6.0 Compliance with National Standards and Required Provisions of the Magnuson Act

6.1 National Standards

6.1.1 National Standard 1: Overfishing and Optimum Yield

> *"Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry. "*

The Council has determined that continuation of the status quo overfishing definition, with re-estimated reference points using new data and a higher minimum biomass threshold complies with National Standard 1 guidelines. Unlike prior analysis, the updated reference point values for the Georges Bank and Mid-Atlantic regions are much closer than they have been in earlier estimates. The new values are 4.94 kg/tow for Georges Bank and 6.18 kg/tow for the Mid-Atlantic region. Since these values have become closer to one another and because the primary management measures that apply resource wide to the scallop fleet, the Council has chosen to apply one set of biological reference point using the status quo overfishing definition, in lieu of two, as it had done in past actions and analyses.

Advice from the NMFS Northeast Fisheries Science Center suggests that a single overfishing definition for the aggregate sea scallop resource can be expressed as a weighted sum of the properties of the sea scallops on Georges Bank and in the Mid-Atlantic. That is, the proxy for the target biomass (B_{max}) for the overall resource can be calculated as a weighted average (by size of area) of the separate B_{max} proxy values for Georges Bank scallops and for Mid-Atlantic scallops. As is presently the case, these proxies are expressed in terms of average weight (kg) per tow in the NMFS sea scallop research vessel survey. If the overfished state is assumed to be $½B_{MSY}$ then sea scallops would be considered to be overfished when the overall index in any year was less than ½ of the weighted B_{max} value.

The determination of overfishing is more difficult as it depends on a model-based estimate of F that is consistent with the age-specific partial recruitment pattern used to derive Fmax. The aggregate spatially-averaged F reference point proxy can be estimated by weighting the Georges Bank and Fid-area-specific F_{max} values by their respective target biomass levels. A contemporary estimate of the spatially averaged F can be obtained as an index biomass-weighted average of Fs for Georges Bank and the Mid-Atlantic.

By using the usual criteria for overfishing definitions, overfishing would occur when the current spatially-averaged F is greater than the aggregate F_{MSY}. The F target is set at 80% of F_{MSY}.

The status quo overfishing definition was originally developed by the Scallop PDT for Amendment 7, which implemented changes required by the Sustainable Fisheries Act. This overfishing definition was reviewed by the Council's Overfishing Definition Review Panel (Applegate et al. 1998) and found to be consistent with National Standard 1 and new guidelines. The Review Panel concluded that seven components were needed in an overfishing definition to meet the requirements of the Act and of the National Standard 1 guidelines: Status determination criteria, a maximum fishing mortality threshold, a minimum biomass threshold, a biomass target, a specification of maximum sustainable and

optimum yield, a maximum rebuilding time period specification, and a control law or fishery mortality management strategy.

Status Determination

Status determination consists of a rate of removals from the stock and a biomass estimate. The first determines whether overfishing is occurring by comparing this rate with a maximum fishing mortality threshold. The second determines whether the stock is overfished by comparing the value with the minimum biomass threshold.

The rate of removals, or fishing mortality rate, is determined from a variety of models and methods that measure the percent of the stock removed by fishing. Often, this estimate is computed by measuring the rate of decline of sequential annual catches from a year class, or cohort. In the case of sea scallops, until recently, too few year classes have remained in the commercial catch long enough to get a reliable estimate of the size of the cohort to compute fishing mortality. Most importantly, however, is that commercial catches are rarely aged, because the fleet typically shucks scallops at sea and discards the part of the scallop that might be used to age the catches. In lieu of this, the Northeast Fishery Science Center employed a modified DeLury model to estimate fishing mortality, using the numbers caught by the research survey in two age classes, or bins. Thus fishing mortality can be estimated for any part of the resource that is surveyed in successive years for the number of scallops in the two age groups. This fishing mortality estimate has been reviewed by the Stock Assessment Review Committee and found to be consistent with and comparable to F_{max}, estimated by a Thompson-Bell yield-per-recruit analysis.

