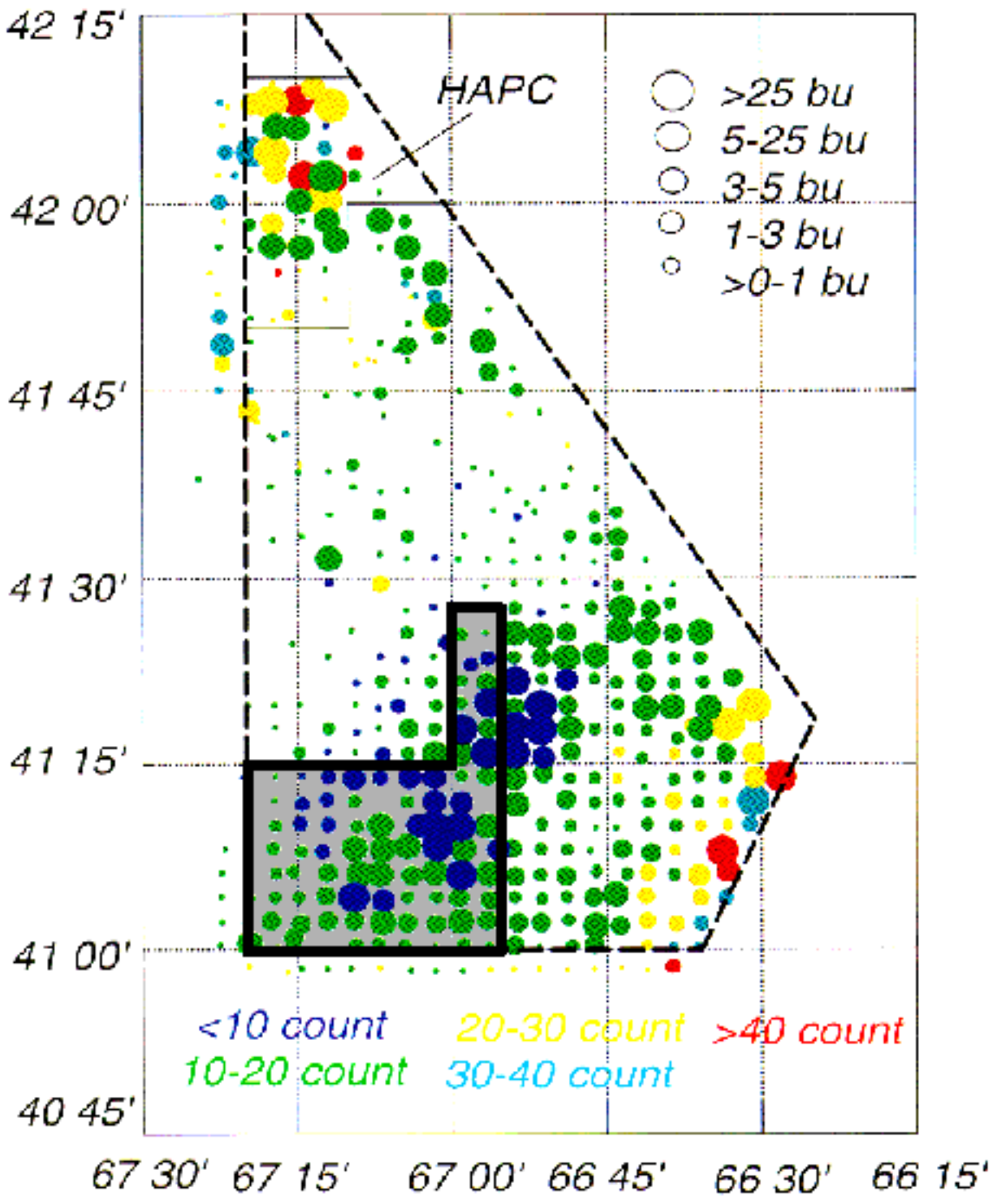


Figure 11. Boundaries of Closed Area II option 3 overlayed on top of the distribution of scallop catches from the CMAST experimental fishery in 1998. The proposed area to allow scallop fishing is within the heavy lines.

5.2.4 Scallop Demarcation Line (Framework 11)

5.2.4.1 Option 2: Closed Area Demarcation Line

The demarcation line for purposes of accumulating a greater number of days than actually taken on trips that fish in the closed areas would be the boundary of Closed Area II or the Nantucket Lightship Area, whichever was open for scallop fishing. Any time that the vessel enters the area would trigger an automatic accumulation of days-at-sea (10 days for Alternative 1) or days would accumulate at a higher ratio (2:1 or 3:1 for Alternative 2). Once a vessel entered the closed area during a scallop day-at-sea, it would be prohibited from returning to the area unless it returned to port, thereby "calling out" of the scallop fishery.

Rationale: The Council rejected this option because it allowed too many opportunities to evade the regulations and was therefore difficult to enforce. This option would prevent the vessels from being penalized because they are farther away from the closed areas and their steam time is greater. Trips that never actually reach the closed areas to fish, due to weather, mechanical failure, or other reasons, would also not be penalized and no post-trip adjustment would be necessary. The prohibition on re-entering the closed areas (once the vessel had been in the closed area during that trip) is necessary to reduce the incentive for vessels to anchor just outside the closed area to shuck scallops when the days accumulate at a lower rate than days in the closed areas. Unfortunately, this provision would also prevent a vessel from fishing in more than one closed area during a single trip, in the event that both areas are open simultaneously.

5.2.5 Gear Restrictions (Framework 29)

5.2.5.1 Minimum Twine Top Mesh (Framework 29)

All scallop vessels using dredges in the Northeast Region will be required to use twine tops with 8-inch or greater diamond mesh. This mesh may be hung on the square or the diamond within the area of the dredge occupied by the twine top. The purpose of this measure is to reduce groundfish and other finfish bycatch and take advantage of recent research that shows a significant reduction of catch, especially for flatfish, with insignificant reductions in scallop catch when scallops are large.

Rationale: The Council rejected this option because the expected bycatch with this twine top was too high. Preliminary data with larger mesh and industry advice indicated that larger mesh in Closed Area II would reduce bycatch and not affect the ability of a vessel to catch the scallop possession limit.

5.2.5.2 Other gear modifications to reduce bycatch

The Council may include restrictions on the configuration of the dredge or its components to reduce bycatch based on industry advice. Other than the larger twine top identified in the previous section, there are no known and proven bycatch reduction devices that would be effective at reducing finfish bycatch without significant losses of scallops. Some research, for example on funnels, ticklers, and other types of finfish excluders has been promising and proposals for an experimental fishery in areas with large scallops to test gear modifications for reducing bycatch or habitat impacts should be encouraged.

Industry on the other hand apparently has an opportunity to voluntarily reduce finfish bycatch under this program. Two changes in fishing and gear handling have the potential for reducing finfish bycatch without significantly reducing scallop catch. The impacts of both of these practices is discussed in more detail in Section 8.1.1.2.4.2.

One method is to simply tow the dredges slower than the current 4.5 knot standard. The reason for the higher towing speed is to cover more fishing area and catch more scallops per tow. In the closed areas, the scallop biomass is high enough that vessels will be able to catch enough scallops so that their landing are constrained by the scallop trip limit and the vessel's shucking capacity, not by the catch rate. If the vessels towed the gear slower, they would catch less per hour, but that would balance the shucking capacity and (for Alternative 1 only) there would be no cost to extend the trip to 10 days.

A second method to reduce finfish bycatch arose during evaluation of the experimental fishery. Some researchers and fishermen that had observed films of scallop dredging thought that letting the dredge sit stationary on the bottom for a few minutes prior to hauling the gear back would also significantly reduce bycatch. Even if the yellowtail flounder bycatch was reduced by half, it could keep the total yellowtail flounder catch under its target TAC.

Rationale: No proposals were raised that could be enforced during the final framework meeting. Changes in fishing operations, however, could be very effective in reducing bycatch and the Council encourages the industry to voluntarily explore and adopt ways to reduce bycatch.

5.2.6 Possession limits for species caught as bycatch

5.2.6.1 Status quo

Keeping the status quo possession limit would mean that scallop vessels could land up to 300 pounds of large mesh regulated species (including yellowtail and windowpane flounders). It is anticipated that the catches of these species will significantly exceed the current provisions for bycatch and vessels would be forced to discard large amounts of valuable species. On the other hand, the current trip limit would make the trips less profitable for scallop vessels to continue fishing when the scallop catch rates fall. With a higher groundfish trip limit to accommodate the expected bycatch, the value of a trip to fish in the closed areas would remain high and encourage fishing even though the scallop catch might be higher elsewhere.

Rationale: The Council rejected the status quo multispecies possession limit because of the expected regulatory discards. This alternative would increase regulatory discards by nearly 200,000 pounds. The monkfish possession limit, proposed by the Monkfish FMP, is expected to be high enough to prevent a large amount of regulatory discards.

5.2.7 Reporting requirements (Framework 11)

Additional reporting requirements will be necessary to ensure compliance with the rules for accessing the re-opened closed areas and for ensuring compliance with the redefined closed areas.

5.2.7.1 Trip Declaration and Notification of Landing

5.2.7.1.1 Option 1: Trip Declaration and Notification

Prior to leaving port on a scallop trip, vessels will be required to notify NMFS by VMS messaging or call-in that the vessel will be fishing within a re-opened closed area. Vessels must receive an acknowledgment from NMFS that the vessel is authorized to fish in the re-opened closed area to ensure that the vessel had not taken more than the allowed amount of trips that it is eligible to take. At the end of a declared trip to the re-opened closed areas, scallop vessels must notify NMFS by VMS messaging within 6 to 8 hours of offloading.

Rationale: The trip declaration and notification is intended to ease the enforcement burden and to prevent vessels from offloading portions of catch at different locations to avoid the scallop trip limit. This option was rejected, however, because law enforcement advised that minor modifications to the existing VMS program could provide satisfactory monitoring of the fishery.

5.2.7.1.2 Option 2: Status quo

The status quo would not require vessels to declare a trip to fish in the closed areas or to notify officials of their intent to land scallops.

Rationale: Trip declaration is unnecessary if the VMS program is used to automatically accumulate days at a higher rate when a scallop vessel entered one of the closed areas. If the Council chooses another demarcation line or counts steam time on closed area fishing trips at a different rate, trip declaration will be necessary.

Similarly, notification of a vessel's intent to land scallops would be less important if the Council chooses to have no scallop trip limits. The main reason for the notification is to monitor compliance with a scallop trip limit.

5.2.7.2 Mandatory Observers

Due to concerns about bycatch, discard mortality, and habitat impacts the Groundfish Oversight Committee and the EFH Technical Team both recommended that mandatory observers either be required on all scallop vessels fishing in the closed areas or that observers be used to the maximum extent possible. Since the Sea Sampling Observer Program is funded almost entirely by funds for estimating marine mammal encounters and moralities, additional funds are needed to increase the sea sampling frequency to acceptable levels.

Rationale: The Council approved 25 percent, rather than 100 percent, observer coverage because the cost of funding 100 percent observer coverage would be prohibitive. The data in the previous section could be collected more accurately by fully funding 100 percent sea sampling coverage. In addition to better catch, effort, and discard information, sea samplers could also collect data about habitat that will be crucial to making future decisions regarding access to other closed areas.

5.2.8 Enforcement Recommendations

1. Beginning immediately, violators of closed areas will not be allowed into the scallop exemption program.
2. The scallop exemption program should begin in September 1999.
3. It is estimated that at least 100 observers are needed to enforce the trip limit alternative, therefore, that alternative is not preferred at this time. The Enforcement Committee, when an adequate number of observers are available in the future, will recommend trip limits with 100% observer coverage as the preferred alternative.
4. A PRA must begin immediately to implement a scallop bag tag program.
5. The Enforcement Committee prefers the DAS Allocations alternative, without any trip limits.

Rationale: The above enforcement recommendations were rejected by the Council, due to concerns about legal issues, safety, and administration. The Council favored not allowing violators into the scallop exemption (i.e. closed area) program, but legal advice was that this prohibition might create a retroactive penalty that violated the original settlement. The Council did not want to delay the opening of the closed area for scallop fishing because of the potential for hurricanes late in the year. Complete observer coverage was rejected due to cost and the availability of observers. Scallop bag tags would trigger a lengthy review under the Paperwork Reduction Act (PRA), delaying access to the closed area. It was also thought to be administratively burdensome for a temporary fishery to implement bag tags. This management measure may be considered in future framework adjustments or plan amendments. The day-at-sea ratio alternative was rejected because of safety and economic concerns created by a potential derby fishery.

5.2.9 Alternative 1 - Trip Allocations and Scallop Trip Limits For Scallop Fishing in Closed Area II

This management action would re-open portions of Closed Area I and/or the Nantucket Lightship Area (NLSA) for scallop fishing, using a combination of trip allocations and scallop trip limits to control fishing mortality so it does not exceed MSY for scallops in the closed areas. Limited access vessels would be eligible to take a certain number of trips during the season and land up to the scallop trip limit on trips of 10 or less days. Under this proposal, the trip allocations would be based on the maximum number of eligible vessels in the first quarter and on all vessels landing the scallop trip limit throughout the season. This procedure requires that all vessels would have to land the scallop trip limit on every trip to achieve or exceed the TAC.

The Council chose Alternative 1 as the basis for the proposed action. The description of Alternative 1 is however included in Section 5.2 because it includes some options (e.g. quarterly allocations, various trip allocations and possession limits, varying trip lengths, etc.) that the Council ultimately rejected for the proposed action.

5.2.9.1 Effort limits (Framework 11)

Vessels with limited access scallop permits will be allowed to fish within the re-opened closed areas for a maximum number of trips. In addition, there will be an assumed trade-off of days outside of

the closed area for the ability to land greater amounts of scallops within the closed areas. These two factors will limit the total amount of fishing effort and also achieve at least conservation neutrality for scallops.

5.2.9.1.1 Trip Allocations

Vessels would be able to take up to six trips per three month period (July-September; October-December if the season specification in Section 5.2.2.1 is approved) or up to two trips per month. The number of trips that will be allocated to eligible vessels will depend on the target TAC and on a scallop trip limit that is deemed to be economically viable. Lower scallop trip limits would allow vessels to make more trips and higher scallop trip limits would require the Council to allocate fewer trips to avoid exceeding the target TAC.

If the Council chooses to allocate trips by quarter or three-month period, it may also require that no two trips occur within 15 calendar days of one another. For example, if vessels may take three trips per quarter to the re-opened closed areas, two trips could be taken in one month and the last trip would have to be taken in another month. This could be administered by requiring a vessel to declare into the re-opened closed area fishery no sooner than 15 days after the start of a previous trip within the closed areas or that the vessel would be prohibited from landing scallops less than 15 days after the last unloading of a declared trip. The latter approach may make it difficult to accommodate early returns to port due to weather, mechanical failure, or because the catch reached the scallop trip limit.

In-season adjustment

The number of trips that vessels may take within each month or quarter will be determined based on the seasonal TACs identified in Section 5.2.2. The number of trips allocated during each period will initially be based on the maximum number of eligible vessels that could participate in the closed area scallop fishery.

If the Regional Administrator determines that the number of trips should be changed, the adjustment will be made by Notice Action, after consulting with the Council on the proposed change. The Regional Administrator will be authorized to make an adjustment to the number of authorized trips each limited access scallop vessel can take into the closed areas, contingent on having sufficient information available to determine how many vessels have or will fish in the closed areas. The table below illustrates a possible outcome and how the trips could change by Notice Action.

Factor	First three-month period	Second three-month period
TAC	10,000,000 pounds	6,000,000 pounds
Observed catch	4,000,000 pounds	
Number of vessels expected	2658	120
Number of vessels observed	120	
Scallop trip limit	10,000	10,000
Number of trips allocated	2	5

Although not all vessels will fish for scallops in the re-opened closed areas, this approach is risk adverse, explicitly taking into account the uncertainty in the biomass estimate and uncertainties about the actual catch rates (and potential discards) under commercial conditions.

8 All eligible vessels having limited access scallop permits.

Allocation of trips for the first three-month period

For the evaluation of the framework management measures, the Council considered from one to six trips per calendar quarter, or one to two trips per month. To ensure that the allocation to trips does not cause the fishery to exceed the TAC, the scallop trip limit would decline when more trips are allocated to eligible vessels. The scallop trip limits needed for various amounts of trip allocations are shown in Section 5.2.9.2.

5.2.9.1.2 Day-At-Sea Restrictions And Tradeoffs

Any declared scallop trip or any trip that fishes within the re-opened closed areas may not be longer than 10 day-at-sea. Trips that are less than 10 days-at-sea will accumulate 10 days-at-sea to count against the annual allocation of scallop day-at-sea if the vessel lands any scallops for that trip. Vessels that return to port due to weather, mechanical failure, or any other reason without scallops onboard will accumulate days for the actual time called into the fishery. If a vessel declares that it is taking a trip into the re-opened closed areas and it catches its scallop trip limit in three or four days, for example, the trip will count for 10 days-at-sea instead of the actual time away from the dock. On the other hand, if a vessel has a mechanical problem on the way out and returns without scallops after two days-at-sea, the trip will count for two days against the vessels annual allocation of days-at-sea.

The intent of the day-at-sea provision is to reduce total fishing time for scallops in exchange for the ability to catch more scallops per day-at-sea to mitigate the potential negative impacts caused by re-opening the closed areas for scalloping. This reduced fishing time will assure conservation neutrality, compensate for habitat impacts within the closed areas by reducing habitat impacts in the currently open areas, and compensate for the increased groundfish bycatch within the closed areas by reducing groundfish bycatch in the areas that are currently open to scalloping.

The Council is concerned about market gluts that may occur if vessels are allowed to take all trips at one time or make back-to-back trips. It is for this reason that the trip allocations will be made on a quarterly (possibly requiring a lay-over between trips so they occur no less than 15 days of one another) or monthly basis.

5.2.9.2 Scallop Trip Limits (Framework 11)

Any trip that occurs east of the Georges Bank scallop demarcation line (Section 5.2.4 would be prohibited from landing more than the scallop trip limit. This scallop trip limit will be based on the TAC, the number of eligible vessels, and the number of trips that vessels may take into the re-opened closed areas. The Council intends on setting a scallop trip limit that will also be economically viable for vessels that fish in the re-opened closed areas. This choice will be made out of the scallop trip limit options shown in Section 5.2.9.1.1.

The purpose of the scallop trip limit is to ensure that the fishing activity within the re-opened closed areas does not exceed the target TAC. It is necessary to apply the scallop trip limit to all areas east of the Georges Bank scallop demarcation line to prevent vessels from transferring scallops at sea and avoid the scallop trip limit. Since few vessels that fish in the currently open areas of Georges Bank land more scallops than the proposed scallop trip limits, the scallop trip limit will have a negligible impact on trips that do not enter the re-opened closed areas. Applying the scallop trip limit to all areas of Georges

Bank will also reduce the incentive to illegally enter the re-opened closed areas to avoid the scallop trip limit or to avoid absorbing the 10 day-at-sea minimum.

Scallop trip limit options in Table 11 were derived from the TAC for Closed Area II associated with the biomass estimate from both dredge efficiency models divided by the number of potential trips in a quarter. The number of potential ten-day trips take into account the number of occasional vessels that can only take one 10-day trip per year and the number of part-time vessels that can take five 10-day trips (actually four 10-day trips plus one eight day trip). For the low biomass estimate (TAC = 2,700 mt meat weight), the scallop trip limit would range from 1,600 pounds per trip for six trips per quarter to 8,100 pounds per trip for one trip per vessel in the quarter. The scallop trip limits associated with the medium biomass estimate (TAC = 4,300 mt meat weight) range between 2,500 and 13,000 pounds per trip for six to one trips per quarter. Similarly the scallop trip limits associated with the high biomass estimate (TAC = 6,800 mt meat weight) range between 3,900 and 20,300 pounds per trip.

Table 11. Scallop trip limits associated with various allocations of trips per month or quarter, derived from the TAC divided into two equal periods and the number of eligible vessels by permit category. Boldfaced cells represent the alternative selected by the Council for the proposed action.

Total trips per vessel	Trips per quarter	Average trips per month	Potential 10-day trips for season	**Scallop trip limit (lbs. meat weight)**		
				TAC = 2,700 mt (Low biomass)	TAC = 4,400 mt (Medium biomass)	TAC = 6,800 mt (High biomass)
1	0.5	0.17	365	16,200	26,000	40,600
2	1	0.33	679	8,100	13,000	20,300
3	**1.5**	**0.50**	**993**	5,700	**9,200**	14,300
4	2	0.67	1,307	4,400	7,000	10,900
6	3	1.00	1,879	3,000	4,800	7,500
8	4	1.33	2,395	2,300	3,600	5,700
10	5	1.67	2,911	1,800	2,900	4,600
12	6	2.00	3,427	1,600	2,500	3,900

Comparison of Table 11 for Closed Area II and Table 18 for the NLSA indicates that the trip allocations and scallop trip limits are nearly identical, for equivalent measures of dredge efficiency and biomass. To ease the administrative and enforcement burden, the scallop trip limits for both areas could be the same without allowing higher catches than anticipated in one or the other area. It may also be possible to allocate a combined number of trips to fish for scallops in either area and allow the catch rates and fishing costs determine how much scallops are harvested from each area. This combination might cause a localized depletion of scallops in the open portion of one of the areas, but since both areas are considered to be in the Georges Bank reproductive stock, a combined allocation of trips to fish within the groundfish closed areas causes no concerns for the health of the overall resource.

5.2.9.2.1 Shell Stocking

5.2.9.2.1.1 Option 2 – Status Quo

No limit would be placed on the amount of shell stock that could be landed.

Rationale: Currently there is no limit on the amount of shell stock that vessels can land, yet most scallop dredge vessels do not land shell stock. The reason that significant landings of shell stock does not occur is because of maintaining product quality on long scallop trips.

Without a scallop trip limit, it is less important to prevent scallop vessels from landing shell stock. There would be no dockside regulatory discarding caused by the scallop trip limit or illegal landings that exceed the scallop trip limit. On the other hand, the biological impact analysis (Section 6.2.6) shows that shucking capacity will be a significant restriction on the amount of scallops that can be harvested from the closed areas during either a trip with a maximum duration or when there is a scallop trip limit. In either case, there will probably be a significant incentive to land shell stock to decrease the amount of days accumulated while shucking scallops for the day-at-sea ratio. With no scallop trip limit for Alternative 1, there would be a significant incentive to fish all 10 days-at-sea to avoid a day-at-sea tradeoff.

5.2.10 Alternative 2 - Days-At-Sea Allocations For Scallop Fishing in Closed Area II

This management action would re-open portions of Closed Area II and the Nantucket Lightship Area (NLSA, see Section 5.3) for scallop fishing, using higher days-at-sea accounting to control fishing mortality in the closed areas. Limited access vessels would be eligible to take trips into the re-opened closed areas, but instead of counting one day-at-sea for each day the vessel is called into the fishery, the trip will count for more than one day-at-sea for each day the vessel is in the fishery. This higher amount will be set equal to the expected catch per day-at-sea for trips in the closed areas divided by the estimated catch per day-at-sea in the open areas. For example, if there is eight times the biomass per square meter in the closed area as in the open areas and the dredge has equal catchability in the two areas, then the vessel would accumulate 32 days-at-sea for and 8-day trip. Since this ratio proscribes that the vessel will land equal weights of scallops for the number of days-at-sea that it accumulates and the scallops are larger in the closed area than in the open area, this strategy ensures that fishing mortality for the resource will be less than if the days-at-sea allocations were taken entirely in the open areas.
Rationale: The Council rejected Alternative 2 because it would create an incentive to fish as quickly as possible inside the closed area. This in turn could cause safety concerns from deckloading shell stock, decrease product quality, reduce incentives to avoid finfish bycatch, and increase discard mortality for sea scallops. These effects are described in more detail in Section 8.1.1.3.1.

5.2.10.1 Effort limits (Framework 11)

Vessels with limited access scallop permits will be allowed to fish within the re-opened closed during a scallop day-at-sea. Any day-at-sea for a declared trip to one or more of the groundfish closed areas will be counted for more than one day-at-sea per day that the scallop vessel is called in the fishery. This ratio will be set equal to the ratio of the scallop density inside the re-opened closed areas compared to the scallop density in the remaining open areas of the Georges Bank survey strata.

5.2.10.2 Day-At-Sea Restrictions

Vessels with limited access scallop permits will be able to fish within the groundfish closed area(s) on declared fishing trips (Section 5.2.7.1). The days-at-sea that accumulated during a declared trip would accumulate at a higher rate than at present and reduce the opportunity to fish in the open areas during the vessels remaining annual days-at-sea allocation. How much that this approach would reduce the opportunity to fish in open areas depends largely on the amount of unused days-at-sea that are available in 1999. This issue is analyzed and evaluated in Section 6.2.6.1

The preferred range for the rate of accumulation is between 2 and 3 days-at-sea for each 24-hour period that the vessel is in the fishery (i.e. at-sea on a scallop trip). This ratio would apply to the time that a vessel on a scallop day-at-sea in the closed areas. A vessel that remained in a closed area for

144 hours (six days), for example, would accumulate between 288 hours (twelve days) and 432 (eighteen days). The steam time to and from the closed area would accumulate on a 1-for-1 basis. That is a trip that took 18 hours to steam each way to and from a closed area would accumulate 36 hours (1.5 days-at-sea) in addition to the amount of days accumulated while in the closed area.

Rationale: This range of days-at-sea ratios represents the difference between mean scallop density in the open and closed areas of Georges Bank. Since access to Closed Area I is not under consideration in the framework adjustment, the ratio of scallop biomass within it has been excluded from the open/closed ratio.

For "full-recruits", that is scallops that are vulnerable to fishing for at least a year, the density in Closed Area II and the NLSA about 120 scallops/tow while the density in the open areas of the Georges Bank stock area is 41.0 scallops per tow (the density in the Mid-Atlantic, should the Council choose to include it in this procedure is 28.5 scallops/tow). Thus there is a 2.9-fold difference in the density of scallops within the closed areas compared to scallops in the open areas of Georges Bank (Table 12).

This approach would allow the scallop fishery to harvest an equal number of fully-recruited scallops per day-at-sea in the closed and open areas. Since the scallops in the closed areas are much larger than in the open areas, scallop vessels would benefit because landings would be higher. While the ratio of the trip length to day-at-sea accumulated could be as high as 3, the increased catch per day-at-sea in weight would range between 4.0 and 5.1 (Table 12). If the area option that the Council selects has larger scallops than the average for Closed Area II and/or the NLSA, then the landings per day-at-sea accumulated would be higher than estimated in Table 12. Another way of looking at this approach for setting the day-at-sea ratio is that it would allow scallop vessels to catch an equal number of scallops per day-at-sea accumulated in the closed and open areas of Georges Bank. The scallop vessels would benefit because the scallops in the closed areas are larger and the landed weight would be higher per day-at-sea the closed areas.

Although it might be more appropriate to use the density of full-recruits to trade off fishing mortality on scallops in the closed and open areas, the ratio is smaller when partially-recruited scallops are included. Partial recruits are those scallops that have been vulnerable to fishing for at least six months while they are growing. During the next fishing year, partially-recruited scallops would be classified as fully-recruited. The density of scallops in the groundfish closed areas is about 250 scallops per tow in Closed Area II and the NLSA versus 127.8 scallops/tow in the currently open areas of the Georges Bank stock area (122.3 scallops/tow in the Mid-Atlantic). Including the partial recruits, there was a 1.9-fold difference between the closed and open areas (Table 12).

While the higher ratio accounts for mortality on fully-recruited scallops, the approach that includes partially-recruited scallops may take into account the intended effort shift from areas with high concentrations of small scallops to areas with primarily large scallops. To the extent that fishing mortality could fall on partially-recruited scallops, this approach could account for conservation-neutrality (i.e. equal or lower fishing mortality) that arises from the effort shift from small to large scallops.

Table 12. Mean scallop abundance and biomass per tow in the 1998 NMFS Sea Scallop Research Survey.

	All Closed Areas	**Closed Area II**	**Nantucket Lightship Area**	**Georges Bank Open Areas**
Number per tow – full recruits	304.3	120.9	120.4	41.0
Ratio to open area	7.4	2.9	2.9	

Number per tow – partial and full recruits	497.0	244.9	247.8	127.8
Ratio to open area	3.9	1.9	1.9	
Weight (g) per tow – full recruits	7904.8	3357.2	4320.1	845.2
Ratio to open area	9.4	4.0	5.1	

Historically, this ratio was at present levels in 1990 and 1991, but the increased biomass when partial recruits are included was due to a strong year class of small scallops. The ratio quickly declined in 1992 (Figure 12) as the strong year class was targeted by the fishery with the areas that are now closed to scallop fishing. Since the closure of the groundfish areas to scallop fishing in December 1994, the ratio of the number of scallops of commercial size in the closed versus open areas increased to near 2 in 1996 and near 3 in 1997 and 1998. If scallop effort remains below F_{MSY}, the ratio in the number of scallops would probably increase or remain nearly the same in the closed versus open areas. Biomass of scallops in Closed Area II is expected to increase in 1999 by 23% over the 1998 levels. If however, scallops abundance in the closed areas are reduced by fishing effort and/or survival in the open areas increases due to less fishing effort, then the advantage of fishing in the closed areas would slowly decrease as the actual ratio declined below the ratio chosen for this management measure.

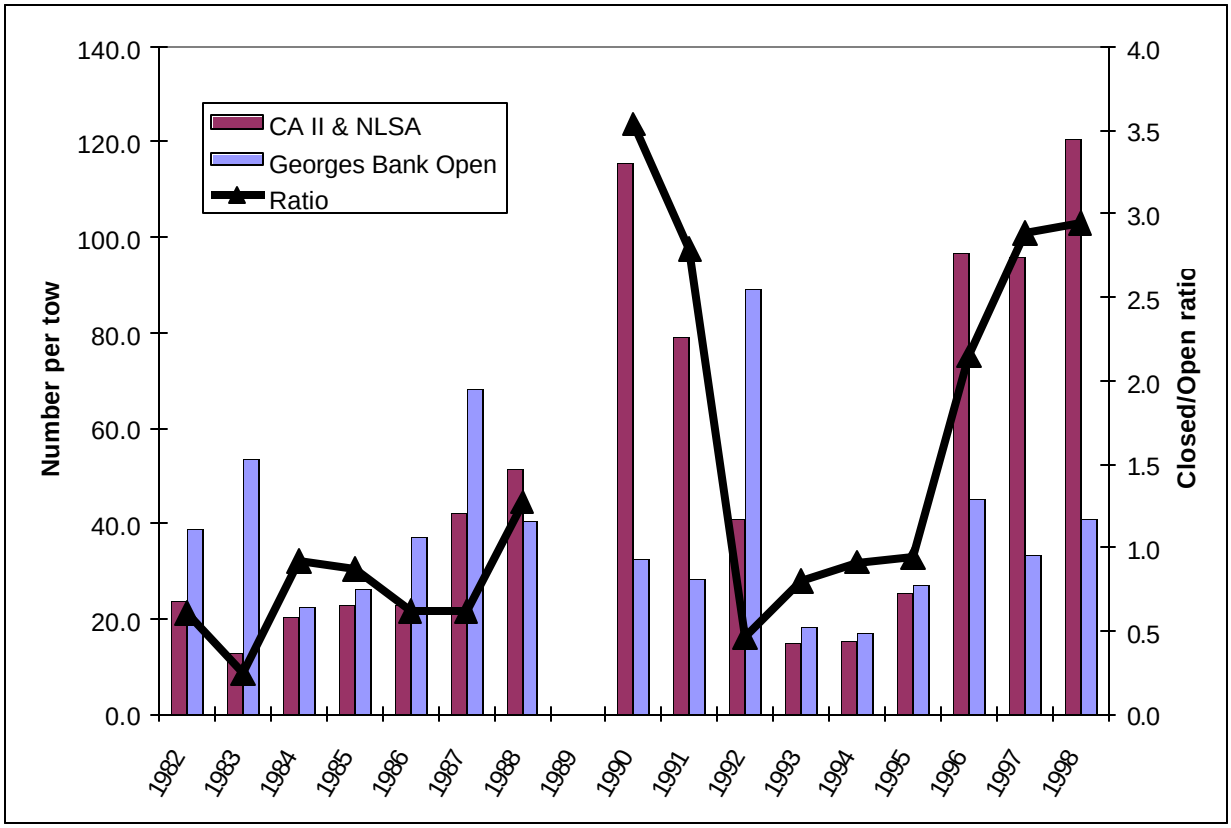


Figure 12. Time series of NMFS scallop survey number per tow for full and partial recruits in open vs. closed areas of Georges Bank. The closed areas exclude Closed Area I, since only Closed Area II and the Nantucket Lightship Area are being considered for scallop fishing in this framework adjustment.

This management measure is intended to substitute for the proposed scallop trip limit in the Council's preferred management option (Section 5.2.9). It is expected that a day-at-sea ratio, rather than a scallop trip limit, would be less costly to NMFS and the fishing industry by relying on less complicated equipment and procedures that are already in place. At the same time, there would be less opportunity for cheating than a scallop trip limit would since a day-at-sea ratio would be administered by a reliable, proven system. No additional reporting requirements except a declaration to take a trip into a closed area would be required.

The intent of the day-at-sea provision is to reduce total fishing time for scallops in exchange for the ability to catch more scallop weight per day-at-sea to mitigate the potential negative impacts caused by re-opening the closed areas for scalloping. This reduced fishing time will assure conservation neutrality, compensate for habitat impacts within the closed areas by reducing habitat impacts in the currently open areas, and compensate for the increased groundfish bycatch within the closed areas by reducing groundfish bycatch in the areas that are currently open to scalloping.

5.2.10.3 Trip allocations and maximum trip length (Framework 11)

Vessels with limited access scallop permits will be authorized for a maximum number of trips during 1999 into the closed area(s). During the season when the closed areas are re-opened to scallop fishing, limited access vessels will be allowed to take a limited number of trips into a closed area, ranging from one to twelve trips. This limit is intended to prevent the scallop fleet from using all of their days-at-sea to fish within the closed area(s) and exceeding the target TAC (Sections 5.2.2 and 0).

The number of trips for each vessel will be based on the total trips that will be expected to land the TAC, divided by the number of eligible vessels. Table 13 gives an illustration of the number of the method for determining the number of trips that vessels may fish in the closed area(s).

Table 13. Example calculations of the number of trips to authorize. Four factors determine the maximum number of trips to allow into the closed area(s): the TAC, the expected catch per day-at-sea, the maximum trip length, and the number of eligible vessels.

Factor	Low example	High example
TAC	10,000,000 pounds	20,000,000
Expected catch per day-at-sea	2,000 pounds	2,500 pounds
Total days-at-sea allowed (A/B)	5,000 days	8,000 days
Maximum trip length	12 days	8 days
Total trips allowed (C/D)	417	1,000
Number of eligible vessels	365	365
Total trips per vessel (E/F rounded)	1 trip	3 trips

Trips to fish for scallops in the closed area may be no longer than a maximum trip length set by this framework action. The range of alternatives that the Council is considering ranges from 8 to 12 days-at-sea. A maximum trip length is needed to control how much fishing effort and catch is generated during an authorized and declared trip to the closed area. Without limiting the length of a trip, vessels would compensate for the limited number of trips by increasing the trip lengths and using nearly all of their allocated days-at-sea on the few trips that would be allowed for fishing in the closed area. If the trips are as long as had been observed by some vessels in the past, nearly all of the 120 days-at-sea allocated to full time vessels in 1999 could be taken in the closed area, greatly exceeding the target TAC.

Vessels that intend to fish for scallops in the closed area must declare their intention before leaving port. The actual time that the vessel is at sea during a declared trip must not exceed the maximum trip length set by this framework adjustment. The actual time that a vessel is at sea (i.e. declared into the fishery) will count against the annual day-at-sea allocation at a 2 for 1 or 3 for 1 ratio. This accounting for the time a vessel would be at sea applies wherever the vessel fishes for scallops during a declared trip, except for the provisions included in Section 5.2.7.1.1. The table below illustrates how the day-at-sea accounting would work in a variety of circumstances.

Table 14. Three examples of legal trips to fish for scallops within the closed area and how the maximum trip length and days-at-sea ratio would apply to that trip.

Example	**A vessel from a port east of the Georges Bank demarcation line that fishes entirely within the closed area**	**A vessel from a port east of the Georges Bank demarcation line that fishes in the (groundfish) closed and other open areas**	**A vessel from a port west of the Georges Bank demarcation line that fishes in the (groundfish) closed and other open areas**
Total trip length	10 days (240 hours)	10 days (240 hours)	16 days (384 hours)
Days-at-sea in the Mid-Atlantic (steaming time or fishing)	0	0	6
Days fished in open areas of Georges Bank	0	4	0
Days fished within the groundfish closed area	9	5	9 (plus one day steaming time while in the Georges Bank area)
Total time at sea	10	10	16 days, 10 within Georges Bank
Total days-at-sea accumulated (3 for 1 ratio)	30 (720 hours)	30 (720 hours)	36 days (30 while in Georges Bank and 6 while in the Mid-Atlantic area)

5.2.10.4 Scallop Trip Limits (Framework 11)

The scallop trip limits for Alternative 2 would be the same as for Alternative 1 (Section 5.2.9.2).

Rationale: Although the day-at-sea ratio is intended as the controlling mechanism for Alternative 2, a trip limit would serve as a backstop measure in case that the day-at-sea ratio is not high enough to prevent a run-away fishery and derby-style fishing. Since the trip limits are not intended as a controlling mechanism, the ability to effectively enforce them is less of a problem. Unlike Alternative 1, the combination with a high day-at-sea ratio would limit the incentive to transfer scallops at sea while still maintaining harvest control and lessening safety concerns.

5.2.10.5 Maximum Trip Duration

Vessels would be prohibited from remaining in the closed areas for more than three to seven days, depending on the expected catch rates and the trip limits that apply.

Rationale: This restriction would prevent the trip limit from becoming the primary controlling mechanism to limit scallop catch and trip length. It would therefore, in itself, be a primary controlling mechanism, especially as catches decline from their initially high rates. Setting a maximum trip duration would greatly reduce the need to enforce trip limits, but careful effort monitoring through the VMS program would be necessary. The maximum trip length, based on the amount of time estimated that vessels would need to catch the scallop trip limit, is very sensitive to the assumptions about the distribution of fishing effort within the re-opened closed areas and to the fishing practices (i.e. tow duration) that vessels observe. Section 8.1.1.3.3.1 discusses these estimates in more detail.

5.3 Alternatives Considered And Rejected to Re-open Portions of the Nantucket Lightship Area (NSLA) for Scallop Fishing

Scallop vessels that are eligible to access the closed area(s) would be able to fish for scallops within the northeast portion of the NLSA. This area, described by the points of latitude and longitude in the table below, and the entire NLSA were originally closed by the December 1994 Emergency Action to protect yellowtail flounder. This action prevented the scallop fishery from accessing a very important scallop resource area.

During 1994, this was not a critical issue because of the low scallop abundance and biomass. Scallop biomass has increased by 16 times the 1994 level, primarily in this favorable scallop habitat. Yellowtail flounder are less abundant here than in the other areas of the NLSA, reducing the probability of large yellowtail flounder bycatch.

Table 15. Proposed northeastern area of the NLSA to re-open for scallop fishing.

Latitude	Longitude
40°50'N	69°00'W
40°30'N	69°00'W
40°30'N	69°30'W
40°50'N	69°30'W
40°50'N	69°00'W

Under either of the management alternatives described in Sections 5.2.9 and 5.2.10, there would be a separate TAC for the NLSA, based on catching the maximum sustainable yield from that area separate from Closed Area II. The current biomass estimates and the TAC the Council is proposing for the NLSA is described in Section 5.3.

Any scallop vessel that is eligible to fish in Closed Area II will also be eligible to fish in the NLSA. Scalloping will be allowed only during July to December, months expected to have the lowest bycatch of yellowtail flounder and other groundfish species. All other management measures within Sections 5.2.9 and 5.2.10, except for setting trip limits and allocating trips for vessels to fish for scallops in the NLSA would apply. The trip limit options are described in Section 5.3.2.1 for vessels fishing in the NLSA under the management alternatives described in Sections 5.2.9 and 5.2.10.

The only survey data available for the Nantucket Lightship Area (NLSA) were from the NMFS annual scallop survey. Comparison of survey and commercial dredge data for adjacent tows within Closed Area II during the experimental fishery indicated that the survey dredge sampled the exploitable size scallops relatively well. The survey dredge, however, captured more small scallops, compared to the commercial dredge. For all sizes, the NMFS dredge gave a swept area biomass estimate about 15 percent higher than adjacent commercial tows, largely as a result of the higher catch of small scallops. Based on these general results, the PDT concluded that the swept-area biomass estimate from the survey dredge for

exploitable size scallops would give a robust, but less accurate estimate of total exploitable biomass in the NLSA.

Rationale: The Council rejected this alternative to re-open portions of the Nantucket Lightship Area because of the higher amount of uncertainty about scallop biomass and finfish bycatch. No experimental fishery had been conducted in the NLSA, similar to the one conducted in Closed Area II. The Council encourages research in this area to collect the information needed to explore opening portions of this area for scallop fishing at a later time.

Re-opening the NLSA was also rejected because Southern New England yellowtail flounder are in worse shape than are Georges Bank yellowtail flounder. According to SAW 27 results, the biomass of Southern New England yellowtail flounder, although recovering, remains at very low levels compared to Bmsy. Addtiional time prior to re-opening the NLSA for scallop fishing could allow further rebuilding of Southern New England yellowtail flounder, increasing the catch that can be removed without causing overfishing or jeopardizing the rebuilding program.

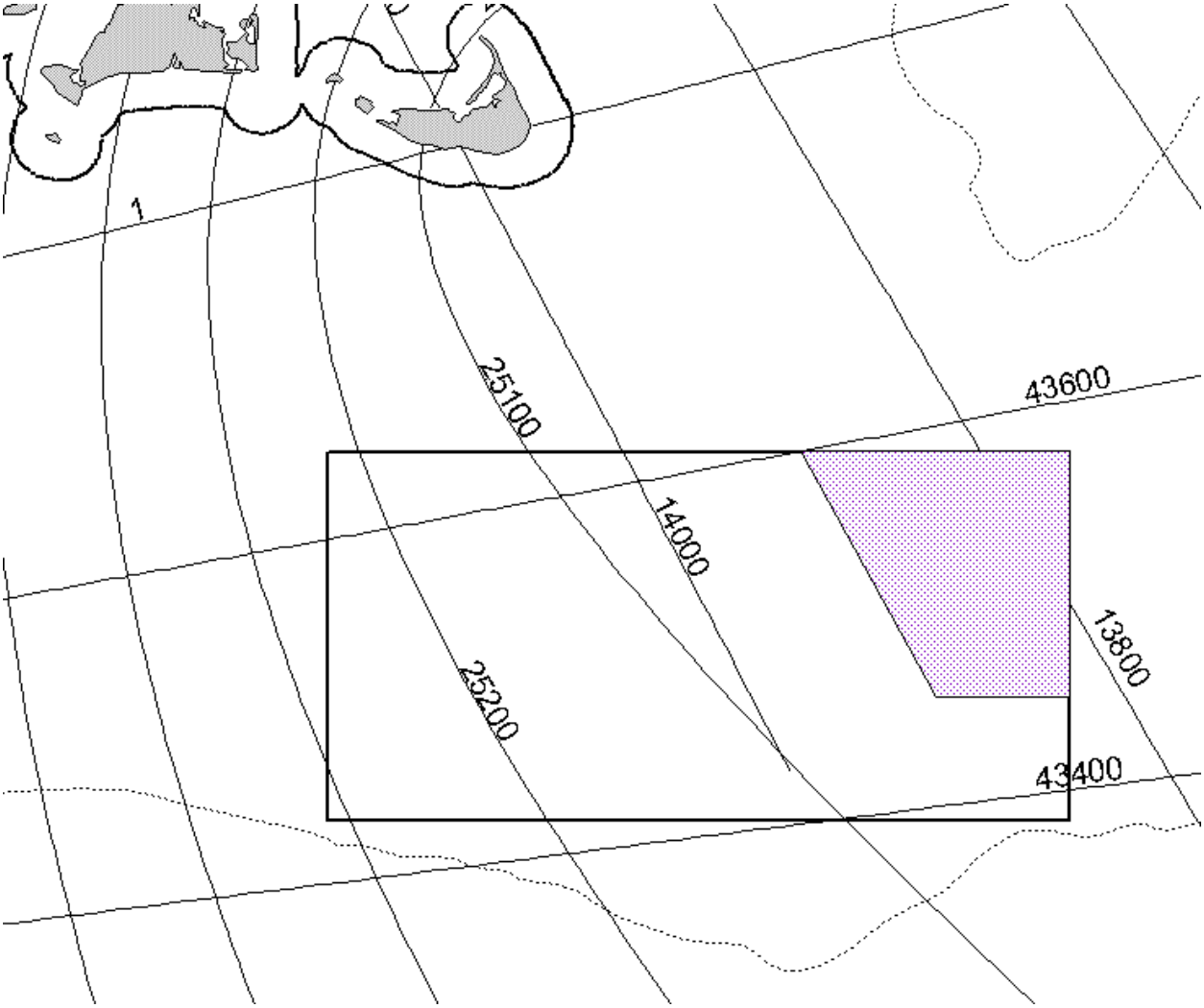


Figure 13. Proposed boundaries of the portion of the Nantucket Lightship Area to be re-opened for scallop fishing. Target Allowable Catch (TAC; Framework 11)

5.3.1 Target TAC for Scallops in the NLSA

Depending on the dredge efficiency estimated by the three models, the exploitable biomass estimates range between 28 and 52 million pounds meat weight. Applying the expected increase in meat weight at size and the natural mortality rate, the exploitable biomass is expected to increase to 38 to 71 million pounds meat weight in 1999, assuming there is no fishing mortality. The 36 percent increase in the NLSA is more than the 23 percent increase in Closed Area II because there are fewer large scallops in the NLSA as a proportion of all scallops in that area. The smaller, faster-growing scallops cause a larger increase in biomass over the year.

This difference in biomass change can be estimated out on a smaller scale within the closed areas. Survey strata in Closed Area II with the largest scallops, for example, are not expected to increase in biomass from 1998 to 1999, and may even decline at higher natural mortality rates.

Table 16. Exploitable biomass estimates for the NLSA based on the NMFS scallop dredge survey in August 1998.

Dredge efficiency estimate	**Patch model**	**Intermediate**	**Leslie-Davis**
Tow length (nm)	0.875	0.875	0.875
Dredge efficiency	40%	25%	16%
Swept-area exploitable (>70 mm) biomass - August 1998	21	33	52
Swept-area exploitable (>70 mm) biomass in 1999 (36% increase)	28	45	71
Exploitable biomass in 1999 (mt)	13	21	32

The fishing mortality rate that is expected to produce MSY for the resource is F_{max}, and approximately equals a 20 percent exploitation rate. Applying this exploitation rate to the combined exploitable biomass estimates above, gives the TACs and reserve values in Table 8.

Based on the estimated TACs, the Scallop PDT cautions against using the high and possibly the medium biomass estimate for specifying the TAC. Examination of these results and comparison to the historic landings since 1957 (Table 4 in Appendix I) indicates that the medium and high biomass estimates give TACs near or above the highest levels in the time series. During this period, US landings ranged between 662 (1996) and 10,660 (1961). Since scallops were at some time during the early portion of the time series at or above B_{MSY}, at some point the landings had to exceed MSY to bring biomass below B_{MSY}. Unreported landings, especially while the meat count was in effect, would bring the maximum landings more in line with the TACs calculated below.

Table 17. TAC and one-percent reserve for 1999 in the Nantucket Lightship Area.

	Low biomass estimate	Medium biomass estimate	High biomass estimate
Total Allowable Catch (lbs.)	5,514,000	8,822,000	13,784,000

Total Allowable Catch (mt)	2,500	4,000	6,300
1-percent research reserve (lbs.)	55,100	88,200	137,800
Annual Fishery TAC (lbs.)	5,459,000	8,734,000	13,646,000

5.3.2 Trip Allocations and Trip Limits For Scallop Fishing in Nantucket Lightship Area (NLSA) (Preferred)

All the management measures described in Section 5.2.9 that apply to Closed Area II would also apply to the Nanatucket Lightship Area. Since there would be a separate TAC for the NLSA and trip limits are the primary management measure to keep the scallop fishery from exceeding the TAC, different trip limits are under consideration for the NLSA. These trip limit options are described in Section 5.3.2.1.

If the Council adopts different trip allocations and trip limits for the NLSA than for Closed Area II, vessels would have to specify whether they will fish within Closed Area II or within the NLSA when they declare their intent to fish in the groundfish closed areas prior to leaving port on a scallop trip. Vessels would not be able to fish in both areas on a single trip, even though both areas might to be open simultaneously.

5.3.2.1 Trip Limits (Framework 11)

Any trip that occurs east of the Mid-Atlantic/New England scallop demarcation line (Section 5.1.4.1) would be prohibited from landing more than the trip limit. This trip limit will be based on the TAC, the number of eligible vessels, and the number of trips that vessels may take into the re-opened closed areas. The Council intends on setting a trip limit that will also be economically viable for vessels that fish in the re-opened closed areas. This choice will be made out of the trip limit options shown in Section 5.2.9.1.1.

The purpose of the trip limit is to ensure that the fishing activity within the re-opened closed areas does not exceed the target TAC. It is necessary to apply the trip limit to all areas east of the Georges Bank scallop demarcation line to prevent vessels from transferring scallops at sea and avoid the trip limit. Since few vessels that fish in the currently open areas of Georges Bank land more scallops than the proposed trip limits, the trip limit will have a negligible impact on trips that do not enter the re-opened closed areas. Applying the trip limit to all areas of Georges Bank will also reduce the incentive to illegally enter the re-opened closed areas to avoid the trip limit or to avoid absorbing the 10 day-at-sea minimum.

Trip limit options in Table 11 were derived from the TAC for Closed Area II associated with the biomass estimate from both dredge efficiency models divided by the number of potential trips in a quarter. The number of potential ten-day trips take into account the number of occasional vessels that can only take one 10-day trip per year and the number of part-time vessels that can take five 10-day trips (actually four 10-day trips plus one eight day trip). For the low biomass estimate (TAC = 2,500 mt meat weight), the trip limit would range from 1,500 pounds per trip for six trips per quarter to 7,500 pounds per trip for one trip per vessel in the quarter. The trip limits associated with the medium biomass estimate (TAC = 4,000 mt meat weight) range between 2,300 and 12,000 pounds per trip for six to one trips per quarter. Similarly the trip limits associated with the high biomass estimate (TAC = 6,300 mt meat weight) range between 3,600 and 18,700 pounds per trip.

Table 18. Trip limits associated with various allocations of trips per month or quarter, derived from the TAC divided into two equal periods and the number of eligible vessels by permit category.

Total trips per vessel	Trips per quarter	Average trips per month	Potential 10-day trips in quarter	**Trip limit (lbs. meat weight)**		
				TAC = 2,500 mt (Low biomass)	TAC = 4,000 mt (Medium biomass)	TAC = 6,300 mt (High biomass)
1	0.5	0.17	183	15,000	23,900	37,400
2	1	0.33	365	7,500	12,000	18,700
4	2	0.67	679	4,000	6,400	10,000
6	3	1.00	993	2,700	4,400	6,900
8	4	1.33	1307	2,100	3,300	5,200
10	5	1.67	1621	1,700	2,700	4,200
	6	2.00	1879	1,500	2,300	3,600

Comparison of Table 11 for Closed Area II and Table 18 for the NLSA indicates that the trip allocations and trip limits are nearly identical, for equivalent measures of dredge efficiency and biomass. To ease the administrative and enforcement burden, the trip limits for both areas could be the same without allowing higher catches than anticipated in one or the other area. It may also be possible to allocate a combined number of trips to fish for scallops in either area and allow the catch rates and fishing costs determine how much scallops are harvested from each area. This combination might cause a localized depletion of scallops in the open portion of one of the areas, but since both areas are considered to be in the Georges Bank reproductive stock, a combined allocation of trips to fish within the groundfish closed areas causes no concerns for the health of the overall resource.

5.3.3 Days-At-Sea Allocations For Scallop Fishing in the Nantucket Lightship Area (Non-preferred)

All the management measures described in Section 5.2.10 that apply to Closed Area II would also apply to the Nanatucket Lightship Area. Although there would be a separate TAC for the NLSA, the day-at-sea ratio chosen for scallop fishing in Closed Area II would be adequate for scalloping in the NLSA. Scallop densities (Table 12) in both areas are nearly the same compared to the open areas of Georges Bank and the basis for setting a day-at-sea ratio (Section 5.2.10.2) is therefore equivalent in both areas.

5.4 Alternatives Considered And Rejected - Status Quo

Maintaining the status quo would allow no scallop fishing within Closed Area I, Closed Area II, and the NLSA. Scallop fishermen would continue to fish in the remaining open areas of Georges Bank, the Gulf of Maine and in the Mid-Atlantic at the current fishing mortality rate.

This action would promote the fastest rebuilding of overfished groundfish stocks, managed by the Multispecies FMP, especially for Georges Bank cod, Georges Bank haddock, and Georges Bank yellowtail flounder. The first two stocks are rebuilding due to survival of existing year classes and fish growth. Recent recruitment, however, has been below normal and the recovery of stock biomass to the management targets is expected to slow or reverse. Between 1998 and 2000, cod spawning stock biomass (SSB) is expected to decline by 10 percent to 38.5 mt (43% of B_{MSY}) and haddock SSB is expected to increase by 9 percent to 56.9 mt (54% of B_{MSY}). If the fishing mortality increases to the management target, haddock SSB would decline to 49.2 mt in 2000. Georges Bank yellowtail, on the other hand, has rapidly rebuilt (as expected) and biomass is expected to increase from 26.2 mt in 1998 to 42.5 mt if fishing mortality does not exceed the target. This is above the target biomass level and the stock would no longer be considered overfished.

Scallop biomass within the closed areas has increased by 15 to 20 times the level observed in 1994, when the groundfish closed areas became off limits to scallop fishing. The mean weight per tow in the NMFS scallop survey increased from 2.8 kg in 1997 to 7.9 kg/tow in 1998 (Rago, pers. comm.). Although there is some uncertainty in the annual estimate, there appears to be no indication that the increase in scallop biomass in the closed areas is slowing. There also do not appear to be any indications of density-dependent effects that are slowing growth or increasing natural mortality (Rago and Stokesbury, pers. comm.).

The longer that the older scallops remain unharvested, however, the more chance that yield from the resource may begin to decline, either from reduced growth and meat yields or from unusual mortality events that could affect localized large scallop beds. Failure to open parts of Closed Area I and the NLSA will also prevent the scallop industry from recovering the economic benefits of the closed area. In the areas that are now open, the biomass of adult scallops remains low and faced with declining day-at-sea limits, some scallop vessels may be operating at uneconomic levels. Re-opening portions of the multispecies closed areas would allow many of these vessels to operate and make a profit.

Rationale: The status quo (not to allow scallop fishing in the closed areas) was rejected because the net benefits of a limited scallop fishery were positive and the proposed action would not jeopardize the rebuilding programs for scallops and groundfish. Estimated net benefits of the proposed action are $35 million. Choosing the status quo would therefore cost the economy $35 million dollars. Biomass in Closed Area II is expected to increase in 1999, but could begin declining as natural mortality removes more biomass than the increase caused by growth of older scallops.

Due to an expected shift in fishing effort from open scallop areas and due to the tradeoff in day-at-sea for closed area trips, the proposed action is expected to be conservation neutral for many species. For yellowtail flounder, the proposed action is not expected to be conservation neutral unless the scallop fleet can significantly reduce its bycatch below expected levels. To reduce the potential that this increased yellowtail flounder bycatch would jeopardize its rebuilding program, the proposed action authorizes the Regional Administrator to suspend the closed area scallop fishery when the yellowtail flounder bycatch exceeds 387 mt. Current projections indicate that catch could increase by this amount without exceed the yellowtail flounder target TAC.

6.0 APPLICABLE LAW

The sections that follow will be completed prior to submission of the framework, when the Council has obtained comments about the initial proposal and has selected a preferred alternative.

6.1 Magnuson-Stevens Fishery Conservation and Management Act - Consistency with National Standards

6.1.1 National Standard 1 – Optimum Yield

> *"Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the OY from each fishery for the U.S. fishing industry."*

Scallops

The management measures in the proposed action are designed to optimize yield from the scallop resource within Closed Area II, while preventing overfishing. Although the total biomass of scallops within Closed Area II remains uncertain due to unresolved differences in models, the Council chose an intermediate target scallop TAC to harvest scallops at a rate consistent with F_{max}, a proxy for F_{MSY} according to Amendment 7.

Due to the uncertainty in the biomass estimates, it is possible that the resulting fishing mortality rate for scallops in Closed Area II will exceed F_{max}. The range of the scallop stock covers all of Georges Bank, however, including scallops in Closed Area I and the Nantucket Lightship Area. These areas will remain off limits to scallop fishing during this fishing year. Scallop biomass in these two other closed areas has also rebuilt. It is therefore unlikely that the proposed action will cause the stock to be overfished.

In fact, a primary objective of the proposed action is to move fishing effort from areas with small scallops to areas with large scallops. To the extent that this action reduces fishing mortality on small scallops, the delayed fishing effort will enhance rebuilding by allowing greater survival of the fast-growing, small scallops. The change shift in fishing effort could , at least temporarily, result in a different overall exploitation pattern for the Georges Bank stock. This would increase the biological reference point (F_{max}), relieving overfishing for the Georges Bank scallop stock and increasing maximum sustainable yield. The analysis of the overfishing definition discusses this effect at length in Amendment 7 (NEFMC 1998).

At the same time, the proposed action is a step toward allowing the Scallop FMP to achieve optimum yield. Once scallops have grown to the sizes seen in many, but not all areas of Closed Area II, the main effect of an area closure is to make that resource unavailable to the fishery. This eventually reduces yield as natural mortality removes a greater portion of the biomass increase caused by growth. As the resource within a closed area approaches its carry capacity, the productivity (as measured by surplus production) slows down, unless the individuals in the population (in this case scallops) emigrate from the closed area or contribute to reproduction in other areas. Although scallop biomass within Closed Area II is probably a long way from the carrying capacity, the limited fishery proposed by this action lets the fishery harvest the large scallops, while letting the more productive (in terms of growth rate) scallops continue growing.

Multispecies

The target yellowtail flounder TAC and the provision to suspend the closed area scallop fishery if the catch exceeds this target is consistent with Amendment 7 to the Multispecies FMP and the existing rebuilding program. The 387 mt target TAC is the difference in catch between the Amendment 7 target, $F_{0.1}$, and the expected catch by multispecies vessels during 1997. The proposed action will not, therefore, cause overfishing of Georges Bank yellowtail flounder (a primary multispecies stock) or jeopardize the rebuilding program established by Amendment 7.

Other regulated multispecies, especially winter and windowpane flounders, will also be impacted by the proposed closed area scallop fishery, but a rebuilding program has yet to be established for these stocks. SAW 28 (NEFSC 1999) concluded that Georges Bank winter flounder was overexploited and at a low level of biomass. Like yellowtail flounder, the closed area fishery could increase mortality on this stock, but might also benefit from reduced scallop fishing effort on other portions of Georges Bank. If the closed area fishery is suspended early from exceeding the yellowtail flounder TAC, the catch of Georges Bank winter flounder would likewise be kept to a minimum. There is a potential, however, that industry efforts to avoid catching yellowtail flounder might increase the catch of Georges Bank winter flounder, since the distribution of these species within Closed Area II differs. The status of windowpane flounder will be assessed during SAW 30, to be reported in August 1999.

Monkfish

Monkfish are widely distributed and bycatch on scallop vessels is high in many other areas. Projections (Section 8.1.1.1.6) however indicate that there could be a net increase in monkfish catches as a result of the closed area fishery. Since monkfish are overfished and will be in a rebuilding program (with the implementation of the Monkfish FMP), the increased catch could require complementary action under the Monkfish FMP. The basis for these projections of catch in the existing open scallop areas is weak and the effect of the expected effort shift into portions of Closed Area II is very uncertain. Seasonal effect also could not be taken into account and could change the estimate.

6.1.2 National Standard 2 – Scientific Information

"Conservation and management measures shall be based upon the best scientific information available."

All available information and detailed studies of the 1998 experimental fishery were used to assess the impacts of various management alternatives and options. This information includes the latest data on day-at-sea use, vessel trip reports, landings, sea sampling observations, and an intensively-sampled experimental fishery that was conducted within Closed Area II during 1998. The Council set aside further consideration of a closed area scallop fishery within the Nantucket Lightship Area due to insufficient information on scallop biomass, finfish bycatch, and habitat.

6.1.3 National Standard 3 – Management Units

"To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination."

While the Council chose a TAC that it expects will provide maximum sustainable yield from the scallop resource within Closed Area II, it did this with the knowledge that the action could reduce fishing effort in other areas where large scallops are not as abundant. While the target TAC that was chosen for Closed Area II might cause fishing mortality in that area to exceed F_{max} if the lower biomass estimates are accurate, the overall effect will be to reduce fishing mortality or at least be conservation neutral on the stock as a whole (Section 6.2.6.1). The action takes advantage of the opportunity afforded by the rebuilt resource in Closed Area II to manage the entire stock.

6.1.4 National Standard 4 – Allocations

> *"Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be:*
> - *Fair and equitable to all such fishermen*
> - *Reasonably calculated to promote conservation*
> - *Carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges."*

All vessels with a limited access scallop permit are eligible to fish in the closed area fishery, regardless of where they customarily fish or land their scallops. Due to proximity to the fishing grounds, there is some advantage to vessels in New England from lower costs to travel to and from port. All vessels, however, are limited to fishing in the scallop demarcation area or in the open portions of Closed Area II for a maximum of 10 days.

Steam time to and from port does not count (Section 5.1.6.3), reducing economic disincentives for distant vessels from Mid-Atlantic ports. Many distant vessels are likely to take back-to-back closed area trips to reduce costs. The first trip, in this case, will depart from a Mid-Atlantic port (where supplies would be purchased locally) and return to a New England port to unload after fishing. The second trip would depart from New England and return to a Mid-Atlantic port to unload scallops. During the last dominant year class of scallops on Georges Bank, this was a common strategy for vessels from Mid-Atlantic states.

6.1.5 National Standard 5 – Efficiency

> *"Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose."*

This framework adjustment, allowing access to Closed Area II by scallop vessels, proposes no sector allocations or limited access beyond the ones established by Amendment 4 to the Atlantic Sea Scallop FMP. All vessels with a limited access scallop permit are eligible to participate in the closed area fishery and all vessels except ones with occasional scallop permits will receive the same opportunity to fish. Occasional vessels will only be able to take one closed area trip, because the automatic accumulation of days would use the vessel's entire annual allocation of days-at-sea.

While vessels that take closed area trips will probably accumulate more days than the actual trip duration, the proposed action avoids the economic waste often associated with a derby fishery. A derby fishery is one that the regulations encourage vessels to harvest the maximum amount of fish or shellfish

before access is denied. Alternative 2 has some features that would encourage vessels to fish as quickly as possible to reduce the amount of days accumulated during a trip. These effects are discussed in more detail in Section 8.1.1.3.

The yellowtail flounder target TAC and the threat of an early suspension of the closed area fishery could create an incentive to take the three allocated closed area trips as early in the season as possible, however. Economic waste, in this situation, could arise because vessels cannot take trips during the most advantageous period when prices are high. For example, if the industry believes that it cannot complete the scallop fishery before the bycatch exceeds the yellowtail flounder TAC, all the vessels that plan to take a closed area trip might take their trips as quickly as possible. This could result in temporary price declines that reduce producer surplus, although the benefits could accrue to different sectors of the economy (as consumer surplus, for example).

6.1.6 National Standard 6 – Variations and Contingencies

> *"Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches."*

The proposed action allows the Regional Administrator to either suspend the fishery because yellowtail flounder bycatch is to high (Section 5.1.2.3) or to make a mid-season adjustment to allocate more trips (Section 5.1.6.1) and change the scallop possession limit (Section 5.1.7). These adjustments address variations and contingencies that might occur during the progression of the proposed closed area fishery. Improved monitoring and reporting mechanisms are proposed that will allow timely in-season adjustment of management measures to respond to changing or unexpected conditions.

The estimated impacts and effects of the various management alternatives and options were based on the 1998 experimental fishery, conducted in Closed Area II. Many factors including seasonality and inter-annual variations could affect the performance of a commercial fishery vs. the expectations derived from last year's experimental fishery. One of the more important assumptions that will be violated by the proposed action is the distribution of fishing effort within the open portion of Closed Area II. Many vessels will target the highest concentrations of scallops and hopefully avoid areas with high bycatch of yellowtail flounder. Other vessels may work in areas that scallops are less abundant to avoid other scallop vessels or gear conflict. It was impossible to predict to what extent vessels will fish in relation to scallop density and how much the average conditions (predicted by the model) would differ from actual results. The proposed action, therefore, allows for responding to these uncertainties and changing conditions.

6.1.7 National Standard 7 – Costs and Benefits

> *"Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication."*

Monitoring and reporting procedures use existing systems and technology to minimize the administrative burden on the government and on individuals. The minimum amount of reporting is required to ensure the fishery does not exceed the management targets and to enhance compliance. No duplicative reporting is required unless it is absolutely required to provide real-time monitoring of the fishery. Real-time monitoring will allow rapid response to contingencies that arise during the progress of the fishery.

6.1.8 National Standard 8 – Communities

"Conservation and management measures shall, consistent with the conservation requirements of the Magnuson-Stevens Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to:

- *Provide for the sustained participation of such communities; and*
- *To the extent practicable, minimize adverse economic impacts on such communities."*

Producer surplus will increase by $32.1 million for the proposed action compared to status quo (i.e. not allowing a closed area scallop fishery). These benefits will accrue to the vessel owners, the crew, and the communities that depend on them and their business. This action will enhance profitability of the scallop fleet, creating jobs (although there are existing limits on direct employment), and continuing to sustain communities with scallop vessels.

On the other hand, there may be some collateral impacts on communities that rely on groundfish landings, especially species that inhabit Georges Bank. The proposed action limits these negative impacts on communities that are depending on groundfish landings by capping the yellowtail flounder catch (Section 5.1.2.3), requiring scallop vessels to use a more-selective large mesh twine top (Section 5.1.5), and establishing incentives for the industry to adopt fishing methods that will reduce groundfish bycatch. A discussion of impacts from the perspective of both the scallop and groundfish fisheries is given in Section 0.

6.1.9 National Standard 9 – Bycatch

"Conservation and management measures shall, to the extent practicable:

- *Minimize bycatch; and*
- *To the extent bycatch cannot be avoided, minimize the mortality of such bycatch."*

The proposed action raises the possession limit for regulated multispecies, without increasing the incentive to target these overfished stocks after the vessel had caught its scallop possession limit. If the fleet takes all 1,095 allocated trips in Closed Area II, the action could reduce discards by 219,000 pounds since it is expected that nearly all trips will catch more than the multispecies possession limit. Monkfish possession limits, regulated by the Monkfish FMP, appear to be sufficient to prevent discarding in most cases.

The management approach adopted by the Council will also minimize scallop discarding, compared with other forms of potential management. A prime example of what could occur for other alternative is discussed in Section 8.1.1.3.1. As opposed to other management alternatives, the proposed action allows vessels to slow down and carefully process the species that come on deck. Since the vessels will be able to catch the scallop possession limit in less than 10 days-at-sea, some vessels may take different approaches to avoid or reduce bycatch even though it might take more time to actually fish. On closed area trips, vessels will automatically accumulate 10 days-at-sea regardless of how short the trip is, eliminating the incentive to catch scallops as quickly as possible no matter how much bycatch the vessel encounters.

Although the proposed action has a scallop possession limit, there is no reason that vessels need to deck load or discard scallops. Highgrading is not expected to be a problem since the price differential between large and small scallops is not great enough to be an incentive to highgrade. Crews that shuck scallops often discard small scallops that are uneconomic to process in favor of larger scallops, but this is

usually done within a short time period and scallop survival is thought to be high. Due to the low possession limits for other species, it is also unlikely that the vessels would continue scallop fishing after having caught and processed the scallop possession limit.

6.1.10 National Standard 10 – Safety of Life at Sea

> *"Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea."*

The proposed action spreads the expected fishing activity out in time and space, so as to avoid some of the problems that might compromise safety. The maximum amount of area is proposed to be open to scallop fishing within Closed Area II, without increasing the potential impacts on habitat to unacceptable levels. This area option could reduce the potential for crowding and gear conflict, giving the vessel operator more flexibility to fish in the safest areas. The proposed scallop possession limit (10,000 pounds) is commonly caught on many scallop vessels (albeit on longer trips) and can be safely stored onboard the vessel. On last factor that improves safety is that the closed area trips are expected to be shorter than usual. Compared to taking longer trips to catch the same amount of scallops in the existing open scallop areas, the proposed action places the vessel at-sea for shorter periods and reduces the risk of facing inclement weather and other at-sea hazards.

Other alternatives propose to allow a fishery in more restrictive areas, possibly causing crowding and other problems. Other ways that have been proposed to manage the fishery also could set up incentives to fish or travel as quickly as possible, under any weather condition, to reduce the amount of days the vessel accumulates on a closed area trip. Lastly, other forms of counting days-at-sea might cause vessels to deck load scallops to potentially unsafe levels. These potential incentives and effects are described more fully in Section 8.1.1.3.1.

6.2 National Environmental Policy Act (NEPA) - Environmental Assessment

The proposed action is not significant for the purposes of preparing an Environmental Impact Statement (EIS). The most recent EIS documents for the Multispecies FMP and the Atlantic Sea Scallop FMP adequately describe the fishery, the resource, the biological, and the human environment. The proposed action in this Framework Adjustment does not change the goals, objectives, or rebuilding plans for either multispecies or sea scallops and the scope of this framework adjustment only includes the 1999 fishing year for sea scallops. This Environmental Assessment (EA) estimates and describes the potential impacts of the proposed action in the context of the existing management measures for multispecies and sea scallops.

6.2.1 Purpose and Need for the Proposed Action

The purpose and need for the proposed Framework Adjustment is described in Section 3.0.

6.2.2 Description of the Proposed and Alternative Actions

The description and rationale for the proposed measures is described in Section 5.0.

6.2.3 Description of the Physical Environment

The physical environment is described in the EIS for Amendment 9 to the Northeast Multispecies FMP and Amendment 7 to the Atlantic Sea Scallop FMP.

6.2.4 Description of the Biological Environment

The biological environment is described in the EIS for Amendment 9 to the Northeast Multispecies FMP and Amendment 7 to the Atlantic Sea Scallop FMP.

6.2.5 Description of the Human Environment

The human environment is described in the EIS for Amendment 9 to the Northeast Multispecies FMP and Amendment 7 to the Atlantic Sea Scallop FMP.

6.2.6 Biological Impacts

If the groundfish closed areas are re-opened to scallop fishing in a way that effectively shifts the majority of actual (i.e., unused DAS) fishing effort away from the open areas, it could be an effective first step at rebuilding the scallop resource in the Great Sought Channel, the New York Bight and the Delmarva regions when it is coupled with the existing and planned effort reduction in A#7. Closing areas on Georges Bank and the Mid-Atlantic to scalloping has concentrated the fishing effort into smaller areas, depleting the available resources more than if the closed areas had been left open. Re-opening the groundfish closed areas to scallop fishing would be a first step to reversing this trend and allowing the day-at-sea reduction schedule to have its full effect.

Selective closing of areas to scallop fishing is not without its benefits, however, especially if areas are closed at times when smaller scallops predominate. Closed areas could effectively impose a delayed exploitation pattern, taking advantage of the rapid growth rate of younger scallops, and significantly improving yield. This strategy will be the core issue for the next plan amendment.

Although last year's experimental scallop fishery in Closed Area II gave good, highly-detailed information in the scallop resource and bycatch, the commercial vessel tows were generally limited to 10 minutes. As a result, the experimental fishery data provided little direct evidence about how a commercial scallop fishery will operate in the closed areas in 1999. The catches were not restrained by shucking capacity because the tow duration and gear handling differed so markedly from what is likely to occur under normal commercial operations. There were also no data to indicate how various management restrictions would influence how, where, and how long the vessels would fish in the re-opened closed areas.

Enough information was however available to make some statistical inferences and develop a fishery model, especially when combined with the annual research survey data and ancilary informaion from the industry about how long it takes to handle the gear, maximum tow duration, and how the vessels would respond to the different resource conditions within the closed areas. Another important piece of information came from Kirkley et. al. (1991) who measured the shucking capacity for vessels using seven to nine-man crews. The shucking capacity (in pounds) varied as a function of scallop size (i.e. meat count).

The information from these various sources were combined into a model that could estimate total fishing effort, scallop catch, and bycatch amounts for a variety of potential management options under consideration in Framework Adjustment 11/29. The results give an indication of the net change in fishing effort (measured in fishing time and days-at-sea) and whether the estimated catches will exceed the target TACs for scallops and various bycatch species. The methods that describe this model are given in Section 8.1.1.4.

6.2.6.1 Conservation Neutrality and Rebuilding

With regard to the Scallop FMP, specifically Amendment 7, conservation neutrality means no net increase of fishing mortality on the stock compared to the target mortality rate established by Amendment 7. The target fishing mortality rate for the 1999 fishing year is 0.83, a combined average for the Georges Bank and Mid-Atlantic stocks. This target mortality rate is associated with a day-at-sea use of 26,936 days. For the purposes of this framework, therefore, conservation neutrality is any option in which the total days used (as opposed to days accumulated) is less than 26,936 days in 1999.

Also since the Amendment 7 day-at-sea allocations (and expected use) were calculated to achieve rebuilding in 10 years, any outcome that would cause the fleet to fish less than 26,936 days-at-sea would not jeopardize the rebuilding schedule. There is no new information to indicate that a different rebuilding schedule is appropriate at this time, therefore there is also no need to re-estimate rebuilding as long as the framework adjustment causes the fleet to fish no more than 26,936 days-at-sea. The following analysis of biological impacts on scallops does not therefore extend beyond the 1999 fishing year, since the proposed measures will also expire at the end of the 1999 fishing year.

The basis for the link between days-at-sea and fishing mortality was the basis for Amendments 4 and 7 to the Atlantic Sea Scallop FMP. Essentially, the amendments make the assumption that one day-at-sea used by an average vessel will produce one unit of fishing mortality, irregardless of the condition of the resource and the amount of allocated days-at-sea.

The proposed measures and the radically different resource condition within the closed areas causes this relationship to break down, especially when the catch rate exceeds the shucking capacity of the vessel. Even though the analytic model estimates both days-at-sea used and days-at-sea accumulated (they are different when there is a days penalty for fishing in the closed areas), the used days-at-sea could still be a biased indicator of scallop fishing mortality due to the radically different conditions.

For the first time, the data from the experimental fishery and the model developed for this framework adjustment gives a measure of total fishing time, that is the amount of time that a scallop dredge is actually fishing. This variable (fishing time, f) is a classic measure of fishing mortality when catchibility (q) is constant (Gulland 1969). The relationship between catch, fishing effort, and abundance is described by the following relationship:

$$C = qfN$$

This formula and its application in this analysis require that catchability of scallops in the closed areas and the existing open areas is the same. In other words, a unit of fishing mortality (in this case hours fished) in both produces a catch that is in the same proportion to the relative population abundance (i.e. numbers of scallops). This relationship is also a basic tenet for the research surveys results. As long as this relationship holds for both areas, a net decrease in fishing time will equate to a decrease in fishing mortality. Total fishing time is therefore also used to determine conservation neutrality.

6.2.6.2 Biomass estimates

The results from two models to estimate total scallop biomass in Closed Area II were submitted to the Council's Scientific and Statistical Committee for review on February 23, 1999. These models both used a swept-area expansion (i.e. the ratio of total area to the area swept during a survey) coefficient to estimate the total biomass in Closed Area II. Differences in the models arose from assumptions or estimates made for the number of scallops in the dredge's path as a ratio to the number of scallops caught by a sample. This ratio is known as dredge efficiency.

Using similar data sets from depletion studies that were conducted within Closed Area II during the experimental fishery, different statistical treatments and assumptions about the degree of overlap on subsequent tows led to varying estimates of dredge efficiency. Since the number of scallops estimated to be on the bottom before a dredge pass is inversely proportional to the dredge efficiency, a lower dredge efficiency will produce a higher swept-area biomass estimate and vice versa.

One model developed to measure dredge efficiency was a classic Leslie-Davis model that made some assumptions about the size of the sampled area. This model estimated the number of scallops in the sampled area prior to a depletion study via a linear regression of the declining catch rate on cumulative catch (Appendix VII). The average estimate for these studies was about 16 percent, agreeing with many prior studies of dredge efficiency in other areas or on Georges Bank where scallops were under exploitation by an active fishery. The dredge efficiency estimates for the 19 depletion experiments analyzed by this model ranged from 6 to 30 percent (Table 19). Unlike the prior studies of dredge efficiency, however, the scallops in this study were larger than in prior studies as a result higher survival in the closed areas lasting four years. This dredge efficiency result gave a total biomass estimate of 63 million pounds (28,000 mt) of scallop meats.

A second model used a statistical framework and continuous tow path observations to estimate the frequency and sequence of overlapping tows, on a 60 by 60-foot resolution. Although this model (Appendix VIII) explicitly estimated the effective sampling area of the depletion studies, it also required an assumption of a parameter called gamma. One interpretation of gamma is that it represented the amount of area that was effectively sampled by a single dredge pass during the experiment. The gamma estimate indicated that the effective sampling area was different than the physical dredge width.

This statistical model was called a "Patch Model" and gave dredge efficiency estimates ranging from 24 To 57 percent, with a mean of 40 percent (Table 19). Using the same swept-area extrapolation procedure to estimate total biomass within Closed Area II as the one used above, the mean dredge efficiency estimate from this model gives 25 million pounds (11,000 mt) of scallop meats.

These two models were used by the Council to determine a range for the total biomass within Closed Area II and for determining a target scallop TAC, set as the amount of scallops that could be caught without exceeding F_{max} for Closed Area II. This biological reference point is the proxy F_{MSY} for the entire scallop resource. For the current exploitation pattern (i.e. the proportion of scallops vulnerable to fishing for each age or length), F_{max} is estimated to be 0.24, or a 19.4 percent annual exploitation rate.

Based on the size frequency of scallops within Closed Area II, the total biomass was expected to increase by 23 percent in 1999, relative to the levels observed during the 1998 experimental fishery. This increase was used to adjust the biomass estimate for Closed Area II, reflecting the expected conditions in 1999. On an adjusted basis, the biomass in 1999 ranged between 31 and 77 million pounds (14,000 to 35,000 mt).

Responding to specific terms of reference while evaluating the preliminary results from these two models, the Council's Scientific and Statistical Committee concluded that:

"Two primary factors influence the estimate of total stock biomass: the tow path length that represents when fishing occurred and dredge efficiency. The one with the greatest influence on the biomass estimate is dredge efficiency. The SSC agreed that the NEFSC estimate of tow-path length was the most appropriate, because it explicitly estimated the fishing that occurred during set-out and haul-back of the dredges. The SSC, therefore, recommends that the Council use the longer tow path length, estimated by the NMFS method. Coincidentally, this will reduce some of the difference between the two estimates of stock biomass.

After reviewing the two models and general assumptions within each approach, the SSC was unable to determine the primary difference that gave a two to three-fold difference in the estimate of dredge efficiency and therefore biomass. The patch model appears to be more rigorous and should be the most appropriate statistical treatment of the experimental data. The source of the differences, however, was not readily apparent and the SSC could not therefore strongly recommend one approach over the other. The SSC, therefore, recommends further investigation to determine which set of assumptions display the contrasts observed. This analysis can be done in a short time period and the Council could act on those results, without further review by the SSC."

Additional efforts to explore the assumptions and methods to estimate dredge efficiency gave similar and intermediate results. On one hand, some investigations indicated that the Leslie-Davis model could give biased results because of the order in which successive tows in the depletion study area crossed bottom that had been fished in prior tows. Tows that fished new areas very late in a depletion experiment tended to inflate the estimate of biomass even though it was partially accounted for in a larger swept-area total for the experiment. This would generate lower dredge efficiency estimates than would be accurate, i.e. a negative bias. The Patch Model, on the other hand, explicitly took into account this potential permutation.

Scientists from CMAST also evaluated dredge efficiency using different assumptions from the original Patch Model. By increasing the theoretical resolution of the dredge path, they tried to effectively remove the influence of gamma and the need to simultaneously estimate this parameter. With a 6-inch theoretical resolution, rather than a 60-foot resolution in the original model, their estimates averaged 31 percent, with a range of 7 to 82 percent (Table 19).

At the same time, other CMAST scientists estimated dredge efficiency using a maximum likelihood estimate, with several priors for the error distribution. With a log-normal error assumption, the mean estimate for selected depletion experiments was 29 percent (D. Chai, pers. comm.).

Although the results are still inconclusive and further peer review is scheduled for later in 1999, the results subsequent to the February 23 SSC meeting were consistent with a 25 percent dredge efficiency factor used by the Council to select an intermediate TAC. Further investigation and highly detailed data from the proposed commercial fishery could identify what models and assumptions were the most accurate. Until this issue is clarified, the Council selected an intermediate TAC for specifying the management measures for the proposed action. The methods and rationale for this choice is given below.

Table 19. Comparison of alternative estimates of dredge efficiency for commercial scallop dredges. Estimated overlap ratios and comparison of CMAST (Leslie-Davis), 6" Patch Model, and 60' patch Model estimates of efficiency. Leslie Davis estimates restricted to experiments in which overlap index exceeded 0.4 (Stokesbury, pers. comm.). NMFS estimates restricted to experiments in which navigation information was complete.

		Navtrack postion			NMFS	CMAST	**Efficiency Estimates %**		
Vessel	Experiment	Area Swept Once (m^2)	Total Area Swept (m^2)	Ratio	1-A/a'	1-A/a'	CMAST Leslie-Davis Model	CMAST 6" Patch Model	NMFS 60' Patch Model
Celtic	1					0.59	9.11	23.38	
	4					0.57	5.73	52.38	
	5					0.79	13.77	69.35	
Christian & Alexa	1					0.43	17.8		
	4					0.5	29.09		
	6					0.48	12.23		
	7					0.85	12.14		
	10					0.81	27.96		
	11					0.71	20.26		
Eileen Marie	3	149,406	274,838	1.840	0.46	0.61	12.01	42.9	43.14
	4	132,225	247,648	1.873	0.47	0.49	24.88	18.27	56.87
Guidance	2					0.56	12.59	7.36	
	3	72,193	89,747	1.243	0.20			20.38	47.08
	4	200,416	426,378	2.127	0.53	0.57	7.02	34.38	23.89
	5	144,617	278,559	1.926	0.48	0.56	16.15	22.35	30.94
	6	69,338	90,766	1.309	0.24			32.25	
	7	123,797	249,708	2.017	0.50	0.57	18	82.38	27.96
	8	100,414	139,253	1.387	0.28			21.16	
Good News	2	265,863	357,384	1.344	0.26	0.46	14.7	12.3	41.04
	3	223,154	430,451	1.929	0.48	0.45	10.69	6.79	48.38
	4	228,267	372,935	1.634	0.39	0.6		64.8	
Thor	3	182,164	365.316	2.005	0.50	0.55	16.34	28.37	
	4	120,183	178,197	1.483	0.33			7.24	
	5	166,524	322,549	1.937	0.48	0.47	16.87	25.24	54.73
	6	178,156	342,464	1.922	0.48			9.23	24.91

0.40	0.58	15.65	30.55	39.89	Overall
0.43	0.52		27.42	39.89	NMFS-CMAST Patch Subset
0.46	0.52	15.04		40.87	CMAST LD - NMFS Subset
		13.68	32.73		CMAST LD - CMAST Patch Subset
0.46	0.52	15.04	30.58	40.87	All Three Estimates Present

6.2.6.3 Total Allowable Catch

The policy of the Council regarding scallop fishing in the re-opened closed areas is to keep the total scallop catch at or below the level that would produce maximum sustainable yield from the scallops in the closed areas. According to the scallop overfishing definition, this amount is the catch that would be harvested if mortality equals F_{max}, or 0.24 (exploitation = 19.4%). Estimates of total stock biomass in Closed Area II remain uncertain due to unresolvable differences in model results that estimate dredge efficiency. Incorporated in the experimental fishery were detailed depletion experiments that were designed to measure dredge efficiency. Different statistical treatments, however, give different estimates of the amount of area that is effectively sampled and as a result, dredge efficiency. The range of biomass estimates for these models range from 25 to 63 million pounds in Closed Area II and 21 to 51 million pounds in the Nantucket Lightship Area.

Setting the scallop TACs must therefore be done while recognizing the risk of choosing a high TAC option when the true biomass is low and vice versa. The following table shows the expected fishing mortality rate on scallops in the closed areas with all combinations of biomass estimates and choices for the TAC.

Table 20. Expected fishing mortality rate for scallops in closed areas for different choices of TACs and estimates of total stock biomass.

Closed Area II				**Nantucket Lightship Area**			
	1999 Biomass (mt)				1999 Biomass (mt)		
TAC (mt)	14,000	22,000	35,000	TAC (mt)	13,000	21,000	32,000
2,700	0.24	0.15	0.09	2,500	0.24	0.15	0.09
4,300	0.41	0.24	0.15	4,000	0.41	0.24	0.15
6,800	0.75	0.31	0.24	6,300	0.75	0.31	0.24

Quantitative estimates of the effects of these choices requires an evaluation of the value of current catches versus increased or decreased scallops for harvest in subsequent years. Since access to the closed areas in future years is uncertain, a quantification of the effects is beyond the scope of this framework adjustment. The PDT therefore developed a qualitative evaluation of the risks associated with overharvesting or underharvesting the resource. The qualitative comparison of the TAC choices is summarized in the table below.

Table 21. PDT risk assessment for setting scallop TACs in the closed areas.

Risk of choosing low TAC when the high biomass estimate is correct	**Risk of choosing high TAC when the low biomass estimate is correct**
Might not reduce targeting of small scallops in open areas and therefore may maintain a high level of incidental mortality	May retard rebuilding progress
May not optimize economic returns over time.	Could cause localized depletion, making the area inaccessible for several years
Could increase loss from natural mortality, especially if density-dependent effects occur. There has not yet been any evidence of density-dependent effects through 1998	May not allow sustainable harvesting when the economic benefits could be greater
Could reduce surplus production (i.e. increases	Could increase the prospect of a derby fishery

Risk of choosing low TAC when the high biomass estimate is correct	Risk of choosing high TAC when the low biomass estimate is correct
in biomass for the resource) by continuing the high rate of harvest on young, fast-growing scallops	
Management measures may not encourage the fishery to target the larger scallops in the closed areas	Greater risk of violating SFA goals for scallops and other species
	Could imply lower future yield if rebuilding is postponed.
	Could increase fishing effort (e.g. activation of latent effort) and therefore increase bycatch and habitat impacts within the closed area

Under uncertain conditions, it is often helpful to examine the choices in light of historic observations. Appendix V provides a detailed comparison of the proposed TACs for landings from various scallop areas. Based on this document, the PDT examined the historical landings from areas that include Closed Area II and advised that "the TAC based on 16% efficiency appears to be risky when compared with the historic landings time series."

Including Canadian landings (3,000 mt), the 9,800 mt TAC (20 percent of the highest biomass estimate) was only exceeded three times (for four years each in 1960-1963 and 1977-1981, and one year in 1990). Each time, landings rapidly declined to around 4,000 mt, suggesting that landings greater than 10,000 mt (7,000 mt US) were unsustainable.

6.2.6.4 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 loosing 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.

6.2.6.5 Bycatch

In contrast to meeting the Amendment 7 fishing mortality target in 2000, a lower fishing mortality rate may be needed in 2000 to stay within the SFA overfishing definition rebuilding program, depending on the F generated in 1999. The SFA fully-recruited F target for this stock, for the 1999 stock biomass, is F=0.32. This F, when applied to the projected stock size for 1999, would generate total landings of 5,121 mt stock-wide. The Canadian catch in 1998 was 1,137 mt. If the Canadian catch holds steady, landings by U.S. vessels could increase to 3,800 mt (Table 22; 1998 catch was 1,822 mt).

The Groundfish Advisory Panel and Groundfish Committee concurred that the yellowtail flounder bycatch by scallop dredge vessels should not exceed the historical proportion caught by this sector, that is 5-15 percent. Under the TAC in Framework 27 based on the Amendment 7 rebuilding target, 5-15 percent of the TAC equates to 136-409 mt (Table 22). Under the fishing mortality rate prescribed by the revised overfishing definition in Amendment 9, based on a ten-year rebuilding schedule, the TAC would be 3,800 mt in 1999, assuming no increase in the Canadian quota (1,200 mt) from 1998. Under this strategy, the yellowtail TAC for the exemption program would be 196-588 mt.

Table 22. Catch and fishing mortality estimates for setting Georges Bank yellowtail flounder TACs in the 1999 fishing year.

Source	Year	Fishing Mortality	Recommended Catch By Scallop Fleet (mt)	US Catch (mt)	Canadian Catch (mt)	Total Catch (mt)
MSMC Report	1998	0.17		1,100	1,200	2,300
PDT Update	1998	0.22		1,822	1,137	2,959
Projection	1999	$F_{0.1}$ = 0.25	129 – 387	2,577	1,200	3,777
Projection	1999	F_{reb} = 0.35	196 - 588	3,921	1,200	5,121

The committee clarified that the yellowtail TAC for scallop dredges would be based on the fishing mortality target under the SFA rebuilding program overfishing definition (that is, 196-588 mt) but that it would not change the current TAC for the stock under Framework Adjustment 27. The general sentiment of committee members was that this exemption program should not impinge on the directed flounder fishery that is already restricted by closed areas, days-at-sea and an increased square mesh size rule (under Framework Adjustment 27). This view is the basis for apportioning the yellowtail TAC based on historical catch patterns.

The biomass-based F corresponding to F_{msy} is F= 0.31, which corresponds to a fully-recruited F=0.39. The biomass-based F corresponding to $F_{threshold}$ under the SFA rebuilding definition control rule is F=0.30 for a stock that is at or above 1/2 B_{msy} which corresponds to a fully-recruited F=0.37. This is the fishing mortality rate calculated to rebuild the stock to B_{msy} in ten years. Since this is the maximum rate that will achieve the rebuilding goal, and since the 1999 biomass of GB yellowtail flounder is barely over $1/2B_{msy}$ (24,000/44,000=0.54), the PDT applied a slightly lower full-recruited fishing mortality rate of F=0.35 to calculate as a rebuilding target F under the SFA control rule. Applying this F to the mid-year stock size in 1999 generates a total catch of 5,121 mt, and subtracting the 1998 Canadian quota of 1,200 mt, a U.S. catch of 3,921 mt.

If the current level of fishing effort increases from F_{98}=0.22 to $F_{0.1}$=0.25, the total U.S. catch is projected to be 2,577 mt, assuming no change in the Canadian quota from 1998 to 1999. This compares to a TAC projected by the MSMC of 2,725 mt based on projected landings in 1998 of 1,110 mt. Given the increasing trend in fishing mortality on this stock in recent years, and the potential for effort to be displaced from the Gulf of Maine and other fisheries, there is a high likelihood that this increase in F will

be realized in 1999. If the F target is increased from the Amendment 7 level to the SFA target level in 1999, U.S. landings could increase by 1,344 mt, to 3,921 mt. However, the current management plan is based on the Amendment 7 fishing mortality goals, and if landings exceed the TAC, the regulations require the Council to take action to reduce fishing effort to a level consistent with those goals.

6.2.6.6 Impacts on Habitat

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). The alternatives and actions proposed in this framework adjustment are not expected to increase the total adverse impacts on essential fish habitat resulting from fishing activity.

7.0 Proposed Measures

All proposed measures are intended to allow controlled access to a current groundfish closed area on Georges Bank (Closed Area II) for scallop fishing during the 1999 - 2000 sea scallop fishing year. 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 Area II; 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 a currently closed area. The habitat of the reopened area will see an increase in impacts due to fishing activity; however, the increase in fishing activity in the current closed area will be accompanied by a decrease in fishing activity in other currently open areas. Thus, we would expect a decrease in impacts due to scallop fishing activity in currently open areas.

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. 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.). 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. Prey abundance may also be increased in areas of higher complexity and functional value.

There are different 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 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 individuals in gravel areas was reduced by 48% following disturbance by bottom-tending mobile fishing gear, while the number of individuals 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 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. 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 will only recover in the absence of disturbance.

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 area. This shift in fishing effort may 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. There is expected to be an overall increase in harvested biomass as a result of scallop fishing the reopened areas; however, overall, the increases biomass will come from the relatively flat sand areas of the current closed area. Since this habitat is thought to be less sensitive to disturbance from fishing activity and recover more quickly than other habitats of the region, overall impacts to the habitat of the region may be reduced.

It is important to remember that areas that will see an increase in effort (i.e., the current closed area) currently face no impacts from bottom-tending mobile fishing gear, while the areas that would see a decrease in effort (from scallop fishing) would 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 could reduce, but not eliminate, 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. 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. 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.

Scallop TAC

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

Area Option

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. 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. These bottom types both take relatively longer to recover from disturbance due to fishing activity than do flat sandy areas.

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 are minimal to the habitat of Closed Area II that is proposed for reopening to scallop fishing, given the bottom types within the area and the expected recovery from these fishing impacts.

Season

The seasonal nature of the proposed measures (as early as June 15 and through December 31) dictates that there will be time during the current fishing year for the habitats of Closed Area II reopened to scallop fishing to recover at least partially from any adverse impacts due to scallop fishing activity.

Trip Allocation and Scallop Possession Limit:

For each of the maximum three trips into the current closed area proposed to be allocated to each scallop fishing vessel, ten days-at-sea would be accumulated regardless of trip length. 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 Closed Area II during the 1998 experimental fishery, it is expected that it will take considerably less than ten days-at-sea for each vessel to attain the possession limit. In effect, each scallop vessel that fishes in the reopened area will not be able to fish some days-at-sea in other areas, potentially translating into reduced 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 day-at-sea.

Scallop Demarcation Line

Implementation of the proposed scallop demarcation line may have the effect of a temporary or partial area closure. The same scallop fishing regulations for fishing within the closed area will apply to vessels outside of the closed area but within the scallop demarcation line. There would be little incentive or reason to fish within the scallop demarcation line given the relatively high scallop biomass within the closed area.

This potential decrease in scallop fishing activity surrounding Closed Area II may reduce the adverse impacts associated with these fishing gears within the scallop demarcation area. 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 proposed action. If fishing effort within the proposed scallop demarcation area is displaced, the proposed measure could locally 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.

Suspension of Fishing in Reopened Area

The potential suspension of scallop fishing in the reopened area 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 area. 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. Early suspension of the closed area scallop fishery, however, would reduce

the habitat benefits attributed to the fishery and might even be counter productive if the days fished in the closed area come entirely from unused days-at-sea.

Twine Top Mesh Size

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

TAC Set Aside

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

Vessel Monitoring Systems

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

Trip Declaration

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

Shell-stock Limit

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.

Possession Limit for Regulated Species

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

8.0 Alternatives Considered but Not Selected:

Area Options

In addition to the proposed area option, the Council considered, but did not select, two alternatives for reopening Closed Area II for scallop fishing. Both options proposed to reopen subsections of Closed Area II south of 41° 30' north latitude. The subsections were identified based on the expected bycatch of yellowtail flounder and were designed to minimize yellowtail flounder bycatch while maximizing scallop harvests.

From a habitat perspective, it may have been preferable to limit the reopening to one of these smaller area alternatives. Current scientific thought is that the habitat of a system might recover more quickly and completely if adverse impacts are constrained to a portion of the overall system than if the impacts are diffused over the habitat of the entire system. This approach could allow the undisturbed portions to serve as a "seed" area for habitat recovery of the disturbed areas.

Season

In addition to the proposed season, the Council considered, but did not select, two alternatives for reopening Closed Area II for scallop fishing. These proposed alternatives were not expected to have any significant effect on the habitat of the region compared to the proposed season selected by the Council.

Trip Allocations and Possession Limits / Days-at-sea Control

Compared to the trip allocation and possession limit proposed by the Council, the other alternatives for trip allocations and possession limits and/or days-at-sea controls were not expected to have any significantly different effect on the habitat of the region.

Nantucket Lightship Closed Area Option

The Council considered, but did not select, an option to reopen a portion of the Nantucket Lightship Closed Area for scallop fishing, in addition to the proposed portion of Closed Area II. Had the Council selected this option as well, additional area would have been subjected to disturbance by scallop fishing gear. By not proposing this additional area be reopened for scallop fishing, any potential adverse impacts from scallop fishing on the habitat of this area have been eliminated.

Gear Conflict Season / Area Restrictions

The Council considered, but did not select, two options proposed to minimize potential gear conflicts between scallop vessels and the lobster fishing industry. These alternatives were not expected to have any significant effect on the habitat of the region.

Impacts on Endangered Species and Other Marine Mammals

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 and in the associated NMFS Biological Opinion. Impacts were most recently reviewed in Amendment 7 to the FMP. Prior to that action, they were discussed in the February, 1998 Environmental Assessment associated with the NMFS Interim Action to Implement Sea Scallop Protection Measures in the Atlantic Sea Scallop Fishery.

Volume I of the Final Environmental Impact Statement (FEIS) for Amendment 5 to the Northeast Multispecies FMP also contains a list of threatened, endangered and other marine mammal species that are likely to occur within the waters governed by that FMP, as does the NMFS Biological Opinion issued on November 30, 1993. Also see Volume I, FEIS for Amendment 7 to the FMP, the Biological Opinion issued by NMFS on February 16, 1996 and the Biological Opinion issued on December 13, 1996 following an unusual right whale mortality event earlier in that year.

Further 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 reports present information on stock definition and geographic range, population size and productivity rates and known impacts. The most recent information on sea turtle status is contained in the status review of listed turtles prepared jointly by NMFS and the U.S. Fish and Wildlife Service (NMFS and USFWS, 1995).

Right Whales and Critical Habitat - Because there is little likelihood of right whale interactions with scallop dredges and because of scallop gear configuration and the behavior of the animals, this species probably will not be adversely affected by the measures contained in this framework adjustment. Neither should the proposed action affect or modify the implementation of measures contained in the Large Whale Take Reduction Plan or right whale critical habitat.