Sea scallop stock biomass is measured more directly by the survey, but it does not measure total biomass. Instead the mean stratified weight per tow is compared with B_{max}, a value calculated to occur under equilibrium conditions when fished continuously at F_{max}, or the fishing mortality rate that produces maximum yield-per-recruit. If scallop recruitment occurs at the time series median value, and the stock is fished at F_{max}, the number of recruits observed by the survey would grow to a biomass index represented by B_{max}, expressed as a mean weight per tow. Changes in recruitment from this median value or changes in fishing mortality relative to F_{max} would cause the biomass to change relative to B_{max}. The biomass estimate and its comparison to B_{max} has also been reviewed by the Stock Assessment Review Committee and found to be consistent with and comparable to B_{max}.

Thus, for all surveyed areas of the scallop resource, the status of the stock can be measured against a biological reference point to determine whether overfishing is occurring or whether the stock is overfished, meeting the criteria in §600.310(d)(2) and with §600.310(d)(5).

Maximum Fishing Mortality Threshold

The sea scallop overfishing definition specifies a maximum fishing mortality threshold equal to F_{max}, or the fishing mortality rate that maximizes yield-per-recruit. Since no stock-recruitment relationship has been found over the range of observed stock size (from about 15 to 100% of B_{MSY}), this fishing mortality rate is a suitable and valid proxy for F_{MSY}. The maximum fishing mortality threshold is defined as a continuous function of biomass and defines a constant level of annual escapement, associated with F_{MSY}. Below the target biomass, the maximum fishing mortality threshold declines according to the sea scallop stock's ability to regenerate to target biomass within 10 years. Below one-half of the biomass target, the maximum fishing mortality threshold declines according to the ability to regenerate to target biomass within five years. Below the target biomass, this continuous function may be replaced by a rebuilding plan, should one become necessary.

Under the status quo overfishing definition, the stock-wide average fishing mortality rate should not exceed F_{max} and the level associated with the MSY control rule, therefore the status quo overfishing definition complies with §600.310(d)(2)(i).

Minimum Biomass Threshold

Although sea scallops have been estimated to be highly productive and have exhibited remarkable recovery potential, the Council is adjusting the minimum biomass threshold from ¼ Bmsy to ½ Bmsy, because the old minimum biomass threshold was never intended to be used to define a point in which rebuilding should be started. It was originally defined as a low biomass value to avoid and the MSY control rule was designed to do that. Since there is a measurable criterion to determine whether the scallop stock is overfished and it represents a level where spawning has not been adversely affected by low spawning stock size, the overfishing definition thus complies with §600.310(d)(2)(ii).

Biomass Target

"If the stock or stock complex is overfished, the purpose of the action is to rebuild the stock or stock complex to the MSY level within an appropriate time frame." §600.310(e)(3)(i).

Although not explicitly described in the National Standard 1 guidelines, a biomass target defines a stock level that is consistent with MSY and a benchmark for determining when rebuilding has been achieved. While biomass may vary around this reference point, it is desirable to keep stock biomass around this value – both to prevent the stock from approaching an overfished level and to maximize yield, subject to various environmental, ecological, economic, and social factors.

For the sea scallop resource, the biomass target is Bmax, associated with the production of maximum yield when recruitment is at the time series median value. Thus the overfishing definition includes and complies with the specification of an "MSY stock size" as defined by §600.310(c)(iii).

Maximum Sustainable (MSY) and Optimum Yield (OY)

MSY is defined by the average amount of scallops that can be removed from the resource with a fishing mortality rate equal to F_{max}. Coincidentally, this corresponds to the product of the biomass per recruit calculated to occur when fishing at Fmax, the median annual recruitment of sea scallops, and the Fmax fishing mortality rate. This value is sensitive to actual recruitment and to the size selectivity of the fishery. Thus, the specification of MSY in the overfishing definition is a formula that allows the fishery to "remove a constant fraction of the biomass in each year, where this fraction is chosen so as to maximize the resulting long-term average yield", in compliance with §600.310(c)(2) of the National Standard guidelines.