Harbor Porpoise - As with right whales and most other cetacean species, harbor porpoise are also unlikely to interact with scallop dredge gear. Harbor porpoise are the subject of a Take Reduction Plan implemented by NMFS in December, 1998 and are most vulnerable to entanglement in fixed gear. During any given season porpoise may be found on Georges Bank, but are generally more abundant in the western Gulf of Maine and move northward to the Bay of Fundy in the summer. This species, therefore, should not be adversely affected by the proposed action.

Sea Turtles - Loggerhead, leatherback and Kemp's ridley turtles are known to inhabit the action area and are potentially 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 represent 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.

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. The event 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 in 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.

As described more fully in Section 5.0, this framework adjustment proposes to temporarily open portions of Closed Area II for purposes of conducting a limited sea scallop fishery. Overall, the Council has concluded that both this action and the fishery may affect threatened and endangered marine species and other marine mammals, but will not jeopardize the continued existence of any listed species. The impacts of specific measures are discussed below.

Of those proposed, most measures address sea scallop or multispecies conservation issues and are unrelated to endangered and threatened species or any other marine mammals. These include the scallop and yellowtail flounder TACs, the 10-inch twine top requirement, the possession limits for scallops and species taken as bycatch, the TAC set-asides to fund observers and research efforts and the enforcement provisions. The following measures may have either direct or indirect impacts.

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, if they use a dredge. The rationale for this measure is discussed in Section 5.1.1. Although overall scallop effort could increase by up to 15 percent, depending on the amount of participation by vessels that are currently inactive, this outcome is not likely to increase negative impacts on endangered or other protected species for the following reasons. First, vessels that participate in the scallop trawl fishery in the Mid-Atlantic region have the opportunity to switch to dredge gear and fish in the closed area. If this scenario occurs, potential interactions with sea turtles may decline as a result of vessels switching from nets to gear that is less likely to interact with turtles. Second, potential turtle interactions with dredge gear also may be reduced if vessels move from the mid-Atlantic to Georges Bank, where turtles are less abundant because of cooler water temperatures. And third, the scallop fishery historically has not been associated with marine mammal bycatch. It is listed in Category III on the Marine Mammal Protection Act's *List of Fisheries for 1999* (with no documented marine mammal interactions).

Area and Seasonal Restrictions - The open season for participation in the closed area scallop fishery would occur on or before July 1, but no earlier than June 15, and extend no later than December 31, 1999. A significant portion of the Great South Channel region of Georges Bank is considered a high-use area by a number of endangered as well as other marine mammal species, particularly in the spring and summer months. Fin, humpback and minke whales and white-sided dolphins regularly feed in the region throughout this period. Although the timing is variable, a significant portion of the right whale population aggregates in the Great South Channel area from April through June, with a peak in May. Because the scallop fishery proposed is to be conducted in a limited area (Figure 9), there appears be adequate spatial and, in the case of right whales, seasonal separation to mitigate the potential risks of serious injury or mortality to these protected species in the fishery.

Effort Limits - Fishing effort would be limited to a total of no more than three trips per vessel for full and part-time vessels. Each vessel would be assessed a minimum of 10 days-at-sea per trip and boats in the occasional category would be allowed only one trip in the closed area. Vessels could not remain in the demarcation and closed area for longer than 10 days. If participation by currently inactive vessels does not materialize, the assessment of 10 days-at-sea per trip could result in an overall effort reduction in the scallop fishery, thereby reducing potential risks to protected species. The maximum trip length may also have similar benefits given that scallop trips in open areas are, on average, 15-days long.

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 demarcation and closed areas for the duration of the program proposed could also enhance the assessment of impacts on protected species in addition to providing valuable information about the scallop resource and the fishery.

The alternatives considered and rejected by the Council include variations of most of the measures proposed (Section 5.1) and would result in impacts to endangered and other protected species that are similar to those discussed above. Several elements, however, differ enough to merit further attention.

- If net boats lost the option to use trawls to fish for scallops, potential interactions with sea turtles might be reduced in the Mid-Atlantic where that gear type is most commonly used.
- Allowing vessels with general category permits to target scallops in the re-opened closed area could result in increased potential threats to protected species there because a very large number of vessels would be eligible to participate in the fishery.

- Each of the three alternative area restrictions considered and rejected would have resulted in a smaller area available to the proposed scallop fishery. This could affect impacts on protected resources, depending on a number of largely unpredictable factors. For example, if a significant amount of effort was concentrated in a relatively small area, potential negative impacts could result, depending on the presence of animals that might be vulnerable to dredge gear such as sea turtles. If the incentive to shift fishing effort into the closed area was diminished, the status quo might prevail in the open areas.

In general the measures proposed in this framework adjustment should not significantly alter the current impacts on protected resources and, under certain scenarios, could result in conservation benefits.

8.1.1.1 Biological impacts of the Proposed Action (Section 5.1)

8.1.1.1.1 Eligibility and Vessel Participation

There are no other eligibility options concerning vessels with limited access scallop permits, due to equity issues that arise from National Standard 4. The exclusion of vessels with general category scallop permits (Section 5.1.1.2), however, raises no equity concerns because of the 400-pound scallop possession limit that applies to these vessels and the remoteness of the proposed closed area fishery.

Excluding vessels with general category scallop permits does however have positive biological impacts. Without excluding vessels permitted to retain scallops within this open-access permit category, there would be fewer controls on the amount of scallops that could be caught within Closed Area II. It could also open up opportunities for non-compliance. These vessels could be a potential recipient for at-sea transfers, reducing compliance with the scallop possession limit. It could also increase the opportunity to target species that are otherwise protected by Closed Area II, under the guise of catching 400 pounds of scallop meats.

Requiring scallop net vessels to use trawls within the closed area fishery will improve size selection and reduce finfish bycatch. Framework Adjustment 5 placed restrictions on what limited access scallop vessels could use nets to target scallops, due to concerns over size selection. Improved size selection increases the scallop yield by catching scallops after they have had a chance to grow to adult size. This issue is less important in Closed Area II due to the large size of most scallops found there. There may, however, be some localized areas of small scallops that would benefit from requiring dredges, rather than allowing scallop trawls. More important is the effect on finfish bycatch. The sweep of a scallop trawl is much greater than two fifteen-foot dredges, commonly used by scallop vessels. Finfish have more difficult time swimming away from the much larger scallop trawls and their finfish bycatch is correspondingly higher in equivalent fishing areas. Since the bycatch of yellowtail flounder and monkfish will be high in Closed Area II, requiring dredges rather than trawls will have a beneficial effect on these overfished species.

8.1.1.1.2 Target TACs

The target TACs for scallops and yellowtail flounder (Section 5.1.2) are intended to keep the proposed closed area fishery within biological thresholds. Both measures have important, positive biological impacts. In the first case, the TAC will achieve maximum sustainable yield (MSY) from the scallop resource within Closed Area II and in the second case the TAC will ensure that the closed area fishery will not jeopardize the yellowtail flounder rebuilding program.

The target scallop TAC is important for setting initial management measures, like the scallop possession limit and the closed area trip allocations. It will also serve as the basis for making mid-season adjustments (Section 5.1.7) and additional trip allocations (Section 5.1.6.1). The target yellowtail flounder TAC is important in restraining bycatch so that the total removals (including catches by multispecies trawl vessels) from the Georges Bank yellowtail flounder stock does not exceed the target fishing mortality rate, $F_{0.1}$.

8.1.1.1.3 Season

The closed area scallop fishery season (Section 5.1.2.2) could have some biological impacts for scallops, because the TAC and scallop possession limit is expressed and monitored in terms of scallop meat weight. Since scallop meat yield varies seasonally, the season could have marginal implications on the realized fishing mortality rate associated with the target TAC. The fishing mortality rate will have an inverse relationship with meat yield.

Scallop meat yield tends to decline from summer into fall and winter (Serchuck and Smolowitz 1988; Haynes 1966). A later season, or one where more trips are taken later in the season, would translate into a higher fishing mortality rate associated with the target TAC. This result occurs because scallop vessels would have to catch more scallops (in number) to catch the 10,000 scallop possession limit on a closed area trip.

Comparing June and October, Serchuck and Smolowitz (1988) estimated that meat yield for the largest scallops (107 mm) sampled on New Bedford vessels decreased from 36 to 52 count (Figure 14). Thus, for a 10,000 lb. scallop possession limit, the number of scallops in the catch would rise by over 40 percent, and is equivalent to a 40 percent increase in fishing mortality. The scallop meat yield for 107 mm scallops decreased by about 10 percent, from 36 to 40 meats per pound, between June and July. Since there is interannual variability and the 107 mm scallops are smaller than the average scallops found in most parts of Closed Area II, this 10 percent decline in meat yield is probably insignificant. The scallops in Serchuck and Smolowitz (1988) came from various areas where New Bedford vessels were fishing in 1987 and 1988.

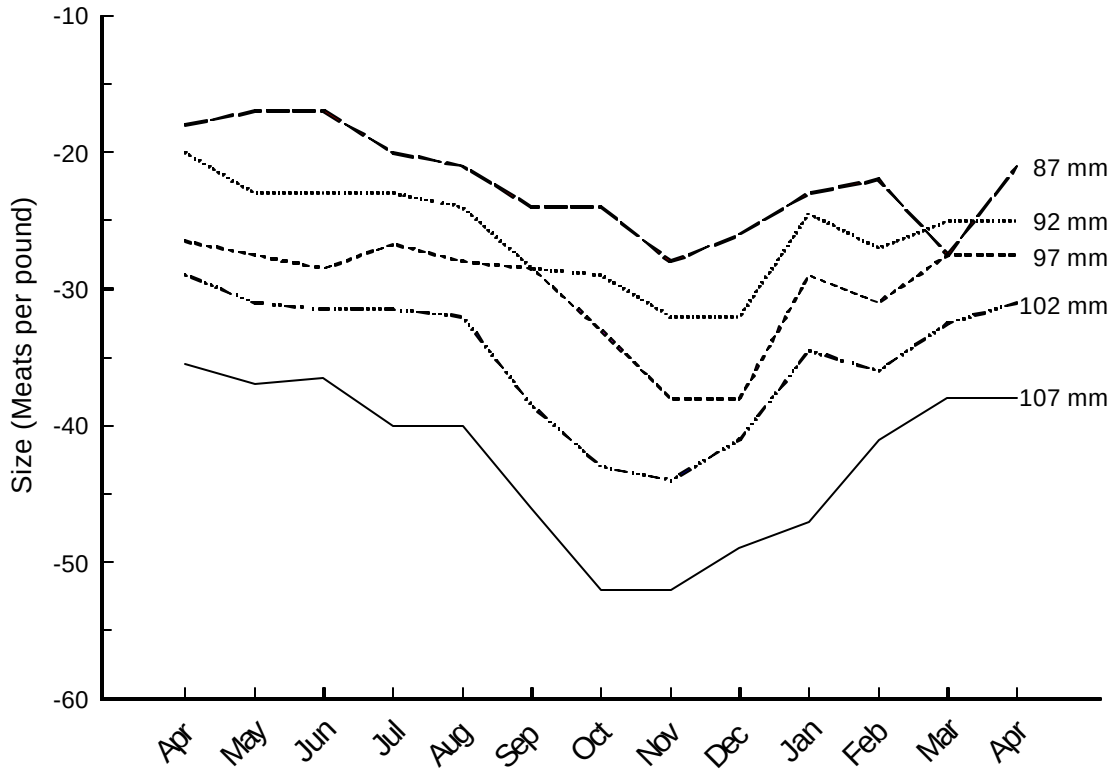


Figure 14. Average meat count (meats per pound) at shell height (mm) of sea scallops from samples taken by New Bedford scallop vessels participating in the Cooperative NMFS/Council/Industry Sea Scallop Data Collection Program, April 1987 – April 1988. Scallop meat weight is inverted to show size going from large scallops (10 meats per pound) to small scallops (60 meats per pound). From Serchuck and Smolowitz (1988).

Haynes (1966) estimated scallop meat yield by season specifically for Georges Bank in an earlier study. Scallops from 55 trips from 1958 to 1962 were observed. Classifying the scallop seasons by reproductive activity (Spawning – October; Ripening – November through March; Maturity – April through September), Haynes (1966) found significant differences between the following three regression estimates for length (L) and weight (W):

Spawning – October:

$$\log_e W = -10.2516 + 2.785 \log_e L$$

Ripening – November though March:

$$\log_e W = -11.7472 + 3.131 \log_e L$$

Maturity – April through September:

$$\log_e W = -10.9926 + 2.995 \log_e L$$

Using these equations and the average scallop length (123 mm) expected in Closed Area II, south of 41°30' N latitude, gives a mean weight for each season of 23.4, 27.7, and 30.7 grams, respectively. This translates into an average meat count of 19.4, 16.3, and 14.8, respectively. Thirty-one percent more scallops are needed in October to catch the scallop possession limit than the number of scallops needed in April through September, translating into a 31 percent increase in fishing mortality and fishing time for an equal weight of landings.

The scallop closed area fishery season will also have an impact on the amount and mortality of bycatch. Seasonal distribution of the bycatch within Closed Area II will have a significant bearing on the amount and composition of the bycatch. Interannual variability and other factors, however, make it difficult to predict the seasonal differences in bycatch. General trends and inferences can be made based on landings, observed spawning activity, and surveys. Haddock and cod spawn in Closed Area II primarily during January through April (Colton, et al. 1979), but these species tend to be less vulnerable to scallop dredging.

Figure 15. Spawning areas and times of selected species, derived from Colton, et al. (1979). Primary spawning months are shaded black and secondary months are shaded gray.

Species	Area	J	F	M	A	M	J	J	A	S	O	N	D
Atlantic herring	Georges Bank												
Cusk	All												
Cod	Georges Bank												
Haddock	Georges Bank												
Pollock	All												
Red hake	Southern Georges Bank & Nantucket Shoals												
Summer flounder	Nantucket Shoals and South												
Windowpane flounder	Georges Bank, Nantucket Shoals and South												
Witch flounder	Gulf of Maine												
American plaice	Gulf of Maine												
Yellowtail flounder	Georges Bank, Nantucket Shoals and South												
Winter flounder	All												

Yellowtail flounder, on the other hand, tend to be much more vulnerable to capture by scallop dredges and spawn in Closed Area II during March through July, inclusive (Figure 15). According to a numerical ranking of scallop dredge impacts on finfish species by the Council's PDTs (Appendix VI), the highest impact would be in May (12.47), while June and July were thought to have lower impacts on juvenile bycatch (5.83 and 4.26, respectively). The PDTs assigned the lowest impacts on juvenile yellowtail flounder during August to February.

Monkfish, another species that will be highly vulnerable to capture, tend to move to shoal areas and banks to spawn during March to June (NEFMC 1998). In the more northerly portions of its range, like Closed Area II, spawning tends to occur during June and possibly as late as July. Although monkfish are vulnerable to capture by scallop dredges year around, they may be more available to a scallop fishery on the shoaler portions of Closed Area II during the early portion of the proposed season.

Depending on handling practices, high temperature tends to increase discard mortality as the bycatch experiences a greater difference in temperature compared to ambient bottom conditions. Scallop fishing, later in the proposed season, could reduce discard mortality.

Conclusion

Scallop fishing mortality would be the lowest (for a given TAC) during the summer months. Scallop quality and price also would be highest at this time. Another important factor, weather tends to deteriorate later in the proposed season, especially during late August and September when hurricanes tend to be more frequent. Finfish bycatch and discard mortality, on the other hand, would be lower during the late summer and fall months of the proposed fishery.

The proposed action tries to balance these competing factors, proposing to allow a limited closed area scallop fishery during June 15 to December 31. Slight delays in the opening, however, could allow spawning aggregations of vulnerable finfish to disperse, without significantly affecting the fleets ability to catch scallops when price and the yield is highest.

8.1.1.1.4 Scallop Demarcation Area

The proposed action will have a positive impact on scallops within the scallop demarcation area, reducing overfishing in that area. How many trips that have occurred, or would have occurred during 1999, within the scallop demarcation area is not available within the short time for a framework adjustment process. Analysis would require highly detailed data that is not readily available. The number of trips that occur on Georges Bank is highly variable, depending on the resource condition and availability of scallops in other areas. The scallop fleet has historically been very mobile, often targeting newly recruiting year classes, wherever they have occurred.

The Council anticipates, however, that few trips within the scallop demarcation area will occur during the closed area fishery. The allocation of three closed area trips has the potential to decrease fishing effort in the scallop demarcation area by about 45 days[9]. This is 38 percent of the annual 120-day allocation for a full-time scallop vessel. Since the three trip closed area allocation includes this area, vessels that generally fish more than three trips per year in the scallop demarcation area will either take some trips in Southern New England and the Mid-Atlantic or take the other five trips (75 days/15 days per trip) after the closed area fishery is suspended or expires on December 31, 1999. In the first case, the resulting effort shift could reduce scallop mortality for the Georges Bank stock and increase mortality for the Mid-Atlantic stock. In the second case, no mortality changes would be realized except by the automatic accumulation of 10 days-at-sea for a closed area trip.

If as a result of the closed area fishery, scallop vessels take fewer trips in the scallop demarcation area than they would otherwise have taken, this measure could reduce fishing mortality on Georges Bank yellowtail flounder. This mortality reduction could mitigate the yellowtail flounder bycatch in Closed Area II more than predicted by the impact analyses.

Conclusion

The scallop demarcation area will have a negligible impact on scallop biology, but could reduce mortality on the Georges Bank stock while potentially increasing mortality on the Mid-Atlantic stock. The reduced scallop fishing effort in the scallop demarcation area could, however, mitigate the yellowtail flounder catches in Closed Area II more than the predicted amount.

8.1.1.1.5 Gear Restrictions

9 Although it varies from vessel to vessel, trip duration is about 15 days for scallop vessels that fish on Georges Bank.

The impact of requiring scallop vessels to use dredges is to improve size selectivity and reduce finfish bycatch. Each is analyzed and evaluated in the Environmental Assessments for Framework Adjustment 5 to the Atlantic Sea Scallop FMP and for Framework Adjustment 9 to the Northeast Multispecies FMP, respectively. The relative effect of requiring that only dredges be used in the Closed Area II scallop fishery was not analyzed for this specific action, because these issues were generally addressed by the two framework adjustments above and there is no new data specifically for Closed Area II using anything other than dredges.

Dredges, on the other hand, are believed to have more habitat impact than would a scallop trawl, especially in habitat sensitive areas. The greater weight of the dredge and its heavier contact with the bottom tends to cause greater changes on the bottom, although in a narrower path than the area covered by a scallop trawl. The proposed fishing area is believed to be less susceptible to habitat disturbance, however, and have a more rapid recovery rate. These effects are discussed in more detail in Section 6.2.6.6.

The increase in the twine top mesh size from the 6-inches to 10-inches in the scallop demarcation area and in Closed Area II will reduce finfish bycatch, especially flatfish and possibly small skates. Data on this specific gear was lacking, but inferences were made from two related studies conducted in the nearby open fishing areas.

During the 1998 experimental scallop fishery, DuPaul et al. (1999) compared the performance of dredges with 8-inch square mesh twine tops compared to dredges with 12-inch square mesh twine tops, but no 10-inch twine tops were used. In general, DuPaul et al. (1999) found a significant difference in the bycatch of many species, except for yellowtail flounder.[10] The catch of sea scallops also showed significant reductions in the dredge with a 12-inch mesh twine top, however. There appeared to be few differences between the catch of finfish or scallops for twine tops with comparably-sized square and diamond mesh.

Although no scallop size selection data for different twine tops is available, the loss of scallops from a larger twine top could be less than that observed in prior studies in other areas. The sea scallops, available in the areas towed during this study of 12-inch mesh twine tops, were smaller than those that will be available in Closed Area II during 1999.

In an earlier study of scallop dredge and twine top performance in the open areas of Georges Bank, Henriksen et al. (1997) also found significant decreases in finfish bycatch with larger twine top mesh. As pointed out by Mr. Smolowitz during the final framework meeting, this study found a 34-41 percent reduction in yellowtail flounder catch and no reduction in scallop catch, comparing a dredge with an 8-inch twine top mesh with one of 6-inches. Reductions in the bycatch of other finfish, especially flatfish, were also noted. These results persuaded the Council to choose an 8-inch mesh twine top requirement for the proposed action, since the results in areas with small scallops (found in the now open areas) showed little or no decline in scallop catch but a significant decrease in finfish bycatch.

Similar to DuPaul et al. (1999), the 10-inch mesh twine tops also had a significant reduction in finfish bycatch (Henriksen et al. 1997), but showed a significant reduction in scallop catch. The catch of yellowtail flounder in the Henriksen et al. (1997) data were 30-63 percent lower than the control dredge with a 6-inch mesh twine top.

[10] The lack of significance for yellowtail flounder was attributed to high tow variability.

Based on this information also discussed at the final framework meeting, the Council believed that 10-inch mesh twine tops could cause economic losses and was not appropriate for the now open scallop fishing areas. The larger scallops found within Closed Area II might not show the same escapement, however, relative to the different twine top mesh (a significant amount of scallop escapement occurs through and between the links and rings). The economic loss on a closed area fishery would also not be as great, since the trip will automatically accumulate 10 days-at-sea and most trips are expected to last six or seven days under average conditions. Scallop vessels are still expected to catch the scallop possession limit, although it might take slightly longer to catch the scallops.

8.1.1.1.6 Effort and Scallop Possession Limits

Allocating three closed area trips, with a 10,000 pound scallop possession limit, is very unlikely to exceed the target scallop TAC unless a high fraction of inactive vessels and Confirmation of Permit Histories begin fishing or the fishery fails to comply with the scallop possession limit. Depending on the level of participation by eligible limited access scallop vessels, the proposed action will be conservation neutral to slightly conservation negative, as evaluated by total fishing time and actual days-at-sea used.

Unless the fishery can avoid bycatch by relocation or by changes in fishing practices, there will be substantial amounts of finfish bycatch, especially yellowtail flounder, windowpane flounder, and monkfish. If the fishery is unable to avoid catching yellowtail flounder, it is probable that the closed area scallop fishery will not be able to harvest the entire target scallop TAC, due to early suspension of the fishery due to the target yellowtail flounder TAC. The anticipated bycatch of miscellaneous skates was not estimated, but it was a very large proportion of the observed bycatch during the experimental fishery. The bycatch of all regulated species is expected to exceed the multispecies possession limit, but monkfish catches are not expected to exceed the monkfish possession limit under average conditions.

Scenarios analyzed

Three scenarios were analyzed to assess the probable impacts of the proposed action. These scenarios are labeled T11, M12, and M13 (Table 23). All three analyses predict fishing time, scallop catch, and finfish bycatch for an allocation of three closed area trips, a 10,000 pound scallop possession limit, and an automatic accumulation of 10 days-at-sea for each closed area trip. All take into account the amount of unused days (including carry forward days) that each participating vessel will have during the 1999 fishing year, if the vessel fishes in the existing open areas the same amount of time as it did during the 1998 fishing year. If insufficient unused days are available to fish all three closed area trips without exceeding the 1999 fishing year day-at-sea allocations, the analyses assume that there will be a reduction in fishing effort in the existing open areas. More detail about the methods and assumptions are given in Section 8.1.1.4.

The only difference between Scenarios T11, M12, and M13 (Table 23) is the level of participation for eligible scallop vessels. Scenarios T11 assumes that all 233 active[11] full and part-time scallop vessels take three closed area trips, accumulating 30 days-at-sea. The two active occasional vessels are assumed to take one trip, accumulating the total annual allocation of 10 days-at-sea. Ninety-four (94) of the 235 active vessels register their primary port as VA or NC. These southern vessels are less likely to participate in a fishery in Closed Area II due to the added travel costs.

11 For the purposes of analysis, an active vessel is one that reported being in the scallop fishery for at least one day-at-sea between March 1, 1998 and February 28, 1999.

On the other hand, some inactive vessels and people with Confirmation of Permit Histories (CPH) may reactivate vessels or permits to participate in the closed area fishery. The analyses of Scenarios M12 and M13 (Table 23) include these vessels to estimate the range of probable outcomes.

Scenario M12 assumes that all 265 active and inactive full and part-time vessels will take three closed area trips, accumulating 30 days-at-sea. Forty-eight (48) occasional vessels are assumed to take one closed area trip, accumulating the annual allocation of 10 days-at-sea. Unlike the active vessels in Scenario T11 described above, the inactive vessels will fish on previously unused days-at-sea, causing increases in fishing effort, scallop catches, and finfish bycatch. Due to the high cost of entry (i.e. purchasing or leasing a vessel, assigning the CPH permit on the new vessel), the CPH permits were not included in this analysis. In this case, 137 of the 313 active and inactive vessels list VA or NC as their primary port and many of these vessels are unlikely to participate in the closed area fishery. Twenty-nine (29) of these vessels have occasional limited access scallop permits and are even less likely to fish their one authorized closed area trip. Failure to participate in the closed area fishery by some of the 313 vessels assumed to fish in Scenario M12 will mitigate increases of fishing effort if any of the CPH permits are assigned to new or replacement vessels and begin fishing.

The assumptions about vessel participation in Scenario M13 (Table 23) take a more balanced approach between the two scenarios described above. This scenario assumes full participation by active and inactive scallop vessels, but only 34 percent of the vessels listing VA or NC as its primary port. This 34 percent is equivalent to no participation by inactive vessels and 50 percent participation by active vessels from VA and NC. The amount of unused days-at-sea are adjusted accordingly, accounting for the expected unused days by full-time, part-time, and occasional vessels. In this analysis (Scenario M13), 224 vessels are assumed to fully participate in a closed area fishery. Average round-trip steam time declines from 3.03 days in Scenario M12 to 2.64 days in Scenario M13, because of the reduced participation by distant vessels.

Conservation neutrality and predicted scallop catch

The proposed action is conservation neutral, but may produce slight increases in fishing effort and scallop fishing mortality, depending on the amount of participation. The net change in total fishing time (Table 23) ranges from an eight percent decrease in days fished (bottom time) if only active scallop vessels fully participate (i.e. fish all three closed area trips, accumulating 30 days-at-sea) to a fifteen percent increase if both active and inactive vessels fully participate. Since fishing mortality can be expressed as a function of fishing effort (Section 6.2.6.1), the proposed action is expected to have a similar effect on scallop fishing mortality.

Although the proposed action is expected to violate the Scallop FMP's presumption about the linearity between days-at-sea and fishing mortality, the change in actual days-at-sea fished is another measure that might indicate conservation neutrality. The actual days-at-sea used is predicted to increase from one to twelve percent (Table 23), depending on participation by inactive scallop vessels.

In the former case (Scenario T11; Table 25), the increase in fishing effort caused by using unused days to fish in the closed area would be counter-balanced by the unfished days that are nonetheless accumulated. At the beginning of the proposed closed area fishery, the vessels under average conditions12 are predicted to catch the scallop possession limit in slightly more than three days.

12 Estimated from the average catch per 10-minute tow during the 1998 experimental fishery, for Closed Area II, south of 41°30 N latitude. For a description of adjustments to this data to predict commercial fishery conditions in 1999, see Section **8.1.1.4**.

Accounting for a three-day round trip to and from port, the vessel would therefore accumulate 10 days-at-sea for a six-day trip. The ratio of days-at-sea accumulated to actual days used is thus 1.6 (Table 25).

The net result is that actual days-at-sea fished is predicted to increase slightly from 24,964 days (Table 29) to 25,149 days (Table 25). Total days-at-sea accumulated will be higher, however, due to the automatic accumulation of 10 days-at-sea for each closed area trip. This added accumulation of days-at-sea could translate into lower fishing mortality in the 2000 fishing year from a reduction in days carried forward13.

If vessels take fewer than three trips and therefore accumulate less than 30 days-at-sea, a greater proportion of days accumulated will be generated from unused days-at-sea, instead of fishing effort that will otherwise occur in the existing open areas. For this reason, a lower allocation of trips or reductions in opportunities to take closed area trips (from a suspended fishery, for example) will tend to be less conservative for scallops than the analysis indicates. This is why the net change in fishing time and the amount of total days-at-sea used declines by increasing the number of closed area trips (Table 25).

If inactive vessels begin fishing for scallops due to the closed area fishery, total days fished could increase by 15 percent (Scenarios M12 and M13; Table 38) over current levels. The increase is due to the participation of formerly inactive scallop vessels that utilize unused days-at-sea to fish in the closed area fishery. Even though days-at-sea during closed area trips would accumulate at nearly the same ratio as for active vessels in Scenario T11 (the differences are due to minor changes in average steam time to and from port), the reactivation of latent days causes the total days-at-sea used to increase from 24,964 days in 1998 to 27,499 – 28,124 days-at-sea fished (Table 38).

Predicted scallop catch for the proposed action ranges from 2,767 to 3,824 mt, all below the target scallop TAC of 4,300 mt. Including the reduced catch in currently open areas that would result from effort shifts, the net increase in the scallop landings ranges from 31 to 48 percent compared to the status quo.

These scallop catch estimates are somewhat higher than those for similar options considered by the Council at the final framework meeting. For the cases if only active scallop vessels fully participate in the closed area fishery (Table 25), the predicted scallop catch ranges from 2,724 to 2,949 mt (Scenarios T1 to T5), versus 3,139 mt for the proposed action (Scenario T11). Similar comparisons can be made when other assumptions about participation by inactive vessels are made (Table 38;Scenarios M12 and M13).

The reason for the higher predicted catches is that the 10,000 pound scallop possession limit is somewhat higher than would have been calculated for a three closed area trip allocation under the methods discussed in Section 5.2.9.1.1. Similar to the proposed possession limit alternatives discussed in that section, the scallop possession limit associated with a three-trip allocation would have been 8,700 pounds. The Council believed that increasing the scallop possession limit to 10,000 pounds is justified because not all eligible vessels (or permits) will fish in the re-opened closed area. In order to land the 4,300 mt target scallop TAC, all eligible vessels (including Confirmation of Permit Histories) would have had to fully participate in the closed area fishery. The higher scallop possession limit also means that the potential mid-season possession limit adjustment (Section 5.1.7) might be less than it otherwise would have been with an initial 8,700 pound scallop possession limit. This in effect front loads the allocation of

13 According to current regulations, vessels may carry forward (or transfer) up to 10 unused days to the next fishing year, provided that the vessel fished at least one scallop day-at-sea in the current fishing year.

trips and expected scallop landings into the first half of the closed area fishery season, but this achieves some other objectives including scallop yield and fishing mortality (Section 8.1.1.1.3), maximizing price (Section 8.1.2), and vessel safety.

Although fishing mortality is not predicted to increase (unless a significant fraction of inactive vessels begin fishing), total scallop landings are predicted to increase because the scallop vessels would be catching larger scallops within Closed Area II. If few inactive vessels begin fishing and the scallop possession limit is effective, the scallop landings will be significantly under the target scallop TAC, allowing an opportunity for additional allocations of closed area trips through the mid-season adjustment.

Yellowtail flounder and finfish bycatch

The following results are based on catch rates observed during the experimental scallop fishery conducted by the Fishermen's Survival Fund, CMAST, and NMFS during 1998. Although very informative, these observations occurred during a very short period and may not be representative of conditions on Georges Bank during 1999. Seasonal changes in distribution could have an important impact on the actual bycatch from the fishery, especially if the industry voluntarily tries to avoid bycatch by fishing in different areas within Closed Area II.

No attempt was made in this analysis to account for changes in stock biomass of the expected bycatch species between 1998 and the proposed closed area fishery in 1999. Too many uncertainties in stock growth and distribution exist to make reliable predictions about their effect on catch per unit effort for scallop dredges operating within the open portion of Closed Area II. In lieu of these theoretical adjustments, the average catch per 10-minute tow was used without adjustment to predict total catch from a proposed closed area fishery in 1999.

A third factor that cannot be taken into account is the effect of the proposed 10-inch mesh twine top requirement (Section 5.1.5). Vessels used 8-inch mesh during the 1998 experimental fishery, but no comparisons within the closed areas were made using 10-inch mesh twine tops. Experiments outside Closed Area II using 10-inch mesh twine tops showed significant reductions of finfish bycatch, but these reductions may not be directly translatable to a fishery within Closed Area II catching large scallops. A description of the impacts of the larger twine top requirements is given in Section 8.1.1.1.5.

Based on the 1998 experimental fishery in Closed Area II, south of 41°30' N latitude, the closed area scallop fishery is expected to catch 1,700 to 2,400 mt of yellowtail flounder (Table 25 and Table 38) under average conditions and there is no suspension of the fishery (Section 5.1.2.3). The predicted yellowtail flounder catch is somewhat higher than most alternatives in the final framework meeting document, because the higher scallop possession limit implies greater fishing time associated with each of the three allocated trips. These estimates were calculated under an assumption of uniform fishing effort throughout the area that this action proposes to open. The Council, however, expects that the scallop fleet will be able to avoid high catches of yellowtail flounder by relocating or through changing fishing methods.

In the event that yellowtail flounder bycatch is as high in Closed Area II as predicted, it could require an early suspension of the fishery. With a 387 mt target yellowtail flounder TAC for scallop dredge vessels fishing in Closed Area II, an early suspension could only allow scallop landings of 650 to 700 mt, or about 20 percent of the target scallop TAC. If the scallop vessels are able to reduce their yellowtail flounder bycatch, as expected, the closed area scallop fishery could harvest a greater fraction of the target scallop TAC.

Bycatch of other finfish is also slightly higher than for other management options for the same reason as given for yellowtail flounder, but tend to be less important. The expected bycatch of winter flounder ranges from 180 to 255 mt (Scenario T11 in Table 42; Scenarios M12 and M13 in Table 51). Compared to a total stock biomass of 5,100 mt predicted for 1999 (NEFSC 1999) with a status quo catch of 1,200 mt (F_{sq} = 0.34), this expected catch in the closed area fishery will not jeopardize the winter flounder stock. The added catch within the closed area fishery could also be mitigated by reduced fishing effort on other portions of Georges Bank.

Between 180 and 255 mt of windowpane flounder bycatch is predicted (Table 42 and Table 51), based on the 1998 experimental fishery data in Closed Area II, south of 41°30' N latitude. These bycatch estimates are a significant fraction of the 1,000 mt maximum sustainable yield (MSY) estimated by Applegate et al. (1998). Bycatch of windowpane flounder could be mitigated by shifts of fishing effort from other areas of Georges Bank, but fishing mortality could increase due to fishing effort that would have otherwise occurred in the Mid-Atlantic or increased due to the utilization of unused days-at-sea.

Monkfish bycatch is predicted to range from 1,632 to 2,310 mt within the open portion of Closed Area II (Table 42 and Table 51). Accounting for the expected reduction in catch from shifts in fishing effort, this bycatch is expected to increase monkfish catch by 19 to 33 percent above the status quo catch of 4,762 mt. Due to the peculiar morphology of monkfish, minimal reductions in bycatch are anticipated by the 10-inch mesh twine top requirement.

Monkfish are managed by the Council's Monkfish FMP and will be regulated by a mortality reduction schedule and stock rebuilding program when the management plan is implemented shortly. According to the most recent estimates (NEFMC 1998), monkfish are overfished (i.e. below its biomass target) and fishing mortality is too high. Any increases in fishing mortality are problematic. On the other hand, monkfish bycatch is a recognized, unavoidable consequence of scallop fishing. This is why the allowable monkfish bycatch for vessels on a scallop day-at-sea is 300 pounds tail-weight per day-at-sea. If the experimental fishery causes a significant increase in mortality, the Council may have to take complimentary action to manage monkfish mortality.

A significant amount of barndoor skate bycatch was observed during the 1998 experimental fishery in Closed Area II. Based on these observed catches, the predicted bycatch from the closed area fishery ranges between 179 and 254 mt (Table 42 and Table 51). While these amounts are comparable to the expected bycatch of winter flounder, barndoor skates are much larger and the number of fish in this amount of bycatch is consequently smaller in comparison.

Compared to the number of monkfish, skates, and yellowtail flounder, bycatch of barndoor skate is a relatively rare occurrence but their total weight can add up. In general, large animals like barndoor skate fair relatively better than smaller animals in the dredge and can be discarded alive. Handling can also be better than for other species because a barndoor skate is more noticeable on deck, enhancing the prospects for survival.

8.1.1.1.7 Bycatch Possession Limits

The bycatch possession limits (500 pounds for regulated multispecies, 300 pounds tail-weight per day-at-sea for monkfish) will prevent or reduce the incentive to continue fishing on a closed area trip after the vessel caught the scallop possession limit.

The catch of regulated multispecies is expected to be considerably higher than 500 pounds (8,200 to 8,400 pounds, Table 55 and Table 64). The low multispecies possession limit will, however,

encourage scallop vessels to minimize their bycatch by changing their fishing operation. At the same time, some discarded fish will survive. The low possession limit will also make it less attractive to fish on a closed area trip, when and if the scallop catch is not enough to justify automatically using 10 days-at-sea.

The monkfish possession limit (300 pounds tail-weight per day-at-sea; 996 pounds whole-weight per day-at-sea) is expected to accommodate the monkfish bycatch for most trips. The estimated monkfish catch per trip is 5,900 to 6,000 pounds whole-weight per trip (Table 55 and Table 65), or about 1,800 pounds tail-weight and equivalent to what could be legally landed by scallop dredge vessels during a six-day trip. Since vessels are predicted to catch the scallop possession limit in about three days and since round trip steam time is about three days from New Bedford, the monkfish possession limit is not expected to cause regulatory discards in the closed area fishery for the average vessel.

8.1.1.1.8 Reporting Requirements

This proposed measure will improve the proposed action's ability to stay under the biological limits and gather information that will be crucial to making future decisions about area rotation strategies to manage sea scallops. Otherwise this proposed measure is not expected to have a direct effect on sea scallops or bycatch.

8.1.1.1.9 Observer Coverage

This proposed measure will improve the proposed action's ability to stay under the biological limits and gather information that will be crucial to making future decisions about area rotation strategies to manage sea scallops. Otherwise this proposed measure is not expected to have a direct effect on sea scallops or bycatch.

The Council chose to increase the target TAC to fund the required observer program. On one hand, it can be argued that the one percent increase in the target scallop TAC increases fishing mortality by one percent, compared to what it might be without the one percent adjustment. On the other hand, the greater observer sampling will greatly increase the proposed action's ability to stay within the biological constraints. Without the greater observer sampling, required by the proposed action, the scallop and yellowtail flounder catches would have a substantially higher probability of exceeding the biological targets. Even though the Council increased the target scallop TAC by one percent, it can be argued that improved compliance will reduce mortality more than what otherwise might have occurred without observers.

8.1.1.1.10 Industry-funded Research

This proposed measure could help identify and evaluate new fishing technology or methods to reduce unwanted bycatch. In the long run, this effort could reduce biological impacts on otherwise valuable bycatch or improve productivity through reduced impacts on habitat. It may also allow greater access to otherwise harvestable scallops that are in protected areas, closed due to habitat considerations.

In the short term, the mechanism to pay for research (a TAC set aside) will have no biological impacts, since it falls within the annual scallop TAC chosen to be consistent with the MSY goals of the FMP.

8.1.1.1.11 Enforcement Provisions

This proposed measure will improve the proposed action's ability to stay under the biological limits and gather information that will be crucial to making future decisions about area rotation strategies to manage sea scallops. Otherwise this proposed measure is not expected to have a direct effect on sea scallops or bycatch.

8.1.1.2 Biological impacts of Alternative 1 (Section 5.2.9) – Trip allocations and scallop trip limits

8.1.1.2.1 General Conclusions

The proposed management options will keep the scallop catches below the target TACs, unless all inactive vessels and Confirmation of Permit Histories begin fishing in the closed areas.

The estimates of total yellowtail bycatch for all management options are nearly three times the Groundfish Oversight Committee recommendation. No management options are less than the yellowtail flounder TAC that could be available in 1999, assuming that the maximum TAC is consistent with , the Amendment 7 target. Since Georges Bank yellowtail flounder has been rebuilding, the yellowtail flounder bycatch for many management options is very close to the TAC that could be available to meet the TAC targets for a 10-year rebuilding schedule for Amendment 9.

Scallop vessels could reduce bycatch by voluntarily slowing their towing speed or letting the dredge sit stationary on the bottom for about five minutes before haul-back.

Allocations of less than three trips (i.e. an accumulation of 30 days-at-sea from fishing in the closed areas) would not be conservation neutral, because of the expected use of unused days by active scallop vessels. If the Council chooses Area Option 2 and allocates 4 trips per vessel, the days-at-sea are estimated to decline by 6% from 24,964 to 23,360 days-at-sea (Table 25).

With an allocation of four trips (i.e. 40 days-at-sea accumulated), total fishing time by active vessels, is estimated to decline by 15%. More trips with lower scallop trip limits would cause greater reductions in fishing effort.

The 10-day maximum trip length is not expected to limit fishing activity. Most vessels will be able to catch and shuck the scallop trip limit in less than 10 days. Some vessels may therefore, reduce costs or increase individual crew share by taking fewer than seven crew members or by fishing within the closed areas where scallops catches are less.

Raising the scallop trip limit, while holding the number of allocated trips constant and vice versa, has a significant risk of overharvesting the target scallop TACs.

Conservation neutrality (i.e., no increase in fishing mortality and reduction in fishing time is highly dependent on the amount of fishing effort that is generated from unused days-at-sea vs. the days-at-sea that vessels now use to fish for scallops in the open areas. If only one trip per vessel is allocated (to maximize the scallop trip limit), it would cost the fleet 2,320 days-at-sea. This is less than the total amount unused days-at-sea that active vessels could use to fish in the closed areas.

To achieve conservation neutrality with higher trip limits (and fewer trips into the closed area), the Council should expand the days-at-sea trade off to take other actions to reduce fishing effort in the existing open areas.

Allocations of eight or more trips would be uneconomic due to the low scallop trip limits and because net scallop landings would be less than the status quo.

The anticipated effort shift from the open to the closed areas could be less than anticipated in 1999, due to re-activation of latent fishing effort. The effort shift from the existing open areas would be greater in 2000, when latent effort is less from the reduced days-at-sea allocation.

8.1.1.2.2 Scenarios Analyzed

The table below describes 56 out of approximately 400 management options included in Alternatives 1. Summary results are included in the sections that follow and more detailed results are given in Appendix IV.

These analyses explored the various management options in two fundamental ways: varying the number of closed area trips to allocate to each vessel (Series T1 to T5 and T11) and varying the day-at-sea accumulation (Series M1 to M3 and M12). In the first set of scenarios, the trip limit declines as the number of allocated trips increases, keeping the total allocated catch by all eligible vessels constant. The second set, explores differences in the impacts of varying day-at-sea ratios (rate of accumulation), maximum trip duration, and vessel participation. Scenarios T11 and M12 analyze the effects of the proposed action, the first assuming participation by active limited access scallop permits and the second by active and inactive limited access scallop permits. Inactive vessels are those that a limited access permit was assigned to a vessel (unlike Confirmation of Permit Histories), but the vessel used no scallop days-at-sea during the 1998 fishing year.

In additions to these two series, assumptions about dredge efficiency (Scenarios D1 to D3) and vessel participation and/or unused days-at-sea (Scenarios M1 to M3 and M12) are also analyzed and evaluated. Even though the Council selected a medium TAC, which would remove scallops at a rate equivalent to F_{max} in Closed Area II if the medium biomass estimate is accurate, dredge efficiency also has an affect on the rate of depletion of scallops from a commercial fishery. These effects are estimated for 16, 25, and 40 percent dredge efficiencies. From a different perspective, the catch and conservation neutrality depends on the amount of vessels that fish and the availability of unused days to fish in the closed areas, respectively. These possibilities are analyzed and evaluated by considering the effects if all inactive vessels fish in the closed areas and the effects if the day-at-sea allocations were lower, as anticipated during the 2000 fishing year. The expected effects of these management options and/or assumptions are described in Sections 8.1.1.2.4.1 to 8.1.1.2.4.2.

Table 23. Summary of management options analyzed, changes in fishing effort, and estimated yellowtail flounder bycatch. The proposed action is boldfaced.

Scenario	Alternative	Number Of Trips	Trip Limit (lbs. meat)	Maximum Trip Length	DAS Tradeoff	Vessel Participation	Dredge Efficiency	Change In Fishing Time (Option1)	DAS Accumulation Ratio	Change In DAS	Estimated Yellowtail Flounder Catch (mt) (best option)	Area Option With Lowest Catch
T1	1	1	26,000	10 days	10 days	Active	25%	+6%	1.0	+9%	1,335	2
T2	1	2	13,000	10 days	10 days	Active	25%	0%	1.4	+6%	1,511	2
T3	1	4	7,000	10 days	10 days	Active	25%	-18%	2.0	-6%	1,640	2
T4	1	6	4,800	10 days	10 days	Active	25%	-34%	2.3	-18%	1,655	2
T5	1	8	3,600	10 days	10 days	Active	25%	-50%	2.5	-30%	1,615	2
D1	1	2	13,000	10 days	10 days	Active	16%	+3%	1.1	+10%	1,511	2
D2	Same as T2											
D3	1	2	13,000	10 days	10 days	Active	40%	-3%	1.8	+3%	1,511	2
V1	1	4	7,000	10 days	10 days	Active & Inactive; 1999 DAS	25%	+4%	1.9	+9%	2,208	2
V2	1	4	7,000	10 days	10 days	Active & Inactive; 2000 DAS	25%	-75%	1.9	-53%	1,812	2
V3	Same as T3											
V4	1	4	7,000	10 days	10 days	Active; 2000 DAS	25%	-83%	2.0	-62%	1,713	2
M1	1	2	19,500	10 days	10 days	Active	25%	+3%	1.1	+10%	2,403	2
M2	Same as T2											
M3	1	2	13,000	15 days	15 days	Active	25%	-9%	2.1	-3%	1,509	2
T11	**1**	**3**	**10,000**	**10 days**	**10 days**	**Active**	**25%**	**-8%**	**1.7**	**+1%**	**1,952**	**2**
M12	**1**	**3**	**10,000**	**10 days**	**10 days**	Active & Inactive	**25%**	**+15%**	**1.6**	**+12%**	**2,419**	**2**
M13	**1**	**3**	**10,000**	**10 days**	**10 days**	See description 14	**25%**	**+15%**	**1.6**	**+10%**	**1,709**	**2**

14 See Section 8.1.1.1.6.

8.1.1.2.3 Experimental Fishery Results by Area Management Option

Table 24. Experimental fishery data and adjustments for projecting total commercial catch in 1999 for each area management option.

	Entire Closed Area II	Closed Area II Option 1	Closed Area II Option 2	Closed Area II Option 3	Immediately Outside Closed Area II	Nantucket Lightship Area
Sea Scallop Research Survey						
Number of survey tows - 1998		16	4	5		15
Mean kg/tow - 1998	3.36	2.50	3.48	2.96		4.24
Average meat count - all sizes	19.16	52.18	13.61	16.15		17.33
Average meat count - > 83 mm	17.51	21.25	11.19	11.48		14.80
Surplus production - all sizes	23.1%	65.2%	8.9%	12.7%		18.7%
Projected mean kg/tow - 1999	4.13	4.20	3.84	3.38		5.09
Average meat count - all sizes	14.08	28.58	13.21	12.97		13.21
Average meat count - > 83 mm	13.12	15.06	9.63	9.82		11.68
Projected commercial fishing capacity						
Commercial catch (lbs/day-at-sea) - 1999						
Maximum shucking capacity (lbs/day-at-sea) - 1999	3,054	2,660	4,158	4,081		3,431
Experimental Fishery - 1998						
Mean weight (kg) per 10-minute tow	12.22	11.93	14.61	14.33	1.52	Not sampled
Average meat count			11.56	12.19		
Experimental Fishery Bycatch (kg)						
Yellowtail flounder kg/10-min tow	8.05	10.45	7.17	7.64	1.04	Not sampled
Winter flounder kg/10-min tow	4.11	1.10	1.45	0.87	0.70	Not sampled
Four-spot flounder wgt/10-min tow	0.62	0.48	0.07	0.56	0.29	Not sampled
Windowpane flounder wgt/10-min tow	2.91	1.69	2.35	1.86	1.74	Not sampled
Monkfish wgt/10-min tow	6.75	9.98	10.41	11.75	4.64	Not sampled
Red hake wgt/10-min tow	0.08	0.12	0.14	0.14	0.02	Not sampled
Silver hake wgt/10-min tow	0.06	0.09	0.08	0.09	0.01	Not sampled
Cod wgt/10-min tow	0.01	0.00	0.00	0.00	0.00	Not sampled
Haddock wgt/10-min tow	0.12	0.12	0.00	0.00	0.00	Not sampled
Barndoor skate wgt/10-min tow		1.10	1.78	1.46		
Lobster wgt/10-min tow	1.55	1.05	0.76	0.14	0.37	Not sampled

8.1.1.2.4 Closed Area II Options

8.1.1.2.4.1 Scallop Catch

The expected scallop catch for all trip allocations and scallop trip limit options (*) do not exceed the 4,000 mt TAC, based on a medium biomass assumption. If only active vessels fish for scallops in the re-opened closed areas, the scallop catch will be between 2,500 and 3,000 mt, depending on the chosen management option (Table 25 to Table 28).

Trip allocations and scallop possession (Table 11 and Table 18) limits appear that they will prevent the scallop catch from exceeding the TACs. Under the management limits proposed for Alternative 1, the scallop trip limit and the vessel's shucking capacity are the most restrictive aspects. The expected scallop catches are therefore a function of the number of trips allocated, the scallop trip limits, and the number of vessels that fish in the closed area(s). Since the proposed scallop trip limits were set by dividing the TACs by the total number of eligible vessels and the number of allocated trips, it is impossible for the scallop catch to exceed the TACs as long as the scallop trip limits are the most restrictive element when fishing in the closed areas.

If only active vessels (i.e., vessels that fished for at least one days-at-sea in 1998) participate about 58 to 69 percent of the TAC could be caught (assuming 100% compliance and participation by active vessels). This proportion of the TAC is consistent with the proportion of limited access scallop permits that accumulated days-at-sea in 1998 (232/365 = 64%).

If all inactive vessels (i.e. vessels with limited access scallop permits that did not accumulate days-at-sea in 1998) also fish in the closed areas for their maximum number of allocated trips, the estimated scallop catch would increase to 3,518 mt (82 percent of the TAC) if two trips per vessel are allocated and the scallop trip limit is 13,000 pounds (Scenario V1, Table 34). Again, this proportion of the TAC is consistent with the proportion of active and inactive limited access scallop permits (313/365 = 86%). The remaining limited access scallop permits are issued a "Confirmation of Permit History" and would require the permit holder to obtain a vessel to fish in the closed area. In most cases, this would be a significant economic hurdle and the expected profits do not appear to justify the cost of purchasing an expensive scallop vessel. Scallop catch when all limited access scallop permits (including those with Confirmation of Permit Histories) were therefore not analyzed.

Total scallop catch, on the other hand, depends on the amount of days-at-sea consumed by the day-at-sea tradeoff while fishing in the closed areas. Allocation of more trips and correspondingly lower scallop trip limits, translate into more fishing effort shifting into the closed areas from the existing open scallop areas in Southern New England and the Mid-Atlantic.

Table 25. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Area Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II. The scenario for the proposed action is boldfaced.

Scenario	**Variable:** Allocated trips	Fishing time in closed area (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
T1	1	1,112	18,002	6%	27,284	1.0	2,736	44%	1,673	0.61
T2	2	1,115	16,818	0%	26,486	1.4	2,724	38%	1,678	0.62
T3	4	1,204	13,629	-18%	23,382	2.0	2,927	26%	1,812	0.62
T4	6	1,213	10,631	-34%	20,347	2.3	2,949	11%	1,826	0.62
T5	8	1,186	7,760	-50%	17,386	2.5	2,888	-6%	1,785	0.62
T11	**3**	**1,297**	**15,244**	**-8%**	**25,149**	**1.7**	**3,139**	**+37%**	**1,952**	**0.62**

Table 26. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Area Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
T1	1	1,293	18,002	7%	27,264	1.0	2,493	40%	1,335	0.54
T2	2	1,463	16,818	2%	26,448	1.5	2,724	38%	1,511	0.55
T3	4	1,588	13,629	-15%	23,360	2.0	2,926	26%	1,640	0.56
T4	6	1,602	10,631	-32%	20,329	2.3	2,949	11%	1,655	0.56
T5	8	1,563	7,760	-48%	17,361	2.5	2,887	-6%	1,615	0.56

Table 27. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Area Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
T1	1	1,284	18,002	7%	27,253	1.0	2,503	40%	1,413	0.56
T2	2	1,409	16,818	1%	26,380	1.5	2,723	38%	1,550	0.57
T3	4	1,528	13,629	-16%	23,285	2.0	2,927	26%	1,681	0.57
T4	6	1,540	10,631	-32%	20,251	2.3	2,949	11%	1,695	0.57
T5	8	1,503	7,760	-49%	17,286	2.5	2,886	-6%	1,654	0.57

Table 28. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Nantucket Lightship Area. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in the Nantucket Lightship Area.

Scenario	**Variable:** Allocated trips	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
T1	1	985	18,002	5%	27,102	1.1	2,736	44%		0.00
T2	2	980	16,818	-1%	26,067	1.6	2,724	38%		0.00
T3	4	1,066	13,629	-18%	22,931	2.2	2,927	26%		0.00
T4	6	1,075	10,631	-35%	19,893	2.4	2,948	10%		0.00
T5	8	1,049	7,760	-51%	16,942	2.6	2,888	-6%		0.00

When only one trip per vessel is allocated, the amount of days-at-sea that are accumulated while fishing in the closed areas accounts for less than the amount of unused days available to active scallop vessels. There appears to be no economic reason why active vessels will not use their unused days-at-sea to fish in the closed areas. Two-thousand, nine-hundred and thirteen (2,913) unused days-at-sea are projected for active vessels in 1999 (Table 29). Inactive vessels contribute another 3,508 unused days-at-sea that might be used to fish in the closed areas, but there may be economic costs for these vessels to begin scalloping again.

With a 26,000 pound scallop trip limit and one allocated trip (Scenario T1), it is estimated that it would take about six days (the amount varies some for each area option due to differences in scallop size and corresponding shucking capacity) to catch and process the scallop catch. Combined with an average steam time of three days (round trip), very few days would be accumulated above those actually fished and they do not exceed the amount of unused days-at-sea available to active scallop vessels. The scallop catch in the closed areas, therefore, would occur in addition to the existing scallop catch in the open areas and total scallop catch would increase by 40 to 44 percent (Scenario T1; Table 25 to Table 28).

As the number of trips allocated increase, the corresponding trip limit declines (Table 11) and it takes fewer days to catch and shuck scallops to land the 13,000 lb. trip limit. With a 13,000 lb. trip limit (Scenario T2), it is expected to take about 3 days to catch and process the limit. A trip to the closed areas under this option is expected to last 6 days (including three days for steaming time) and each trip would accumulate 10 days, for a total of 20 days that would come from using unused days-at-sea or through an effort shift from the open scallop areas. Due to the expected effort shift, the total scallop landings would be somewhat less, a 38 percent increase in total landed weight, relative to the status quo.

With more allocated trips (Scenarios T3 to T5), the amount of time to catch and process the scallop trip limit becomes shorter, consuming more days that could be fished by the active vessels in the existing open areas. The total catch is estimated to be less than the other options. If the Council allocates eight trips per vessel (and a corresponding 3,600 pound scallop trip limit), the total scallop landings would actually decline by six percent (Table 25 to Table 28).

Table 29. Day-at-sea allocations in 1998, 1999, and 2000 with actual or projected day-at-sea use by scallop vessels with full-time, part-time, and occasional limited access permits.

	Full-time	Part-time	Occasional	Total
Number of Permits				
Active vessels	207	23	2	232
Inactive vessels	19	16	46	81
Confirmation of permit histories	32	17	3	52
Total	258	56	51	365
1998 DAS allocations with carryover-active vessels only	31047	1450	44	32541
1998 DAS-used	25465	1006	22	26493
% DAS-used of total allocation with carryover	0.82	0.69	0.50	0.81
1999 DAS Allocations (without carryover)	120	48	10	
Total Allocation -Active Vessels	24840	1104	20	25964
Total DAS -Inactive Vessels	2280	768	460	3508
Total Allocation	27120	1872	480	29472
1999 DAS Allocations (with carryover)				
Total Allocation -Active Vessels	26572	1273	32	27877
Total allocation -Inactive Vessels	2280	768	460	3508
Total Allocation	28852	2041	492	31385
1999 Projected DAS-used				
Active Vessels only	23988	962	14	24964
% DAS-used of total allocation without carryover	0.97	0.87	0.70	0.96
% DAS-used of total allocation with carryover	0.90	0.76	0.44	0.90
Inactive vessels (if fished in 1999)	2204	736	322	3262
Total potential DAS-used	26192	1698	336	28226
% DAS-used of total allocation without carryover	0.97	0.91	0.70	0.96
% DAS-used of total allocation with carryover	0.91	0.83	0.68	0.90
2000 DAS Allocations (without carryover)	51	20	4	
Total Allocation -Active Vessels	10557	460	8	11025
Total DAS -Inactive Vessels	969	320	184	1473
Total Allocation	11526	780	192	12498
2000 DAS Allocations (with carryover)				
Total Allocation -Active Vessels	10700	495	10	11206
Total DAS -Inactive Vessels	969	320	184	1473
Total Allocation	11669	815	194	12679
2000 Projected DAS-used				
Active Vessels only	10180	406	6	10592
% DAS-used of total allocation without carryover	0.96	0.88	0.75	0.96
% DAS-used of total allocation with carryover	0.95	0.82	0.60	0.95
Inactive vessels (if fished in 1999)	950	304	138	1392
Total potential DAS-used	11130	710	144	11984
% DAS-used of total allocation without carryover	0.97	0.91	0.75	0.96
% DAS-used of total allocation with carryover	0.95	0.87	0.74	0.95

Area-specific effects on estimated scallop catch

There are no differences, other than slight computation effects, between the scallop catches among the area options in Closed Area II (Table 25 to Table 28). Catch rates (catch per hour fished) will decline faster in the smaller area options (because each scallop tow covers a greater fraction of the re-opened closed area), but not to the point that it reduces landings for a 10-day trip. The area options also do not differ in the amount of total scallop landings from all areas including Southern New England and the Mid-Atlantic, because the same amount of total days (20 days per vessel when two trips are allocated) would accumulate for fishing in the closed areas.

Dredge efficiency

Dredge efficiency (ranging from 16 to 40 percent under different statistical models) has a very large influence on the expected scallop catch. The estimated scallop catch in the closed areas is 4,254 mt for a 16 percent dredge efficiency assumption (Scenarion T1; Table 30 to Table 33) and 1,697 mt for a 40 percent assumption (Scenario T3). These results are, however, consistent with the TACs that are based on the high, medium, and low biomass estimates (which in turn are dependent on the assumption or estimate of dredge efficiency). The scallop catch from the closed areas would be 63 percent of the low TAC, assuming that only active vessels fish for scallops in the closed areas and 16 percent dredge efficiency. Estimated scallop catch as a proportion of the TAC is 63 percent for the medium TAC (Scenario T2) and high TAC as well.

Triggering a re-closure of the areas for scallop fishing is therefore very problematic, if the closure is based on the amount of scallop landings. Higher catches than anticipated under a medium or high dredge efficiency assumption could mean that the management measures are not preventing the scallop fleet from exceeding the target TACs, or it could mean that the dredge efficiency is less than expected and that total scallop biomass is higher than it was estimated. Until this dilemma is resolved, it is inadvisable to use scallop landings to close the fishery in the closed areas.

The observed scallop landings, on the other hand, will provide another estimate of commercial dredge efficiency when compared with these model results (assuming too that there is good compliance with the regulations). Measuring the rate of change in catch per unit effort (either total fishing time or days-at-sea used) and the distribution of scallop effort relative to the resource distribution within the re-opened closed areas will be extremely useful for evaluating future area rotation strategies. Careful measurement would provide useful information for a gigantic depletion study where the area fished is bounded by the area management boundaries.

A vessel's scallop shucking capacity, however, has a very large influence on the estimated total scallop catch, including those from the existing open areas. With low dredge efficiency and two allocated trips, the total scallop catch would be 69 percent above the status quo. Conversely, at high dredge efficiency, total scallop catch would be only 12 percent above the status quo. This result could imply that more trips with lower scallop trip limits could be allocated and still achieve a net increase in scallop catch if the dredge efficiency is low.

Table 30. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Area Option 1. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Fishing time in closed area (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
D1	16%	1,707	16,818	3%	27,535	1.1	4,254	69%	2,570	0.60
T2	25%	1,115	16,818	0%	26,486	1.4	2,724	38%	1,678	0.62
D3	40%	688	16,818	-3%	25,783	1.8	1,697	12%	1,036	0.61

Table 31. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Area Option 2. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
D1	16%	2,192	16,818	6%	27,359	1.1	4,254	69%	2,264	0.53
T2	25%	1,463	16,818	2%	26,448	1.5	2,724	38%	1,511	0.55
D3	40%	891	16,818	-2%	25,733	1.9	1,697	12%	921	0.54

Table 32. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Area Option 3. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
D1	16%	2,119	16,818	5%	27,268	1.2	4,254	69%	2,332	0.55
T2	25%	1,409	16,818	1%	26,380	1.5	2,723	38%	1,550	0.57
D3	40%	858	16,818	-2%	25,691	1.9	1,695	12%	944	0.56

Table 33. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Nantucket Lightship Area. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
D1	16%	1,551	16,818	2%	26,880	1.3	4,254	69%		0.00
T2	25%	980	16,818	-1%	26,067	1.6	2,724	38%		0.00
D3	40%	627	16,818	-3%	25,523	2.0	1,697	12%		0.00

Vessel participation

As indicated above, the amount of vessels that fish in the closed areas will obviously have a major impact on total scallop catch. Nonetheless, the scallop catch from the closed areas is not expected to exceed the TACs, even if all inactive vessels begin fishing in the closed areas for scallops. Scallop catch from the closed areas is expected to total 3,500 mt (Scenario V1, Table 34 to Table 37), 82 percent of the TAC.

Total scallop catch from all areas, however, are expected to increase by 57 percent (Scenario V1) compared to status quo. If only active vessels fish (Scenario T3), total scallop catch is only expected to increase by 26 percent. The reason for the increase is that every day fished by an inactive vessel results in an increase in fishing effort and catch. Thus, inactive vessels beginning to target scallops with latent fishing effort could mitigate the anticipated effort shift that could occur through active vessels fishing in the closed areas.

The amount of latent effort that could be used by active and inactive vessels would have a considerable influence on the potential re-activation of latent days. Next year, unused days-at-sea are expected to decline from 2,913 days in 1999 to 614 days in 2000. If only active vessels fished in the closed areas, total scallop catch would decline by 42 percent relative to 1999 status quo levels, less than the expected decline in scallop catch from Amendment 7 measures alone. For inactive vessels, unused days (i.e. their entire allocation) would decline from 3,508 days in 1999 to 1,473 days in 2000. In this case (Scenario V2), total scallop landings would decline 29 percent relative to 1999 status quo levels. The re-opening of the groundfish closed areas for scallop fishing would more effectively shift effort away from the open areas in the 2000 fishing year, because fewer unused days would be available to fish in the closed areas.

Table 34. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Area Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Fishing time in closed area (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
V1	w. Inactive - 1999 DAS	1,467	17,204	4%	27,324	1.9	3,518	57%	2,208	0.63
V2	w. Inactive - 2000 DAS	1,314	3,170	-75%	11,709	1.9	3,179	-29%	1,978	0.62
T3	Active - 1999 DAS	1,204	13,629	-18%	20,347	2.0	2,927	26%	1,812	0.62
V4	Active - 2000 DAS	1,138	2,004	-83%	9,519	2.0	2,778	-42%	1,713	0.62

Table 35. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Area Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
V1	w. Inactive – 1999 DAS	1,973	17,204	7%	27,395	1.9	3,517	57%	2,038	0.58
V2	w. Inactive – 2000 DAS	1,748	3,170	-73%	11,730	1.9	3,177	-29%	1,805	0.57
T3	Active – 1999 DAS	1,588	13,629	-15%	23,360	2.0	2,926	26%	1,640	0.56
V4	Active – 2000 DAS	1,602	2,004	-80%	9,484	2.0	2,777	-42%	1,544	0.56

Table 36. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Area Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
V1	w. Inactive – 1999 DAS	1,887	17,204	6%	27,288	1.9	3,517	57%	2,077	0.59
V2	w. Inactive – 2000 DAS	1,677	3,170	-73%	11,641	2.0	3,177	-29%	1,845	0.58
T3	Active – 1999 DAS	1,528	13,629	-16%	23,285	2.0	2,927	26%	1,681	0.57
V4	Active – 2000 DAS	1,540	2,004	-80%	9,414	2.0	2,775	-42%	1,583	0.57

Table 37. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Nantucket Lightship Area. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
V1	w. Inactive – 1999 DAS	1,405	17,204	3%	26,822	2.1	3,515	57%		0.00
V2	w. Inactive – 2000 DAS	1,252	3,170	-75%	11,247	2.1	3,179	-29%		0.00
T3	Active – 1999 DAS	1,066	13,629	-18%	22,931	2.2	2,927	26%		0.00
V4	Active – 2000 DAS	1,075	2,004	-83%	9,091	2.2	2,778	-42%		0.00

Other Management Effects and Compliance Issues

To show the effects of the various management measures on the scallop catch, the above scenarios were altered beyond the measures proposed by this Framework Adjustment. The two most restrictive management measures, the scallop trip limit and the day-at-sea tradeoff, were varied to show their effect and how much they influence scallop catches inside and outside the proposed re-opened closed areas.

In one scenario (M1), the proposed 13,000-lb. scallop trip limit was increased by 50% while holding the number of allocated trips at two per vessel. In this case (Table 38 to Table 41), scallop landings would increase from 2,700 mt to 4,100 mt when only active vessels fish. The number of actual days-at-sea on a trip to the closed area would likewise increase to more than eight days because it would take longer to catch a higher trip limit. This is only 200 mt below the target TAC and there would be a significant risk of overshooting the TAC if inactive vessels began fishing for scallops.

Scenario M1 also estimates the outcome if the scallop trip limits are ineffective because compliance is poor. This result could come about because vessels land more than the scallop trip limit within a 10-day trip or transfer their scallop catch at sea. This scenario does, however, assume that all vessels catch and land 50 percent more than the scallop trip limit. In reality, the model estimates that this would take nearly 10 days (the maximum trip length) and it is unlikely that all vessels would disregard the scallop trip limit.

In another scenario, the day-at-sea tradeoff was increased by 50 percent to 15 days with a maximum trip length of 15 days. Scallop catch from the closed areas would remain the same, about 2,700 mt, but the days accumulated would obviously be greater and induce more of an effort shift from the open areas to the re-opened closed areas. If it is economic to fish in the closed areas while loosing more days to fish for scallops in the existing open areas, the days-at-sea accumulation ratio (actual day-at-sea used vs. days-at-sea accumulated) would increase from 1.5 to 2.2. In other words, a seven-day trip would accumulate 15 days vs. 10 days. Including the potential use of unused days-at-sea by active vessels, the total scallop catch from all areas would increase by 30 percent, rather than 38 percent (Scenario M3).

With mandatory VMS use, it is much harder for vessels to extend their trip duration beyond the proposed 10 days. The model estimates, however, that vessels would initially be able to catch and process the proposed trip limits in about seven days. This time is expected to increase through the season as catch per unit effort declines (i.e. depletion), but nonetheless the scallop trip limit in Alternative 1 is the more restrictive management measure.

There is an incentive to cheat on the scallop trip limit and maximize the use of each trip's 10 days-at-sea as a result. At the same time, unused days-at-sea reduce the fishing effort shift into the closed areas and the benefits that are expected to derive from it. The Council could increase the number of allocated trips and set the scallop trip limit to correspondingly lower levels. In some ways, this makes the incentive to cheat on the scallop trip limit greater because it takes less time to catch and process the scallops that a vessel can land.

Another way of managing these potential problems is to disassociate the maximum trip length with the days-at-sea tradeoff. Reducing the maximum trip length to seven days would reduce the incentive to exceed the scallop trip limit. At the same time, increasing the days-at-sea accumulation for each trip in the closed area could increase the shift in fishing effort from the existing open areas (away from areas of small scallops) and mitigate the potential re-activation of latent effort, while keeping the scallop trip limit at the higher of the proposed amounts.

Table 38. Comparison of maximum trip duration and scallop trip limits. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II. The scenarios associated with the proposed action are boldfaced.

Scenario	**Variable:** Trip length or limit	Fishing time in closed area (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
M1	10 days/ Limit 19,500	1,731	16,818	3%	27,420	1.1	4,086	60%	2,606	0.64
T2	10 days/ Limit 13,000	1,115	16,818	0%	26,486	1.4	2,724	38%	1,678	0.62
M3	15 days/ Limit 13,000	1,119	15,224	-9%	24,326	2.1	2,720	30%	1,684	0.62
M12	**10 days/ Limit 10,000**	**1,607**	**19,041**	**+15%**	**28,124**	**1.6**	**3,824**	**48%**	**2,419**	**0.62**
M13	**10 days/ Limit 10,000**	**1,135**	**19,638**	**+15%**	**27,499**	**1.6**	**2,767**	**31%**	**1,709**	**0.62**

Table 39. Comparison of maximum trip duration and scallop trip limits. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Trip length or limit	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
M1	10 days/ Limit 19,500	2,327	16,818	6%	27,528	1.1	4,017	59%	2,403	0.60
T2	10 days/ Limit 13,000	1,463	16,818	2%	26,486	1.5	2,724	38%	1,511	0.55
M3	15 days/ Limit 13,000	1,461	15,224	-7%	24,143	2.2	2,720	30%	1,509	0.55

Table 40. Comparison of maximum trip duration and scallop trip limits. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Trip length or limit	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
M1	10 days/ Limit 19,500	2,250	16,818	6%	27,432	1.1	4,071	60%	2,476	0.61
T2	10 days/ Limit 13,000	1,409	16,818	1%	26,486	1.5	2,723	38%	1,550	0.57
M3	15 days/ Limit 13,000	1,407	15,224	-8%	24,075	2.2	2,720	30%	1,548	0.57

Table 41. Comparison of maximum trip duration and scallop trip limits. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 1 – Nantucket Lightship Area. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Trip length or limit	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
M1	10 days/ Limit 19,500	1,682	16,818	3%	26,862	1.3	2,736	39%		0.00
T2	10 days/ Limit 13,000	980	16,818	-1%	26,486	1.6	2,724	38%		0.00
M3	15 days/ Limit 13,000	991	15,224	-10%	23,875	2.4	2,720	30%		0.00

Fishing Effort and Conservation Neutrality

Due to the use of unused days, the total fishing effort would increase if the allocation of trips (and corresponding days-at-sea in the closed areas) is low. With only one trip allocated and a high scallop trip limit (Scenario T1), the total fishing will increase by five to seven percent (Table 25 to Table 28). Similarly, the actual days-at-sea used by active vessels would increase from 24,964 days to no less than 27,253 days (the amounts vary by area option due to small differences in the time it would take to catch the scallop trip limit). Accumulated days would be higher because of the day-at-sea tradeoff for trips in the closed areas.

An allocation of two trips (and 20 days; Scenario T2) would maintain fishing time at present levels because the increased fishing time within the closed areas would be offset by the reduced fishing time in the existing open areas. Fishing time is of course lower per actual day-at-sea in the closed areas because shucking capacity constrains the amount of fishing effort per day-at-sea. Even though the total fishing time equals the status quo, the number of days used increases by 6 percent to no less than 26,380 days.

Four or more trips are estimated to decrease fishing effort, measured by both fishing time and days-at-sea used (again days accumulated would be higher due to the minimum 10-day accumulation for each trip in the closed areas). Total fishing time decreases to about 50 percent for eight allocated trips (accumulating 80 days-at-sea), while total days-at-sea used decreases to as much as 17,286 days for area option 3. This is a 31 percent decrease in days used, but total scallop catch would decline by 6 percent and the low scallop trip limits would make fishing in the closed areas unattractive compared to fishing in the open areas.

Assumptions about dredge efficiency have little influence over the net change in fishing time or days-at-sea used (Table 30 to Table 33). For an allocation of two trips, closed area fishing by inactive vessels (Scenario V1, Table 34 to Table 37) would increase total fishing time and days used by about five percent. Very significant reductions in total fishing time are expected in the 2000 fishing year (Scenarios V2 and V4), primarily due to the large cut in days-at-sea allocations.

Increasing the scallop trip limit (Scenario M1), while keeping the trip allocation constant, increases total fishing time and days used because vessels in the closed areas could fish longer before reaching the scallop trip limit. On the other hand, increasing the days-at-sea accumulation for trips in the closed areas (Scenario M3) decreases fishing time and days used since the vessels would accumulate more days-at-sea and could fish less in the existing open areas.

Finfish Bycatch; Comparison of Area Options

Yellowtail Flounder

Assuming a 25 percent dredge efficiency (translating into a rate of scallop depletion and total fishing time), total yellowtail flounder catch ranges from 1,335 mt (Scenario T1; Table 26) to 1,826 mt (Scenario T4; Table 25). These estimated catches compare poorly with the difference between the projected 1999 yellowtail flounder TAC (2,700 mt) and 1998 US catch (1,855 mt). This comparison ignores the probable increase in US catch with constant fishing effort due to increasing yellowtail flounder biomass and catch per unit effort. Even with constant effort, the US yellowtail flounder catch is likely to increase and the difference between the TAC and the groundfish fleet catch will be less than 845 mt.

Although the experimental fishery data suggested areas where the ratio between yellowtail flounder bycatch and scallop catch was lower than average, the increased fishing time in smaller areas is expected to reduced these differences as scallop catch per unit effort declines and fishing time per trip increases. Scallop catch per effort will decline faster in the smaller areas because it takes less time to fish the entire area and the rate of depletion for an equal number of trips (and days accumulated) is greater.

Unlike scallops, there appeared to be no evidence of decline in yellowtail flounder catches in the experimental fishery depletion studies. Although these studies were rather localized, yellowtail flounder are much more mobile than scallops and are likely to re-inhabit the areas that have been dredged. The flounder may even be temporarily attracted to a dredged area due to suspension and exposure of prey items. High abundance of yellowtail flounder are also found outside of Closed Area II, a potential source of immigration into a dredged area. For these reasons, the PDT recommended assuming no depletion effects for yellowtail flounder when estimating total catch.

Comparing the yellowtail flounder catch estimates for the same scenarios, option 2 produces marginally lower catches of yellowtail flounder. The ratio of yellowtail flounder to scallop catches are estimated to range from 0.54 to 0.56 for Option 2, 0.56 to 0.57 for Option 3, and 0.61 to 0.62 for Option 1. These differences are relatively insignificant and all exceed the difference between 1998 catch and the 1999 target yellowtail flounder TAC.

Dredge Efficiency

Similar to the effect on the scallop catch estimates, yellowtail flounder catch is very sensitive to assumptions about dredge efficiency. Since it takes longer to catch the scallop trip limits when a dredge has low efficiency, the total time fished per trip increases and catches of scallop, yellowtail flounder, and other species increase. This could be acceptable for scallops, because the target TAC can be related to dredge efficiency. For yellowtail flounder, on the other hand, there is an external estimate of the TAC (i.e. it is unrelated to scallop dredge efficiency).

For area option 1 (Table 30), the total fishing time ranges from 688 days when dredges are 40 percent efficient (Scenario D1), to 1,115 days when dredges are 25 percent efficient (Scenario T2), and to 1,707 days when dredges are 40 percent efficient (Scenario D3). The corresponding yellowtail flounder catch is 1,036; 1,678; and 2,570 mt respectively (Table 30). Under all scenarios and area options, the ratio between yellowtail flounder bycatch and scallop catch remains constant, no matter what assumption is made about dredge efficiency.

Vessel Participation and Other Management Measures

Similar to the scallop catches, higher yellowtail bycatch is expected when inactive vessels fish in the closed areas. The major differences with the effect on yellowtail bycatch are the amount and former location of fishing effort that is transferred into the closed areas. More effort that transfers from the Mid-Atlantic area will increase the catches of yellowtail flounder more than the change in total fishing effort indicates.

Increasing the scallop trip limit while allocating the same number of trips increase the total yellowtail bycatch because total fishing time increases (Scenarios M1 and T2; Table 38 to Table 41). By increasing the scallop trip limit by 50 percent, yellowtail bycatch for area option 1 would increase by 55 percent to 2,606 mt. On the other hand, yellowtail bycatch from the closed areas remains nearly the same if the day-at-sea accumulation per trip increases to 15 days (Scenario M3). The only yellowtail bycatch reduction that would occur by increasing the day-at-sea accumulation would be from that fishing effort that transferred from the Georges Bank and Southern New England yellowtail stock areas.

Bycatch of Other Species

The relative effects of the management options are very similar for other species, because their catch mainly is a function of total fishing time in the closed areas. The greatest fishing times occur with the intermediate trip allocations, rather than with less trips and higher scallop trip limits or more trips and lower scallop trip limits (Table 42 to Table 44). These differences appear to be minor, however.

The only difference, compared to changes in scallop catch and fishing time, is for the three area options for scallop fishing in Closed Area II. These differences result from the different geographic distributions for each species within Closed Area II. Species that have a greater habitat affinity to areas of scallop abundance tend to be more vulnerable to scallop gear, while faster swimmers tend to be less vulnerable to scallop dredges. Bottom-dwellers like flatfish and monkfish tend to be more vulnerable than roundfish, like cod and haddock.

For winter flounder, area option 3 tends to have the lowest total bycatch estimates (Table 44). The bycatch estimates for windowpane flounder, monkfish, and barndoor skate are lowest for area option 1. These differences mainly arise because the average catches in the experimental fishery were lower over the entire half of Closed Area II than for the smaller portions of it included in options 2 and 3 (Table 43 and Table 44, respectively).

Other factors, such as dredge efficiency (Table 45 to Table 47), vessel participation (Table 48 to Table 50), and management options (Table 51 to Table 53), the expected bycatch follows the same pattern as observed for fishing time and yellowtail flounder bycatch. The outcomes by area option also follow the same pattern for a given set of factors. More detail about the results for each area option is given above. This pattern emerges because the estimated bycatch of yellowtail flounder and other species is simply a product of the experimental fishery catch rate for a given area option and the total estimated days fished.

Table 42. Estimated finfish bycatch for Alternative 1 – Area Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II. The proposed action scenario is boldfaced.

Scenario	**Variable:** Allocated trips	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
T1	1	176	270	1,598	34%	176
T2	2	177	271	1,602	27%	176
T3	4	191	292	1,730	12%	190
T4	6	192	294	1,744	-4%	192
T5	8	188	288	1,705	-21%	187
T11	**3**	**205**	**315**	**1,864**	**+24%**	**196**

Table 43. Estimated finfish bycatch for Alternative 1 – Area Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
T1	1	271	438	1,937	41%	331
T2	2	306	495	2,193	39%	375
T3	4	332	538	2,379	26%	407
T4	6	335	542	2,401	9%	410
T5	8	327	529	2,343	-8%	401

Table 44. Estimated finfish bycatch for Alternative 1 – Area Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
T1	1	161	345	2,171	46%	270
T2	2	176	378	2,383	43%	296
T3	4	191	410	2,584	30%	321
T4	6	193	414	2,605	14%	324
T5	8	188	404	2,543	-3%	316

Table 45. Estimated finfish bycatch for Alternative 1 – Area Option 1. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
D1	16%	270	414	2,454	45%	270
T2	25%	177	271	1,602	27%	176
D3	40%	109	167	989	14%	109

Table 46. Estimated finfish bycatch for Alternative 1 – Area Option 2. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
D1	16%	459	742	3,285	62%	562
T2	25%	306	495	2,193	39%	375
D3	40%	187	302	1,336	21%	228

Table 47. Estimated finfish bycatch for Alternative 1 – Area Option 3. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
D1	16%	265	569	3,585	69%	446
T2	25%	176	378	2,383	43%	296
D3	40%	107	230	1,451	24%	180

Table 48. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated finfish bycatch for Alternative 1 – Area Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
V1	w. Inactive – 1999 DAS	232	356	2,109	40%	232
V2	w. Inactive – 2000 DAS	208	319	1,889	-43%	208
T3	Active – 1999 DAS	191	292	1,730	12%	190
V4	Active – 2000 DAS	180	276	1,636	-55%	180

Table 49. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated finfish bycatch for Alternative 1 – Area Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
V1	w. Inactive - 1999 DAS	413	668	2,957	58%	506
V2	w. Inactive - 2000 DAS	366	592	2,619	-27%	448
T3	Active - 1999 DAS	332	538	2,379	26%	407
V4	Active - 2000 DAS	313	506	2,241	-42%	383

Table 50. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated finfish bycatch for Alternative 1 – Area Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
V1	w. Inactive - 1999 DAS	236	507	3,192	63%	397
V2	w. Inactive - 2000 DAS	210	450	2,836	-23%	353
T3	Active - 1999 DAS	191	410	2,584	30%	321
V4	Active - 2000 DAS	180	386	2,434	-38%	303

Table 51. Comparison of maximum trip duration and scallop trip limits. Estimated finfish bycatch for Alternative 1 – Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II. The scenarios associated with the proposed action are boldfaced.

Scenario	**Variable:** Trip length or limit	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
M1	10 days/Limit 19,500	274	420	2,488	46%	273
T2	10 days/Limit 13,000	177	271	1,602	27%	176
M3	15 days/Limit 13,000	177	272	1,608	18%	177
M12	**10 days/Limit 10,000**	**255**	**390**	**2,310**	**33%**	**254**
M13	**10 days/Limit 10,000**	**180**	**276**	**1,632**	**19%**	**179**

Table 52. Comparison of maximum trip duration and scallop trip limits. Estimated finfish bycatch for Alternative 1 – Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Trip length or limit	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
M1	10 days/Limit 19,500	487	788	3,487	67%	596
T2	10 days/Limit 13,000	306	495	2,193	39%	375
M3	15 days/Limit 13,000	306	495	2,189	31%	374

Table 53. Comparison of maximum trip duration and scallop trip limits. Estimated finfish bycatch for Alternative 1 – Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Trip length or limit	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
M1	10 days/Limit 19,500	282	604	3,806	73%	473
T2	10 days/Limit 13,000	176	378	2,383	43%	296
M3	15 days/Limit 13,000	176	378	2,379	35%	296

Net change in bycatch

Estimating the total weight for bycatch in Closed Area II is addresses only one part of the equation, the increase in catch of various species as a result of scallop fishing. The other half is the change in bycatch in areas that are now open to scalloping. Depending on the type of management measures the Council chooses for managing the scallop fishery in the closed areas, varying amounts of scallop effort will be shifted from the open areas. Options that cause vessels that fish in the closed areas to use fewer days will have a smaller reduction in bycatch in other areas.

Insufficient data exists to use the depletion model, estimating changes in fishing time and scallop catch, to also estimate total bycatch in the open scallop areas in Southern New England and the Mid-Atlantic. The best that can be done is to rank the importance of various observed bycatch amounts from sea sampling. Unfortunately, only daytime tows are generally observed and the measurement of fishing time is not compatible with a different measure of fishing time from the last year's experimental fishery.

The ranking of total bycatch on sea sampled trips and the comparison of the weight of bycatch versus the weight of various bycatch species is informative, however. Table 54 summarizes by region the weight of the observed catch on sea sampled trips during 1998, totalling 1,080 hours of fishing. Overall, the species with the highest weights were monkfish (13.8 percent of scallop weight), skates (2.1 percent), and yellowtail flounder (1.1 percent). The monkfish catch rates were highest in the Mid-Atlantic and the Gulf of Maine. Yellowtail flounder had the highest catch rates in the Gulf of Maine and on Georges Bank. Skates were recorded only in the Mid-Atlantic, possibly as a result of low sampling priority in other regions. It is unlikely that all bycatch was recorded on these trips or that the hail weights were very accurate for all species.

Nonetheless, it appears that reductions in scallop effort in the open areas would benefit mainly monkfish and skates. Yellowtail flounder form a much greater proportion of the scallop catch within Closed Area II (54 to 62 percent) than outside the closed areas (2 to 6 percent). Although the sea sampling data for bycatch on scallop vessels is somewhat sparse and may have some biases, it appears that the yellowtail bycatch reduction from effort shifts from the open areas would not greatly compensate for the increased catch within Closed Area II or the Nantucket Lightship Area.

Table 54. Observed catches on sea sampled scallop dredge trips during 1998.

	Region				Grand Total	Ratio
	Georges Bank	Southern New England	Mid-Atlantic	Gulf of Maine		
Tow duration (hrs)	278	1	724	77	1,080	
Monkfish (lbs)	690	-	5,562	550	6,803	13.8%
Herring (lbs)	44	-	-	2	46	0.1%
Winter flounder (lbs)	252	-	46	47	345	0.7%
Summer flounder (lbs)	7	-	290	-	297	0.6%
Witch flounder (lbs)	20	-	93	12	125	0.3%
Yellowtail flounder (lbs)	242	1	83	229	555	1.1%
American plaice (lbs)	122	1	-	-	123	0.2%
Sand dabs (lbs)	206	-	251	26	483	1.0%
Haddock (lbs)	-	-	-	-	-	0.0%
White hake (lbs)	45	0	1	31	77	0.2%
Pollock (lbs)	-	-	-	-	-	0.0%

	Region				Grand Total	Ratio
	Georges Bank	Southern New England	Mid-Atlantic	Gulf of Maine		
Black sea bass (lbs)	-	-	11	-	11	0.0%
Spiny dogfish (lbs)	10	-	70	62	142	0.3%
Skates (lbs)	-	-	1,019	-	1,019	2.1%
Misc. (lbs)	7,389	1	16,895	1,675	25,960	52.7%
Scallops, discarded (lbs)	55	0	680	3	738	1.5%
Scallops, landed (lbs)	15,127	43	29,223	4,127	48,519	98.5%

8.1.1.2.4.2 Trip limits for bycatch species

Assuming a 25 percent dredge efficiency, the estimated catches of large mesh groundfish totaled 3,000 to 21,000 pounds per trip, greatly exceeding the 300-pound groundfish trip limit for vessels not on a multispecies day-at-sea. Although the amounts decrease as the number of allocated trips increase, the same amount of groundfish would have to be discarded. Only anecdotal information exists about finfish discard mortality from scallop dredges. Scallop vessels usually make short tows, varying from 45 to 90 minutes long. This practice sometimes keeps discard mortality down, especially when there are few rocks and scallops in the dredge. The dredges that would be fished in the closed areas will catch more scallops and finfish in the dredge are likely to have a higher mortality rate as a result. Although flatfish tend to have a greater chance of surviving discarding than would roundfish, like cod and haddock, the discard mortality will still be significant.

The two management options presently available are to allow the scallopers to land their bycatch or maintain the low groundfish trip limit. The original intent of the low groundfish trip limit was to keep vessels from targeting any amount of groundfish, unless they were fishing during a multispecies day-at-sea. Since the scallop catches will be very valuable, it is unlikely that the possibility of landing groundfish bycatch would increase fishing effort for groundfish. On the other hand, since scallopers would accumulate 10 days-at-sea on each trip in the closed area anyway, a raised groundfish trip limit could be an incentive to continue fishing the trip in the closed area for other species until the vessel caught whatever trip limit applied to the bycatch.

Similarly, the monkfish catches could be very high, with total catches nearly as much as the estimated landings of scallops. The monkfish catch per trip ranges from 2,100 to 21,000 pounds. According to the Monkfish FMP, a scallop vessel that is not fishing during a monkfish day-at-sea would be able to land 300 pounds tail-weight per day-at-sea. For the scallop trips in the closed areas, it would mean that the vessel could land 2,100 pounds of monkfish on a seven-day trip to 3,000 pounds of monkfish on a 10-day trip. With the lower trip allocations having the higher scallop trip limits, the monkfish landings could be two to three times the amount allowed for in the Monkfish FMP. Scallop vessels that also qualify for monkfish limited access could not simultaneously declare into the monkfish fishery (on a monkfish day-at-sea), since only dredges would be allowed in the closed areas.

There are two possibilities for the industry to reduce its finfish bycatch by changing the way they fish and haul their gear. One method would be to pull the dredge more slowly, allowing finfish a greater chance at escaping the dredge. Under conditions of less scallop biomass, this would also have an equivalent decline of scallop catch and reduce profits. Shucking capacity and the trip limit will be the major restrictions on landings, however. Vessels are expected to catch the scallop trip limits in three or less days and the vessel would still have to take fewer tows to allow a seven-man crew to keep up with

the catch rate. Instead of deck-loading the vessel with scallops, the vessels could reduce their tow speed and take fewer crew members without impacting their ability to land the scallop trip limit in a 10-day trip.

Table 55. Estimated bycatch per trip for Alternative 1 – Area Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II. The proposed action scenario is boldfaced.

Scenario	**Variable:** Allocated trips	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
T1	1	21,052	15,184
T2	2	10,603	7,647
T3	4	5,736	4,137
T4	6	3,935	2,838
T5	8	2,947	2,126
T11	**3**	**8,236**	**5,940**

Table 56. Estimated bycatch per trip for Alternative 1 – Area Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
T1	1	19,538	18,411
T2	2	11,055	10,418
T3	4	5,998	5,652
T4	6	4,035	3,802
T5	8	2,979	2,808

Table 57. Estimated bycatch per trip for Alternative 1 – Area Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
T1	1	19,208	20,633
T2	2	10,541	11,323
T3	4	5,714	6,139
T4	6	3,841	4,126
T5	8	2,844	3,055

Table 58. Estimated bycatch per trip for Alternative 1 – Area Option 1. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
D1	16%	16,235	11,710
T2	25%	10,603	7,647
D3	40%	6,546	4,721

Table 59. Estimated bycatch per trip for Alternative 1 – Area Option 2. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
D1	16%	16,565	15,609
T2	25%	11,055	10,418
D3	40%	6,764	6,374

Table 60. Estimated bycatch per trip for Alternative 1 – Area Option 3. The trip limits are listed in Table 18for the TAC=6,800; 4,000; and 2,700 mt; dredge efficiency = 16, 25, and 40%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Dredge efficiency	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
D1	16%	15,856	17,033
T2	25%	10,541	11,323
D3	40%	6,444	6,922

Table 61. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated bycatch per trip for Alternative 1 – Area Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
V1	w. Inactive - 1999 DAS	5,817	4,196
V2	w. Inactive - 2000 DAS	5,768	4,160
T3	Active - 1999 DAS	5,736	4,137
V4	Active - 2000 DAS	5,716	4,123

Table 62. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated bycatch per trip for Alternative 1 – Area Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
V1	w. Inactive – 1999 DAS	6,043	5,695
V2	w. Inactive – 2000 DAS	5,904	5,563
T3	Active – 1999 DAS	5,998	5,652
V4	Active – 2000 DAS	5,751	5,420

Table 63. Comparison of vessel participation and days-at-sea allocations in 1999 and 2000. Estimated bycatch per trip for Alternative 1 – Area Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Vessel participation	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
V1	w. Inactive - 1999 DAS	5,735	6,161
V2	w. Inactive - 2000 DAS	5,620	6,037
T3	Active - 1999 DAS	5,714	6,139
V4	Active - 2000 DAS	5,494	5,902

Table 64. Comparison of maximum trip duration and scallop trip limits. Estimated bycatch per trip for Alternative 1 – Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Trip length or limit	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
M1	10 days/Limit 19,500	16,464	11,875
T2	10 days/Limit 13,000	10,603	7,647
M3	15 days/Limit 13,000	10,653	7,684
M12	**10 days/Limit 10,000**	**8,377**	**6,042**
M13	**10 days/Limit 10,000**	**8,177**	**5,898**

Table 65. Comparison of maximum trip duration and scallop trip limits. Estimated bycatch per trip for Alternative 1 – Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Trip length or limit	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
M1	10 days/Limit 19,500	17,582	16,568
T2	10 days/Limit 13,000	11,055	10,418
M3	15 days/Limit 13,000	11,037	10,401

Table 66. Comparison of maximum trip duration and scallop trip limits. Estimated bycatch per trip for Alternative 1 – Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 10 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Trip length or limit	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
M1	10 days/Limit 19,500	16,835	18,084
T2	10 days/Limit 13,000	10,541	11,323
M3	15 days/Limit 13,000	10,524	11,305

8.1.1.2.5 Nantucket Lightship Area

The TAC proposals for the Nantucket Lightship Area (NLSA) and the corresponding scallop trip limits are nearly the same as for Closed Area II. Since they were so similar, the same analyses were conducted for NLSA using the Closed Area II trip limits to complete the analyses for this Framework Adjustment timetable. The results are nearly identical to those for Closed Area II, even though the area proposed for re-opening is somewhat smaller than the Closed Area II proposals. The rate of scallop depletion in the area is therefore somewhat faster, but this did not have a significant outcome on the results or the relationship of one management option versus another.

No bycatch information is available for scallop dredges in the NLSA, so estimates of Southern New England yellowtail catches are not available. Distributions of potential bycatch species can also only be inferred from the periodic research surveys and from port interviewed trips when the NLSA was open to scalloping. The relationship between the commercial dredge and the survey dredge could be somewhat different in the NLSA compared to Closed Area II, due to differences in bottom type and other factors. For these reasons, there would be less uncertainty about re-opening portions of the NLSA for

scallop fishing if a limited experimental fishery were conducted in that and other potential scallop areas that have been closed.

8.1.1.3 Biological impacts of Alternative 2 (Section 5.2.10) – Days-at-sea ratio

8.1.1.3.1 General Conclusions

The day-at-sea ratio option will create an incentive to catch the maximum amount of scallops that a vessel could land in a short as time as possible within the closed areas. The above incentive to balance landings with the days-at-sea tradeoff is not operative for Alternative 2. Under a days-at-sea ratio strategy, vessels will try to catch and shuck as many scallops as possible to avoid taking more days-at-sea off the clock than absolutely necessary while fishing in the closed areas.

Even though vessels could be prohibited from re-entering the closed areas once they depart from them, there is still an incentive to catch all the scallops they can while the day-at-sea accumulation ratio is high, then exit the closed area and shuck scallops while the days-at-sea accumulate at a 1-for-1 rate. In fact, the prohibition on re-entry actually increases concerns about vessel safety, product quality, and discard mortality. The following scenario gives an indication of the type of problems that could occur:

Linking days-at-sea to time in the closed area to time spent in the area rather than pounds of scallop meats removed may not be conservation neutral. Vessels would load-up on shellstock as fast as possible, fishing non-stop until they thought they had enough to yield 10,000 lbs., and leave the area to shuck. Since the day-at-sea multiplier (2:1 or 3:1) only applies to time spent in the closed area we would not see the appropriate number of days-at-sea accumulated relative to the amount of resource taken. Shucking, not harvesting, will be the bottleneck for scalloping, so industry would make the necessary compensation to shuck the scallops in areas where the cost (in days-at-sea) is less.

Given the above scenario and the proposed days-at-sea usage, the vessel would load-up on the amount of shellstock that the captain thought would yield 10,000 lbs. To be realistic, the vessel would load-up on the amount of shellstock that would guarantee 10,000 lbs of scallop meats. After catching this amount (or more), the vessel will exit the closed areas to shuck scallops until they get 200 50-lb bags (10,000 lbs). Since there will probably still be unshucked scallops in the hold or on deck, the captain now has two choices (a) risk landing more than 10,000 lbs or (b) shovel the remaining scallops overboard. After 2-3 days in the hold or on-deck they are now, in all probability, dead scallops. This creates the potential for a terrible waste of the resource.

To estimate the amount of shellstock that would yield 10,000 pounds of meats, the captain will figure on about 8 lbs on meat weight per basket of shellstock. This computes to 10,000/8 to indicate that the will captain will have to shellstock about 1250 baskets of scallops weighing 50-60 lbs each. That's a lot of weight and volume on the deck of a vessel and in the hold. There have been accounts of other vessels in similar conditions sinking off Cape Cod because of deck-loaded sea scallops that probably blocked the scuppers in heavy seas. This could create safety and search and rescue problems for scallop vessels and the Coast Guard.

Effects of management measures on total scallop catch and effort

The scallop catch and fishing effort estimates in the closed areas are almost identical to those for Alternative 1. The main difference is the different (sometimes higher, sometimes lower) amount of days-

at-sea accumulated for a trip that fishes in the closed area. If the days-at-sea tradeoff from the ratio approach is more conservative than for Alternative 1, then either it would be more effective in shifting fishing effort from the existing open areas to the now closed areas. Alternatively, it would make it more unattractive to fish in the closed areas, relative to fishing in the open areas at a lower day-at-sea cost.

Either way, exactly the same effect could be achieved by increasing the automatic day-at-sea accumulation to more than 10 days for Alternative 1. This coupled with the negative effects on behavior described above, makes Alternative 2 less attractive.

8.1.1.3.2 Scenarios Analyzed

The table below describes 40 out of approximately 300 management options included in Alternatives 2. Summary results are included in the sections that follow and more detailed results are given in Appendix IV.

These analyses explored the various management options in two fundamental ways: varying the number of closed area trips to allocate to each vessel (Series T6 to T10) and varying the day-at-sea accumulation (Series M4 to M8). In the first set of scenarios, the trip limit declines as the number of allocated trips increases, keeping the total allocated catch by all eligible vessels constant. The second set, explores differences in the impacts of varying day-at-sea ratios (rate of accumulation), maximum trip duration, and vessel participation. The expected effects of these management options and/or assumptions are described in Sections 8.1.1.3.3.1 to 8.1.1.3.3.3.

Table 67. Summary of Alternative 2 (Section 5.2.10) management options analyzed, changes in fishing effort, and estimated yellowtail flounder bycatch.

Scenario	Alternative	Number Of Trips	Trip Limit (lbs. meat)	Maximum Trip Length	DAS Tradeoff	Vessel Participation	Dredge Efficiency	Change In Fishing Time (Option1)	DAS Accumulation Ratio	Change In DAS	Estimated Yellowtail Flounder Catch (mt) (best option)	Area Option With Lowest Catch
T6	2	1	26,000	10 days	2:1	Active	25%	0	2.0	2%	1,335	2
T7	2	2	13,000	10 days	2:1	Active	25%	-7%	2.0	-1%	1,439	2
T8	2	4	7,000	10 days	2:1	Active	25%	-18%	2.0	-7%	1,565	2
T9	2	6	4,800	10 days	2:1	Active	25%	-28%	2.0	-12%	1,580	2
T10	2	8	3,600	10 days	2:1	Active	25%	-38%	2.0	-17%	1,541	2
M4	2	2	13,000	10 days	3:1	Active	25%	-20%	3.0	-14%	1,439	2
M5	2	2	13,000	7 days	2:1	Active	25%	-6%	2.0	0%	1,426	2
M6	2	2	13,000	15 days	2:1	Active	25%	-9%	2.0	-2%	1,436	2
M8	2	2	No limit	7 days	2:1	Active	25%	-5%	2.0	-1%	1,550	2

8.1.1.3.3 Closed Area II Options

8.1.1.3.3.1 Scallop Catch

Two-for-One Ratio

Estimates of total scallop catch and finfish bycatch for Alternative 2 (Table 68 to Table 71) are nearly identical to those for Alternative 1. This result occurs because the same trip limits are proposed for Alternative 2 and that is what controls the scallop catch and total fishing time in the closed areas.