Likewise, the Council's overfishing definition includes a specification of OY that is the yield from the scallop resource that would result from applying a target fishing mortality that is 80% of Fmax. In Amendment 7, the Council chose to set the target as a fraction of Fmax to account for uncertainty in the Fmax estimate. Coincidentally, setting fishing targets 20% lower than Fmax also helps to reduce the fluctuations in annual catches caused by periodic episodes of fishing above the average resource productivity represented by Fmax. Thus OY also addresses some economic and social factors by applying a risk-adverse target. The status quo overfishing definition, therefore complies with §600.310(i)(6) of the National Standard guidelines. The actual yield for any single year, however, will vary from the average OY, however, in response to changes in stock size, size frequency, and availability of sea scallops to the fishery.

The above criteria are sufficient to protect the overall resource form overfishing and from the population falling below B_{MSY}. However, they are insufficient by and of themselves to ensure attainment of optimum yield, unless the Council's future management decisions are sufficiently constrained based on the condition of the resource. This is because the maximum fishing mortality threshold and the optimum yield target are calculated as if all scallops in the resource are or will be available to the fishery, when in fact substantial fractions of the stock are and will be with permanently closed areas, either for groundfish rebuilding, habitat conservation, or both. Conversely, scallops in closed rotation management areas will become available to the fishery and localized TACs and fishing mortality targets will achieve maximum yield from the scallops found there, albeit at a later time when the scallops attain a desired size.

Thus, when permanently closed areas exist, fishing at OY for the entire resource would not achieve MSY from scallops that are or will be available to fishing, if the result is to fish at levels exceeding Fmax on those scallops. If, for example, 50% of the scallop resource is contained within permanent closures, then a stock-wide fishing mortality target of 0.2 (17% exploitation rate) increases to 0.4 (32% exploitation rate) on scallops that are or will become available to the fishery. Thus, the applied fishing mortality rate to available scallops will exceed Fmax and fail to achieve MSY, unless other management objectives in the FMP come into play. Such management mechanisms are embodied in the bi-annual framework adjustment process (Section 5.1.9), which specifies that the annual framework adjustment, "will achieve optimum yield and prevent overfishing on a continuing basis"

The basis for this conclusion that the overfishing definition does not assure achievement of OY, and a solution to the problem, was described and included in the Regional Administrator's September 8, 2003 letter. The process by which the Council's future decisions would be constrained, as described in the Regional Administrator's letter, was subsequently adopted by the Council. The presence of high-density populations within closed areas can be sufficient to drive the region-specific abundance indices to levels that meet the biomass target. In these instances, setting F at the whole-stock fishing mortality target will not achieve optimal yield from the areas open to fishing. To ensure that yields approach maximum values in the presence of long-term closures, it will be necessary to reduce effort to levels below the aggregate F_{MSY} level. This strategy would be consistent with the principle of structuring fishery regulations to obtain the optimal yield per recruit from areas open to fishing.

The Council adopted an adaptive strategy to maximize yield from the scallop resource, using area rotation and area-specific mortality controls. The Council furthermore incorporated that goal into its framework adjustment process (Section 5.1.9), to set area-specific annual mortality targets and allocations.

The US scallop fishery is capable of harvesting 100% of OY and at this point or at any point in recent history 100% of the annual ABC. Domestic processing capabilities are furthermore fully capable of processing the domestic sea scallop landings. Therefore, following the specification process for §600.310(f)(7) of the National Standard guidelines, DAP = DAH = OY. Therefore, JVP, or the amount of scallops available for joint ventures is zero.

Maximum Rebuilding Time Period

For overfished stocks, §600.310(e)(4)(ii) requires the Council to "specify a time period for rebuilding the stock or stock complex." NMFS has determined that the scallops in the Georges Bank and Mid-Atlantic regions are not overfished and furthermore that the stock biomass was near the existing biomass targets. Changes in the biological reference points will not change this conclusion, making rebuilding unnecessary.

Although rebuilding is unnecessary, the overfishing definition control rule (see below) from the status quo overfishing definition implies rebuilding strategies that do not exceed 10 years and therefore the maximum rebuilding time period is in compliance with the National Standard guidelines and with §600.310(e)(4)(ii). The Council may, if rebuilding again becomes necessary, modify the default rebuilding strategy in the control law to achieve FMP objectives and maximize net benefits, as long as the rebuilding plan is consistent with §600.310(e)(4)(ii)(B)(2) of the National Standard guidelines.