Besides causing different influences on fishing practices, the main difference between the two alternatives is that the days-at-sea ratios in Alternative 2 can be more restrictive in some cases than the 10-day accumulation in Alternative 1. For lower trip allocations (Scenarios T6 and T7), the day-at-sea ratio causes the vessel to accumulate more day-at-sea than the 10-day accumulation for Alternative 1. Conversely, the low scallop trip limits associated with the higher trip allocations make Alternative 1 more conservative because vessels would catch the limit faster and would accumulate fewer than 10 days for Alternative 2 for each trip in the closed areas. As a result of the greater day-at-sea accumulation for some allocations of trips, Alternative 2 would cause more fishing effort than Alternative 1 to be transferred to the closed areas if the Council allocates less than four trips.

Three-for-One Ratio

Raising the day-at-sea ratio to three (Scenario M4; Table 72 to Table 75) causes a greater reduction of scallop fishing effort in the existing open areas, because vessels accumulate more days-at-sea while fishing in the closed areas. Scallop catches in the closed areas is exactly the same as long as the scallop fleet fishes all allocated trips. On the other hand, increasing the accumulation of days for fishing trips in the closed areas also increases the cost to the vessel. To justify a trip into the closed area, the vessel operator would compare the revenue (and cost) per one day-at-sea in the closed area versus the potential revenue (and cost) for two or three days-at-sea in the open areas. Since the catch in the open area would be 50 percent higher for three days than for two days, raising the day-at-sea accumulation rate could make re-opening the closed areas relatively less attractive, reducing the benefits of opening the area and allowing the fleet to harvest larger, rather than smaller, scallops.

Table 68. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 2 – Area Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Fishing time in closed area (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
T6	1	1,112	16,804	0%	25,557	2.0	2,736	44%	1,673	0.61
T7	2	1,115	15,543	-7%	24,648	2.0	2,725	38%	1,678	0.62
T8	4	1,204	13,469	-18%	23,152	2.0	2,928	26%	1,812	0.62
T9	6	1,213	11,681	-28%	21,863	2.0	2,949	11%	1,826	0.62
T10	8	1,186	10,047	-38%	20,684	2.0	2,888	-6%	1,785	0.62

Table 69. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 2 – Area Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
T6	1	1,293	16,804	1%	25,537	2.0	2,439	39%	1,335	0.55
T7	2	1,393	15,543	-6%	24,521	2.0	2,608	36%	1,439	0.55
T8	4	1,515	13,469	-17%	23,039	2.0	2,809	24%	1,565	0.56
T9	6	1,530	11,681	-27%	21,753	2.0	2,833	9%	1,580	0.56
T10	8	1,491	10,047	-36%	20,569	2.0	2,771	-8%	1,541	0.56

Table 70. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 2 – Area Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
T6	1	1,284	16,804	0%	25,526	2.0	2,503	40%	1,413	0.56
T7	2	1,346	15,543	-6%	24,463	2.0	2,614	37%	1,481	0.57
T8	4	1,464	13,469	-17%	22,975	2.0	2,818	24%	1,610	0.57
T9	6	1,476	11,681	-27%	21,686	2.0	2,839	9%	1,624	0.57
T10	8	1,441	10,047	-36%	20,506	2.0	2,778	-8%	1,585	0.57

Table 71. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 2 – Nantucket Lightship Area. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
T6	1	985	16,804	-1%	25,375	2.0	2,736	44%		0.00
T7	2	980	15,543	-8%	24,228	2.0	2,725	38%		0.00
T8	4	1,066	13,469	-19%	22,701	2.0	2,927	26%		0.00
T9	6	1,075	11,681	-29%	21,409	2.0	2,948	10%		0.00
T10	8	1,049	10,047	-38%	20,240	2.0	2,888	-6%		0.00

Table 72. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 2 – Area Option 1. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Fishing time in closed area (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
M4	3:1 DAS ratio; 10 days	1,115	13,304	-20%	21,418	3.0	2,725	21%	1,678	0.62
T7	2:1 DAS ratio; 10 days	1,115	15,543	-7%	24,648	2.0	2,725	38%	1,678	0.62
M5	2:1; 7 days	1,110	15,829	-6%	24,854	2.0	2,730	34%	1,670	0.61
M6	2:1; 15 days	1,119	15,350	-9%	24,508	2.0	2,720	31%	1,684	0.62
M8	2:1; 7 days; no limit	1,500	15,529	-5%	24,817	2.0	3,676	47%	2,258	0.61

Table 73. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 2 – Area Option 2. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
M4	3:1 DAS ratio; 10 days	1,393	13,304	-18%	21,291	3.0	2,608	19%	1,439	0.55
T7	2:1 DAS ratio; 10 days	1,393	15,543	-6%	24,521	2.0	2,608	36%	1,439	0.55
M5	2:1; 7 days	1,380	15,829	-4%	24,921	2.0	2,586	31%	1,426	0.55
M6	2:1; 15 days	1,391	15,350	-7%	24,237	2.0	2,604	29%	1,436	0.55
M8	2:1; 7 days; no limit	1,500	15,529	-5%	24,817	2.0	2,785	33%	1,550	0.56

Table 74. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 2 – Area Option 3. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
M4	3:1 DAS ratio; 10 days	1,346	13,304	-19%	21,233	3.0	2,614	19%	1,481	0.57
T7	2:1 DAS ratio; 10 days	1,346	15,543	-6%	24,463	2.0	2,614	37%	1,481	0.57
M5	2:1; 7 days	1,347	15,829	-5%	24,880	2.0	2,616	32%	1,483	0.57
M6	2:1; 15 days	1,344	15,350	-7%	24,179	2.0	2,610	29%	1,479	0.57
M8	2:1; 7 days; no limit	1,500	15,529	-5%	24,817	2.0	2,881	35%	1,651	0.57

Table 75. Estimated fishing effort, scallop catch, and yellowtail bycatch for Alternative 2 – Nantucket Lightship Area. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Fishing time (days)	Fishing time outside closed area (days)	Net change from status quo	Total Days-at-sea used	Days-at-sea accumulation ratio	Scallop catch (mt)	Net change from status quo	Yellowtail flounder (mt)	Ratio to scallop meat
M4	3:1 DAS ratio; 10 days	980	13,304	-21%	20,998	3.0	2,725	21%		0.00
T7	2:1 DAS ratio; 10 days	980	15,543	-8%	24,228	2.0	2,725	38%		0.00
M5	2:1; 7 days	962	15,829	-7%	24,493	2.0	2,726	34%		0.00
M6	2:1; 15 days	991	15,350	-9%	24,057	2.0	2,721	31%		0.00
M8	2:1; 7 days; no limit	1,500	15,529	-5%	24,817	2.0	3,822	50%		0.00

8.1.1.3.3.2 Finfish Bycatch; Comparison of Area Options

Yellowtail flounder

The estimated catch of yellowtail flounder for Alternative 2 (Table 68 to Table 70) is nearly identical to the catch estimates for Alternative 1 (Table 25 to Table 27), comparing similar management options (i.e. area options, trip allocations, and scallop possession limits). This result occurs because the primary difference between the two alternatives, an automatic 10 day-at-sea tradeoff vs. a 2-for-1 accumulation of days, affects days available to fishing in the existing open areas (see Section 8.1.1.3.3.1) and therefore the economic attractiveness of fishing in the closed area fishery (Section 8.1.2.7).

As for Alternative 1, area option 2 (Table 69) had the lowest predicted yellowtail flounder bycatch, but there are small differences between the area options for reasons given in Section 8.1.1.3.3.1. Yellowtail flounder bycatch was predicted to be slightly lower for allocations of few trips with high scallop possession limits (Scenarios T6 and T7) or with allocations of more trips with low scallop possession limits (Scenario T10). Intermediate allocations of trips and medium scallop possession limits had the highest predicted yellowtail flounder bycatch. Since these results were nearly identical with those for Alternative 1, the effects of dredge efficiency assumptions or of vessel participation were not evaluated for Alternative 2.

Varying the day-at-sea accumulation ratio (3-for-1) or the maximum length of the trip had very little effect on the ratio of scallop catch to yellowtail flounder bycatch (Table 72 to Table 74). In all cases, the lowest yellowtail flounder bycatch occurred for area options 2 and 3. And since the day-at-sea ratio or trip length had little effect on the total fishing effort estimate, the differences in yellowtail flounder bycatch among the various management alternatives was negligible.

Bycatch of Other Species

The trends and estimated bycatch of other important finfish were similar to the trends and estimates for Alternative 1. Area option 1 had the lowest predicted bycatch for winter flounder, windowpane flounder, and monkfish (Table 76 to Table 78). In general, an allocation of few trips and higher scallop possession limits (Scenarios T6 and T7) had the lowest predicted total bycatch. The bycatch estimates for trips within the closed area fishery, however, are not appreciably different than those for Alternative 1, again because the day-at-sea ratio strategy for accumulating days-at-sea had no appreciable effect on the amount of fishing effort within the closed areas.

As a result of the differences in day-at-sea accumulation for Alternatives 1 and 2, management options with high scallop possession limits tend to be more conservative for Alternative 2. Especially for species that occur often as bycatch in the existing open scallop areas (i.e. monkfish, skates, winter flounder, summer flounder, etc.), Alternative 2 could reduce total bycatch (and possibly habitat impacts) more than Alternative 1 if high scallop possession limits are chosen.

Depending on the management option, the net change in bycatch for some of these species caught by all scallop fisheries could be significantly different from Alternative 1. For some options the accumulation of days-at-sea for a closed area trip is greater than for a 10-day automatic accumulation, evaluated for Alternative 1. Comparing Table 68 (Alternative 2) to Table 25 (Alternative 1), for example, the net change in total fishing time is more conservative for Scenarios T6 and T7 than for T1 and T2. This is because the 2-for-1 day-at-sea accumulation is greater than the day-at-sea accumulation ratio of 1.0 and 1.4, respectively. In the case of T1, it takes the full 10 days to catch the 26,000 pound scallop

possession limit and 10 days accumulate under Alternative 1 vs. 20 days under Alternative 2 (T6). For the 13,000 pound scallop possession limit associated with a 2-trip allocation (T2), vessels are expected to catch the limit in seven days, accumulating 10 days for Alternative 1 and 14 days for Alternative 2. With a 3-for-1 day-at-sea accumulation (Scenario M4, Table 72 to Table 75), a trip expected to last seven days would accumulate 21 days-at-sea.

While these options appear to have little effect on the bycatch estimates (Table 76 to Table 81), they would have a significant influence on the amount of bycatch in the existing open scallop areas since the Alternative 2 would allow fewer days-at-sea available to fish in the existing areas if vessels take trips in the closed area fishery.

Conversely, the lower scallop possession limits associated with the higher trip allocations (Scenarios T9 and T10) accumulate less days-at-sea than a fixed 10 day-at-sea accumulation because vessels are expected to catch the lower scallop possession limit (Table 67) in a day or two. Including travelling to and from port, these trips would last fewer than five days and a 2-for-1 accumulation would therefore accumulate less than 10 days-at-sea.

The trends and bycatch amounts for barndoor skates would be nearly the same as for Alternative 1, especially since Georges Bank is thought to be a prime center of abundance. Average catch per tow for barndoor skates during the 1998 experimental fishery were not available at the time these estimates were made. Since the same procedures used for estimating the bycatch of yellowtail flounder and other finfish also applied to barndoor skates and the results for Alternatives 1 and 2 were very similar, there was no reason to add this data to the Alternative 2 analysis when it became available.

Table 76. Estimated finfish bycatch for Alternative 2 – Area Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
T6	1	176	270	1,598	27%	#N/A
T7	2	177	271	1,603	20%	#N/A
T8	4	191	292	1,730	11%	#N/A
T9	6	192	295	1,744	2%	#N/A
T10	8	188	288	1,705	-8%	#N/A

Table 77. Estimated finfish bycatch for Alternative 2 – Area Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
T6	1	271	438	1,937	34%	#N/A
T7	2	292	472	2,087	30%	#N/A
T8	4	317	513	2,271	23%	#N/A
T9	6	320	518	2,292	13%	#N/A
T10	8	312	505	2,235	3%	#N/A

Table 78. Estimated finfish bycatch for Alternative 2 – Area Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
T6	1	161	345	2,171	39%	#N/A
T7	2	169	361	2,277	34%	#N/A
T8	4	183	393	2,476	27%	#N/A
T9	6	185	396	2,496	17%	#N/A
T10	8	180	387	2,437	7%	#N/A

Table 79. Estimated finfish bycatch for Alternative 2 – Area Option 1. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
M4	3:1 DAS ratio; 10 days	177	271	1,603	8%	#N/A
T7	2	177	271	1,603	20%	#N/A
M5	2:1; 7 days	176	269	1,595	21%	#N/A
M6	2:1; 15 days	177	272	1,608	19%	#N/A
M8	2:1; 7 days; no limit	238	364	2,156	32%	#N/A

Table 80. Estimated finfish bycatch for Alternative 2 – Area Option 1. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
M4	3:1 DAS ratio; 10 days	292	472	2,087	18%	#N/A
T7	2	292	472	2,087	30%	#N/A
M5	2:1; 7 days	289	467	2,068	31%	#N/A
M6	2:1; 15 days	291	471	2,084	29%	#N/A
M8	2:1; 7 days; no limit	314	508	2,248	33%	#N/A

Table 81. Estimated finfish bycatch for Alternative 2 – Area Option 1. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Winter flounder (mt)	Windowpane flounder (mt)	Monkfish (mt)	Net change from status quo	Barndoor skate (mt)
M4	3:1 DAS ratio; 10 days	169	361	2,277	22%	#N/A
T7	2	169	361	2,277	34%	#N/A
M5	2:1; 7 days	169	362	2,279	36%	#N/A
M6	2:1; 15 days	168	361	2,273	33%	#N/A
M8	2:1; 7 days; no limit	188	403	2,538	40%	#N/A

8.1.1.3.3.3 Trip limits for bycatch

Like Alternative 1 (Table 55 to Table 57), the total bycatch on a closed area trip is determined by the amount of fishing time, the catch rates from the experimental fishery, and the expected trip length. Since these are unaffected by the day-at-sea accumulation, the results for comparable management options (Table 82 to Table 84) are exactly the same as those for Alternative 1. For the different management options evaluated for Alternative 2, the total bycatch of groundfish and monkfish per trip are approximately equal for all options (Table 85 to Table 87) because the estimated trip length (i.e. days fished per trip) is unaffected by the management options evaluated in Scenarios M4, M5, M6, and M8.

Table 82. Estimated bycatch per trip for Alternative 2 – Area Option 1. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
T6	1	21,052	15,184
T7	2	10,603	7,647
T8	4	5,736	4,137
T9	6	3,935	2,838
T10	8	2,947	2,126

Table 83. Estimated bycatch per trip for Alternative 2 – Area Option 2. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
T6	1	19,537	18,411
T7	2	10,570	9,960
T8	4	5,762	5,430
T9	6	3,960	3,731
T10	8	2,957	2,786

Table 84. Estimated bycatch per trip for Alternative 2 – Area Option 3. The trip limits are listed in Table 18for the TAC=4,000 mt; dredge efficiency = 25%; with a 2-for-1 day-at-sea tradeoff for trips fishing in Closed Area II.

Scenario	**Variable:** Allocated trips	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
T6	1	19,208	20,633
T7	2	10,115	10,866
T8	4	5,511	5,919
T9	6	3,783	4,063
T10	8	2,828	3,038

Table 85. Estimated bycatch per trip for Alternative 2 – Area Option 1. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
M4	3:1 DAS ratio; 10 days	10,603	7,647
T7	2	10,603	7,647
M5	2:1; 7 days	10,534	7,598
M6	2:1; 15 days	10,653	7,684
M8	2:1; 7 days; no limit	14,240	10,271

Table 86. Estimated bycatch per trip for Alternative 2 – Area Option 2. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
M4	3:1 DAS ratio; 10 days	10,570	9,960
T7	2	10,570	9,960
M5	2:1; 7 days	10,454	9,851
M6	2:1; 15 days	10,568	9,958
M8	2:1; 7 days; no limit	11,364	10,709

Table 87. Estimated bycatch per trip for Alternative 2 – Area Option 3. Allocation of two trips and a 13,000 lb. scallop trip limit; dredge efficiency = 25%.

Scenario	**Variable:** DAS ratio or Trip length	Groundfish catch per trip (lbs.)	Monkfish catch per trip (lbs.)
M4	3:1 DAS ratio; 10 days	10,115	10,866
T7	2	10,115	10,866
M5	2:1; 7 days	10,105	10,855
M6	2:1; 15 days	10,113	10,864
M8	2:1; 7 days; no limit	11,252	12,087

8.1.1.4 Assumptions and methods

Commercial fishery depletion – expected change in CPUE over time (days-at-sea).

Estimation of scallop effort and catch

Although last year's experimental scallop fishery in Closed Area II provided high-quality, detailed information about dredge efficiency, scallop biomass, and bycatch, the tows were standardized and lasted no more than 10 minutes. Estimates could not be derived directly about how a commercial fishery would operate in Closed Area II where biomass is high and the vessel operators could tow anywhere they chose (within the area to be opened) and for any length of time. To estimate the total fishing effort, scallop catch, and finfish bycatch the experimental fishery data had to be extrapolated using new methods.

These new methods had to take into account the expected catch rates, the maximum tow duration (either from dredge fullness or from expected industry practices), the maximum shucking capacity of the vessel, steaming time to and from the fishing areas, dredge efficiency, the fleet composition (part-time and occasional vessels may not have the opportunity to take all allocated trips), and unused days that vessels could employ to fish in the closed areas. The management factors that had to be taken into account included a scallop trip limit, a maximum trip length, the number of allocated trips, a 10-day "deduction" or a day-at-sea ratio (either applied to the whole trip on only to days when fishing in the closed area), and various area options.

Estimates of three basic variables were needed: the number of 10-minute tow equivalents that a vessel would be able to take during a 24-hour fishing day, the total number of 10-minute tows within an area under consideration, and the number of fishing days that would be generated by each management option. The number of actual fishing days is dependent on the management options and on the expected catch rate, which in turn depend on each other. The Plan Development Team used the following cumulative model to untangle this conundrum, account for the potential depletion effects as the fishery continued, and estimate the effects of each management option.

Production capacity: Expected number of 10-minute tow equivalents within 24 hours of commercial fishing:

As the catch rate declines to amounts less than the vessel's 24-hour shucking capability, fishing time will increase to a maximum determined by the tow length and the dredge handling time. This process, i.e. the number of 10-minute tow equivalents that a vessel will fish, is described by Equation 1.

The first portion of Equation 1 describes the maximum number of commercial tows that are physically possible in 24 hours of fishing. With an average 60-minute tow and 15-minute handling time, the maximum number of 10-minute tows is 115.2, or 1152 minutes of fishing time per day. The dredge could also fill to capacity, further restricting tow times and is described by

C_{max}/C. The denominator was constrained to no more than 60 minutes tow duration and a 15 minute process time for dredge handling. The PDT received advice from fishermen that the usual practice was to haul the dredges back after 45 minutes and it took no more than 15 minutes to return the dredge to the bottom to fish. Since the management measures could cause fishermen to maximize their fishing time, the maximum tow duration was increased to 60 minutes. This value may vary, depending on conditions.

The second portion of Equation 1 describes the number of 10-minute tow equivalents for an average commercial tow, taking into account the crew's shucking capability in 24 hours (also accounting for the steam time to port when the crew can continue shucking scallops). It is simply the product of the equivalent number of 10-minute tows per commercial tow (C_{max}/C, or 60 min/10 min, whichever is less) and the steam time adjusted shucking capacity (P_{max}) divided by the expected 24-hour catch (L). The latter term (P_{max}/L) was allowed to be no less than one, so that it only changed T_{24} when the catch rate exceeded the vessel's shucking capacity.

$$T_{24} = \left(\frac{1440}{\frac{C_{max}}{\overline{C}} * 10 + P} \right) * \frac{C_{max}}{\overline{C}} * \frac{P_{max}}{L} \qquad \text{Equation 1}$$

Where:

T_{24} = Number of tows per day-at-sea
C_{max} = Maximum catch for two 30 foot dredges
C = Average catch per standard 10-minute tow
P = Process time for set-out, haul-back, and on-deck handling
P_{max} = The weight of scallops that a vessel with a seven-man crew can shuck in 24 hours, accounting for the steam-time for the trip back to port. If P_{max} is less than the average catch (C), then P_{max} was set to the catch rate (i.e. the vessel could shuck all the scallops that could be caught in a 24-hour period).
L = Expected landings per day fished, based only on the expected catch rate of the dredge in 24 hours

Area swept calculations: Number of possible 10-minute tows in area where access is allowed:

The depletion rate is a function of the dredge efficiency (i.e. the proportion of scallops by a dredge in its path) and the frequency that an area is passed over by a dredge. NMFS estimated that the amount of area fished by a 10-minute tow was one nautical mile long. Multiplying the tow length by 30 feet (the total dredge width) and dividing that into the total area for each management option gives the total number of potential tows (Equation 2). The management area would therefore be fished one time if the tows were lined up so that they did not overlap and fishing effort was therefore uniform.

Of course this uniform fishing activity is highly unlikely in a commercial fishery, so T_N represents the number of tows that it will take to fish the area an average of one time. As a result, the catch rate for tow $T_N + 1$ will theoretically be one minus the dredge efficiency (1 – E). In practice, fishing effort will most likely be clustered around the area of the highest concentrations of scallops (or at least the most valuable or cheapest to harvest scallops). Since the fishing effort will be non-uniform and the prime fishing locations will be fished multiple times, the observed catch rate will probably fall faster than predicted by Equation 3 predicts, but the average observed catch per tow will also be higher than used in the model to estimate total fishing time. Future comparisons between empirical and theoretical (i.e. average) results predicted by this model need to account for the non-uniform distribution of fishing effort.

$$T_N = \frac{A}{a} \qquad \text{Equation 2}$$

Where:

A = total area of accessible fishing area
a = area swept by 10-minute tow

Scallop depletion rate: Total scallop catch, accounting for the decline in CPUE over the fishing season:

The catch rate is expected to decline over time (days fished), as a function of dredge efficiency and the size of the management area. The total catch (Equation 3) is therefore the summation of the product of the total catch on each day fished (C_t) and the inverse of the dredge efficiency (1-E) raised to the fraction of days fished to the days needed to fish the management area one time. The exponent is the number of days fished divided by the number of days required to fish the entire area that would be open to fishing.

$$C = \sum_{t=0}^{t=D_n} (1-E)^{D_t/(T_N/\ T_{24})} * C_t \qquad \text{Equation 3}$$

Where:

C_t = Expected catch rate at t days fished since access allowed
D_t = Number of 24-hour periods (days fished) since access to the closed area is allowed
D_n = Number of 24-hour periods (days fished) that would accrue if all allocated trips are taken
T_N = Number of 10-minute tows possible in the area where access is allowed

Total bottom time (time that the dredge is fishing) per 24-hours:

Total bottom time (time fished as measured by the time that the dredge is on the bottom) per day is the total number of 10-minute tow equivalents fished by the scallop vessels (T_{24}) divided by the number of 10-minute periods in 24 hours.

$$Bottomtime = \frac{\sum_{t=0}^{t=D_n} T_{24}}{144}$$ Equation 4

Total days fished:

Accounting for the scallop possession limit and combining Equations 1 and 3, the total time fished for the fishery is therefore the sum of the scallop possession limit divided by the product of the average catch per 10-minute tow times the number of 10-minute tow equivalents for 24-hours of fishing (T_{24}). For some management options (e.g. Section 5.2.10), the number of days fished was capped at a fixed amount, less the expected steam time to and from port.

$$Daysfished = \sum_{t=0}^{t=D_n} \frac{L_{\max}}{\left(\overline{C * T_{24}}\right)_{D_t}}$$ Equation 5

Where:

L_{max} = Scallop possession limit (per trip)
C = Catch per 10-minute tow
T_{24} = Number of 10-minute tows in 24-hours of fishing activity
Dt = Number of days-at-sea allocated for the allocated closed area fishery trips

Total days absent (i.e. days-at-sea without a day-at-sea trade-off):

Adding the time it takes to steam to and from port to Equation 5 gives the number of days-at-sea that would have been accumulated, if not for the automatic accumulation of a fixed amount or ratio of days-at-sea. This is the same quantity as days absent from port.

$$Daysabsent = \sum_{t=o}^{t=D_n} \frac{L_{\max}}{\left(\overline{C * T_{24}}\right)_{D_t}} + S$$ Equation 6

Where:

S = average steam time for vessels fishing in the closed area(s)

Total days-at-sea accumulated – Alternative 1:

For a fixed amount of days-at-sea that a closed area trip would accumulate (Section 5.2.10), the total days-at-sea is Equation 6 plus the difference between days accumulated and days away from port. Simplification of Equation 7 by subtraction gives Z, or simply the number of days accumulated.

$$Daysatsea = \sum_{t=0}^{t=D_n} \left\{ \frac{L_{\max}}{\left(\overline{C * T_{24}}\right)_{D_t}} + S + \left(Z_1 - \frac{L_{\max}}{\left(\overline{C * T_{24}}\right)_{D_t}} + S \right) \right\}$$ Equation 7

Where:

Z_1 = the number of days accumulated for each trip that fishes for scallops in the closed area(s)

Total days-at-sea accumulated – Alternative 2:

When days-at-sea on a closed area trip accumulate as a fixed proportion to days actually away from port (Section 5.2.10), the total days-at-sea accumulated is the product of Equation 5 and a fixed ratio R, plus the steam time to travel to and from port.

$$Daysatsea = \sum_{t=0}^{t=D_N} \left(\frac{L_{\max}}{\left(\overline{C} * T_{24}\right)_{D_t}} * R \right) + S \qquad \text{Equation 8}$$

Where:

R = Days-at-sea ratio

Total scallop catch:

Unless the catch rate (Equation 3) declined below an amount that the scallop possession limit (L_{max}) could not be caught, the total scallop catch is simply the summation of the product of the scallop possession limit and the number of allocated trips. If the scallop catch falls below this ceiling, the total scallop catch is given by the following modification of Equation 5 for the trips where this occurs.

$$Scallops = \left[\frac{Z_2}{L_{\max} \Big/ \left(\overline{C} * T_{24}\right)_{D_t}} \right] * L_{\max} \qquad \text{Equation 9}$$

Where:

Z_2 = Maximum number of days fished within the closed area fishery.

Total bycatch:

Since a decline in catch per unit effort for bycatch species was not observed for most depletion experiments in the 1998 fishery, no depletion during a commercial fishery was estimated or assumed. Although reductions in bycatch catch per unit effort were not observed in the depletion studies, depletion may occur during a much larger commercial fishery. In a limited depletion study where a single vessel makes repetitive tows over a single area, new fish can easily swim into the area to replace ones that have been caught and died15. One hypothesis is that the discarded and neighboring fish could have been attracted to the tow path to feed on suspended prey that is usually buried in the bottom. These fish would have been caught on subsequent passes of the dredge during the depletion experiment. Over a larger commercial fishery, however, fish may have to swim farther and could be less attracted to suspended food. Also some fish that had been discarded in the depletion experiments will be retained and landed in a full-scale commercial fishery.

Without depletion effects, the total bycatch estimate is simply the product of the observed catch rate from the experimental fishery and the total number of 10-minute tow equivalents during the proposed fishery.

$$Bycatch = C_i * \sum_{t=0}^{t=D_n} T_{24} \qquad \text{Equation 10}$$

15 Some discarded finfish survived and may have remained in the area to be caug

Where:

C_s = Catch per 10-minute tow

8.1.1.4.1 Caveats or Concerns

The extrapolations of commercial catch rates in the NLSA and for the open scallop fishing areas have the assumption that the catch characteristics for the survey and commercial dredges vary together. In other words, if the survey dredge catches half as many scallops in the open areas than in Closed Area II, then the commercial dredge will also catch half as much. If the commercial fishing tunes the dredge to perform better in sand or gravel found in the NLSA, than the estimates presented here underestimate the commercial catch in the open areas

The estimates of 1999 catches for the proposed area options are subject to sampling error. Surplus production i.e., the change in scallop biomass between 1998 and 1999, is based on the length frequency distributing from research survey data since it samples small scallops. Some area options, especially Option 2 and Option 3 had few survey tows and the surplus production estimate could vary in either direction from the actual rate. This surplus production estimate was applied to the 1998 experimental fishing catches to estimate commercial catch in 1999.

The scallop catch and finfish bycatch may vary from that observed during the experimental fishing. The experimental fishing during 1998 was conducted during August and October, the original schedule being modified by the passage of a hurricane. Inter-annual and seasonal variations will influence the availability of scallops to the commercial dredge and also change the catch rates of the finfish bycatch. This variability could be quite substantial, especially for the smaller area options, and the catch rates should be closely monitored to allow in season adjustments.

8.1.2 Economic Impacts

8.1.2.1 Introduction

The opening of the parts of Closed Area II to scallop fishing will have positive impacts on the economic viability of the scallop vessels and on the net national economic benefits derived from this industry. The extent of impacts are determined by the TAC, the possession limits and days-at-sea restrictions that will apply under the proposed measures of this Framework. This analysis provides an assessment of the impacts both on individual vessel operations and on the economic costs and benefits to the nation of the proposed action and alternatives considered but rejected.

8.1.2.2 Summary of results

- The price per pound of scallops is expected to decline as the scallop landings increase with access to the closed areas. The extent of this reduction will depend on the increase and monthly distribution of scallop landings from closed and open areas for various TAC and possession limit scenarios as well as on the size composition of landed scallops (Table 89).

- The access to the closed areas is estimated to have a positive impact on the gross and net revenues of the vessels, and therefore on the financial viability of the scallop fleet. The annual net revenues (gross revenues minus trip expenses) of a hypothetical vessel with a average GRT and horse power

are estimated to increase by about 45 percent under the proposed alternative as compared to the status quo level. Accordingly, total revenue of the scallop fleet is expected to increase by $32.5 million for the proposed action. The increase in producer benefits as measured by the producer surplus will also be around $32.1 million.

- Increase in the supply of scallops and lower prices will benefit scallop consumers. These benefits are measured by the consumer surplus and will increase by $4.5 million under the proposed action.

- The net national benefits, that is, the sum of changes in producer and the consumer surpluses, will be positive. For the proposed action, the net national benefits from the scallop industry are expected to increase by $36.6 million assuming that only those vessels that were previously active will continue to fish with access to the closed areas (Scenario T11). The increase in estimated compliance and enforcement costs by $0.6 million will however reduce net benefits to $36 million. The net benefits would be higher if effort increase from the participation of the inactive vessels. Such an increase would be, however, at the expense of long-term benefits since conservation risks will increase with an increased effort (Scenario M12). Table 88 summarizes the results for the proposed action and for the alternatives considered but rejected.

Table 88. Summary of costs and benefits

	Proposed action Medium TAC		Alternatives Considered but Rejected			
	Only Active Vessels Fish (T11)	Active and Inactive Vessels fish (M12)	Two-trips allocation Medium TAC	Two-trips Allocation Low TAC	Two-trips allocation High TAC	Four-trips Allocation Medium TAC
Scallop possession limit per trip	10,000	10,000	13,000	8,100	20,300	7,000
Change in revenues	32.5	38.9	32.5	12.6	52.4	24.8
Change in costs*	0.4	0.7	2.0	1.2	3.2	-4.4
Change in consumer surplus	4.5	6.2	4.8	0.5	11.1	2.5
Change in producer surplus	32.1	38.2	30.5	11.5	49.1	29.2
Net benefits	36.6	44.4	35.3	12.0	60.2	31.7

*** Negative sign indicates cost savings.**

- The economic impacts of the TAC, area, and trip-allocation options considered but rejected will also be positive. The level of impacts on revenues and net benefits for the two-trip allocation (scenario T2) and medium-TAC option will be close to that of the proposed action (Scenario T11, Table 88). The benefits of accessing the closed areas decrease, however, if the vessels are required to land the allowable catch in a greater number of trips at a smaller possession limit per trip.

- For the low-TAC scenario, the impacts on revenues and net benefits will be lower and for the high-TAC scenario, the impacts will be higher than estimated for the medium-TAC option. For two-trips allocation scenario, the net benefits under low-TAC scenario is estimated to be $12 million and the under high-TAC scenario, to be $60 million (Table 96). However, these estimates do not take into account the long-term conservation risks (benefits) of increased (reduced) scallop mortality under a high-TAC (low-TAC) option.

- For each trip-allocation scenario, the economic impacts of the closed area II option1 are almost identical to closed area II options 2 and 3. Access to the Nantucket Lightship Area (NLSA) would have similar results as well, with slightly lower revenue impacts because of the lower possession limits and lower TAC for this option (Table 93).

- A possession limit of less than 4,400 pounds is estimated to be uneconomical for vessels to fish in the closed areas. This conclusion is valid for a maximum trip length and trade-off of 10 days-at-sea for fishing in the closed areas, and for a steam time of 3 days-at-sea for a round trip. A shorter (or longer) steam time or a higher days-at-sea trade-off may change the possession limit below which it becomes uneconomical to fish in the closed areas (Table 92). An increase in landings per day-at-sea from the open areas will increase the economical level of possession limit above 4,400 pounds per trip.

- The analysis assumes that there will be no short-term impact on the revenues in other fisheries, such as for a multispecies vessel. Although the scallop vessels are expected to have a bycatch of multispecies flounder species, these fish probably would not be caught by multispecies vessels in the short run for the following reasons:
  1) Flatfish, particularly yellowtail flounder, are relatively less mobile than other groundfish such as cod and therefore are more likely to remain within Closed Area II;
  2) If scallop fishing effort is displaced from others parts of eastern Georges Bank or the total level of effort is reduced by the imposition of the buffer zone, there might be a net decrease in the level of yellowtail catch by scallop dredges;
  3) The yellowtail TAC for the proposed action already allows for an increase in yellowtail flounder landings by multispecies vessels and, therefore is less likely to have an impact on the level of multispecies landings than if no increase in yellowtail landings were assumed;
  4) The multispecies TACs are target TACs that do not limit fishing activity in the current year, although if target fishing mortality levels are exceeded, TACs are usually decreased in subsequent years. (There even may be instances where a TAC is exceeded but a subsequent stock assessment concludes that fishing mortality targets have been met because of changes in abundance relative to the catch).

8.1.2.3 Assumptions and Methodology

The economic impacts are examined using a biological-economic simulation model that combines landings and landings per day-at-sea (LPUE) of the biological model with a monthly price model and vessel cost equations. The methodology of the biological model is discussed in Section 8.1.1.4. The general assumptions of the economic analysis can be summarized as follows:

- Status quo alternative reflects the fishing restrictions and days-at-sea schedule as determined by Amendment 7 measures. It also assumes continuation of Georges Bank closed areas.

- Unless otherwise specified, it is assumed that, with access to the closed areas, the active vessels will maximize their days-at-sea-use in 1999, but inactive vessels and the history permits will not participate in the fishery. During 1998 fishing year, 207 full-time, 23 part-time and 2 occasional vessels participated in the fishery. Most full-time vessels have 10 days-at-sea carry-over from the earlier years of the days-at-sea program, and according to the projections, on the average, a full-time active vessel can use 128 days-at-sea in 1999 (Table 29). Therefore, area-opening scenarios assume that the full-time vessels will use 128 days-at-sea in 1999. Under the projected status quo conditions with no access to closed areas, the full-time vessels are expected to use only 116 days-at-sea. The possible impacts of increased participation by inactive vessels are also discussed, however, in the relevant sections (Scenario M12).

- The maximum trip length for fishing in the closed areas is assumed to be 10 days-at-sea. This trip length also shows the days-at-sea trade-off from fishing in the closed areas. In other words, the vessels use 10 days-at-sea from their allocation for each trip they take to the closed areas including the steam time. The implications of increasing the days-at-sea trade-off are also discussed.

- Unless otherwise specified, the economic impacts are analyzed for medium-TAC scenario. The implications of high or low TAC options are also discussed (Table 94).

- The monthly scallop landings in the closed areas are assumed to be evenly distributed during the opening season.

- The vessel costs are estimated for an average scallop vessel that has a GRT, HP, and crew size equivalent to the fleet average. The estimation was based on the cost equations provided in Appendix 4 of Amendment 7 of the Sea Scallop Fishery Management Plan.

- Landings per day-at-sea (LPUE) in the open and the closed areas for each scenario is estimated from the biological model (Section 8.1.1.4).

- The scallop revenues are estimated from projected landings and the monthly price model.

- Trip and variable costs are estimated in 1997 prices as a function of days-at-sea, GRT, HP and crew.

- Bycatch revenues from the closed and the open areas are not taken into account in the revenue estimates shown in the Tables. The implications of the possession limits are briefly discussed, however, in Section 8.1.1.1.7.

8.1.2.4 Scenarios analyzed

Impacts of the proposed action are analyzed for two scenarios labeled T11 and M12. The first scenario, T11, assumes that only active vessels will participate in the scallop fishery during 1999. Scenario M12, on the other hand, assumes that all active and inactive vessels, but not the vessels with history permits, will participate in the fishery with access to the closed areas. The impacts of the proposed action were compared with the status quo option. As defined above, status quo reflects the fishing restrictions and days-at-sea schedule determined by Amendment 7 measures. It also assumes continuation of Georges Bank closed areas.

The alternatives considered but rejected by the Council were examined for four area scenarios, and five trip allocation options. Area scenarios include closed area II options 1, 2 and 3, and Nantucket Lightship Area (NLSA) option. The impacts of trip allocation and possession limits were analyzed for five scenarios, labeled T1 to T5. These scenarios are defined in Table 90 below, by the number of closed area trips that will be allocated to each vessel at the corresponding possession limits. In addition to area and trip allocation scenarios, the impacts of low, medium and high TAC options are also analyzed. For a description of the scenarios analyzed see also Table 23.

8.1.2.5 Impacts on prices

The price per pound of scallops is expected to decline as the scallop landings increase with access to the closed areas. The extent of this reduction will depend on the increase in monthly scallop landings both from closed and open areas for various TAC and scallop possession limit options and also on the

size composition of landed scallops. The monthly distribution of landings will also have an important impact on prices.

The price of scallops is estimated by a monthly dynamic model as a function of:

- monthly domestic landings,
- quantity of fresh and frozen scallop imports from all countries,
- disposable income,
- seasonal variables
- change in meat count,
- lagged price.

A description of the monthly price model is provided in Appendix III to this document (Table 105). Empirical results show that the price of scallops varies inversely with the level of domestic landings and imports, but increase as the disposable income increase. The prices also exhibit some monthly patterns during the year, increasing in summer months (July to September), and decreasing especially in winter months and early spring. This is consistent with the biological findings that scallop meat tends to decline from summer into fall and winter. Therefore, the opening of the closed areas during summer would maximize the benefits to the scallop fishery while minimizing the increase in the fishing mortality rate associated with the target TAC (Section 8.1.1.1.2).

The scallop revenues for each management option are calculated from the estimated landings and prices in the following sections. Table 89 provides an example of the impacts of opening the closed areas to fishing on the price of scallops for the medium TAC scenario (4,300 Mt.). The landings from the open areas are estimated at 12.5 million pounds, and if all the eligible vessels fish, the landings from the closed areas are estimated to reach the TAC at 9.5 million pounds. For this scenario, if the TAC is landed during the first quarter, the average annual price is estimated to decline by 9 percent, and the average monthly price during the opening months will decline by 18.5 percent. An even distribution of the monthly landings will minimize the price reduction to 7 percent for 1999 fishing year, and to 14.3 percent for the opening periods.

These results should be interpreted with caution, however, since the impacts of the increased size composition on the prices are not taken into account. The size of the scallops to be landed from the closed areas is expected to be large with higher prices per pound. Therefore, the estimates given in Table 89 will probably underestimate the prices under the proposed area-opening options, or overestimate the price reductions. It should also be emphasized that these estimates are based on 1997 prices holding the monthly composition and the quantity of imports constant at their 1998 levels.

Table 89. Landings and Prices for medium-TAC scenario with access to the closed areas.

	TAC is landed during the first 3 months	TAC is landed in the first month of each quarter	TAC is landed evenly each month
Landings from open areas (million pounds)	12.51	12.51	12.51
Landings from closed areas (million pounds)	9.48	9.48	9.48
Total (all areas)	21.99	21.99	21.99
Price per lb. (annual monthly average)			
With no access to closed areas	$6.81	$6.81	$6.81
With access to the closed areas	$6.18	$6.24	$6.34
Percentage Change (%)	-9.16%	-8.42%	-6.93%
Monthly average price during July-Dec. before opening	$7.24	$7.24	$7.24

after opening	$5.90	$6.00	$6.20
Percentage Change (%)	-18.51%	-17.11%	-14.31%

The scenario analyses provided in the following sections are based on the assumption that the monthly landings from the closed areas will be evenly distributed throughout the opening season. Same assumption is applied in the estimation of producer and consumer surpluses and the net benefits.

8.1.2.6 Impacts on scallop landings and days-at-sea use

The proposed access to the closed area(s) is expected to increase overall scallop landings (in meat weight) compared to its status quo level. If only active vessels continue to fish in 1999, the estimated scallop landings may increase from 13.2 million pounds under the status quo to 18.5 million pounds under the proposed action (Table 90). The scallop landings from the open areas will, however, decline to 11.5 million pounds as part of the fishing effort is diverted to the closed areas.

In general, the degree of impacts on landings for various area-opening options will be determined by several factors including:

- the level of participation and days-at-sea-use in the fishery,
- the TAC,
- number of trips,
- scallop possession limit per trip, and
- days-at-sea restrictions that apply for fishing in the closed areas.

Even though some options for a given TAC allow a vessel to land approximately the same amount of scallops in the closed areas during the opening period, the number of trips combined with days-at-sea restrictions affect the days-at-sea a vessel can fish in other areas. As a result, total scallop landings and revenues would be different for each alternative (Table 90 to Table 93).

The levels and the change in the estimated days-at-sea use for the proposed action, status quo, and alternatives considered but rejected are shown in the second column of Table 90. For the status quo option, it is estimated that the full-time vessels will fish only 116 days, leaving, on the average, four days-at-sea unused out of their allocation of 120 days-at-sea in 1999 fishing year.

The access to the closed areas will increase the economic opportunities from fishing for scallops. For this reason, the vessels are expected to increase their activity in order to maximize their economic returns, and use their allocations in full. The full-time vessels on the average have 8 days-at-sea carry-over from the earlier years of the days-at-sea program. Therefore, an average full-time active vessel can use up to 128 days-at-sea in 1999 (Table 29).

Table 90 shows the portion of the days-at-sea allocation used, total fleet landings and landings per day-at-sea (allocated) in the closed and open areas for the proposed measures and for the trip-allocation alternatives considered but rejected. Proposed action allows vessels to take three-trips to the closed areas and land up to 10,000 pounds per trip. At the maximum trip length of 10 days-at-sea, the vessels will accumulate 10 days-at-sea from their allocation for each trip they have taken to the closed areas. Therefore the days-at-sea allocation in the closed areas is calculated by multiplying the number of trips with 10, even when the actual trip including the steam time may take less than 10 days-at-sea. In contrast, the days-at-sea used in the open areas indicates the actual days-at-sea used to fish plus the steam time. The same trip length restrictions were applied to the non-selected options.

Under the proposed action, if vessels take three-trips to the closed areas using 30 days-at-sea from their allocation, they will be able to fish only 98 days-at-sea in the open areas. The landings per day-at-sea in the open areas is estimated to be 540 pounds. As a result, the scallop landings from the open areas will be 11.5 million pounds, less than for example, if vessels are allowed to fish only two-trips in the closed areas at a possession limit of 13,000 pounds per trip under scenario T2 (Table 90). This is because the days-at-sea used in the open areas will be higher under a two-trip allocation option, i.e., 108 days-at-sea, since vessels use only 20 days-at-sea in the closed areas.

Therefore landings from the open areas decrease as the number of trips to the closed areas increase. For example, under 6-trip allocation option (scenario T4), the scallop landings from the open areas will decline to 8.3 million pounds as the days-at-sea used in closed areas to 60 days-at-sea, leaving only 68 days-at-sea for vessels to fish in the open areas.

For the proposed action, the scallop landings from the closed areas will be around 6.9 million pounds, i.e., less than the medium-TAC of 9.4 million pounds, assuming that only vessels that were active in the previous years will participate in the fishery. The estimated landings for trip-allocation options considered but rejected by the Council will range from 6 to 6.5 million pounds since these have lower possession limits compared to the proposed action.

If inactive vessels (but not vessels with history permits) also participate in the fishery, total days fished could increase by 15 percent over current levels (See Table 37 and the biological impacts section 6.2.6.6.6). As a result, the landings from closed areas would increase to 8.4 million pounds and landings from all areas to 19.5 million pounds (Scenario M12, Table 90).

Table 90. Days-at-sea used, Fleet landings and Landings per day-at-sea used

	Days-at-sea allocation used	Total Fleet Landings in Million Pounds	Landings(lb.) Per day-at-sea used
Status quo	**No Access to the Closed Areas**		
Closed area	0	0	0
Open area	116	13.2	527
Total	116	13.2	
T11. Proposed action Only active vessels fish	**(three-trips, scallop possession limit =10,000 pounds per trip in Closed area II)**		
Closed area	30	6.9	3,216
Open area	98	11.5	540
Total	128	18.5	
M12. Proposed action Both active and inactive vessels fish	**(three-trips, scallop possession limit =10,000 pounds per trip in Closed area II)**		
Closed area	30	8.4	3,239
Open area	98	11.2	522
Total	128	19.6	
T1. One- trip allocation	**(scallop possession limit =26,000 pounds per trip in Closed area II)**		
Closed area	10	6.0	2,600
Open area	116	13.2	527
Total	126	19.2	
T2. Two-trips allocation	**(scallop possession limit =13,000 pounds per trip in Closed area II)**		
Closed area*	20	6.0	1,300
Open area	108	12.5	532
Total	128	18.5	

	Days-at-sea allocation used	Total Fleet Landings in Million Pounds	Landings(lb.) Per day-at-sea used
T3. Four-trips allocation	**(scallop possession limit =7,000 pounds per trip in Closed area II and 6,400 pounds in NLSA)**		
Closed area	40	6.5	700
Open area	88	10.5	547
Total	128	16.9	
T4. Six-trips allocation	**(scallop possession limit =4,800 pounds per trip in Closed area II)**		
Closed area	60	6.5	480
Open area	68	8.3	562
Total	128	14.8	
T5. Eight-trips allocation	**(scallop possession limit =3,600 pounds per trip in Closed area II)**		
Closed area	80	6.0	360
Open area	48	6.4	576
Total	128	12.4	

8.1.2.7 Economic Impacts on Vessels

The impacts the proposed action on vessel revenues

The proposed action will have positive impacts on the gross and net revenues of the scallop vessels. The annual net revenues of an average scallop vessel are estimated to increase by approximately 44 percent with access to the closed areas (Table 91).

Table 3 compares the estimated gross and net revenues per day-at-sea from the closed and open areas, and provides estimates of annual revenues for a full-time scallop vessel. The net revenue was estimated as the difference between the gross revenue and trip expenses, thus shows the surplus out of which crew shares are paid and the vessel owner receives a profit. The steam time is assumed to be 3 days-at-sea for a round trip, and the trip expenses are estimated for a hypothetical scallop vessel with a gross tonnage and horse power equal to the fleet average, and with a crew size of 7 men.

The bycatch revenues in the closed and open areas are not taken into account in the revenue estimations. Because of the low possession limit, 500 pounds of regulated species of groundfish and 300 pounds of monkfish per trip, the bycatch revenues are not expected to be significant enough to change the profitability of fishing in the closed versus the open areas. For example, 500 pounds groundfish would only generate $650 per trip at an ex-vessel price of $1.5 per pound, or $65 per day-at-sea for fishing in the closed areas. The vessels may be able derive a similar or even a higher amount from the already open areas. Therefore fishing in the closed areas is not expected to affect significantly the vessel revenues from bycatch under the proposed possession limits.

Due to the higher abundance of the scallop stock in the closed areas, both gross and net revenues per day-at-sea from these areas will greatly exceed those from the open areas. Since a vessel can land the same amount of scallops in less time in the closed areas, the trip expenses per day-at-sea use (from allocation) will be lower. As a result, the net revenues per day-at-sea from the closed areas will be more than the double of the revenues from the open areas.

Finally, the annual net revenue of an average vessel is expected to increase from about $316,000 under the status quo to about $456,000 under the proposed action. As a result, both the vessel profits and crew shares will increase for the current in the lay system.

Increased effort with the participation of the inactive vessels in the fishery would lower the landings per day-at-sea from the open areas as scenario M12 shows (Table 91). On the other hand, the increase in overall landings with more participation would reduce the scallop prices further, lowering the revenues per vessel below the levels estimated in Table 91. The proposed access would still have positive impacts, however, increasing the annual revenues per vessel by 32 percent.

The numerical results of this analysis should be interpreted with caution since comparisons of revenues are based on the biological model estimates. The scallop landings for the open areas were estimated to range from 522 to 576 pounds per day-at-sea for various scenarios (Table 90). If the actual landings exceed these amounts, the revenue differences for fishing in the closed versus the open areas will decrease. For example, if vessels could land 1,000 pounds per day-at-sea in the open areas, the revenue per day-at-sea would be equivalent across all areas, reducing the economic incentives for fishing in the closed areas.

Table 91. Gross and net revenues per day-at-sea for the proposed action and status quo.

	Status Quo No Access to the Closed Areas	**Proposed Action** (Only active vessels fish) **(T11)**	**Proposed Action** (Inactive vessels also participate) **(M12)**
Number of trips to the closed areas	0	3	3
Scallop possession limit per trip	0	10,000	10,000
Gross revenue per day-at-sea			
Closed area	0	6,942	6,449
Open area	3,603	3,691	3,391
Net revenue per day-at-sea			
Closed area	0	6,247	5,756
Open area	2,724	2,743	2,491
Annual net revenues (1999 projections)			
Closed area	0	187,417	172,691
Open area	315,973	268,861	244,121
Total	315,973	456,278	416,812
Percent change in annual net revenues compared to status quo		45%	32%

The economic impacts of the alternatives considered but rejected

The economic impacts of the four area options and several trip-allocation alternatives considered but rejected by the Council are examined below for the medium TAC option (Scenarios A1 to A8). The expected net revenues per day-at-sea-allocation used in the closed and open areas were estimated for each trip-allocation option. The results indicate that:

- It would be economically beneficial for a vessel to fish in the closed areas for most options with the exception of eight-trips allocation.

- The gross and net revenues per day-at-sea from closed areas are maximized with fewer trips and higher possession limits.
- For each trip-allocation scenario, the economic impacts of the Closed area II options are similar to each other, and the Nantucket Lightship Area (NLSA) option generates slightly lower gross and net revenues per day-at-sea because of the lower possession limit for this alternative.
- The estimated increase in annual net revenues for alternatives considered but rejected is less than the increase estimated for the proposed action.

Table 92 compares the gross and net revenues per day-at-sea in the closed and open areas. The maximum trip length is assumed to be 10 days-at-sea in the closed areas, except for one-trip allocation option. For this option, a trip including the steam time would take more than 10 days-at-sea (about 11.5 days-at-sea), for a vessel to land the corresponding possession limit of 26,000 pounds.

The analysis of the various trip allocations shows that gross and net revenues per day-at-sea from closed areas are maximized with fewer trips and higher possession limits. The first three trip-allocation options, with a scallop possession limit 7,000 pounds or higher, would provide economic incentives for vessels to fish in the closed areas because they could derive higher revenues from these areas (scenarios T1, T2, T3).

The results also show that a possession limit of less than 4,400 pounds per trip will make it uneconomical for vessels to fish in the closed areas. For example, with a six-trips allocation and possession limit of 4,800 pounds in closed area II, the gross revenue per day-at-sea from the open areas exceeds the gross revenue per day-at-sea from the closed areas (scenario T4). It could still be more profitable for some vessels to fish in the closed areas, however, since the net revenues from these areas would slightly exceed that of from the open areas. This is because trip expenses per day-at-sea allocated would be lower in the closed as compared to the open areas.

The last column of scenario T4 shows that fishing in NLSA would generate about the same net revenues, $2,890, as fishing in the open areas at the possession limit of 4,400 pounds. This conclusion is valid for a maximum closed area trip length and trade-off of 10 days-at-sea, and for a steam time of 3 days-at-sea for a round trip. A shorter or a longer steam time may change the possession limit below which it becomes uneconomical to fish in the closed areas.

Therefore, 4,400 pounds per trip is the possession limit level below which the net revenues per allocated days-at-sea from closed areas will fall short of the net revenues per day-at-sea from the open areas. For example, the 3,600 pounds possession limit option (eight-trips allocation, scenario T8), would leave no incentive for vessels to fish in the closed areas since a higher revenue (gross and net) could be obtained by fishing in the open areas (Table 92).

Table 92. Gross and net revenues per day-at-sea from closed and open areas for Medium TAC (4,300 Mt.) option, days-at-sea is restricted to 10 days-at-sea per trip in closed areas (assuming a 3 days-at-sea steam-time).

	Closed Area II Option 1	Closed Area II Option 2	Closed Area II Option 3	Nantucket Lightship Area
T1. One-trip Allocation	**(Possession limit =26,000 pounds in Closed area II and 23,900 pounds in NLSA)**			
Gross revenue per day-at-sea				
Closed area	16,821	17,101	17,059	17,765
Open area	3,403	3,423	3,418	3,403
Net revenue per day-at-sea				

	Closed Area II Option 1	Closed Area II Option 2	Closed Area II Option 3	Nantucket Lightship Area
Closed area	15,557	14,555	14,581	16,657
Open area	2,526	2,546	2,542	2,526
T2. Two-trips allocation	**(Possession limit=13,000 pounds in Closed area II and 12,000 pounds in NLSA)**			
Gross revenue per day-at-sea				
Closed area	8,587	8,587	8,587	7,927
Open area	3,478	3,478	3,478	3,478
Net revenue per day-at-sea				
Closed area	7,756	7,740	7,715	7,213
Open area	2,590	2,590	2,590	2,590
T3. Four-trips allocation	**(Possession limit=7,000 pounds in Closed area II and 6,400 pounds in NLSA)**			
Gross revenue per day-at-sea				
Closed area	4,727	4,727	4,727	4,322
Open area	3,648	3,648	3,648	3,648
Net revenue per day-at-sea				
Closed area	4,408	4,393	4,400	4,036
Open area	2,734	2,734	2,734	2,734
T4. Six-trips allocation	**(Possession limit=4,800 pounds in Closed area II and 4,400 pounds in NLSA)**			
Gross revenue per day-at-sea				
Closed area	3,340	3,340	3,340	3,062
Open area	3,840	3,840	3,840	3,840
Net revenue per day-at-sea				
Closed area	3,152	3,145	3,148	2,889
Open area	2,893	2,893	2,893	2,893
T5. Eight-trips allocation	**(Possession limit=3,600 pounds in Closed area II and 3,300 pounds in NLSA)**			
Gross revenue per day-at-sea				
Closed area	2,592	2,592	2,592	2,376
Open area	4,043	4,043	4,043	4,043
Net revenue per day-at-sea				
Closed area	2,461	2,457	2,459	2,254
Open area	3,049	3,049	3,049	3,049

Table 93 compares the estimated annual vessel revenues from open and closed areas for four area and three trip-allocation options. One-trip and eight-trip allocation scenarios are not shown because the trip length would exceed 10 days-at-sea under the first one, and it would be unlikely for vessels to fish in the closed areas under the second one.

It is evident from Table 93 that the annual net revenues are maximized if the vessels are allowed to take fewer trips to the closed areas with higher possession limits. As the possession limits decrease and the number of trips to the closed areas increase, the revenues from the open areas would decline because of the increase in days-at-sea-traded off to fish in the closed areas (see also Table 90). The annual net vessel revenues would range between $385,000 for the six-trips allocation scenario (T5) to about $434,000 for a two-trips allocation scenario (T2). These are lower than the estimated annual net revenues, $456,000, for the proposed action.

Table 93. Annual net revenues

	Closed Area II Option 1	Closed Area II Option 2	Closed Area II Option 3	Nantucket Lightship Area
T2. two-trips ALLOCATION	**(Possession limit=13,000 pounds in Closed area II and 12,000 pounds in NLSA)**			
Annual Net revenues (1999 projections)				
Closed area	155,117	154,307	154,794	144,269
Open area	279,774	279,774	279,774	279,774
Total	434,891	434,081	434,568	424,042
T3. four-trips ALLOCATION	**(Possession limit=7,000 pounds in Closed area II and 6,400 pounds in NLSA)**			
Annual Net revenues (1999 projections)				
Closed area	176,316	175,720	176,019	161,454
Open area	240,634	240,634	240,634	240,634
Total	416,950	416,354	416,652	402,087
T4. six-trips ALLOCATION	**(Possession limit=4,800 pounds in Closed area II and 4,400 pounds in NLSA)**			
Annual Net revenues (1999 projections)				
Closed area	189,122	188,694	188,906	173,354
Open area	196,745	196,745	196,745	196,750
Total	385,867	385,439	385,651	370,104

The economic impacts of the three closed area II options are almost equal to each other, whereas the Nantucket Lightship Area (NLSA) option generates slightly lower gross and net revenues per day-at-sea, an lower annual net revenues because of the lower TAC and possession limits (Table 92 and Table 93). In other words, economic impacts mostly vary with the possession-limits rather than the area designations for each alternative.

Impacts of high and low TAC options

The impacts of TAC options considered but rejected by the Council are examined for closed area II option 1 only, since the results expected to be similar for other area options, i.e., closed area II options 2 and 3 and NLSA option. Table 94 compares gross and net revenues per day-at-sea, and total net revenues from closed and open areas at low, medium and high biomass levels for two-trips allocation scenario (T2). The increase in the possession limit from 13,000 pounds for the medium TAC to 20,300 pounds for the high-TAC scenario increases the gross revenues per day-at-sea-allocated in the closed areas from $8,587 to $12,466, and annual net revenues from $434,891 to $515,080. The reduction in possession limits to 8,100 pounds for the low TAC scenario produces the opposite effect, i.e., reduces the gross revenues per day-at-sea from the closed areas to $5,671, and annual net revenues to $350,891.

The high-TAC scenario has similar economic impacts to that of a medium TAC option combined with a higher possession limit (the scenario shown in the last column of Table 94). The possession limits for the low, medium and the high TAC scenarios were determined assuming that all eligible vessels will fish in the closed areas. If it is assumed, however, that only active vessels will use their days-at-sea allocations to the maximum to fish in these areas, the trips limits could be set higher without exceeding the TAC for each option. The last column in Table 94 shows the results for a possession limit of 19,500 pounds for the medium TAC option. Net revenue per vessel would increase to about $493,000 for this scenario, which is close to the level estimated for high TAC option. If, however, access to the closed areas provides incentives for the previously inactive vessels participate in the fishery, the overall TAC of 4,300 metric tons would be exceeded with a 19,500 pounds scallop possession limit.

The results of this analysis should be interpreted with caution since they mostly refer to the short-term impacts. There are long-term biological risks associated with choosing a higher (lower) TAC option when the true biomass is low (high) as were summarized in Section 6.2.6.3. Although a quantitative evaluation of these long-term impacts is beyond the scope of this analysis, it is evident that the risks associated with the high-TAC option are reduced landings and revenues in the subsequent years. The proposed action may minimize these long-term risks, and provide a higher benefit to the scallop industry over a longer period, although its economic benefits in the short-term will be lower than that of the high-TAC option.

The low-TAC option, on the other hand, may reduce the risk of stock depletion if the true biomass is lower than expected. It still poses some risks, however, if the true biomass is higher, by increasing the loss from natural mortality or by continuing the high rate of harvest on small scallops. These factors may lower landings in the future years as well, reducing the overall economic benefits of the closed area access.

Table 94. Impacts of TAC and the possession limits

	Low TAC=2,700 Mt.	Medium TAC=4,300 Mt.	High TAC=6,800 Mt.	Medium TAC=4,300 Mt. High possession limit
	Closed Area II Option 1	Closed Area II Option 1	Closed Area II Option 1	Nantucket Lightship Area
T2. Two-trips allocation				
Possession limit per trip (pounds of scallops)	8,100	13,000	20,300	19,500
Gross revenue per day-at-sea				
Closed area	5,671	8,587	12,466	12,302
Open area	3,557	3,476	3,299	3,386
Net revenue per day-at-sea				
Closed area	4,997	7,756	11,408	11,169
Open area	2,335	2,590	2,164	2,498
Net annual revenue per average vessel				
Closed area	99,947	155,117	228,170	223,384
Open area	250,944	279,774	286,911	269,773
Total	350,891	434,891	515,080	493,157

Impacts of days-at-sea ratios for fishing in the closed areas

The analysis provided so far assumed that the vessels would loose 10 days-at-sea for each trip they take to the closed areas even if the actual fishing and steaming took less than 10 days-at-sea. Increasing this trade-off would have an impact on the total landings of the vessels from the open areas, but the landings from the closed areas would almost stay the same.

For example, if vessels should accumulate 20 days-at-sea for each days-at-sea they fished in the closed area II (for option 1), they would still land the same amount from the closed areas during the opening season. For two-trips allocation scenario (T2) at a possession limit of 13,000 pounds, their gross revenues per day-at-sea-allocated would be reduced by half, however, from approximately $8,600 to $4,300, because they would loose 40 days-at-sea instead of 20 days-at-sea for this option (Table 92,

scenario T2). Since less effort will be available in the open areas (88 days-at-sea per vessel instead of 108 with 10 days-at-sea trade-off), the landings and revenues per day-at-sea from these areas would increase. Therefore, the relative profitability of fishing in the closed areas would decline. Because of the reduction in days-at-sea available for fishing in the open areas, however, to 88 days-at-sea, total landings from these areas would be less compared to the 10 days-at-sea trade-off scenario.

Therefore, in order to obtain a rough estimate of gross revenues per day-at-sea from closed areas for a double trade-off in days-at-sea (20 days-at-sea for each 10 days-at-sea used in the closed areas), the values given in Table 92 should be divided by two. This trade-off would reduce the profitability of fishing in the closed areas even at a possession limit of 7,000 pounds per trip. Average landings per day-at-sea-allocated would decline to 350 pounds, which is much lower than what vessels could already land in the open areas (see Table 90 for landings per day-at-sea). Therefore, increasing the days-at-sea ratio that would almost have the same effects as with reducing the possession limit, or allocating the TAC among more of trips. In order words, management objectives could be attained either by changing the possession limit (thus the number trips) at a 10 days-at-sea trip length and trade-off, or by changing the days-at-sea ratio to be applied to the trips taken in the closed areas.

8.1.2.8 Fleet level impacts and net national benefits

This section provides a cost/benefit analysis of the proposed action and the alternatives considered but rejected. The proposed access to the closed areas will have positive impacts on the scallop fleet revenues and consumer benefits. The net national benefit, as measured by the sum of changes in producer and consumer surpluses, is expected to increase by $36.6 million for the proposed action. These impacts on revenues, costs, and net benefits are discussed below and summarized in Table 95 and Table 96.

Impacts on fleet revenues

For the proposed action, scallop landings are estimated to increase to 18.4 million pounds from the status quo level of 13.5 million pounds. The fleet revenues will increase to $121 million despite an estimated decline in monthly average scallop prices by 4.1 percent. This increase in scallop fleet revenues will exceed status quo levels by $32.5 million (Table 95). If inactive vessels also participate in the fishery to take advantage of the economic opportunities provided by access to the closed areas, total revenues would increase further to $127 million.

The two-trips allocation alternative produces similar results to those of the proposed action in terms of landings, prices and revenues. Despite the similarity of the economic impacts, however, the biological impacts of this alternative would be different. The total fishing effort and scallop mortality in the open areas would be higher with a two-trip allocation option than the levels expected for the proposed measures. In comparison, the proposed action minimizes the increase in fishing mortality by shifting a larger proportion of the fishing effort from the open to the closed areas.

The reduction in actual days-at-sea used for fishing in the open areas for the four- and six-trips allocation alternatives would result in lower revenues, respectively about $113 million and $102 million relative to the levels for the proposed action. These levels are still higher than the estimated status quo revenues respectively by $24.8 million and $13.6 million. Similarly, as shown in Table 96, the fleet revenues would increase by $12.6 million and $52.4 million for low- and high-TAC options (Table 96).

Impacts on variable costs

The variable costs are defined here to include non-labor operating costs, such as, oil, ice, fuel, food expenses, and repairs that vary with fishing effort, vessel and crew size.16 These expenses will differ from their status quo levels depending on the changes in total effort (actual days-at-sea use) with access to the closed areas.

The levels and the change in the estimated days-at-sea-use for the proposed action, status quo are shown in the first four rows of Table 95. For the status quo option, it is estimated that the full-time vessels will fish only 116 days, leaving, on the average, four days unused out of their allocation of 120 days in 1999 fishing year. For the fleet as a whole, days-at-sea-use will total 24,964 days (Table 29). On the other hand, with access to the closed areas, the vessels are expected to increase their activity in order to maximize their economic returns (Section 0). Thus, they are assumed to fish their allocations in full including an average of 8 days carry-over from the previous years.

As a result, the average days-at-sea use by the full-time vessels is estimated to increase to 128 days and total fleet days-at-sea to 27,878 days. The actual days-at-sea used for fishing and steaming will generally be lower than this level since for an average vessel it will take less than 10 days-at-sea to land the scallop possession limit in the closed areas. This conclusion is valid as long as possession limit does not exceed 25,200.17 Also, because of the trade-off in days-at-sea for fishing in the closed areas, the options with more trips will reduce the days a vessel can fish in the open areas.

Actual fishing time is calculated by dividing the possession limit, in this case 10,000 pounds per trip, by the estimated landings per days-fished from the biological model described in section 6.2.6.9 (Assumptions and methods). According to the biological estimates, a vessel could land about an average of 3,200 pounds of scallops per day fished in the closed areas. Therefore, actual fishing time per trip would be 3.1 days, and with a steaming time of 3 days, would add up to about 18.3 days for three 10,000 pounds trip. In the open areas, a full-time vessel would have 98 (128-30) days to fish. Adding this to 18.3 days would result in 116.3 days of actual fishing and steaming time for the proposed action. The actual days-at-sea is estimated with the same method for the other alternatives.

For the proposed action, the actual fleet days-at-sea use is estimated to be about 25,159 days, slightly higher than the status quo level of 24,960 days. For this reason, the variable costs are estimated to increase slightly by $0.4 million. If inactive vessels participate in the fishery as well, the cost increase will be $0.7 million (Scenario M12, Table 95).

Similarly, operating costs would increase by $2 million for two-trips allocation option with an increase in actual fleet days-at-sea use to 26,486 days (Table 96). On the other hand, for the four-trips (T3) and six-trips allocation (T4) options, the total effort would decrease to 23,382 days-at-sea and 20,347 days-at-sea, resulting in cost savings of $4.4 and $10.1 million respectively (Table 96).

Table 95. Revenues, cost savings and net benefits for medium TAC

	Proposed action

16 Since repairs are semi-fixed expenses partly change with fishing effort, only half-of repairs are included in the operating expenses. For further information on the estimation of the costs see Appendix 4 of Amendment 7 to the Atlantic Sea Scallop Fishery Management Plan (The Bio-economic Model, section 3.3, equation 4).

17 If steam time is 3 days, a vessel could use 7 days to fish at the maximum trip length of 10 days in the closed areas. It was also estimated that a vessel could land about 3,200 to 3,600 pounds per day-fished in the closed areas. Therefore, the maximum amount of landings in 10 days-at-sea would be of 25,200 pounds including 3 days steam, and 7 days fishing time.

	three-trips allocation only active vessels fish (T11)	three-trips allocation both active and inactive fish (M12)
Scallop possession limit per trip	10,000	10,000
Days-at-sea used with no opening (Status quo)	24,964	24,964
Total days-at-sea-allocation used with opening	27,878	28,124
Total actual days-at-sea used with opening	25,336	25,560
Change in Variable Costs*	0.4	0.7
Total Scallop landings (million pounds)	18.4	19.6
Total Scallop landings (metric tons)	8,346	8,891
Percentage Change in Average monthly price	-4.1	-4.9
Total Status quo Revenues	88.53	88.53
Total Scallop Revenues from all areas with opening	121.06	127.4
Change in Revenues (Opening - Status quo)	32.5	38.9
Change in consumer Surplus	4.5	6.2
Change in producer Surplus	32.1	38.2
NET BENEFITS	**36.6**	**44.4**

***Note: Negative sign indicates cost savings.**

Table 96. Revenues, costs and net benefits for alternatives considered but rejected.

	Medium TAC			Low TAC	High TAC
	two-trips allocation	four-trips allocation	six-trips allocation	two-trips allocation	two-trips allocation
	(T2)	(T3)	(T4)	(T2)	(T2)
Possession limit	13,000	7,000	4,800	8,100	20,300
Days-at-sea used with no opening (Status quo)	24,964	24,964	24,964	24,964	24,964
Total days-at-sea-allocation used with opening	27,878	27,878	27,878	27,878	27,878
Total actual days-at-sea used with opening	26,590	21,421	16,767	25,926	27,578
Change in total actual days-at-sea used	1,626	-3,543	-8,197	961	2,614
Change in Variable Costs*	2.0	-4.4	-10.1	1.2	3.2
Total Scallop landings (million pounds)	18.5	16.9	14.8	14.9	22.6
Total Scallop landings (metric tons)	8,392	7,666	6,713	6,759	10,251
Percentage Change in Average monthly price	-4.3	-2.5	-0.1	-0.9	-8.1
Total Status quo Revenues	88.53	88.53	88.53	88.53	88.53
Total Scallop Revenues from all areas with opening	121.03	113.32	102.12	101.16	140.91
Change in Revenues (Opening - Status quo)	32.5	24.8	13.6	12.6	52.4

	Medium TAC			Low TAC	High TAC
	two-trips allocation	four-trips allocation	six-trips allocation	two-trips allocation	two-trips allocation
	(T2)	(T3)	(T4)	(T2)	(T2)
Change in consumer Surplus	4.8	2.5	(0.2)	0.5	11.1
Change in producer Surplus	30.5	29.2	23.7	11.5	49.1
NET BENEFITS	**35.3**	**31.7**	**23.5**	12.0	60.2

*Note: Negative sign indicates cost savings.

** All the scenarios in this Table assume that only active vessels will fish in the closed areas.

Producer surplus

The access to the closed areas is expected to have positive impacts on the producer surplus for all options. The change in producer surplus is measured by the change in revenues and the corresponding change in variable costs from their status quo levels. As Table 95 and Table 96 show, the producer surplus is estimated to increase by $32.1 million for the proposed, and by $23.7 to $30.5 for the alternatives considered but rejected. If inactive vessels participate in the fishery as well, the increase producer surplus would be higher due to higher fleet revenues. The low-TAC option would result in the lowest increase ($11.5) and the high-TAC option in the highest increase in producer surplus ($60.2).

The change in producer surplus is also equivalent to the change in economic rents obtained by vessel owners, the captain and the crew. Since the producer surplus is expected to increase for all alternatives with access to the closed areas, the change in its components, i.e., the change in profits and crew shares will also be positive. The distribution of benefits between labor incomes and profits will vary, however, according to the crew share system (lay formula) that will be adopted as the closed areas are opened to the scallop fishing.

Consumer surplus

The scallop consumers will benefit from higher quantity and lower price of scallops as the closed areas are opened for scallop fishing. Consumer surplus, as a measure of consumer benefits, is defined as the extra amount of income consumers would be willing to spend on scallops compared to what they actually spend. For the proposed access, the consumer surplus will increase by $4.5 million. Similarly, consumer surplus would increase by $6.2 million if effort increase with the participation of inactive vessels (scenario M12,Table 95)

The two- and four-trips allocation options would also increase the consumer surplus, by $4.8 million and $2.5 million respectively, whereas the six-trips allocation option would slightly reduce it because of the reduction in total scallops landings under this latter option (Table 96).The increase in the consumer surplus would be negligible for low-TAC option, but would exceed $11 million under the high-TAC alternative because of the larger reduction in prices coupled with higher scallop landings for this option.

Net benefits

The net national benefits of the closed area access options are estimated as the sum of changes in producer and consumer surpluses. The impacts of the proposed action and other alternatives on net national benefits are expected to be positive. The net benefit to the nation is estimated to be $36.6 million for the proposed action Table 95. This estimate does not include the transitional costs, the costs of reporting and enforcement (see below for a discussion of these costs). Since these costs are relatively

small (around $0.55 million), they do not have significant impacts on the net national benefits (See next section).

As Table 95 indicates, the short-term net benefits would be higher, $44 million, if total effort under the proposed action increased with the participation of inactive vessels (scenario (M12). Since the scallop mortality will also be higher with increased effort, the long-term economic benefits may be lower under this scenario.[18]

For the alternatives considered but rejected, the net benefits would range from $23.5 million (six-trips allocation) to $35.3 million (two-trips allocation, Table 96). The estimated impacts are also proportional to the TAC levels, higher for high TAC option ($60.2 million), and lower for the low TAC option ($12 million). These are short-term impacts, however, and do not take into account the conservation risks of increased scallop landings under a high-TAC option that may reduce long-term the economic benefits.

8.1.2.9 Compliance and enforcement costs and net benefits

The proposed regulations will impose some transitional costs on the industry because of the new gear restrictions and reporting requirements**.** The enforcement costs for the government will increase as well.

The transitional costs associated with the gear requirements are summarized as follows:

- All vessels on a scallop days-at-sea are required to use a diamond mesh no smaller than 10-inches for fishing in the closed areas, and no smaller than 8-inches for fishing in the open areas. For this reason, the nets already owned by vessels and net suppliers will become useless. According to a letter from Segal Associates, there is as much as $250,000 worth of nets in either dealer or in vessel inventories. Additionally, another $100,000 worth of nets might have been already ordered from the manufactures. With these, total inventory loss, will be around $350,000.

- Another approach in the estimation of the inventory loss is to calculate a year supply of nets for the scallop fishery. According to the estimates, the Mid-Atlantic scallop boats use 6 to 8 nets per vessel in a year, and the Northeast vessels generally replace their nets for each trip they take. For about 250 active vessels, this would total 3,000 nets for the fishing year 1999, which may be hold in the inventories. The cost of 3000 nets at a wholesale price of $150 per net totals $450,000. Therefore, the inventory loss will range from $350,000 to $450,000. The actual costs to the suppliers and the vessels will be less, since the inventory can be included as a write-off in the tax returns.

- The cost of new nets will be around $900 per vessel for two sets of twine top mesh that need to be purchased for each area plus two spare nets, and constitute a small fraction of the vessel revenues. For the scallop fleet as a whole, the total costs would be around $208,800 assuming that only 232 active vessels will continue fishing in 1999. This amount could not be considered, however, as an additional cost since vessels normally replace nets several times a year.

The new reporting requirements, observer coverage and enforcement provisions are described in sections 5.1.9 – 5.1.12 of the framework document. The costs of these requirements to the public and to the government are examined in Section 9.2, in accordance with the requirements of Paperwork

18 For a further discussion of these impacts see the Section 8.1.2.7 above, and Section 6.2.6.2 of the biological impacts.

Reduction Act (PRA). According to the PRA analysis, the proposed action will increase compliance costs of the scallop industry as well as the enforcement costs for the government:

The VMS requirement will only impact scallop occasional limited access holders, since full-time and part-time vessels are already required to have a VMS. The annualized equipment costs based on a five-year amortization of the purchase and installation price for VMS range from $1,160 to $1,200 depending on the vendor. The total costs for the additional (21 occasional vessels) VMS reporting requirements are estimated to be $43,260 to $56,700 a year (See Table 3 of PRA analysis). Additionally, vessels on a scallop days-at-sea will incur the cost of one new message per day in the closed areas, plus monthly observer reporting costs, totaling $6,595 for all participants (Table 1, PRA). Thus, maximum costs of these reporting requirements to the scallop industry will be around $63,726.

Enforcement costs for the government, including VMS reporting requirements and daily reports, are estimated at $24,910 (Table 100).

Adding these costs to the costs of inventory loss due to the new gear requirements would result in approximately $0.55 million increase in overall costs for the scallop industry and the government. A major proportion of these costs is transitional in nature, and necessary to achieve the economic benefits presented in Table 95 and Table 96. Including these items in estimated cost increase would lower the net benefits slightly by $0.5 million for the proposed action and also for the alternatives considered and rejected.

Impacts on employment

It was not possible to quantify the impacts of the proposed access on the employment in the scallop fishery**.** Although the maximum crew size will remain at 7-men, some vessels may reduce the number of crew to maximize the returns to the individual crew members and the owners from fishing in the closed areas**.** It is uncertain, however, if vessels will indeed follow such an approach, and if they do, to what extent**.** In addition, in communities where the kinship based employment is most common, there may be no reduction in crew, and the economic benefits from fishing in the closed areas may be distributed among more fishermen.

On the other hand, it is also possible for total employment in the fishery to increase as the vessel maximize their days-at-sea-use to take advantage of the economic opportunities created by access to the closed areas**.** As Table 7 shows, however, total effort (days-at-sea-use) under the proposed action will barely increase above the status-quo level (by about 372 days-at-sea)**.** Therefore, the change in employment as measured by the change in fleet CREW*days-at-sea may be negligible for this option**.** Conversely, the employment would decline significantly for four- and six-trips allocation options because of the decline in fleet days-at-sea-use by 3,543 for the first, and by 8,197 days-at-sea for the second option (Table 96)**.** In conclusion, although its net impacts on employment is uncertain, the proposed action will minimize (along with the two-trips allocation option --Scenario T2) any negative impacts**.** Additionally, the proposed access may have positive impacts on total employment in the region as the increase in fishing revenues create demand for other goods and services in the area.

Social and Community Impacts

National Standard 8 of the MSFCMA states that:

Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of

overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

A description of the affected human environment is provided in Section 5.2 of Amendment 7 to the Atlantic Sea Scallop FMP and Section E.6.4 of Amendments 5, 7, and 9 to the Northeast Multispecies FMP. Management measures implemented through Framework 11 to the Sea Scallop FMP and Framework 29 to the Multispecies FMP are intended to fall within the scope of the rebuilding programs outlined in both FMPs. In general, the social and community impacts of this Scallop/Multispecies Framework are short-term in nature, especially since the proposed actions will be effective only until February 29, 2000. The long-term social impacts of this framework adjustment fall within the scope of the impact assessments provided in the respective FMP documents.

Impacts on the Sea Scallop Fishery

In general, the social and community impacts of this framework adjustment will be positive for the sea scallop fleet and the communities in which the vessels land their product. The proposed action will allow the sea scallop fishery to benefit from a substantial accumulation of scallop biomass in the groundfish closed areas. The magnitude of positive social and community impacts resulting from this action will depend on the magnitude of predicted positive economic impacts for the scallop fleet. In general, revenues for scallop vessels that access the closed areas are projected to increase, and the net economic benefits of the proposed management action are estimated to be positive. Positive social and community impacts are therefore likely.

Scallop vessels that access the closed areas will experience a savings in their trip costs, primarily from making shorter trips than they would in the open areas to catch the same amount of scallops. The impact of shorter trips will be positive for vessel owners, captains, crew, and their families. Not only should shorter trips positively affect the fleet's overall safety, but a decrease in the length of time spent away from home should also increase job satisfaction among most scallop fishermen. Time spent away from home is directly linked to perceptions of job satisfaction within fishing communities. Job satisfaction is a principle sociocultural variable associated with fisheries management that can have numerous impacts on fishermen and the communities in which they live and work (Pollnac and Littlefield, 1983).

The communities likely to benefit most from the proposed action are those with larger scallop vessels that tend to make longer trips to offshore areas (i.e. vessels that have the capability to travel to Closed Area II). These communities are New Bedford, Massachusetts, Cape May, New Jersey, and Hampton/Newport News, Virginia. Due to the distance from shore, smaller scallop vessels are unlikely to travel to Closed Area II. However, smaller scallop vessels in these and other communities should benefit from decreased competition for the scallop resource in the existing open areas. During the 1997-1998 fishing year, 234 vessels landing scallops along the East Coast were Ton Class 3 vessels (100-150 GRT), and 190 were Ton Class 4 vessels (greater than 150 GRT). Of these 234 and 190 vessels, the following landed scallops in the primary ports of interest:

New Bedford, MA:	58 Ton Class 3 (24.8% of Ton Class 3) 107 Ton Class 4 (56.3% of Ton Class 4)
Cape May, NJ:	35 Ton Class 3 (15% of Ton Class 3) 21 Ton Class 4 (11.1% of Ton Class 4)
Hampton/Newport News, VA:	40 Ton Class 3 (17.1% of Ton Class 3)

30 Ton Class 4 (15.8% of Ton Class 4)

Altogether, 56.9% of Ton Class 3 vessels and 83.2% of Ton Class 4 vessels that landed scallops during the 1997-1998 fishing year landed them in the above communities (*Source: Fisheries Statistics Office, NMFS Northeast Regional Office*). Thus, these communities serve the majority of larger scallop vessels, the vessels that are most likely to access Closed Area II and benefit from the increased scallop abundance in that area.

Although there is concern about the potential for the distribution of scallop product to shift towards New England ports, Mid-Atlantic processors and dealers are not likely to experience significant losses as a result of the proposed action. Since trips to the closed areas may be counted at a higher rate of days-at-sea, some vessels, especially those travelling longer distances to the closed areas (vessels from Hampton, for example), may begin to land their product in ports closer to the closed areas (New Bedford, for example). Some fear that this may result in a shift in product from the Mid-Atlantic area to the Northeast. However, communities in New England contain a greater number of processors and dealers than those in the Mid-Atlantic. In fact, in 1998, 76% of permitted sea scallop dealers were distributed in ports in New England.

The number of permitted sea scallop dealers in these ports in 1998 is as follows (*Source: Amendment 7 to the Sea Scallop FMP*):

New Bedford/Fairhaven, Massachusetts:	40
Boston, Massachusetts:	18
New York, New York:	18
Naragansett/Wakefield, Rhode Island:	14
Gloucester, Massachusetts:	13
Portland, Maine:	13
Hampton/Newport News, Virginia:	8
Beaufort/Moorehead City, North Carolina	7
Point Pleasant/Barnegat Light/Belford, New Jersey:	6
Rockland, Maine:	6
Provincetown, Massachusetts	5
Wellfleet, Massachusetts	5
Deer Isle, Maine	5
Southwest Harbor, Maine	5

According to the 1997 Processed Products Report, the number of processors in each state that handled sea scallops during 1997 is as follows (*Source: Amendment 7 to the Sea Scallop FMP*):

Connecticut:	1
Maine:	4
Maryland:	4
Massachusetts:	7
New Hampshire:	1
New Jersey:	1
North Carolina:	1
Rhode Island:	1
Virginia:	1

Because the primary form of processing sea scallops is shucking the scallop meat from the shell at sea, most dealers simply distribute fresh scallops (except in a few smaller, specialized markets). Consequently, scallop revenues are less than ten percent of total revenues for most processors. Those

processors with a higher level of dependence often import some or all of their scallops. Therefore, it is unlikely that those processors and dealers located in communities throughout the Mid-Atlantic will experience losses in revenues from a shift in sea scallop product to New England ports. In addition, several major scallop-processing firms are vertically integrated; the firms own their vessels and shoreside facilities, and they have distribution channels within the company. Vertically integrated firms are not likely to be negatively impacted by the proposed action because their vessels will continue to operate in conjunction with their firms as they have in the past.

It is important to note that any potential negative impacts on processors and dealers in the Mid-Atlantic could be mitigated either by not including steaming time in the calculation of days-at-sea for trips to the re-opened areas or by implementing a demarcation line, east of which days-at-sea would begin to be counted on trips to the re-opened areas. This could minimize any negative impacts experienced by communities in the Mid-Atlantic region resulting from a shift in product from Mid-Atlantic shoreside facilities to New England shoreside facilities. Vessels from New Jersey and Virginia may be more likely to return to their home port to unload their product because it would not cost them as many days-at-sea.

Another aspect of the proposed action that is likely to generate positive social and community impacts is the process through which the framework adjustment was developed (depending on the selected options). The scientific partnership between the Northeast Fisheries Science Center, the Center for Marine Science and Technology (CMAST), and the Fisheries Survival Fund resulted in groundbreaking collaborative research efforts between scientists and the fishing industry. Data for Closed Area II was collected through the hard work of six fishing vessels that participated in an experimental fishery. Because the affected communities were involved in the information gathering and decision making processes, management measures are likely to be more accepted, and scientific research is likely to be perceived as more credible. Fishermen who believe that the process was fair and constructive should experience increased job satisfaction, and their perception of the rules and the process through which the rules were developed is likely to be positive.

In summary, the short-term social impacts of the proposed action are likely to be positive for sea scallop vessels, ports, and communities. Scallop vessels that access the closed areas should experience increased revenues and decreased costs for the next fishing year. Changes in the structure of the sea scallop fleet and fishery are not expected from the proposed action. If any changes in fishery structure occur, they will probably be positive for those either accessing the abundant scallop resource in the closed areas, or those experiencing decreased competition for the scallop resource in the open areas. Impacts on job satisfaction will be positive and will result primarily from increased income for participating vessels.

Impacts on the Multispecies Fishery

In general, any negative short-term social impacts of the proposed action on the groundfish fleet are likely to result from decreased prices for species caught as bycatch by scallopers in the closed areas. It is predicted that if scallopers land larger proportions of groundfish bycatch than they have in the past, the price for those species will decrease, primarily because of increased supply. This depends on the trip limit option the Council selects. The primary species of concern are flounder species like Georges Bank yellowtail, winter, and windowpane flounder, the species comprising the highest percentages of bycatch in the scallop experimental fishery in Closed Area II. However, it is unknown whether scallop vessels will land more groundfish than they have in the past. Historically, the proportion of groundfish landings by scallop vessels has been low.

The extent of long-term negative social and community impacts resulting from the proposed action will depend on several factors, including both the magnitude and impact of groundfish bycatch by

scallop vessels in the closed areas. While scallop vessels are projected to catch some amount of groundfish (primarily flatfish) bycatch as they access closed areas to fish for scallops, the impact of this additional mortality on rebuilding plans cannot be fully quantified at this time. Even if groundfish/flatfish landings by scallopers do not increase as a result of the proposed action, the added mortality could affect the rebuilding plans for these species. Further, if groundfish landings by scallopers are not controlled as anticipated under the proposed action and the Georges Bank yellowtail flounder TAC is exceeded for the 1999 fishing year, the Council must take action to reduce fishing mortality to sustainable levels that will promote stock rebuilding consistent with the objectives of the management plan, which could mean additional groundfish management measures and/or a delay in the rebuilding of the stock to a sustainable level.

The fear that the cost of scallop access to the closed areas will be borne by the groundfish fleet exists in several fishing communities. Since the implementation of Amendment 5, the New England groundfish fleet has been greatly restricted in order to rebuild overfished species of groundfish, including yellowtail flounder and winter flounder. Groundfish fishermen fear that groundfish bycatch by scallopers in the closed areas will delay the rebuilding schedules for these species, ultimately resulting in increased costs and a further delay of benefits for the groundfish fleet. Currently, this concern is most prevalent in communities with a substantial number of vessels that target Georges Bank yellowtail flounder. The community with the largest yellowtail flounder fleet is also the community with the largest scallop fleet: New Bedford, Massachusetts. During the 1997-1998 fishing year, 142 vessels landed Georges Bank yellowtail in New Bedford, almost 66% of the total 216 vessels that landed any amount of Georges Bank yellowtail that year. In terms of quantity, over 89% of all Georges Bank yellowtail flounder for the 1997-1998 fishing year was landed by these 142 vessels in the port of New Bedford.

As the scallop fleet accesses the closed areas throughout the next fishing year, these negative social impacts may manifest themselves in the form of social and community conflict, mostly in the port of New Bedford where there is a large proportion of both scallop and Georges Bank flatfish vessels. Divisions among different sectors of the New Bedford fleet have been documented in the past (Amendment 7 to the Sea Scallop FMP), and increased tension among differing user groups can be expected if bycatch by scallopers in the closed areas affects groundfish rebuilding.

Limiting Factors

Several outstanding issues relating to the proposed action could affect the nature and extent of its social and community impacts. Currently, these factors limit the ability to predict and assess the social and community impacts resulting from measures proposed in this framework adjustment. Several management alternatives are presented for Council consideration. As the Council selects final management measures for inclusion in this framework, the following factors may influence the nature and extent of the expected social and community impacts:

Opening of the Nantucket Lightship Closed Area for Scallop Vessels

If the Nantucket Lightship Area (NLSA) also is opened for scallop fishing, then smaller scallop vessels will have the opportunity to access the area and benefit from the increased abundance of scallops. This could spread the distribution of benefits more evenly across a greater number of fishing communities.

The opening of the NLSA to scalloping would lead to increased mortality on groundfish species like southern New England yellowtail flounder. Since the Groundfish PDT determined that southern New England yellowtail flounder cannot support increased fishing pressure at this time regardless of gear

type, the opening of the NLSA to scallopers would likely produce negative social consequences resulting from a delay in the rebuilding of southern New England yellowtail flounder.

Days-at-sea Demarcation Line

If the Council implements a days-at-sea program for trips to the closed areas, then a demarcation line (or another similar measure) would help to minimize any negative impacts on Mid-Atlantic shoreside facilities resulting from a shift in product.

Groundfish Bycatch in the Closed Areas

Most negative social and community impacts for the groundfish fishery stem from the fear that groundfish bycatch (mostly flounder) by scallopers in the closed areas will negatively affect groundfish rebuilding schedules, and ultimately, it will be the groundfish fleet that incurs the cost of scallop access to the closed areas. This cost, however, cannot be quantified. While the experimental fishery did show groundfish bycatch by scallopers in the closed areas, it is unknown how much groundfish the scallopers will actually catch and how that added mortality will affect groundfish rebuilding schedules and the groundfish fleet.

Currently, scallop vessels may land 300 pounds of combined groundfish bycatch while fishing for scallops. If the scallopers are allowed to land larger amounts of groundfish bycatch from the closed areas, the price of some groundfish species could be affected. If the price of groundfish decreases, the groundfish fleet will experience this loss. This could indirectly worsen social problems in communities with both scallop and groundfish vessels.

8.1.3 Other Impacts and Concerns

8.1.3.1 Gear Conflict

Overview

Gear conflict problems frequently occur when fishing vessels target different species in new areas. Fishermen who are accustomed to using a certain gear in a particular area might be displaced by and/or experience gear damage from the new fishing activity. Allowing fishermen to freely shift effort in an open access fishery greatly contributes to the problem. For example, as markets developed and ex-vessel prices increased for monkfish, fishing effort increase in areas of Southern New England where the fish were most abundant. Since the distribution of monkfish overlapped an area where lobster fishing had occurred, gear conflicts escalated. When lobster fishermen expand their fishing range, some mobile gear fishermen claim this in effect forces them out of an area. They argue that once fixed gear is placed in an area, the Magnuson-Stevens Act prohibition on negligently destroying the gear prevents them from fishing in that area.

Since the closed areas on Georges Bank and Nantucket Shoals were made year round in 1994, lobster fishermen have viewed these areas as a place where they can fish with little threat of losing gear due to mobile fishing activities. While precise estimates of the increase in effort in these areas are unavailable, lobstermen have stated at public meetings that effort has increased. The use of these areas as havens has increased in importance as lobster fishing effort has increased and as gear conflicts in other areas have continued. Opening these areas to scallop dredges is likely to result in interactions between lobster traps and mobile gear unless measures are taken to address the concerns of each industry sector.

When gear conflicts are infrequent, fishermen working in proximity to one another are able to forge informal agreements to set their gear in certain areas and follow certain guidelines. This method of resolving the problem is effective as long as the target species do not have a high degree of overlap or when the resource is abundant enough to support the level of fishing effort. When market demand increases, especially for an underutilized species, or when traditional species are not abundant, shifts in fishing effort occur. These shifts can cause gear conflict when vessels using incompatible methods damage gear used by other fishermen. The high concentration of scallops in the closed areas, and relatively low abundance outside the areas, will create a strong incentive for scallop fishermen to fish as often as allowed in these areas. If lobster fishing and scalloping occur in the same areas, scallop fishermen are unlikely to willingly forego fishing opportunities to avoid areas with a concentration of lobster traps.

Both the scallop and lobster industries recognized the potential for conflicts in the closed areas and have tried to identify possible solutions. Lobster fishermen worked closely with the scallop industry during the design of the surveys of the scallop resource in the closed areas. On relatively short notice, lobstermen agreed to move their gear out of the areas targeted by the survey, and the survey design considered the impacts on the scallop fleet. As a result of these industry discussions, and efforts of the Council's Gear Conflict Committee, areas of lobster activity were identified and options developed for reducing the possibility of gear conflicts.

Biological, Economic, and Social Impacts

Conflicts between vessels occur when competition for a resource or fishing area intensifies to the point when fishermen are physically excluded from fishing in an area, when gear loss or damage is caused by a competing fishing activity, or when cooperation ceases to be the norm. On the other hand, competition may arise because fishermen target the same species and occur when fishermen fear being excluded from a 'right' to fish, when fishermen vie for a larger share of a resource allocation, or when fishermen increase their vessel's fishing power to gain (or keep from losing) a larger share of the available fish.

Gear conflict is a special case of the above conflict for the right to fish productive areas and occurs when fishing gear is physically damaged or destroyed. It also occurs when vessels and their crew are physically harmed or in jeopardy of being physically harmed. Gear conflicts are much more intense than simple competition to catch fish.

Officially, NMFS has defined gear conflict as:

> "Any incident at sea involving one or more fishing vessels (a) in which one fishing vessel or its gear comes into contact with another vessel or the gear of another vessel, and (b) which results in the loss of, or damage to, a fishing vessel, fishing gear, or catch." (50 CFR section 611.2)

The Council has adopted the NMFS definition of gear conflict.

It is impossible to capture the full social and economic impacts caused by gear conflict. Intangible costs arise from the displacement of fishermen from the most productive fishing areas, causing fishermen to operate their gear in an inefficient manner, the time and monetary cost of searching for lost gear while at sea, and the cost and burden fishermen incur when they seek compensation for their loss. The only tangible cost is the direct economic impact of lost or destroyed gear, which frequently goes unreported. Trap fishermen also lose income because of fishing time lost while they replace lost gear. Mobile gear

fishermen suffer lost fishing time as they clear gear fouled by fixed gear, or fish in unproductive areas to avoid fixed gear.

Lost fishing gear usually continues to fish until removed from the environment by water currents, other fishing activity, or decay. There have been no studies that would enable the Council to estimate the impact of lost gear on the resource. Fishing mortality caused by lost fishing gear is expected to decline with a reduction in gear conflict. Fish that would otherwise be captured by lost gear will increase yield and will be more likely to contribute to spawning potential. Fish caught by lost gear also represents an immediate economic loss, similar to that caused by discarding. Estimates of the amounts of fish captured by lost fishing gear are unavailable. Lost and damaged fishing gear also create a direct economic loss. When conflicts occur, there is frequently a demand for an enforcement presence, which, if responded to, diverts limited enforcement resources away from other missions. In extreme scenarios, repeated gear conflicts can lead to violence between the participants, though these instances are rare.

In the case of scallop access to the groundfish closed areas, the suggestions of the industry and the Gear Conflict Committee, if adopted, should minimize the possibility of gear conflicts. In the case of CAII, the industry suggestion (see below) will allow lobster fishing to continue with little restriction on the areas recently fished. This proposal does limit the amount of area that will be opened to scallop vessels. It also would open areas to scallop vessels that are of a concern because of yellowtail flounder bycatch. The suggestion presented to the Gear Conflict Committee (see below) will open some lobster fishing areas to scallop fishermen, increasing the risk of gear conflicts and/or resulting in the loss of some lobster revenues if fishermen remove their gear from these areas. In the case of the NLSA, the industry suggestion (see below) will allow current lobster fishing practices to continue. It does, however, limit the amount of area that will be open to scallop fishing.

The impacts of ignoring gear conflict issues will depend on the measures chosen to allow scallop vessels into the closed areas. The likelihood and severity of conflicts will depend on what areas are opened to scallop fishing, and what time periods scallopers will be allowed into those areas. For example, allowing year round access into all of CAII (which is not being considered) would be certain to result in interactions with lobster vessels during the months of July through November.

Discussion of options

Since the multispecies closed areas on Georges Bank and Nantucket Shoals became year round closures in 1994, lobster fishermen have viewed the areas as a haven where they can fish with little danger of losing gear to mobile fishermen. While exact estimates of increases in effort in these areas are not available, lobstermen say the amount of gear in theses areas has increased. Opening the areas to scallop fishermen may lead to gear conflicts between lobster trap and scallop dredge vessels.

The Council's Gear Conflict Committee held a meeting to identify the areas and time periods most valuable to lobster trap fishermen in the Nantucket Lightship Closed Area (NLSA) and Closed Area II (CAII). In the NLSA, lobster fishing is most prevalent from July through December. Most gear is set parallel to the 43000 loran lines, set in 20 to 40 fathoms. Because surf clam vessels operate in the western part of the closed area, most lobster fishing occurs between the 14000 and 13900 loran lines, in the southwestern corner of the area that is proposed to be open. Lobster fishermen suggested that if the area to be opened does not extend south and west of the 13900 loran line, there will be few gear conflicts (Figure 16).

In CAII, most lobster fishing occurs between mid-June and November. Lobster fishing generally starts at the northern end of the closed area and moves south over the course of the season. Traps are

usually set parallel to the 13000 loran line. Gear may be set south of 41° 30' N. latitude, one line proposed as a northern limit for scallop access to the closed area.