Control Law Or Fishery Mortality Management Strategy

The status quo overfishing definition includes an MSY control rule or fishing mortality management strategy that when followed assures that overfishing does not occur and that provides guidance to achieve a fishing mortality rate that has a 50% probability of rebuilding stock biomass to the target within the specified time period, whether required by an official overfished determination or not.

This control law specifies slight reductions in the maximum fishing mortality threshold whenever the stock biomass is below the target, Bmax, to recover to the target biomass within 10 years when biomass is between 50 and 100% of Bmax. At lower stock biomass, the status quo overfishing definition control law applies a risk adverse management strategy and specifies further reductions in fishing mortality to achieve quicker rebuilding. Between 25 and 50% of Bmax, the control rule provides guidance to reduce mortality to a level that would rebuild the scallop stock within 5 years. At stock biomass below 25% of Bmax, the control rule provides guidance to reduce mortality to as close to zero as practicable to rebuild stock biomass as quickly as possible.

Thus, the MSY control rule in the status quo overfishing definition complies with §600.310(c)(2), which allows the FMP to vary fishing mortality as a continuous function of stock size, and with §600.310(f)(5), requiring a precautionary approach and specifically required a reduction in the fishing mortality rate when the stock is below a biomass that would produce MSY.

6.1.2 National Standard 2: Best Available Science

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

The Council uses best available data collected by the NMFS and other sources to evaluate the efficacy of its plans and potential impacts of its amendments or framework actions. For the Sea Scallop FMP and Amendment 10, the Council relied on data summarized in the table below. Various models and statistical summaries were prepared by scientific experts to evaluate the status of the resource, the performance of the plan, and potential effects of alternatives proposed in Amendment 10. Statistical summaries using these data were also provided and discussed in the Affected Environment section (Section 7.0).

These analyses rely on published literature (for example estimates of dredge efficiency and non-catch scallop mortality) or independently-peer reviewed methods (for example the scallop assessment and projection model). Assumptions are documented and analytical methods are explained in Appendix IV.

In addition, the data and analyses are reviewed by several technical committees, comprised of a stable of qualified experts to provide scientific advice to the Council. Members of these committees include qualified scientists from the NMFS, from coastal state marine fisheries divisions, and from universities involved in marine science research. These committees met numerous times throughout the development of Amendment 10, providing technical advice to the Council, and include:

- Scallop Plan Development Team
- Habitat Technical Team
- Science and Statistical Committee
- Social Sciences Advisory Committee

Table 33. Data sources used in Amendment 10 to analyze impacts from proposed management alternatives or to describe the affected environment.

Data	Time series	Source	Usage in Amendment 10 analysis
Dealer reports and landings	1880 - 2002	Northeast Fishery Science Center (NEFSC), NMFS	Characterize trends and assess the stock
Vessel trip reports	1994 - 2001	NEFSC	Analysis of fishing activity by general category vessels
Vessel monitoring system reports	1998 - 2000	NMFS Law Enforcement Division	Analysis and projections of fishing effort distribution
DAS effort reports	1994 - 2002	NMFS Law Enforcement Division	Analysis of trends in DAS utilization and permit activity
Sea sampling observer program reports	1992 - 2001	NEFSC Sea Sampling Observer Program	Estimates of total bycatch by species; Analysis of seasonal and geographic patterns of bycatch on scallop trips
Annual scallop resource surveys	1982 - 2002	NEFSC	Assess the scallop stock and estimate recruitment characteristics
Other resource surveys	1999 - 2003	School for Marine Science & Technology, Univ. Mass. (SMAST)	Scallop density and TAC estimation for controlled access area allocations; Distribution of small scallops for rotation area management closures Comparison and validation of Poppe et al.(1989) sediment data for surveyed areas
Fishery research	Various	VA Inst. Mar. Sci. (VIMS)	Comparative dredge performance; estimates of non-catch mortality;
Finfish surveys; index of abundance by life stage	1963 - 1998	NEFSC	Determination of EFH designations from abundance data
Sediment data	About 1979 - 1989	Poppe et al. 1989	Analysis of fishery impacts relative to substrate type
Finfish surveys; index of species biomass	1995 – 2001	NEFSC	Guild, species assemblage, and benthic species metrics
Data supplied on permit applications	1994 - 2002	Northeast Regional Office, NMFS	Analysis of vessel characteristics, vessel activity, and trends
Scallop ex-vessel price data	1982 - 2002	http://www.st.nmfs.gov/st1/commercial/index.html	Estimation of price equation to evaluate future revenues and economic benefits.
Quantity, value and unit price of scallop imports	1982 - 2002	http://www.st.nmfs.gov/st1/trade/index.html	Estimation of price equation to evaluate future revenues and economic benefits.
Consumer price index (CPI)	1982 - 2003	http://www.bls.gov/cpi/	Estimation of inflation adjusted domestic and import prices of scallops
Per capita disposable income and GDP implicit deflator	1982 - 2002	http://www.bea.doc.gov/bea home.html.	Estimation of price equation to evaluate future revenues and economic benefits.

Data	Time series	Source	Usage in Amendment 10 analysis
Operating costs and fixed costs for the scallop vessels	1983 - 1993 1998	Gautam and Kitts (1996) Georgianna, et al. (1999)	Estimation of fixed and variable costs for limited access scallop vessels to evaluate producer surplus

The economic impacts of the rotation, access and habitat alternatives are evaluated by combining economic model with the biological projections. The economic model includes an ex-vessel price equation, a cost function and a set of equations describing the consumer and producer surpluses, and net economic benefits. These equations and the methods used in estimating them are presented in detail in Appendix IV (Economic Model). The ex-vessel price equation is used in the simulation of the ex-vessel prices, revenues and consumer benefits along with the landings and average meat count from biological projections. The cost function is used for projecting harvest costs and thereby for estimating the producer benefits as measured by the producer surplus. The data sources for the variables used in the price and cost equations, cost/benefit analyses, and economic analyses of vessels impacts are as follows:

- Vessel characteristics, such as tonnage and length were obtained from the permit database maintained by NMFS, Northeast Regional Office.
- DAS-used by limited access scallop permit holders was obtained from NMFS VMS and call-in data.
- Scallop landings, revenues and price by count are obtained from dealer's database. Ex-vessel prices were obtained from by dividing total scallop revenues by scallop landings. Annual and monthly scallop landings and revenues were provided at the Fisheries Statistics and Economics, NOAA Fisheries website at http://www.st.nmfs.gov/st1/commercial/index.html (Personal communication from the National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, MD).
- Quantity and value, and unit price of sea scallop imports were obtained from the Fisheries Statistics and Economics, NOAA Fisheries website at http://www.st.nmfs.gov/st1/trade/index.html. (Personal communication from the National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, MD)
- Ex-vessel and import prices are corrected for inflation and expressed in 1996 prices by deflating current levels by consumer price index (CPI) for food. CPI was obtained from the Bureau of Labor Statistics website at http://www.bls.gov/cpi/.
- Forecasted landings, average meat count, LPUE and DAS-used were obtained from the biological model simulations provided to the Council staff by scientists at NMFS Science Center at Woodshole (work by Dvora Hart).
- Per capita disposable income is also expressed in 1996 dollars by deflating nominal values with the GDP implicit deflator. Both of these variables were obtained from the U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.bea.doc.gov/beahome.html.
- Operating costs and fixed costs for the scallop vessels were estimated with data collected by the Economic and Social Science Branch of Northeast Fisheries Science Center (Gautam, A.B. and A.Kitts. 1996. Documentation for the cost-earnings data base for the Northeast United States commercial fishing vessels. NOAA Memorandum NMFS-F/NEC). The cost data collected by D. Georgianna et all was also used in comparing fixed costs of vessels (Georgianna, Daniel and Alan Cass and Peter Amaral. 1999. The Cost of Fishing for Sea Scallops in Northeastern United States. Cooperative Marine Education and Research Program, National Marine Fisheries Service).
- Information on vessels activity, catch and revenue by port and state are obtained from vessel logbooks.