As a result of the Gear Conflict Committee meeting, an informal meeting was held March 11, 1999 between lobster and scallop fishermen. Attended by about five representatives of each gear type, this group suggested that gear conflicts could be avoided through a combination of area and time limitations for each gear type. For the NLSA, the entire area could be opened to scallop gear from January 1 through June 30 because there is little lobster fishing during this period. From July 1 through December 31, the area east of the 13900 loran line could be opened to scallop gear, with the area west of the line remaining closed to scallop gear during this time period (Figure 16). For CAII, the group suggested that from January 1 through July 31 the area south of 41° 30' N. latitude could be open to scallop vessels. From August 1 through December 31, the group suggested the boundary shift to an east-west line at 41° 15' N. latitude to 67° 05' W. longitude, then north to 41° 30' N. latitude (5.2.3.1). The members of the scallop industry that were present were agreeable to these provisions provided there were no further restrictions and no additional closed areas.

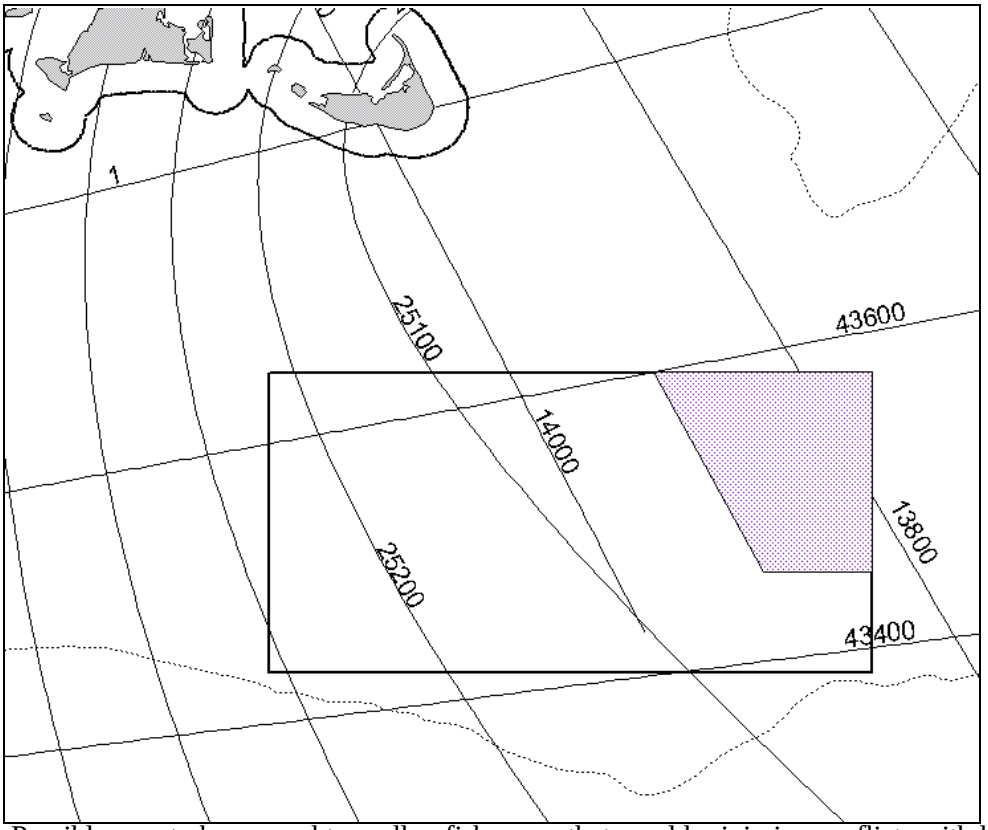


Figure 16. Possible area to be opened to scallop fishermen that would minimize conflicts with lobster gear. Area is defined by following coordinates (western boundary approximately matches 13900 loran line):

(1) 40-30N	69-00W
(2) 40-30N	69-14.5W
(3) 40-50N	69-29W
(4) 40-50N	69-00W
(5) 40-30N	69-00W

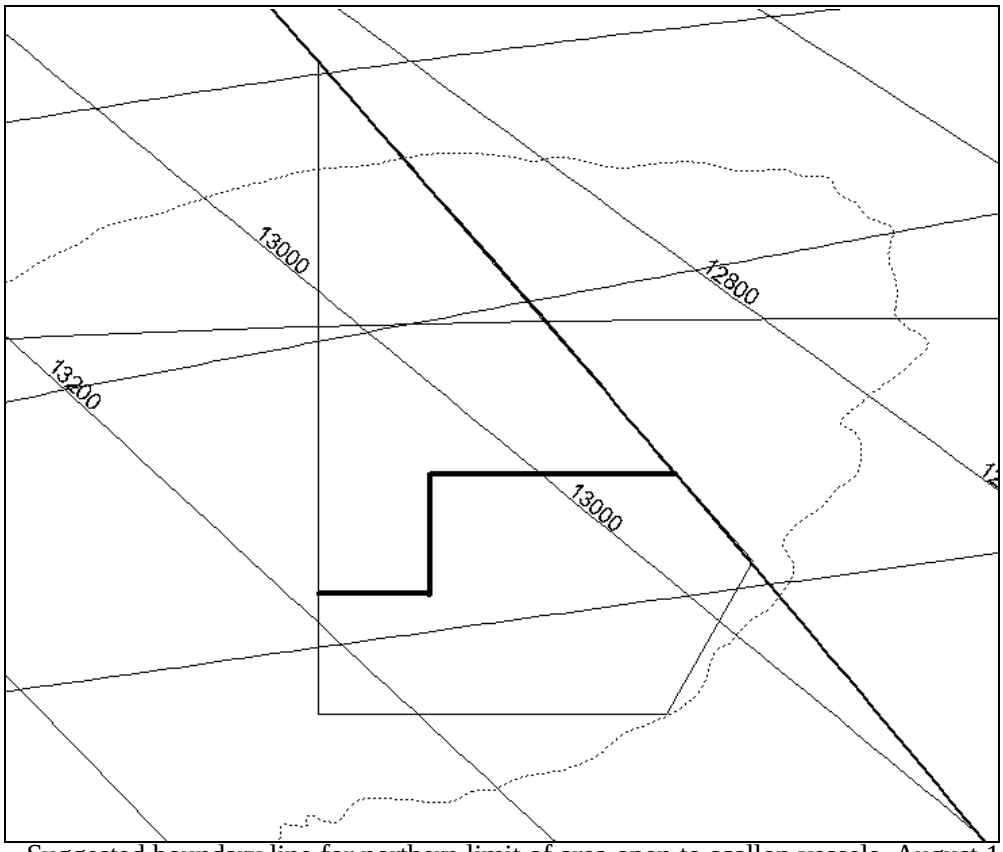


Figure 17. Suggested boundary line for northern limit of area open to scallop vessels, August 1 to December 31 in Closed Area II. According to a group of representatives from both industries, this line would minimize gear interactions between scallop vessels and scallopers.

8.2 Finding of No Significant Impact (FONSI)

NOAA Administrative Order 216-6 provides guidance for the determination of significance of the impacts of fishery management plans and amendments. The five criteria to be considered are addressed below.

9. *Can the proposed action be reasonably expected to jeopardize the long-term productive capability of any stocks that may be affected by the action?*

The proposed action is part of an ongoing stock rebuilding programs established by Amendment 7 to the Atlantic Sea Scallop FMP and Amendment 9 to the Northeast Multispecies FMP that are based on reducing overall fishing mortality, by limiting fishing effort, prohibiting effort in select locations and seasons, and controlling fishing technology. More specifically, this action focuses on transferring or shifting scallop fishing effort from locations with predominately small scallops to areas with predominately larger scallops.

The scallops in Closed Area II are larger than in the now open areas because of the enhanced survival and increased biomass that resulted from a 4½-year closure to all gears capable of catching groundfish, including scallop dredges. Since the proposed action is shown to be conservation neutral in terms of total fishing mortality for the entire scallop resource, the total effect is to delay

exploitation on younger scallops that predominate in the now open areas. This action is therefore expected to promote quicker rebuilding without increasing fishing mortality above the annual mortality target for 1999, established by Amendment 7.

The proposed action will temporarily open a groundfish closed area that had originally been closed to promote rapid rebuilding of groundfish stocks. While these stocks are not yet fully recovered, some additional catch can be taken within the constraints and target fishing mortality rates established by the Multispecies FMP. Although the estimated bycatch exceeds these multispecies limits differences in fishing practices compared with the 1998 experimental fishery, a target TAC for yellowtail flounder, enhanced fishery monitoring, and a potential for suspending the closed area scallop fishery early will prevent the action from exceeding the Multispecies FMP thresholds.

10. *Can the proposed action be reasonably expected to allow substantial damage to the ocean and coastal habitats?*

The proposed action is expected to result in a decline or in no increase in the total amount of fishing time, measured by either contact time on the bottom or in days-at-sea fished (rather than accumulated). The Council specifically chose not to allow access by scallop vessels in other parts of Closed Area II because of potential adverse habitat impacts. The proposed action is also expected to decrease the amount of scallop dredging in the now open areas, mitigating the negative effects within Closed Area II.

Measures are included in the proposed action to limit or mitigate habitat impacts. These include:

- Opening only areas that are less sensitive to disturbance and that will recover more quickly
- Reducing fishing effort (by increasing the day-at-sea accumulation for a closed area trip) in now open areas, possibly having more sensitive habitat than the area proposed to be opened
- Increasing the twine top mesh size to allow more small fish and invertebrates to escape during fishing.

11. *Can the proposed action be reasonably expected to have an adverse impact on public health or safety?*

Since the management measures in the Atlantic Sea Scallop and the Northeast Multispecies FMPs provide flexibility and continuous opportunity to fish within the constraints of the conservation needs of the plan, the Council expects that the proposed measures will not negatively impact safety. The measures do not require vessels to take risks that compromise safety of the vessel and crew.

The proposed action includes measures that specifically avoid creating an incentive to fish as quickly as possible and/or deck-load sea scallops while fishing in the re-opened closed area. Since a closed area trip will automatically accumulate 10 days-at-sea, no matter how long it takes to catch the scallops, vessels can fish more rationally without cost. Under average conditions, a vessel is expected to catch the scallop possession limit in three to four days. With a three-day steam time to and from port, the expected total trip length is six to seven days. The proposed action will therefore allow vessels the opportunity to fish in areas with fewer scallops to avoid bycatch, to fish with fewer crew members (taking longer to shuck scallops prior to leaving Closed Area II), or take other steps that might improve public health and crew safety.

The proposed action could also decrease the incentive to fish in poor weather conditions. The proposed season would allow the opportunity to fish the allocation of the three closed area trips during the summer months, when weather is generally favorable. This is especially important for

smaller or less seaworthy vessel to participate in the closed area scallop fishery without danger from hurricanes and nor'easters.

On the other hand, some alternatives could directly increase the incentives to fish as quickly as possible, characteristic of a derby fishery. These less attractive incentives that could have negative impacts on public health and safety are explained in Section 8.1.1.3.1.

12. *Can the proposed action be reasonably expected to have an adverse effect on endangered, threatened species or a marine population?*

    The management measures proposed in Scallop Framework Adjustment 11/Multispecies Framework Adjustment 29 may affect, but are not likely to jeopardize the continued existence of endangered and threatened species. In a general sense, the effects of scallop fishing were reviewed during the approval of Amendment 7 and prior amendments to the Atlantic Sea Scallop FMP. This review resulted in a no jeopardy opinion as a result of the observed interactions with scallop fishing gear and the proposed management measures. This action is expected to cause total scallop fishing effort to remain at current levels or decline, depending on activation of latent fishing effort. No gear changes, except for a requirement of larger twine top mesh, are required or contemplated. The only effect will be a relocation of fishing effort to the open portion of Closed Area II on Georges Bank.

    One species that might be adversely affected is the barndoor skate, *Raja laevis*. This species has been petitioned by the Center for Marine Conservation to be listed as an endangered species. Although there appears to be a significant decline in numbers in annual research survey data, a formal assessment of the barndoor skate population has not yet been undertaken. The potential impacts on barndoor skates and whether it would jeopardize the population cannot be determined at this time.

13. *Can the proposed action be reasonably expected to result in the cumulative adverse effects that could have a substantial effect on the target resource species or any related stocks that may be affected?*

    The measures in this framework are management adjustments to achieve optimum yield from the scallop resource without jeopardizing the stock rebuilding program for sea scallops or for groundfish. For this reason, the Council does not expect the action to have any cumulative adverse effect on the target resources. In Amendment 7, the Council recognized that effort shifts could occur that may have an adverse impact on other stocks, although the direction and magnitude of that impact could not be predicted. The proposed measures do not substantially change the effect of the stock rebuilding plan on any related stocks nor result in any cumulative adverse effect.

    If anything, the proposed action reverses some of the adverse impacts that were associated with the original closure of portions of Georges Bank, from action taken by Framework Adjustment 5. The loss of fishing areas on Georges Bank has caused scallop vessels to intensively target scallops in the now open areas and to target species in other fisheries, e.g. monkfish. This action is expected to partially reverse that effort shift, at least temporarily, and potentially increase fishing effort by some vessels that have unused days-at-sea. While the impacts of the effort shift are more direct, some of the increased utilization of days-at-sea might help reduce the economic necessity and opportunity to participate in other fisheries, e.g. monkfish.

Based on the preceding criteria and analysis, the Council proposes a finding of no significant impact.

FONSI STATEMENT: In view of the analysis presented in this document and in the FSEIS for Amendment 7 to the Atlantic Sea Scallop Fishery Management Plan and Amendment 9 to the Northeast Multispecies Fishery Management Plan, the proposed action will not significantly affect the quality of the human environment with specific reference to the criteria contained in NAO 216-6 implementing the National Environmental Policy Act. Accordingly, the preparation of a Supplemental Environmental Impact Statement for this proposed action is not necessary.

_____

Assistant Administrator For Fisheries, NOAA **Date**

8.3 Regulatory Impact Review

This section provides the information necessary for the Secretary of Commerce to address the requirements of Executive Order 12866. The purpose and need for management (statement of the problem) is described in Section 3.0. The alternative management measures to the proposed regulatory action are described in Section 5.2. The economic impacts are described in Section 8.1.2 and summarized below under the discussion of how the proposed action is characterized under Executive order 12866.

8.3.1 Executive Order 12866

The proposed action does not constitute a significant regulatory action under Executive Order 12866 for the following reasons:

a) The proposed action will not have a significantly different impact on the landings and revenues of the existing fishery as compared to the levels anticipated in Amendment 7 to the Atlantic Sea Scallop FMP or Amendment 9 to the Northeast Multispecies FMP. Although the Council expects total scallop landings and revenue to increase, Amendment 7 and earlier amendments to the Atlantic Sea Scallop FMP never contemplated that access to Closed Area II would be permanently prohibited. The total biomass and fishing mortality in the closed areas was included both in the overall, average fishing mortality rate and in the biological reference points included in the overfishing definition. Further restrictions for scallop vessels while fishing in Closed Area II will keep the multispecies (groundfish) catch below limits set by Amendments 7 and 9 to the Northeast Multispecies FMP. These catches therefore fall within the scope of those contemplated by these Multispecies FMP amendments.

b) The overall economic impact of the proposed action falls within the range of impacts discussed in the FSEIS of Amendment 7 to the Atlantic Sea Scallop FMP. Taking action will allow fishing in parts of Closed Area II to allow access to the high scallop biomass where groundfish bycatch and habitat sensitivity is low relative to other portions of Closed Area II. According to a supplementary analysis in Section 8.1.2, access to Closed Area II will have positive impacts on vessel revenues, scallop consumers and the economy. The consumer benefits as measured by the consumer surplus will increase by $4.5 million, the producer surplus by $32.1 million and net national benefits by $36.6 million. For these reasons, the proposed action will not adversely affect in a material way the economy, productivity, competition and jobs. The proposed action will not have an annual effect on the economy of more than $100 million.

c) For the same reasons as above, the proposed action will not significantly affect competition, jobs, the environment, or state, local or tribal governments and communities. The area access and trip limits will not affect safety or public health.

d) The proposed action is designed to achieve the biological objectives of Amendment 7, while economic relief to the industry whenever possible without compromising the conservation goals. In the short term, taking action will ensure the FMP achieves optimum yield while not increasing fishing mortality above the annual targets established by Amendment 7 to the Atlantic Sea Scallop FMP and Amendment 7 to the Northeast Multispecies FMP. In the long term, the shift in fishing effort from areas with predominately small scallops to an area with predominately large scallops will delay recruitment, enhancing yield-per-recruit and stock rebuilding. Small, fast-growing scallops will boost rebuilding of stock biomass because they will have a higher survival rate due to lower fishing mortality. At the same time, catching larger, slower-growing scallops (found in Closed Area II) will improve yield and net benefits to the nation.

e) The proposed action will not create an inconsistency or otherwise interfere with an action taken or planned by another agency. No other agency has indicated that it plans an action that will impact the same areas and the fisheries.

f) The proposed action will not materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of their recipients.

g) The proposed action does not raise novel legal or policy issues. Regulations regarding area closures, or trip limits have already been used to manage other fisheries in the Northeast region, including the cod fishery (Multispecies FMP), the monkfish fishery (Monkfish FMP), and the summer flounder fishery (Summer Flounder, Scup, and Black Sea Bass FMP).

9.0 Regulatory Flexibility Analysis (RFA)

The purpose of the Regulatory Flexibility Analysis (RFA) is to reduce the impacts of burdensome regulations and recordkeeping requirements on small businesses. To achieve this goal, the RFA requires government agencies to describe and analyze the effects of regulations and possible alternatives on small business entities. On the basis of this information, the Regulatory Flexibility Analysis determines whether the proposed action would have a "significant economic impact on a substantial number of small entities."

The RFA applies to any rule or regulation that must undergo "notice and comment" under the Administrative Procedures Act (APA), specifically those rules published as proposed rules. When RFA applies, the Council must assess the impacts of the regulations to determine if they will have a "significant economic impact on a substantial number of small entities". Since this action is submitted as a final rule, not subject to further notice and comment under the APA, the RFA does not apply.

Endangered Species Act (ESA)

Section 7 of the ESA requires federal agencies conducting, authorizing or funding activities that may affect threatened or endangered marine species to ensure that those effects do not jeopardize the continued existence of listed species. See Section 0 of this document for a discussion of impacts on ESA-listed species. The management measures proposed in Scallop Framework Adjustment 11/Multispecies Framework Adjustment 29 may affect, but are not likely to jeopardize the continued existence of

endangered and threatened species. The Council recognizes that this conclusion does not change the basis for the previous determination that overall operation of fisheries managed under the Northeast Multispecies FMP, without modification, is likely to jeopardize the continued existence of endangered species under NMFS jurisdiction. These management measures are not expected to result in the adverse modification of right whale critical habitat. Should activities associated with the Sea Scallop or Multispecies FMPs change significantly or new information become available that alters this determination, the Council will reinitiate consultation.

Marine Mammal Protection Act

The New England Fishery Management Council has reviewed the impacts of the Atlantic Sea Scallop and Northeast Multispecies FMPs on marine mammals and concludes that this management action is consistent with the provisions of the MMPA and will not alter existing measures to protect the species likely to inhabit the management unit. See Section 0 for a discussion of these impacts.

9.1 Coastal Zone Management Act (CZMA)

Upon submission of Amendment 7 to the Atlantic Sea Scallop FMP and Amendment 9 to the Northeast Multispecies FMP, the Council also conducted a review of the FMPs for its consistency with the coastal zone management plans of the affected states. All the states concurred with the Council's consistency determinations. See Section 8.6 of Amendment 7 and Section 5.4 of Amendment 9 for the Council's consistency determinations. The response letters of the states are on file at the Council office. The Council has determined that the proposed action is within the scope of measures already reviewed for consistency with states' CZM plans and is, therefore, consistent with those plans. The Council has notified potentially affected states of this action and of its determination that the action is consistent with its earlier determination.

9.2 Paperwork Reduction Act (PRA)

SUPPORTING STATEMENT

Federal Fisheries Vessel Monitoring System
Northeast Region

VESSEL MONITORING AND COMUNICATIONS REQUIREMENTS
OMB NUMBER 0648-0307 0202

9.2.1 Introduction

This submission requests approval of Office of Management and Budget (OMB) revision for the Northeast Region Vessel Monitoring System (OMB Control No. 0648-0307 0202).

The New England Fishery Management Council (Council) is proposing a Framework Adjustment to the Scallop FMP (11) and Multispecies FMP (29). The proposed measures include reporting requirements for vessel owners and operators.

9.2.2 Justification

1. Why is the information necessary?

A comprehensive information system which identifies the participants and which monitors their activity levels and landings is necessary to enforce the management measures and prevent overfishing. This is accentuated for the proposed re-opening, for scallop dredging, of a portion of Closed Area II on Georges Bank. An information system is also needed to measure the consequences of management controls; in this case, to determine if the 10 DAS deduction per trip is appropriate. Attaining or even approaching the TACs for scallop catch and yellowtail by-catch requires management action on the part of the Regional Administrator. In general, information requirements for an effective monitoring and enforcement system include:

Identification of the vessels participating in the Scallop Exempted Fishery (SEF)
Location of the fishing activity
Activity levels
Catch, by-catch, and landings information

Under the Multispecies and Sea Scallop Fishery Management Plans (FMPs), the reporting requirements for vessel owners and operators will include information on fishing catch (scallops) and by-catch (yellowtail flounder) obtained through a mandatory observer program and reported through the Vessel Monitoring System (VMS). The two VMS email messages are:

For observed trips only:
A daily report of total scallops kept
A daily report of total yellowtail caught and scallops kept for observed tows only

For all unobserved trips:

A daily report of total scallops kept

Additionally:

The Frameworks assign a Total Allowable Catch (TAC), for scallops and yellowtail flounder separately, to the re-opened portion of Closed Area II. The VMS provides a means to verify reported catch and by-catch, prior to landing, so that the TAC's can be accurately tracked and at-sea transfer prevented.

The VMS is already required on almost all the eligible boats, and will help in the enforcement of other closed areas during the re-opening period. Scallop vessels will be allowed to fish in areas closed to groundfish vessels. With VMS on board, patrol units will be able to rapidly identify any scallop vessels in the closed areas, helping them sort contacts in the areas.

Only those vessels that give notice of their intent to take one of their three exempted trips (only one exempted trip for Occasional vessels) are allowed into Closed Area II.

2. How, and by whom, will the information be used?

The information will be used by several offices of NMFS and the U.S. Coast Guard. The data collected through these programs will be incorporated into the NMFS databases. Aggregated summaries of the collected information will be used to evaluate the management program and future management proposals. Individual permit information will be required, however, for law enforcement or notification programs.

3. Can improved technology reduce the burden?

This proposal uses improved, existing technology to reduce reporting burdens. The VMS system is used to monitor fishing locations in the Atlantic sea scallop fishery. This electronic system broadcasts the vessel's position on a random, periodic basis. The addition of onboard observers and use of VMS messaging to report real-time scallop catch and yellowtail flounder by-catch are significant management information and enforcement tools. This technology also helps verify fishing locations and monitoring of effort controls in other area closures. This system is expected to benefit fishermen by making it more difficult to misreport catch, by-catch, and location. This will result, in concert with the mandatory observer program, in a more accurate monitoring of the area TACs. It will also facilitate monitoring of the fishery by enforcement agents. In fact, if this technology were not available or were not used, it is extremely unlikely that the New England Council would have approved the exempted fishery for scallops.

4. Describe any duplication of effort

The duplication of effort to collect landings and by-catch data is necessary to assure that the TAC for scallops, and the trigger for closing the exempted fishery based on yellowtail by-catch, is not exceeded. The duplication of effort is described in item 7.

5. How are the impacts on small business minimized

Most of the respondents qualify as small businesses. Only the minimum data needed to monitor compliance with regulations are requested from all respondents; i.e., observers are reporting scallop catch and yellowtail by-catch once per day. VMS is required for all vessels participating in the exempted fishery for scallops in a part of Closed Area II.

6. Could the collection be conducted less frequently?

No. Daily messages are necessary to chart the course of the exempted fishery and assure that scallop TAC and yellowtail by-catch limits are not exceeded, particularly with hundreds of vessels operating at the same time. Hourly transmissions are required to accurately determine the fishing locations. More frequent (than hourly) transmissions may be required to enforce closed areas.

7. Explain if request is not consistent with OMB guidelines.

The data collection is consistent with OMB guidelines, except that the VMS will be required to report vessel catch and by-catch on an daily basis when the vessel is underway in Closed Area II waters (including the boundary area). As described above, daily reports are required to accurately determine scallop catch and yellowtail flounder by-catch, particularly in a fishery managed with area specific TAC's. This is the only way that actual catch and landings can be verified on a near real-time basis. Although vessel reports (VTR) are required within 30 days and include gross fishing areas, the auditing process lengthens the time for the information to reach management offices to about 3 months. The SEF is only two, 3-month periods, and would conclude before the actual landings and by-catch were known. This is particularly important because the results, in terms of catch and by-catch, during the first 3 months will be used to re-structure, if necessary, the SEF for the second 3 months. In addition, absent a VMS, there is no way to verify the catch locations as reported on the form.

8. Describe efforts to get comments from outside the agency.

The specific requirements of Framework 11 & 29 were developed over the course of about 6 months and received extensive public discussion in Council, committee and industry advisory meetings. The New England Fishery Management Council held two public meetings, during the February and April 1999 Council meetings, at which there was a public discussion of the monitoring requirements. Interested parties were provided the opportunity to submit written comments at that time.

9. Explain any decision to provide payment to respondents.

No payment or gift will be made to respondents. Observers will be paid from the proceeds of an additional allocation over and above the trip limit.

10. Describe any assurances of confidentiality.

All data will be kept confidential as required by NOAA Directive 216-100, Confidentiality of Fisheries Statistics, and will not be released for public use except in aggregate statistical form (and without identifying the source of data, i.e. vessel name, owner, etc.)

11. Provide justification for any questions of a sensitive nature.

There are no questions of a sensitive nature.

12. Provide an estimate in hours of the burden of collection of information.

Table 97 summarizes the burden hours, number of respondents, and total burden of the VMS reporting requirements under the Scallop Exempted Fishery (SEF). The burden hours are based on the number of participants expected in the SEF. Regulatory changes contained in this action add daily catch/by-catch reports to previously approved burden estimates for vessel monitoring requirements (hourly location transmissions). New numbers reflect estimates for the SEF only; thus previously approved estimates for

other fisheries, including the normal fishery under the Sea Scallop FMP, are unaffected. The exact number of current participants is the number of limited access, scallop permit holders.

Vessel Monitoring System (VMS)

The plan's use of TAC's assigned by area to control fishing mortality makes it essential there be confidence that reported catch, by-catch, and locations are accurate. For this reason, all vessels in the SEF will be required to use a VMS approved by the NMFS Regional Administrator. Vessels without VMS may not participate in the SEF. Occasional scallop vessels not currently required to have VMS, may purchase or lease VMS in order to take their allocation of one trip within the re-opened portion of Closed Area II.

The VMS will help enforce scallop catch and yellowtail flounder by-catch TAC's. The VMS will continue to provide a record of the vessel's location that can be compared to reported fishing locations to verify accurate reporting. There are areas open to fishing near Closed Area II. The large size of the spawning closures makes it difficult for enforcement units to monitor the boundaries, therefore, a no-fishing border will surround Closed Area II during the SEF season. Vessels fishing within this border must be participating in the SEF. The VMS will allow patrol units to rapidly identify the location of SEF boats so it can be confirmed that they are the only fishing vessels in Closed Area II.

The SEF is only for 1999, thus all eligible, extant vessels are expected to participate. As of April 21, 1999, there were 267 limited access scallop vessels that were not history permits. Table 98 summarizes the characteristics of these vessels. Of the 21 Occasional scallop vessels, four are scallop dredge vessels and 17 are scallop trawl vessels. It is not anticipated that the four scallop dredge vessels and 17 scallop trawl vessels will participate in the SEF due to the 10 DAS allocation for the 1999-2000 fishing year and the requirement of installing a VMS. It is also anticipated that the 17 scallop trawl vessels will not participate due to the additional cost of re-rigging their scallop trawl vessels to dredge vessels. If these occasional vessels decide to participate, installation of the VMS will probably require the presence of the owner or his representative. The installation time is estimated to take 60 minutes, for a total burden of 21 hours. The burden of the VMS is estimated at 2 minutes for submission of proof of VTS installation, for a total burden of 42 minutes.

The estimated time per response, which in the case of VMS is the reporting burden, varies with type of equipment and requirement. Upon installation, vessel monitoring or transponder systems (such as Boatracs, a currently approved VMS vendor) automatically transmit data, which takes about 5 seconds. For requirements to transmit data on Inmarsat (currently not an approved VMS vendor) communications units, transmissions take about 10 minutes. There are estimated to be 21 additional scallop vessels that will be required to have VMS. These 21 Occasional vessels are only allowed to take one, 10 day SEF trip, for a total of 210 DAS. If the 21 vessels that will be required to have a VMS all fish 10 days, and transmit a 5-second (0.0014 hour) report every hour, the total burden is 7.06 hours for a transponder type system.

Requirements for Electronic Reporting of Scallop Exempted Fishery (SEF) Data. Observers submit reports of catch to the NMFS Office for Enforcement, NE Division, for use by in-season management, of the scallop quotas and yellowtail flounder bycatch allowances. In the North Pacific, most industry and many observer reports had been submitted by fax. As a result, transmission and processing of reports were costly, time-consuming, and could be inefficient both for NMFS and the industry. Electronic communication by observers of various reports will greatly improve efficiency and reduces the costs associated with report submission and processing.

All SEF participating vessels, including those subject to observer coverage, must have or obtain electronic communication equipment that facilitates electronic reporting of fisheries data. The equipment includes satellite communication units for at-sea vessels, and computer hardware and software. These requirements do not impose a burden on the industry other than purchasing and installing the necessary equipment. The burden on the industry of submitting Observer reports through their VMS may in fact be reduced under these regulations. All 267 limited access scallop vessels are affected by Observer reporting requirements, including the 21 Occasional vessels that must purchase or lease VMS to participate in the SEF program.

Annual transmission of data time from 267 vessels, based on 7590 fishing days per season and observers transmitting an average of 10 minutes per day = 7590 days x 10 mins. = 1265 hours. [The 246 full-time and part-time vessels are allocated 30 DAS, for a total of 7380 DAS in the program; 21 Occasional vessels, allocated 10 DAS each, total 210 DAS.]

Total annual cost to the public, however, based on the number of messages and 79 cents per message (Office for Enforcement, NE Division), is $5,996.10 [7590 days, one report per day, times $.79].

Separately, all SEF vessels must notify via VMS message their intent to fish in Closed Area II for any given month (fifteen days prior to the month). Hour burdens and costs are itemized in Table 1. Full-time and part-time vessels incur a reporting burden of 123 hours and $583.02; occasional vessels, 3.5 hours and $16.59. Cost is the product of the number of messages times 79 cents.

13. Provide estimates of the burden of the collection on the public.

The costs for the additional (21 Occasional vessel) VMS reporting requirements under the SEF are estimated at $56,700 a year (Table 99). The costs to the public from VMS requirements include the cost of the equipment, installation and monthly message costs. The costs described below are high because:

The hourly polling is only relevant while the 21 Occasional vessels are in the SEF during their one, 10-day trip

The leasing rates for such limited use may be re-negotiated with Boatracs (i.e., these vessels do not need a two or three year lease for a one-time, 1999, 10 day fishery)

Annualized capital and start-up costs

VMS systems selected for use must be approved by the Regional Administrator. Currently there is only one vendor that offers VMS equipment approved for use in the Northeast Region - Boatracs, Inc. There is the possibility, however, that equipment based on the Inmarsat C communication system may be approved in the future. Boatracs system purchase and installation costs about $6,000. Boatracs offers a lease – to – own option at $4,258 / year for a 24-month lease or $3,029 / year for 36 months.[19] An Inmarsat C system installation will range from $3,400 to $5,400 because of various options available, with an additional $400 charge for installation.

The annualized equipment costs based on a five-year amortization of the purchase and installation price is $1,200 for Boatracs and $1,160 (maximum) for an Inmarsat C system. These costs should be compared with the potential benefits from the regulations as will be discussed below. Table 99 shows the total costs of VMS monitoring to the public (excluding the costs of proof of installation given in Table 97) under the proposed regulations.

19 Information is based on personal communications with Bob Negroni of Boatracs, Inc.

Verification of the VMS installation must be provided to NMFS as part of the annual permit process. Because the verification will be included with the permit application, there is no additional cost to mail in the verification.

B. Total operations, maintenance, and purchases of services component

The primary costs after purchase and installation of a VMS is the charge for the messages that communicate the vessel's position, catch and by-catch. The total costs for these messages depends on the system chosen for operation, either Boatracs or an Inmarsat system. There is no estimated maintenance charge for either system.

Boatracs, Inc. currently charges a flat rate for messaging of $125/month, based on one message each hour of every day. In the case of the herring fishery, vessels will not have to transmit position reports when moored in port so the number of messages will be reduced, but it is uncertain if the company will reduce costs for fewer messages. Message costs are about $0.10 per message for Inmarsat, or about $75/month for a message each hour of every day.20 Total annualized costs of VMS per vessel messaging are estimated to be $1,500 for Boatracs and $900 for an Inmarsat C system based on one message each hour of every day. Thus, based on 21 vessels being required to be newly equipped with a VMS, total message costs to the public are $31,500 with Boatracs, and $18,900 with Inmarsat. Because vessels will not be required to transmit hourly messages when moored in port, actual message costs for both systems will be less and will depend on how much vessels fish.

Additionally, the other 246 limited access scallop boats will incur only the cost of one new message per day in the SEF. These costs are estimated to be $5,830.20 (for 7380 messages times the daily charge of 10 cents per message).

Total costs for installing and operating a VMS are summarized in Table 99. The costs to the industry from the VMS monitoring are expected, however, to be lower than estimated above. Cost estimates include message costs for one hourly message every hour of the year; the plan will only require messages when the vessel is underway, reducing communications costs. Most scallop vessels have already installed VMS. VMS also has positive impacts on the industry through improved enforcement, compliance, and management of the fishery resources as summarized under item 1 of this analysis.

Elimination of requirements with VMS monitoring/ Observer coverage
Catch data handled electronically
Discard data now available
Reduced administrative costs
Improved timeliness of data

Other benefits

VMS monitoring will also provide numerous benefits for vessels operations in terms of improved safety, flexibility, and vessel record keeping. Although these benefits to the public cannot be estimated in estimated in monetary terms, they are outlined below:

Benefits for vessel operations

Improved safety

20 Information is based on personal communications with Sandra Yin of NMFS.

- More precise location allows faster response by rescue platforms
- 2-way communication allows vessels to communicate precise nature of problems

Improved vessel record-keeping - more accurate plotting of tow results - catches, bottom characteristics and potential obstructions

More accurate monitoring of vessel operations by owners who are not aboard the vessels

Would provide secure 2-way communications between vessels and shore

Allows vessels /companies to communicate valuable information about catches, markets, logistics, etc.

The VMS would back-up global positioning systems currently used by vessels - this benefit will be greater when the LORAN system is eliminated in the future.

As closed areas become more enforceable, they could be smaller - yet still result in an equivalent level of conservation.

Would increase the flexibility of vessels operations by making area closure smaller or by making feasible measures that apply trip limits to specific areas.

14. Provide estimates of annualized costs to the Federal Government.

The costs for VMS reporting requirements under the SEF are estimated at $20,000 to the government and are summarized in Table 100.

The NMFS Northeast Region currently operates a VMS system for the Atlantic sea scallop fishery. The estimates of the annual administrative and enforcement costs to the federal government from this program are summarized in Table 100. The costs were estimated by extrapolating the costs of the VMS experimental program to a year. The ongoing (recurring) costs amount to $300,00 a year and include staff costs, internet connection, training, travel and the annual costs for equipment and the back-up system.21 These costs are not expected to increase with the VMS requirement for Occasional scallop fishermen. Respondents will submit verification of VMS installation as part of the permitting process, and the government will confirm receipt of proof through the review of permits. Costs associated with processing this verification are assumed to be insignificant when considering the current magnitude of the permitting program. No additional costs are expected to be incurred from the requirement to monitor reports received from Atlantic herring fishing vessels, as the system is highly automated and is already established.

The costs for expanding this program to Observer coverage are not well defined. The primary cost will be in the labor necessary to revise operating software to monitor an exempted fishery with different regulations, protected areas, and other requirements. NMFS estimates that it costs approximately $100,000 to add 50-100 boats from another fishery to an existing VMS system. These costs were amortized over five years and added to the ongoing costs. The total annualized costs of VMS monitoring amount to $320,000. Only $20,000, however, is due to the requirement for VMS in the SEF because the other operating costs support the system's current use in the normal sea scallop fishery.

It is not possible to predict precisely at this moment if these costs would change in the future as more and more vessels are eventually added to the program. The Enforcement Office believes, however, that the present VMS monitoring capacity developed under the experimental program can handle a high number of vessels, including the 442 vessels with scallop limited access and multispecies individual days-at-sea permits, with no substantial increase in costs. At the present time, the system is only monitoring

21 Salary costs are those minimally associated with two GS-13 computer specialists and one GS-11 VMS technician required for daily operation and maintenance of the system. The costs include benefits.

about 230 vessels in the sea scallop and multispecies fisheries. The addition of 21 vessels in the SEF is well within the capability of the existing system.

The overall administrative and enforcement costs, however, are expected to be lower than can be quantified within the framework of the present analysis. First, TAC's must be enforced in-season such that fishing mortality rates are not exceeded. Observers will be paid from an additional allocation above and beyond the trip limit. Also, without the VMS system, the only way to verify reported catch locations for those vessels not declared into the SEF is by examining sighting reports from enforcement units, a laborious process that is unlikely to be performed due to manpower limitations. Third, vessel-generated geographical information will allow more efficient deployment of enforcement resources and would, therefore, increase efficiency and effectiveness in the use of current resources. This is especially so when re-opening formerly closed areas.

A VMS system could potentially enable the Coast Guard to fully meet its fisheries program standards without additional resources. Consequently, VMS is expected to result in significant savings in enforcement costs if its use is broadened to include vessels under the SEF.

In addition to these monetary benefits, VMS/Observer coverage in the SEF would significantly improve the Coast Guard's ability to detect violators and respond with the appropriate action. SEF vessels are allowed to fish in areas closed to groundfish vessels; the VMS requirement will help enforcement units sort vessels detected in the closed areas and determine who is fishing legally. It will augment cutter and aircraft patrols and allow them to be used to enforce other management measures. A VMS will also make boarding efforts more efficient, as it will help Coast Guard distribute boardings in a more equitable manner across all fleet sectors. Further discussion of additional benefits from VTS monitoring for the public and the government in terms of improved compliance, enforcement and management is provided in items 1, 5, and 13 above.

15. Explain potential changes in burden.

This request is for a revision of OMB approval for this VMS collection. The changes in burden requested are the result of program changes/additions that result in additional burden to the public. All burden figures are based on the estimated number of individuals affected. The actual number of individuals may differ from these estimates.

16. Describe any plans for statistical use of the information.

Results from this collection may be used in scientific, management, technical or general informational publications such as Fisheries of the Untied States, which follows prescribed statistical tabulations and summary table formats. Data are available to the general public on request in summary form only. Data are available to NMFS employees in detailed form on a need-to-know basis only.

17. Explain the reasons why display would be inappropriate.

There are no reasons why display would be inappropriate.

18. Explain exceptions.

There are no exceptions.

9.2.3 Collection Of Information Employing Statistical Methods

No statistical methods are employed in the information collection procedures; the requirements are mandatory for participants in the Atlantic sea scallop fishery.

Table 97. Burden and Cost estimates for the Public and the Government

Requirement	Number of Entities	Items per Entity	Total Number of Items	Response Time	Total Burden	Cost to Public (1)(4)	Cost to Government (2)
Vessel Monitoring System							$20,000
Installation	21	1	21	1	21	$315	
Verification requirement	21	1	21	.033	0.693	$10.39	N/A
Reporting burden – hourly	21	240	5,040	.0014	7.056	$105.84	N/A
Purchase and operation	21					$56,700.00	
VMS / Observer reporting burden – daily							$4,910
Full-time / Part-time	246	30	7,380	0.1667	1230	$5,830.20	
Occasional	21	10	210	0.1667	35	$165.90	
VMS / Observer reporting burden – monthly							
Full-time / Part-time	246	3	738	0.1667	123	$583.02	
Occasional	21	1	21	0.1667	3.5	$16.59	
Total					1,420.3	$63,726.94	$24,910

Assumed to be $15 per hour
(2) Assumed to be $25 per hour
(3) This table includes costs to the public and government identified in Tables 3 and 4
(4) Daily Observer reporting on VMS is estimated by the Office for Enforcement, NE Division, to be $0.79 per message

Table 98. Characteristics of limited access scallop vessels in 1999.

	Full-time	Part-time	Occasional
Large dredge	198	8	4
Small dredge	1	5	-
Trawl	15	21	17

Number of vessels = 267.

Table 99. Annualized VMS Cost Estimates for the Occasional vessels.

Equipment	Number of Entities	Equipment Costs	Total Equipment Costs	Annual Message Costs(1)	Total Message Costs	Total Annual Costs per Vessel	Total Costs
Boatracs	21	1,200	25,200	1,500	31,500	2,700	$56,700
Inmarsat C	21	1,160	24,360	900	18,900	2,060	$43,260

(1) Not including daily VMS emails by Observers or Operators

Table 100. Costs to the Government from VMS Monitoring.

VMS Monitoring Annual Costs		
	Salary and Benefits[1]	$230,000
	Internet Connection[2]	$7,500
	Equipment [3]	$20,000
	Back-up System [4]	$38,960
	Software Licensing	$3,500
	Supplies[5]	$11,000
	Training and travel	**$8,000**
	Total Ongoing Costs	**$300,000**
Start-up Costs	Software adaptations	$100,000
	Total Fixed Costs	$100,000
	Annualized Start-up Costs (at 5 year amortization)	**$20,000**
Total Annual Costs [6]		**$320,000**
Previously Committed Costs		
Total Annual Costs[7]		**$300,000**
Net Annual Costs to Government from Herring VMS Monitoring		**$20,000**

Source: Data supplied by NMFS, Office of Enforcement, Northeast Regional Center, and NMFS Headquarters

1. Salary and benefits, three program support personnel.
2. 24-hour maintenance of secure internet node at Gloucester, MA.
Lease and maintenance contract on CPU and monitor.
Lease and maintenance contract on CPU and monitor
5. Optical storage disks, repairs and supplies associated with non-lease equipment (modem, router, printer, thermal paper, WORM drive).
6. Estimated by adding up annualized start-up costs ($2,383) to total ongoing costs.
7. System operating costs currently funded to support program for the sea scallop fishery.

Table 101. Cost to Government from Daily VMS email.

Description	Time (hours)	Materials
1. Create and distribute new forms to all VMS boats	8	0
2. Change program to process new forms and write an output file comprised of delimited records. Email output file at predetermined intervals or post to an FTP site.	8	0
3. Documentation, notification, and training	8	$500.00
4. Support 267 boats x .1 hour per boat	26.7	-
Total		$4,910.00

Source: Boatracs

10.0 Glossary

Amendment - a change to a fishery management plan (see FMP). The Council prepares amendments and submits them to the Secretary of Commerce for review and approval. The Council also may make limited changes to FMPs through a "framework adjustment procedure" (see below).

Days absent – an estimate by port agents of trip length. This data was collected as part of the NMFS weigh-out system prior to May 1, 1994.

Days-at-sea (DAS) - the total days, including steaming time that a boat spends at sea to fish.

DAS Permit - Vessels qualified to be in the limited access sea scallop fishery are required to apply for a DAS permit each year to use their annual DAS allocation**.**

Full-Use - Refers to a vessel with a limited access permit and which used all of its DAS, not counting the 10 DAS that it may carry-over into the next fishing year.

Zero-Use - Refers to a vessel with a limited access permit that did not report using any DAS.

Partial-Use - reported using fewer than 10 DAS less than its annual allocation. For example, a vessel which had 165 DAS in the 1997-98 fishing year but used less than 155 DAS is referred to as a partial use vessel.

History Permit - A history permit is issued to qualified fishermen who apply in writing to retain their eligibility for the limited access fishery in the future. History permits are associated with vessels that sank, were destroyed, or were sold. They may be converted into a DAS permit any time during a fishing year. (This definition is repeated below.)

Environmental Impact Statement (EIS) - an analysis of the expected impacts of a fisheries management plan (or some other proposed action) on the environment and on people, initially prepared as a "Draft" (DSEIS) for public comment. After an initial EIS is prepared for a plan, subsequent analyses are called "Supplemental".

Exempt fisheries - Any fishery determined by the NMFS Regional Administrator to have less than 5 percent regulated multispecies as a bycatch, by weight, of total catch according to 50 CFR ? 648.80(a)(7).

Exploitation rate - the percentage of catchable fish killed by fishing every year. If a fish stock has 1,000,000 fish groundfish large enough to be caught by fishing gear and 550,000 are killed by fishing during the year, the annual exploitation rate is 55%.

Fishermen - the term traditionally used in New England to refer to fishers of both genders.

Fishing effort - the amount of time and fishing power used to harvest fish. Fishing power includes gear size, boat size and horsepower.

Fishing mortality (F) - (also see *exploitation rate*) a measurement of the rate of removal of fish from a population by fishing. Fishing mortality (F) is the rate at which fish are harvested at any given point in time. ("Exploitation rate" is an annual rate of removal, "F" is an instantaneous rate).

FMP - Fishery management plan. Documents describing a fishery and the rules that govern it. These documents form the basis for federal regulations for fisheries under management authority of the regional management councils. These councils are authorized to manage fisheries and are required to prepare fishery management plans by the Magnuson-Stevens Fishery Conservation and Management Act. The New England Fishery Management Council prepares FMPs and submits them to the Secretary of Commerce for approval and implementation.

Framework adjustments - adjustments within a range of measures previously specified in a fishery management plan (FMP). A change usually can be made more quickly and easily by a framework adjustment than through an amendment. For plans developed by the New England Council, the procedure requires at least two Council meetings including at least one public hearing and an evaluation of environmental impacts not already analyzed as part of the FMP.

Limited-access permits - permits issued to vessels that met certain qualification criteria by a specified date.

$\mathbf{F_{0.1}}$ - a conservative target fishing mortality rate used to determine allowable fishing levels.

History permit - A History Permit is issued to qualified fishermen who apply in writing to retain their eligibility for the limited access fishery in the future. History Permits are associated with vessels that sank, were destroyed, or were sold. They may be converted into a DAS permit any time during a fishing year**.**

Natural mortality - a measurement of the rate of fish deaths from all causes other than fishing such as predation, disease, starvation and pollution. The rate of natural mortality may vary from species to species.

Minimum spawning stock threshold - the minimum spawning stock size (or biomass) below which there is a significantly lower chance that the stock will produce enough new fish to sustain itself over the long term.

Multispecies - the group of species managed under the Northeast Multispecies Fishery Management Plan. This group includes whiting, red hake and ocean pout plus the regulated species (cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish).

Open access - describes a fishery or permit for which there is no qualification criteria to participate. Open-access permits may be issued with restrictions on fishing (for example, the type of gear that may be used or the amount of fish that may be caught).

Overfished - A measure of stock biomass that is below a threshold level that would provide adequate spawning activity, ie. the stock's productive capacity.

Overfishing - A level or rate of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to produce MSY on a continuing basis.

Possession-limit-only permit - an open-access permit (see above) that restricts the amount of multispecies a vessel may retain (currently 500 pounds of "regulated species").

Proposed rule - a federal regulation is usually published in the *Federal Register* as a proposed rule with a time period for public comment. After the comment period closes, the proposed regulation may be changed or withdrawn before it is published as a final rule, along with its date of implementation and response to comments.

Recruitment - the amount of fish added to the fishery each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to fishing gear in one year would be the recruitment to the fishery.

Regulated groundfish species - cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish. (These species are usually caught with large-mesh net gear.)

Secretarial review process - a process, which normally takes 140 days from the time the Council, submits a plan or amendment to the Secretary of Commerce until its implementation. The Secretary of Commerce reviews and possibly approves the plan or amendment, which must meet the National Standards, of the Magnuson Fishery Management and Conservation Act and other federal laws. The other laws include the National Environmental Policy Act, the Marine Mammal Protection Act, the Endangered Species Act, the Regulatory Flexibility Act, etc.

Spawning stock biomass (SSB) - the total weight of fish in a stock that are old enough to reproduce.

Stock - a grouping of fish usually based on genetic relationship, geographic distribution and movement patterns. A region may have more than one stock of a species (for example, Gulf of Maine cod and Georges Bank cod).

TAC - Total allowable catch including all sources of fishing mortality such as discards, bycatch of the species in question in other fisheries and recreational landings.

VTS - an electronic vessel tracking system, often used to record the time a vessel is a at sea on a fishing trip or to enforce closed areas.

11.0 Literature Cited

Blaylock, R. A., J. W. Hain, L. J. Hansen, D. L. Palka, and G. T. Waring. 1995. U.S. and Gulf of Mexico marine mammal stock assessments. NOAA Tech. Mem. NMFS-SEFSC-363: 211pp.

Colton, W.G., A.W. Smith, Jr., P.L. Berrien, and M.P. Fahay. 1979. Principal spawning areas and times of marine fishers, Cape Sable to Cape Hatteras. Fish. Bull. 76(4): 911-915.

DuPaul, William D., David B. Rudders, and David W. Kerstetter. 1999. Results of modifications to sea scallop dredge twine tops to facilitate the reduction of finfish bycatch: Georges Bank Closed Area II experimental fishery – September-October 1998. VIMS Mar. Res. Rpt. No. 99-4: 18 pp.