Habitat analyses relied on EFH metrics data and scallop effort data that are identified in the table above and analyzed using methods described in Appendix IV. These analyses and EFH evaluations were

conducted or reviewed by a team of experts that are members of the Council's Habitat Technical Team. The EFH analysis examined the degree of overlap of various habitat closure alternatives and EFH metrics, including EFH designations, distributions of abundance of species by trophic guilds, and sediment type. Species and substrates were characterized as being vulnerable,

The analysis of habitat impacts relied on published reports and available survey data. Inferences drawn from and analyses of these sources of information were reviewed by technical experts. A special Gear Effects Evaluation Workshop was held in the region to assess the relative impacts of fishing gears used in the Northeast Region on the habitat found here. The panel consisted of recognized experts from other regions as well as local experts in the field. To the extent possible, more detailed information (multi-beam sonar and video data) on the substrates and qualities of the seabed were used to assess impacts, but the analysis had to rely on older, less detailed substrate analysis to assess region-wide impacts. The analyses also relied on survey data to provide a region-wide distribution of abundance by species and life-stage to assess potential impacts, making an inference that areas with higher abundances over the time series had the highest habitat suitability for that species and life-stage.

The protected species stock descriptions and the assessments of the potential impacts of scallop fishing on those species were developed using the best available scientific information as well as commercial fisheries data and information provided by Council staff and advisors. The majority of this information is described in the Literature Cited (Section 12.0). The protected species analyses focused on the sea turtle species found in the Mid-Atlantic. The background information used on the range-wide status of those species can be found in a number of published documents, including sea turtle status reviews (NMFS and USFWS 1995, Marine Turtle Working Group - TEWG, 1998, 2000) and biological reports (USFWS 1997), recovery plans for the Kemp's Ridley sea turtle (USFWS and NMFS 1992), Atlantic green sea turtle (NMFS and USFWS 1998a), leatherback sea turtle (NMFS and USFWS 1992), and loggerhead sea turtle (NMFS and USFWS 1998b).

Periodically and in preparation for a regular framework adjustment, the Council prepares a SAFE Report to describe the past, present, and possible future condition of the stocks, marine ecosystems, and fisheries under plan management or in related fisheries that are affected by the Scallop FMP. These reports, which the Council plans to prepare for each bi-annual framework adjustment, contain data and analysis of biological, economic, and social trends and characteristics, consistent with the guidance in §600.315 of the National Standard guidelines.

6.1.3 National Standard 3: Management Unit

> *"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."*

The management unit is all sea scallops of the species *Placopecten magellanicus* found in US waters, although management measures vary within the management unit. The overfishing definition applies to the entire scallop resource throughout the management unit, even though there may be two or more stocks and even though there is insufficient data to presently determine the status of scallops in the Gulf of Maine.

Area-specific management measures will apply to discrete areas within the management unit to ensure that the FMP achieves optimum yield and does not produce an average annual catch that exceeds MSY. Some areas may furthermore close to scallop fishing to protect EFH and/or achieve FMP objectives. Area-specific regulations and allocations may also apply to take advantage of regional

differences in stock status, growth, and natural mortality, to improve the FMP's ability to produce MSY from the resource as a whole.

Under a special exemption program, the States of MA, NH, and ME may establish separate regulations that pertain to federally permitted scallop vessels while fishing in state waters. This FMP also does not regulate vessels without federal fishing permits that fish exclusively in state waters. The proportion of the scallop resource in state waters are a very small proportion of the total stock and does not affect recruitment. State regulations therefore do not jeopardize the capacity of the stock to produce MSY.

The scallop resource furthermore extends into Canada, on and around Georges Bank. There is no direct or indirect scallop management coordination with Canada through treaties or cooperative agreements, although the Council believes that US and Canadian management is not inconsistent. Although Canadian scallops on Georges Bank contribute to recruitment in US waters, there is sufficient spawning capacity in US waters that this source of recruitment plays a minor role in determining the productivity of the entire resource. Being relatively sedentary in the adult stage also implies that Canadian management does not affect the achievement of optimum yield from adult scallops in US waters. Canadian scientists participate in the US scallop stock assessment process and vice versa.