Dupaul, William D., Edward J. Heist, James E. Kirkley, and Salvatore Testaverde. 1988. A comparative analysis of the effects on technical efficiency and harvest of sea scallops (*Placopecten magellanicus*) by otter trawls of various mesh sizes. VA Inst. Mar. Sci., VA Mar. Sci. Rpt. No. 88-10.

Gerstner, Cynthia L. 1998. Use of substratum ripples for flow refuging by Atlantic cod, *Gadus morhua*. Env. Biol. Fish. 51: 455-460.

Gerstner, C.L. and P.W. Webb. 1998. The station-holding performance of plaice, *Pleuronectes platessa*, on artificial substratum ripples. Can. J. Zool. 76:200-208.

Gulland, J.A. 1969. Manual of methods for fish stock assessment: Part 1. Fish population analysis. FAO Manual in Fisheries Science Number 4. 154 pp.

Haynes, Evan B. 1966. Length-weight relation of the sea scallop, *Placopecten magellanicus* (Gmelin). ICNAF Res. Bull. 4:32-48.

Henriksen, S., E. Welch, S. Therrien, R. Smolowitz, P.J. Struhsaker, C. Goudey, and H. Kite-Powell. 1997. Results of gear modification tests to reduce bycatches of commercial finifsh in sea scallop dredges. SER Enterprises. NOAA Award No. NA66FD0026 Report. 23 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service. 1995. status reviews for sea turtles listed under the Endangered Species Act of 1973. NMFS, Silver Spring, MD. 139pp.

New England Fishery Management Council (NEFMC). 1995. Framework adjustment #5 to the sea scallop fishery management plan as amended. NEFMC: 20 pp.

NEFMC. 1998. Monkfish Fishery Management Plan. NEFMC: 492 pp.

NEFMC. 1998. Amendment 7 to the Atlantic Sea Scallop Fishery Management Plan. NEFMC: 136 pp.

Pollnac, Richard B. and Littlefield, S.J. 1983. Sociocultural Aspects of Fisheries Management. Ocean Development and International Law Journal, 12:3-4, p. 209-246.

Serchuck, F.M. and R.J. Smolowitz. 1988. Seasonality in sea scallop meat weight and reproductive condition: Preliminary results from the Cooperative NMFS/Council/Industry Sea Scallop Data Collection Program. NEFC Stock Assessment Workshop, May 1988.

Smolowitz, Ronald, paul J. Struhsaker, Cliff Goudey, and Hauke Kite-Powell. 1997. Results of gear modification tests to reduce bycatches of commercial finfish in sea scallop dredges. NOAA Administration Award No. NA66FD0026, 23 pp.

Waring, G. T., D. L. Palka, K. D. Mullen, J. W. Hain, L. J. Hansen, and K. D. Bisack. 1997. U.S. and Gulf of Mexico marine mammal stock assessments. NOAA Tech. Mem. NMFS-NE-114: 250 pp.

12.0 Acknowledgements

Much of the data, analyses, and graphics included in this document were the result of hard work by the employees of NMFS (Woods Hole) and CMAST (New Bedford). The data for Closed Area II would not have been gathered without the hard work and efforts by the six vessels that participated in the experimental fishery and the partnership between CMAST and the Fishermen's Survival Fund. Special thanks should go to Dr. Paul Rago, Dr. Kevin Stokesbury, Dr. Steven Murawski, Dr. William DuPaul, and David Weathers for their expert assistance in preparing the analyses and graphs contained in this document.

13.0 Comments and Response to Comments

The following comments were made orally or in writing during the Council's deliberations of this framework adjustment. The Council held an initial meeting on February 24, 1999 and a final meeting on April 14-15, 1999. This section summarizes the important comments made before, during, and after these meetings, providing summary of why the decisions were made about the issue identified in the comment. According to the Council's framework adjustment process (50 CFR §648.55) and the Administrative Procedures Act, this opportunity for comment may replace the need to publish a proposed rule and allow for written public comments on the rule.

The proposed scallop fishery must be conservation neutral.

The Council considers conservation neutrality as meaning that there should be no net increase in fishing mortality for scallops and that it does not extend the rebuilding schedule beyond that proposed in Amendment 7. The analyses demonstrate that total fishing effort (inside and outside the proposed fishing area, measured as days fished and days-at-sea) will not increase, except in the unlikely event that a large portion of inactive vessels or Confirmation of Permit Histories begin fishing. The scallop TAC is furthermore chosen to represent what the Council believes to be a maximum sustainable yield for Closed Area II.

Framework Adjustment 11 should serve as a cornerstone for a more permanent rotational scallop fishing strategy.

The proposed action's intent is to allow temporary access to Closed Area II for scallop fishing while groundfish stocks continue to rebuild. Although the access has the added benefit of effort reduction on small scallops, the original closing was never intended to and the temporary opening is not part of a formal rotational area management strategy.

The Council is however developing a new amendment that may, as a portion of the management plan, include a formal area rotation strategy. The proposed scallop fishery for Closed Area II will provide an opportunity to collect needed information to make this strategy possible.

The management measures will be too conservative, such that fishing effort remains in the open areas.

The Council selected an allocation of trips and an associated scallop possession limit that makes these trips more economically attractive than fishing trips in the existing open areas. A higher trip allocation was not possible because to keep the scallop catch below the target TAC, the scallop possession limit would have to too low and it would not be attractive to fish in the closed area fishery. A higher scallop possession limit with fewer closed area trips was not possible because it would not transfer enough effort from the existing open areas to be conservation neutral. The lower number of trips and days-at-sea allocations could come mainly from unused days-at-sea that are allocated, but not taken by active fishing vessels.

In other ways, the Council chose management measures that were less restrictive to give the industry maximum flexibility and to reduce fishing costs. The Council rejected requiring a costly scallop bag tag program and instead chose to monitor the fishery using existing systems as much as practical. The Council also chose one of the largest area options, instead of smaller options that could prove costly and less attractive.

The compounding effect of non-scallop issues can result in an action that doesn't rebalance scallop fishing effort.

The Council has accounted for the benefits, costs, and risks associated with the proposed closed area fishery when choosing the proposed action. The Environmental Assessment shows that it will be more economic to scallop in the closed area fishery than in the existing open areas, unless scallop fishing in the existing open areas becomes more profitable. Since part of the rationale was to provide economic relief while allowing recovery of depleted scallop resources in areas now open, a recovery of scallops in the open areas would shift the perceived balance and reduce the need to promote the

desired rebalancing at this time.

Re-opening these areas now is shortsighted at best and unwise management of important resources at worst.

The Environmental Assessment ensures conservation neutrality for scallops and many other species, accruing from the target TAC and possible suspension of the closed area fishery, from reduced fishing effort in the now open areas, and from requiring more selective fishing gear than is now in use. One of the more critical groundfish stocks, Georges Bank yellowtail, has recovered considerably from its once highly depleted condition. While continued rebuilding is necessary, the proposed action takes the necessary steps to protect this valuable resource.

The proposed action also promotes fishing effort reduction in areas where scallops are depleted and increases yield, while at the same time minimizing habitat impacts by keeping some important areas closed. This action will thus promote rebuilding of the scallop resource by reducing effort on small, fast-growing scallops and minimize impacts on other rebuilding stocks. The proposed action therefore takes a meaningful step toward achieving optimum yield, considering both the Sea Scallop and the Multispecies FMPs.

Yellowtail flounder, skates and other fish will die unnecessarily.

The expected bycatch is estimated and the impact of the bycatch is evaluated in the Environmental Assessment. There are no other proven gears or fishing methods to harvest scallops from the closed area that have less bycatch and less habitat impacts than those proposed by the framework adjustment. By suspending the fishery when certain thresholds are exceeded or by requiring different fishing gear, the proposed action will limit the negative impacts on species where a net increase in mortality is expected. At the same time, the proposed action will decrease bycatch mortality for other species and decrease habitat impacts in areas that are vulnerable to fishing elsewhere.

The ocean floor will be dredged, scraping away and killing the living creatures on and attached to the bottom that have grown back in the more than four years since these areas have been closed to any bottom fishing.

The framework adjustment proposes to re-open only those areas in Closed Area II that are believed to have the lowest habitat value. The bottom primarily consists of a high-energy sand and shell bottom. While not devoid of other species, the habitat in this area is not as complex and diverse as the habitats to the north within Closed Area II. These more complex and diverse habitats would remain closed to scallop fishing.

Although the proposed action will increase impacts in the area to be opened for scallop fishing, the compensating effect will be to reduce scallop fishing effort in areas that are now open. Some of these presently open areas have significantly more complex and diverse habitat than that found in the southern portion of Closed Area II. These biological impacts of this trade off are discussed in the Environmental Assessment.

Important spawning grounds will be disrupted.

The Council proposed that the season last no longer than June 15, 1999 to December 31, 1999. The primary reason for this season is to avoid disruption of spawning activities for groundfish and other

species. The proposed action therefore minimizes disruption of spawning.

Economic gains from scallop fishing will be offset or lost by the setback to cod, yellowtail flounder, and other recovering species.

The target yellowtail flounder TAC will ensure that the proposed closed area fishery will not cause a setback to the species' rebuilding schedule. Increasing the twine top mesh and the expected effort transfers from areas now open to scallop fishing will limit the impacts on other species. Cod do not appear to be vulnerable to scallop fishing with dredges within Closed Area II during the proposed fishing season.

The yellowtail flounder bycatch will exceed the target and jeopardize rebuilding.

To ensure that this will not happen, the proposed action includes provisions for enhanced monitoring and an early suspension of the closed area scallop fishery if the bycatch exceeds the target TAC. The proposed action also includes larger twine top mesh than the vessels used during the 1998 experimental fishery. The larger mesh is expected to substantially reduce yellowtail flounder bycatch. When coupled with voluntary industry efforts to change fishing methods to avoid bycatch, these actions could delay suspension of the fishery due to excess bycatch.

The impact on barndoor skate could be even more severe.

The NMFS is considering a petition to list the barndoor skate as an endangered species. Until the barndoor skate population is assessed the Council is unable to determine the impacts on the population. The Council has however determined that this action and the fishery may affect threatened and endangered marine species and other marine mammals, but will not jeopardize the continued existence of any listed species.

Federal laws require environmental impact studies.

According to NOAA Administrative Order 216-6, defining when to prepare an Environmental Impact Statement (EIS) as required by 40 CFR §1501.3, it has been determined that an EIS is not necessary for the proposed action. To evaluate the extent of the impacts and whether to prepare and EIS, an Environmental Assessment (EA) has been prepared and submitted with the proposed action.

A supplemental EIS was prepared on October 7, 1998 for the Atlantic Sea Scallop FMP and on October 9, 1998 for the Multispecies FMP, covering the management measures and objectives included in those plans. The proposed action allows partial access to part of a temporary closed fishing area that was adopted by Amendment 5 of the Multispecies FMP. This area closure was never contemplated by the Sea Scallop FMP and therefore scallop fishing in this area was contemplated by Amendment 4 that initiated the days-at-sea program and by Amendment 7 that redefined some objectives, adjusted the day-at-sea program, and included a rebuilding program. The rebuilding program for sea scallops assumed that the biomass within the closed area would, at some point, be available for harvest. This action is therefore evaluated and contemplated by the EIS for both plans, requiring only the preparation of an EA.

The closed areas should remain closed until scientific analysis demonstrates that scallop fishing will not jeopardize the recovery of overfished stocks, nor adversely affect the Georges Bank ecosystem.

The proposed action includes management measures to ensure that the closed area scallop fishery does not jeopardize the recovery of overfished stocks. Adverse effects on the Georges Bank ecosystem have been minimized by limiting the area and season when scallop vessels may fish within Closed Area II. In addition, the proposed action includes a TAC set aside as a source of funding for experiments to identify more selective fishing gears or gears that have less habitat impacts. Without the limited closed area fishery and this source of funding, this important research may not be possible without access to the closed area where the resources have recovered from four years of prohibited bottom fishing.

The proposed scallop fishery in Closed Area II is one of the more intensively-studied management options in recent years. Thanks to last year's experimental fishery within Closed Area II, the Council has had very detailed, high-quality information about the scallop resource, potential bycatch, and the impacts of the fishery. Habitat impacts, however, cannot be studied without allowing a reasonable amount of access in areas that have been closed for a long period of time.

Councils must make hard decisions and weight the benefits and costs from competing interests, often with much less information that available here. In this case, the Council has determined after intensive study and evaluation that the benefits of a limited scallop fishery (limited by area, season, amount of fishing effort, and maximum catch) in the southern part of Closed Area II outweigh the risks.

NMFS has plans to survey habitat and the fishing impacts before, during, and after the proposed fishery occurs. In addition to these efforts, NMFS has published an Application for an Experimental Fishing Permit to study the scallop resource, potential bycatch, and the existing habitat in Closed Area I and the Nantucket Lightship Area. This research will be crucial to evaluate future proposals and for developing a long-range area rotation strategy that the Council hopes to include in Amendment 10.

Georges Bank closed areas represent part of the "historic" center of the Atlantic sea scallop fishery and compromise "approximately" half of the Georges Bank scallop grounds by area.

NMFS agrees and therefore scallop fishing is justified, if it does not jeopardize the rebuilding schedule for groundfish or scallops and minimizes the impacts on habitat. Under current conditions, the biomass within the closed areas on Georges Bank includes much more than half of the scallop biomass of the Georges Bank stock. This imbalance has arisen mainly due to the excessively high fishing mortality on scallops within areas now open to scallop fishing. The proposed action encourages a shift in fishing effort to promote rebuilding in areas that are now depleted by excess scallop fishing.

Making the Georges Bank closures permanent would reduce yield and continue the current imbalance in fishing effort.

Permanent area closures can, if chosen incorrectly, reduce yield by making part of fishery resources unavailable. On the other hand, other area closures may enhance yield by improving prospects for spawning and recruitment. The Georges Bank area closures have been very effective and biomass has increased for many of the groundfish stocks found there. More study is warranted to identify when and where permanent area closures can be effective as a means to enhance spawning and recruitment, thereby improving yield.

The proposed action would allow restricted access to Closed Area II during times when and in areas

where groundfish spawning is unusual, while enhancing scallop yield. If the results are as expected the anticipated effort shift could transfer fishing effort from areas with small scallops to areas with large scallops. Assuming that fishing mortality on the stock does not increase through re-activation of unused days or permits, this action could help to delay recruitment and improve yield-per-recruit.

The CMAST sampling program in Closed Area I and in the Nantucket Lightship Area should continue.

NMFS is proposing, through an Application for an Experimental Fishery Permit, to continue in these areas the type of sampling that occurred in the 1998 experimental fishery in Closed Area II. The application encourages participation by all interested research groups to augment the core of the research being proposed.

Bycatch reduction gear research should be encouraged through a set aside of a portion of the TAC.

The proposed action sets aside one percent of the target scallop TAC, or 50 mt, to encourage evaluation of new gears or gear modification that would reduce bycatch and habitat impacts.

The portion of Closed Area II, south of 41°30' N latitude and the northeast corner of the Nantucket Lightship Area (NLSA) should be open for scallop fishing.

The proposed action will allow access for scallop fishing in Closed Area II, south of 41°30' N latitude to provide maximum flexibility to avoid yellowtail flounder bycatch and to minimize costs. The NLSA will remain closed however, due to uncertainty about the scallop resource and habitat. Unlike Georges Bank yellowtail flounder, the stock of Southern New England yellowtail flounder, found in the NLSA, is in much poorer condition and additional rebuilding is needed before additional catches can be allowed.

The area open to scallop fishing should be smaller to avoid potential loss of lobster gear, caused by the gear conflict.

Smaller area options were rejected to give the industry maximum flexibility to avoid stationary gear and research experiments, as well as avoid finfish bycatch. In the areas where lobster gear is a concern, the experimental fishery shows that there are few scallops. The Council believed that it was better to let the industry to develop working arrangements in small, specific areas where lobster gear might temporarily coincide with areas of higher scallop abundance. Regulations at this level of detail to force a separation of fishing zones would be unenforceable and unlikely to succeed in this situation.

The TAC should be based on CMAST estimates, consistent with the scientific literature on dredge efficiency.

The Council chose a target scallop TAC that was intermediate between the two estimates given by scientists. This choice was also consistent with a 25 percent dredge efficiency, nearly the same as a maximum likelihood model, later presented by CMAST scientists. Dredge efficiency estimates in the literature come from studies where scallops were exploited or bottom conditions differed from that found within Closed Area II. While some studies occurred on Georges Bank, the scallops there were smaller than are present now due to the high fishing mortality. Since dredges retain fewer small scallops, this could lead to a reduced estimate of dredge efficiency. Abundance of scallops and other animals, since rebuilt to higher levels within Closed Area II, could also be an important factor in

determining dredge efficiency by plugging the dredge or increasing its weight on the bottom.

Further study of dredge efficiency is warranted, given the uncertainty about dredge efficiency that arose from the 1998 experimental fishery. Peer review of these studies is scheduled for the 30th Stock Assessment Workshop in June of 1999. In addition, other planned experimental fisheries and data that could be obtained from the fishery in Closed Area II could shed additional light on the problem.

Concentration of the fleet would present a safety risk.

The proposed action allows access to the largest area under consideration during the development of Framework Adjustment 11/29. This larger area gives the fleet the most flexibility to avoid bycatch and reduces the potential for problems caused by crowding. Safety was also one of the reasons why the Council rejected Alternative 2, since it could cause an incentive to deck load vessels with scallops and to fish within the Closed Area II as rapidly as possible, potentially under adverse weather conditions.

The trip limit will be an effective way to prevent a "gold rush".

While the scallop possession limit alone will not prevent a derby fishery from developing, it does have favorable attributes, including preventing the fishery from exceeding the target TAC, when combined with the other management measures. A scallop possession limit of this magnitude will be difficult to monitor and enforce, however. As a result, enhanced monitoring activities are needed, increasing cost to industry and the government.

The high biomass of scallops in Closed Area II represents an important and exciting early opportunity to learn how to manage an essentially rebuild stock for optimum yield, as National Standard 1 requires.

Additional data collected during the closed area scallop fishery could be an important source of information for developing an area rotation management strategy, contemplated for Amendment 10 to the Atlantic Sea Scallop FMP.

Industry cannot accommodate the required gear modification in time for the planned implementation of the framework adjustment. The proposed action will cause substantial amounts of inventory to become obsolete and the gear cannot be used for other purposes.

The purpose of requiring 8-inch mesh twine tops in all areas outside Closed Area II and the scallop demarcation area is to compensate for the increased bycatch expected in the closed area scallop fishery. Although only limited studies of its effectiveness are available, preliminary indications are that substantial bycatch reductions can be expected (especially for flounders), without loosing many scallops in areas now open to fishing. This gear is expected to have additional, but unquantified long-term benefits that will be realized through reducing unwanted bycatch or bycatch that cannot be legally landed. NMFS may, based on comments received, delay implementation of the 8-inch twine top requirement to allow time to obtain adequate supplies.

The estimated yellowtail flounder bycatch in the proposed closed area scallop fishery is well over the target TAC, based on the experimental fishery results when vessels were using 8-inch mesh twine tops. As an additional measure that would reduce yellowtail flounder bycatch, the proposed action requires that vessels on a closed area trip use 10-inch mesh twine tops.

The cost of purchasing new twine tops is a small fraction compared to the benefits and increased profits expected from the proposed action. Vessels that are not able to obtain 10-inch mesh twine tops will be able to take their three closed area trips later in the season, provided that the fishery is not suspended for exceeding the yellowtail flounder target TAC.

Early access to the closed area is necessary to avoid adverse fall weather and corresponding safety issues, as well as improve scallop yield.

The proposed action could allow access for scallop fishing in Closed Area II as early as June 15, 1999. Although full-time scallop vessels only have 120 days-at-sea to fish each year, scallop fishing occurs year around and effort does not vary substantially from month to month. For less seaworthy vessels, however, this schedule would allow them to take all three trips during the summer months, when weather is often favorable and scallop yield is high.

Earlier in-season adjustments are not possible because of the time needed to collect and evaluate the closed area fishery data and to allow for participation of larger vessels that might take later trips to play the scallop market. If an in-season adjustment were made earlier and only vessels that had taken a closed area trip were eligible to fish additional trips, some vessels that fish late in the season may not be eligible for more trips.

14.0 Appendix I: Sea scallop landings by region for the US and Canada, 1957 to 1996.

15.0 Appendix II: Finfish and lobster bycatch distribution on commercial vessels participating in the CMAST experimental fishery, 1998.

16.0 Appendix III. Supplementary Economic Impact Results

Table 102. 1999 days-at-sea projections and vessel characteristics.

	Permit Category					**Grand Total**
Data	FT small dredge	Full-time	Occasional	Part-time	PT small dredge	
Number of active vessels	1	206	2	21	2	232
The number of Inactive Vessels		*19	46	**16		
Confirmation of permit histories		*32	3	**17		
Total eligible vessels		*258	51	**56		
Active Vessels						
Average of 98/99 FY DAY-AT-SEA used	15	124	11	48	2	114
1999 Allocation per vessel (without carryover)	120	120	10	48	48	112
1999 projected days-at-sea-use per vessel (minimum)	15	116	7	46	2	108
1999 projected days-at-sea-use per vessel (maximum)	130	128	16	55	58	120
Total 1999 Allocation (without carryover)	120	24720	20	1008	96	25964
Total 1999 Projected days-at-sea-use (minimum)	15	23973	14	958	4	24964
Total 1999 Projected days-at-sea-use (maximum)	130	26442	32	1157	116	27878
Total days-at-sea used during Jul-Dec. 98	4	11577	21	405	1	12008
days-at-sea-use per vessel during Jul-Dec. 98	4	56	11	19	1	52
Landings (lb) per days-at-sea- 98 FY monthly average	127	396	193	413	177	393
Landings (lb) per days-at-sea- Jul –Dec 1998 average	127	362	193	346	56	356
Average of GRT	37	158	53	110	46	151
Average of HP	375	825	363	420	419	779
Average of Crew	3	7	4	5	4	7

* Includes Full-time small dredge

** Includes part-time small dredge

Table 103. Projected 1999 days-at-sea-use and Scallop Landings per days-at-sea in the open areas in 1998 Fishing Year by Ton Class and Permit Category.

		Permit Category			Grand Total
GRT-class	Data	Full-time*	Occasional	Part-time**	
<50 GRT	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	18	2	1	10
	Total 1999 days-at-sea-use (minimum.estimate)	35	2	1	38
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	105		112	107
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	108		112	109
	Number of active vessels	2	1	1	4
50-99 GRT	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	100	12	39	67
	Total 1999 days-at-sea-use (minimum.estimate)	998	12	390	1400
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	338	193	390	354
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	297	193	307	295
	Number of active vessels	10	1	10	21
100-149 GRT	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	115		47	106
	Total 1999 days-at-sea-use (minimum.estimate)	7841		516	8357
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	380		396	382
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	342		319	339
	Number of active vessels	68		11	79
>=150 GRT	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	119		54	119
	Total 1999 days-at-sea-use (minimum.estimate)	15114		54	15168
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	410		589	411
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	378		592	380
	Number of active vessels	127		1	128
All Vessels					
Estimated 1999 days-at-sea-use per vessel (minimum.estimate)		116	7	42	108
Total 1999 days-at-sea-use (minimum.estimate)		23988	14	962	24964
Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)		394	193	389	393
Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)		360	193	317	356
Number of active vessels		207	2	23	232

* Includes Full-time small dredge

** Includes Part-time small dredge

Table 104. Projected 1999 days-at-sea-use and Scallop Landings per days-at-sea in the open areas in 1998 Fishing Year by Primary State and Permit Category.

		Permit category			
Primary State	Data	Full-time*	Occasional	Part-time**	Grand Total
CT	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	129			129
	Total 1999 days-at-sea-use (minimum.estimate)	772			772
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	375			375
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	347			347
	Number of active vessels	6			6
FL	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	118			118
	Total 1999 days-at-sea-use (minimum.estimate)	118			118
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	227			227
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	175			175
	Number of active vessels	1			1
MA	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	118		3	116
	Total 1999 days-at-sea-use (minimum.estimate)	10588		3	10591
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	414		241	412
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	380		0	375
	Number of active vessels	90		1	91
ME	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	69	2	1	47
	Total 1999 days-at-sea-use (minimum.estimate)	276	2	1	279
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	313		112	273
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	270		112	239
	Number of active vessels	4	1	1	6
NC	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	106	12	47	79
	Total 1999 days-at-sea-use (minimum.estimate)	1378	12	425	1815
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	447	193	433	429
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	428	193	410	410
	Number of active vessels	13	1	9	23
NJ	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	117		50	104
	Total 1999 days-at-sea-use (minimum.estimate)	2815		303	3118
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	330		399	344
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	304		312	306
	Number of active vessels	24		6	30
PA	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	127			127
	Total 1999 days-at-sea-use (minimum.estimate)	254			254
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	343			343
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	306			306
	Number of active vessels	2			2

		Permit category			
Primary State	Data	Full-time*	Occasional	Part-time**	Grand Total
RI	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	76			76
	Total 1999 days-at-sea-use (minimum.estimate)	227			227
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	556			556
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	480			480
	Number of active vessels	3			3
VA	Estimated 1999 days-at-sea-use per vessel (minimum.estimate)	118		38	111
	Total 1999 days-at-sea-use (minimum.estimate)	7559		230	7789
	Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)	384		395	385
	Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)	348		269	343
	Number of active vessels	64		6	70
Estimated 1999 days-at-sea-use per vessel (minimum.estimate)		116	7	42	108
Total 1999 days-at-sea-use (minimum.estimate)		23988	14	962	24964
Scallop landings per days-at-sea (lb) in open areas (98 fishing year monthly average)		394	193	389	393
Scallop landings per days-at-sea (lb) in open areas (July-Dec.98 monthly average)		360	193	317	356
Number of active vessels		207	2	23	232

* Includes Full-time small dredge

** Includes Part-time small dredge

Monthly Scallop Price Model

The price model estimates the monthly price of sea scallops for the period 1990-97 as a function of domestic landings, imports, disposable income, monthly dummy variables and a dummy variable reflecting the change in meat count since the implementation of Amendment 4.

Dependent variable: PAT= Sea Scallop price per pound (97 prices)
(Nominal scallop prices deflated by 1997 CPI (seasonally unadjusted) for food).

Table 105. Explanatory variables and their coefficients.

	Coefficients	t-values
Intercept	-0.736327	-0.61
QAT	-0.300916	-4.78
ITQ1	-0.059978	-1.84
DPI	0.000723	2.63
M1	-0.340514	-2.26
M2	-0.489561	-3.19
M3	-0.105051	-6.65
M4	-0.326324	-2.08
M5	-0.194193	-1.15
M6	0.012772	0.07
M7	0.187609	1.05
M8	0.246750	1.55
M9	0.163693	1.11
M10	-0.091720	-0.65
M11	-0.122528	-0.87
D94	-0.483299	-3.61
PAT1	0.737175	11.7

Adj.R2=0.92 DW=1.96 N=95 F=0.69
DW.H=0.58

QAT= Atlantic Sea Scallop landings (lb)
ITQ= Imports of fresh, frozen and preserved scallops from all countries (lb)
ITQ1= Lagged (one period) imports
DPI= Real disposable Income (Seasonally adjusted)
M1, M2,….M11= Monthly Dummy variables
D94= Dummy variable for year 1994, 1995, 1996, 1997 to capture the impacts of abolition of meat-count standard by Amendment 4 to the Sea Scallop FMP
PAT1= Price of scallop lagged one period

17.0 Appendix IV. Depletion Model Estimated Projections Of Scallop Fishing Effort, Scallop Catch, And Bycatch Amounts For Various Area Options In Closed Area II And The Nantucket Lightship Area

Table 106. Scenario T11 depletion model projections – One 10-day trip allocated with a 10,000 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 107. Scenario M12 depletion model projections – One 10-day trip allocated with a 10,000 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active and inactive vessels in the 1999 fishing year.

Table 108. Scenario M13 depletion model projections – One 10-day trip allocated with a 10,000 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active and inactive vessels in the 1999 fishing year. Participation by active vessels in VA and NC assumed to be 50 percent and by inactive vessels from VA and NC assumed not to participate.

Table 109. Scenario T1 depletion model projections – One 10-day trip allocated with a 26,000 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 110. Scenario T2 depletion model projections – Two 10-day trips allocated with a 13,000 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 111. Scenario T3 depletion model projections – Four 10-day trips allocated with a 7,000 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 112. Scenario T4 depletion model projections – Six 10-day trip allocated with a 4,800 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 113. Scenario T5 depletion model projections – Eight 10-day trips allocated with a 3,600 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 114. Scenario D1 depletion model projections – Two 10-day trips allocated with a 13,000 lb. trip limit; 10 days-at-sea accumulated per trip; 16% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 115. Scenario D3 depletion model projections – Two 10-day trips allocated with a 13,000 lb. trip limit; 10 days-at-sea accumulated per trip; 40% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 116. Scenario V1 depletion model projections – Four 10-day trips allocated with a 7,000 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active and inactive vessels in the 1999 fishing year.

Table 117. Scenario V2 depletion model projections – Four 10-day trips allocated with a 7,000 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active and inactive vessels in the 2000 fishing year.

Table 118. Scenario V4 depletion model projections – Four 10-day trips allocated with a 7,000 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active vessels only in the 2000 fishing year.

Table 119. Scenario M1 depletion model projections – Two 10-day trips allocated with a 19,500 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 120. Scenario M3 depletion model projections – Two 15-day trips allocated with a 13,500 lb. trip limit; 10 days-at-sea accumulated per trip; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 121. Scenario T6 depletion model projections – One 10-day trip allocated with a 26,000 lb. trip limit; 2-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 122. Scenario T7 depletion model projections – Two 10-day trips allocated with a 13,000 lb. trip limit; 2-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 123. Scenario T8 depletion model projections – Four 10-day trips allocated with a 7,000 lb. trip limit; 2-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 124. Scenario T9 depletion model projections – Six 10-day trip allocated with a 4,800 lb. trip limit; 2-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 125. Scenario T10 depletion model projections – Eight 10-day trips allocated with a 3,600 lb. trip limit; 2-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 126. Scenario M4 depletion model projections – Two 10-day trips allocated with a 13,000 lb. trip limit; 3-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 127. Scenario M5 depletion model projections – Two 7-day trips allocated with a 13,000 lb. trip limit; 2-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 128. Scenario M6 depletion model projections – Two 15-day trips allocated with a 13,000 lb. trip limit; 2-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 129. Scenario M7 depletion model projections – Two unlimited-duration trips allocated with a 13,000 lb. trip limit; 2-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

Table 130. Scenario M8 depletion model projections – Two 6-day trips allocated with a 13,000 lb. trip limit; 2-for-1 day-at-sea ratio; 25% dredge efficiency; participation by active vessels only in the 1999 fishing year.

18.0 Appendix V. Comparison Of Historic Georges Bank Scallop Landings With The TAC Proposals For Framework Adjustment 11

Comparison of Total Allowable Catches of Sea Scallop from Closed Area II with Historical Catches.

By

Steven Correia
Massachusetts Division of Marine Fisheries

The Scallop PDT has been tasked with developing a target total allowable catch from closed area II. An intense survey of closed area II has been used to provide area swept estimates of total biomass within this area. Several estimates of exploitable biomass have been presented to the PDT and the SSC. The differences in estimates are due to differences in estimates of dredge catchability (q varies from 16% to 40%) and effective tow length (0.8-1.0 nautical miles). Two models have been used to estimate dredge catchability: the Leslie-Davis depletion model and the "patch" model for depletion estimators. Various arguments have been made over the merits of each approach and the PDT has not selected a particular approach as preferable. A comparison of the estimated TAC derived for various values of dredge efficiency with historical landings from Georges Bank may provide insight useful for weighing the risks for selecting a TAC.

The timeseries of landings from Georges Bank encompasses 1957 through 1997 and contains three time periods of peak landings around 15,000 metric tons (1962, 1977, and 1990) followed by steep declines to around 5,000 metric tons (Figures 1 and 2). Prior to 1957, total Canadian and USA landings from Georges Bank and Mid-Atlantic regions combined were less than 10,000 metric tons (Figure 3). Thus these peaks represent the highest landings taken from Georges Bank. These timeseries cover the development of the fishery from a nearly virgin fishery to state of overexploited and depleted. The timeseries contain large fluctuations in landings, strongly suggesting that landings have exceeded MSY on at least three occasions. In a relatively long-lived species like scallops, MSY must have been exceeded to cause the long subsequent decline in landings following peak landings. This interpretation stands even if the periods of peak landings are a function of strong recruitment because MSY is an equilibrium concept implying average conditions.

The Georges Bank fishery began in the late 1930's and the peak in landings in 1962 probably represents the maturation of the fishery from a developing fishery on a virgin stock in the 1930's to overexploited fishery by the early 1960's. Prior to 1959, the industry in New Bedford limited landings via self-imposed regulations such as crew limits, trip limits and layover requirements and landings were generally less than 10,000 metric tons from all stock areas (Figure 3). These restraints were removed in 1959 and total landings from Georges Bank increased from 7,710 metric tons in 1958 to a 15,405 metric ton peak in 1962. Landings rapidly declined below 6,000 metric tons in 1965 and did not improve again until 1974. Landings increased above 10,000 metric tons in 1976, giving rise to the second boom period for Georges Bank. Landings climbed to above 17,000 metric tons in 1977 and 1978 before falling again. In 1984, the International Court drew the Hague line thus setting the Canadian-USA Boundary on Georges Bank. The line gave the Northeast Peak to Canada and divided the Northern Edge between the USA and Canada.

The last boom period began in 1990. By 1990, the fleet was overcapitalized and the fishery was recruitment driven. Standardized DAS increased from 18,889 days in 1980 to 43,014 in 1991. High landings in the early 1990s were driven by a succession of strong recruitment from the 1987-1989 yearclasses. Landings may have been higher in this period than reported due to mis-reported landings of sublegal size scallops. The putative underreporting consisted of landings of undersized scallops to circumvent the meat count regulations. The subsequent decline in landings from Georges Bank was a function of several poor yearclasses, redirection of effort to larger yearclasses in the Mid-Atlantic region, and the year-round closures on Georges and Southern New England. Three year-round area closures that encompass traditional scallop grounds for the Georges Bank stock were closed in December 1994. Closed Area II covers portion of the Northern Edge and a smaller portion of the Southeast parts of Georges Bank. Closed area I and the Nantucket lightship area also cover portions of the Great South Channel.

For purposes of the paper, I compared estimates of exploitable biomass and TAC for closed Area II derived using dredge efficiencies of 16%, 25% and 40% and tow length of 1.0 nm (Table 1) to landings

history from Georges Bank. Closed Area II encompasses a large portion of the Northern Edge and a smaller portion of the southeast parts of Georges Bank. I compared the various TAC with historical US landings from Northern Edge, Northeast Peak, and Southeast parts of Georges Bank (Figures 1a, 1b) and with US historical landings from all of Georges Bank (Figures 2a and 2b). I also compared proposed TACs with combined Canadian and US landings for these areas.

Table 1. Estimates of exploitable scallop biomass and TAC for various three estimates of dredge efficiency. Tow length is 1 nautical mile.

Dredge efficiency	**16%**	**25%**	**40%**
Biomass in 1998	29,000	18,000	11,000
Biomass in 1999	35,000	22,000	14,000
USA TAC	6,790	4,290	2,716
Interim Canadian 1999 TAC[1]	3,000	3,000	3,000
Total TAC	9,790	7,290	5,716

[1]Canadian Georges Bank scallop interim TAC provided by Ginette Robert, Canadian DFO.

The most appropriate comparisons are the historical landings series from the Northern Edge, Northeast Peak and Southeast parts (Figures 1a and 1b). I have included both the timeseries of Canadian and USA landings because the Canadian and American fleets had access to the entire Bank prior to the 1984 International Court decision to draw the Hague line. Closed Area II is a subset of these subareas and portions of these areas remain open on the Canadian and USA side of the Bank. I added the 3,000 metric ton 1999 interim Canadian TAC (Ginette Robert, Personal Communications) to the estimated TACs to account for Canadian landings in 1999 (Table 1). The comparisons of the proposed TACs to a timeseries of USA landings from these areas (Figure 1b) may be useful because of the unavailability of Canadian portions of the Bank to USA fishery. Finally, the comparison of the proposed TACs to the landings timeseries from the entire Georges Bank stock may not be as appropriate as the previous comparisons because closed Area II is a smaller fraction of the total area of Georges Bank than other subsets. Yet even this analysis remains useful for comparing the TACs to the MSY for the entire Bank.

Results

Total landings from the Northern Edge, Northeast Peak and Southeast Parts of Georges Bank were near or exceeded the 9,790 metric tons twelve times in the 29 year timeseries. In eight instances, landings above 9,790 metric tons were followed by a decline in landings (Figure 1a). In the USA landings timeseries only, landings exceeded 6,790 only three times in 29 years (1961-63). Landings immediately declined and have yet to approached 6,790 metric tons again. This strongly suggests that the TAC associated with the 16% dredge efficiency is likely to be above MSY. USA landings from the entire Bank also support this conclusion (Fig. 2b). Comparison of the 9,790 metric tons to the total landings from Georges Bank suggests that this may be the upper limit of MSY for the entire Bank (Fig 2a). This timeseries also includes the highly productive Great South Channel and other open area of Georges Bank that are not encompassed by closed Area II. Clearly, a 6,790 metric ton TAC would not reflect sustainable landings from Area II unless a rotational system were already in place and the rest of the Bank were closed (excluding the Canadian side of the Bank which is managed by quota).

TACs derived from the 25% efficiency and 40% efficiency are harder to interpret. The 25% efficiency appears to provide a TAC near MSY when compared to the total landings from the subareas (Figure 1a) but the TAC appears to have a higher risk of exceeding MSY when compared to the USA landings only from the subareas (Figure 1b). Similarly, the TAC derived from the 40% efficiency appears

to be below MSY when compared to total landings, but the TAC may be near MSY when compared to USA landings only.

Conclusions

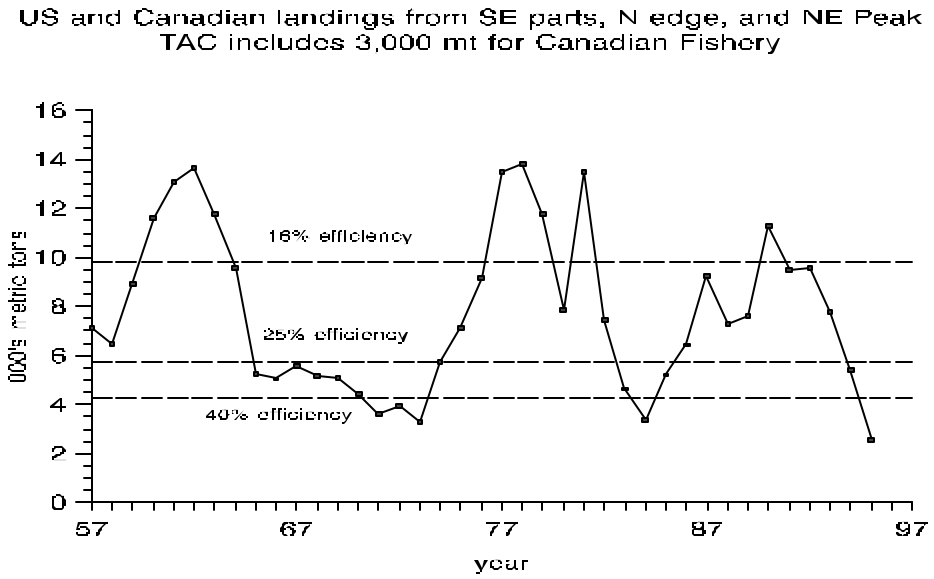
Clearly, the 6,790 metric ton TAC based on 16% dredge efficiency appears to be above any reasonable estimate of MSY and may be risky even if this TAC was set for the entire US portion of the Bank. This TAC appears to be even riskier because the TAC may only taken from a subset of Closed Area II.

The method does not have sufficient resolution to determine whether the 4,290 (25%) or 2,716 (40%) TAC is more appropriate. The method can only determine whether a TAC appears to be unreasonably high relative to catch history. Selection of either the 25% or 40% TAC will have to be based upon other more sophisticated analyses, or based on risk assessment of outcomes.

Several general statements can be made concerning the impact of underestimating or overestimating the TAC. Obviously, overestimating the TAC will provide short-term economic gains for the scallop fleet if price does not significantly drop in response to increased landings. The higher TAC will also redirect more effort away from the current open area providing greater benefits to scallops, fish and habitat in the currently open area. Benefits from reducing exploitation on scallops in the currently open area include increasing age at entry by directing effort from small scallops to older scallops. This will allow scallops in the open area to grow, providing greater future yields. However, overestimating the TAC from closed Area II can impact future management decisions and may set back current rebuilding of sea scallops. Excess removal from closed Area II may deplete this area. This may make designing the rotational program more difficult by reducing the choice of areas to open next year, especially if some current closed areas remain closed due to non-scallop biomass issues such as by-catch and habitat concerns.

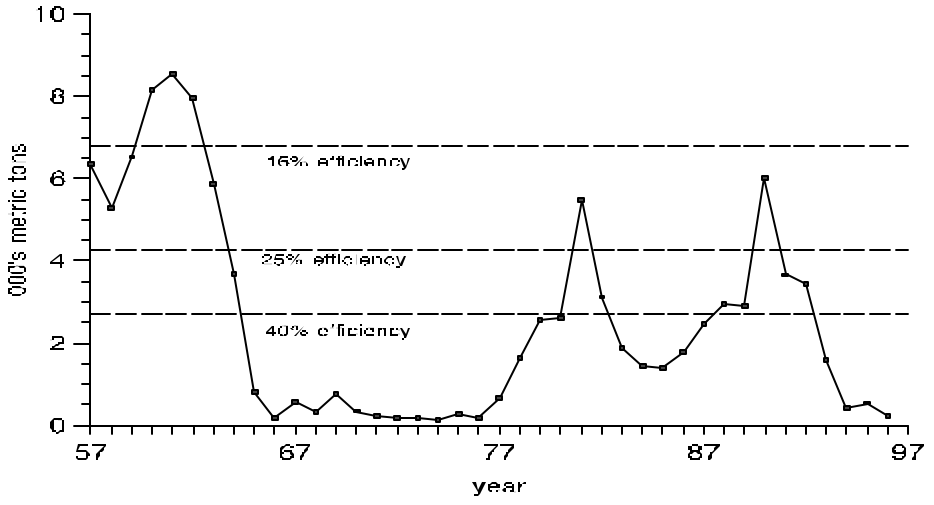
Underestimating the TAC will cause more fishing in the currently open area. This will cause the fleet to target on young scallops just recruiting to the fishery. Open areas will continue to be fished hard because of lower catch rates causing growth overfishing in these areas. The low exploitation rate should allow continued fishing in the newly opened area next year. Underestimating the TAC would not allow industry to fully recover economic benefits of the closed area this year. This impact of underestimating TAC needs to be viewed in the context of the enormous economic stresses on the current fleet, especially with the reduction of DAS to 120 in 1999.

1a



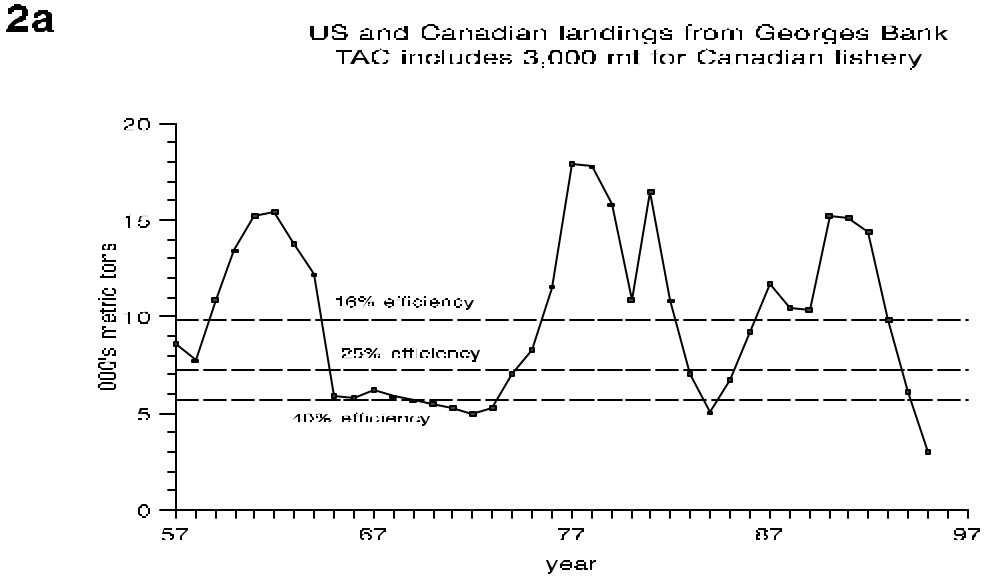
Statistical areas 525, 551, 552, 561, 562, and 525

1b



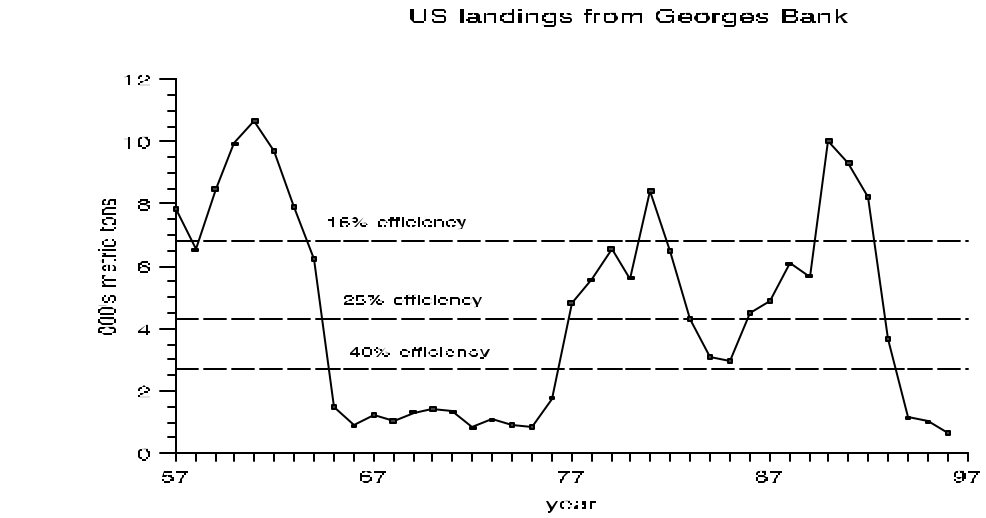
Statistical areas 525, 551, 552, 561, 562, and 525

2a



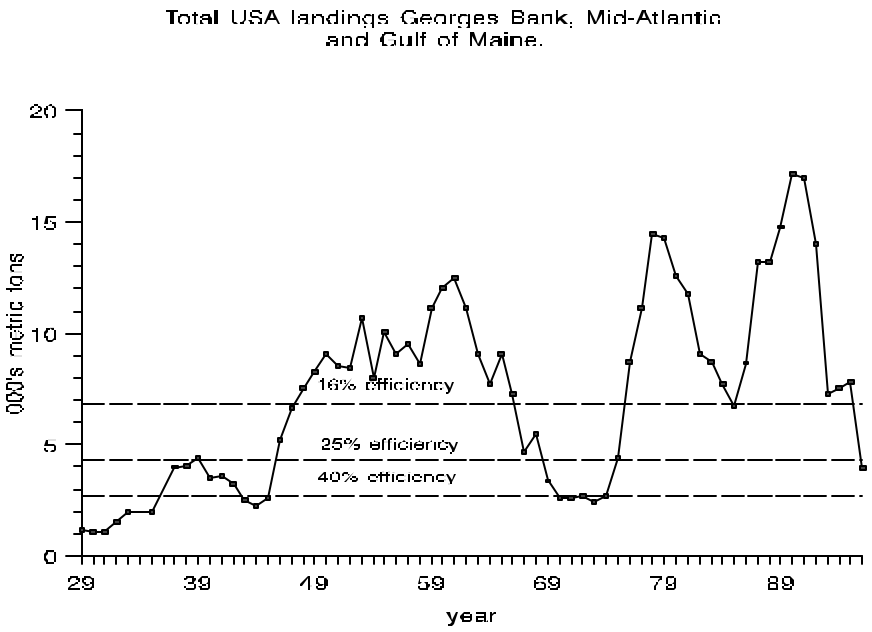
Statistical areas 521, 522, 526, 525, 561, 562, 561, 562

2b



Statistical areas 521, 522, 526, 525, 561, 562, 561, 562

3


Total USA landings Georges Bank, Mid-Atlantic and Gulf of Maine.
000's metric tons
20
15
10
5
0
16% efficiency
25% efficiency
40% efficiency
29
39
49
59
69
79
89
year

19.0 Appendix VI. Joint Scallop and Groundfish PDT Report, October, 17, 1997

20.0 Appendix VII. Population biology and dynamics of the sea scallop, *Placopecten magellanicus*, in the restricted fishing area (II) of Georges Bank – Preliminary Center for Marine Science and Technology Report.

21.0 Appendix VIII. Patch Model for Depletion Estimators – Preliminary NMFS report.

22.0 Appendix IX. Written Comments.

In addition to the following letters, the Council received 155 more letters via fax that read exactly the same.