According to the NMFS Northeast Fisheries Science Center, it is unlikely that biologically important genetic differences exist between sea scallops on Georges Bank and in the Mid-Atlantic. Differences in characteristics that do occur are most likely shaped by environmental variables. Variability in growth rates and timing of reproduction are apparent, but variations (induced, for example, by depth) within areas typically exceed differences between areas. Recruitment and settlement within geographic zones tend to be coherent but these traits are probably due to differential oceanographic retention patterns between ye3ars – rather than the biological properties of the resource itself. Difference in average recruitment rates between areas and expected biomass levels under optimum fishing, once thought to differ by a factor of two, now appear to be nearly equal on Georges Bank and in the Mid-Atlantic.

6.1.4 National Standard 4: Fairness and equity

> *"Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges."*

The Sea Scallop FMP has implemented limited access since 1994 as a means to control fishing effort and to protect the interests of scallop fishermen that had historically been active in the fishery. Initially, three permit classes were created (full-time, part-time, and occasional) based on a vessels level of fishing activity during 1985 - 1990[39]. Since that time, the FMP has implemented several restrictions in a vessel's fishing effort (measured as days-at-sea, or DAS), but the part-time and occasional allocations remained a fixed percentage of a full-time allocation, although under a special small-dredge program a vessel in a part-time or occasional category could (and many have) moved up one DAS category. According to the FMP, part-time vessels have received 40% of the full-time DAS allocation and occasional vessels have received 1/12th of a full-time DAS allocation, rounded off to the nearest DAS.

[39] The original control date for Amendment 4, which implemented limited access.

There were no restrictions on where the DAS could be used and many vessels fished on the scallop resource offshore of their ports. Most scallop fishermen use large, sea-worthy boats that are capable of fishing scallops that are considerably distant, however. The Scallop FMP prohibits businesses and individuals from possessing more than 5% of the limited access permits, thereby preventing an entity from acquiring an excessive share of fishing privileges.

Beginning with Framework Adjustment 11, in 1999, the FMP has made a special allocation to limited access permit holders to fish in controlled access areas. These areas re-opened to scallop fishing after being closed several years and had special provisions to prevent local scallop depletion, market gluts, excessive finfish bycatch, unacceptable habitat impacts, and gear conflict. Vessels that were allocated the controlled access fishing privileges could fish in the re-opened area, or use its DAS to fish in regular, open fishing areas elsewhere. Therefore a vessel was not necessarily at a disadvantage because it could not fish in a remote controlled access area, although its profits per DAS might be less fishing in open fishing areas closer to the homeport. Equal number of trips were allocated to all limited access scallop vessels, but part-time and occasional vessels could not take all the controlled access area trips that were allocated, because each trip costs 10 DAS and vessels may not have sufficient DAS allocations to take all trips. One of the difficulties, particularly during 2001-2003, has been to establish a scallop possession limit/DAS charge (called a tradeoff) that was sufficiently attractive for vessels to fish in controlled access areas where the tradeoff applied. Raising the scallop possession limit was not an option because vessels would become unable to catch and process the possession limit within the 10 DAS that was charged for the trip. On a per day charged basis, the catch rates were higher in the regular, open fishing areas.

This program had desirable characteristics, but too many vessels were using their DAS allocations to fish in regular, open fishing areas rather than within the controlled access areas. This reaction caused fishing mortality to remain chronically high in regular, open fishing areas and has prevented the FMP from achieving OY because fishing mortality exceeded F_{MSY} for open area scallops. Conversely, OY was not being achieved because the target fishing mortality rate in controlled access areas was not being met, either.

Amendment 10 offered two solutions to this dilemma. One was an overfishing definition that would establish area-specific mortality targets to achieve OY from each area. This is an important feature for scallop management, because scallops don't move very far and total yield is dependent on when and where fishing effort occurs. One feature of this alternative overfishing definition was that it reduced the resource-wide fishing mortality target due to the effect of permanent or long-term closures, a feature the Council and public found unacceptable.

A second alternative approach that the Council approved instead was to continue using the status quo overfishing definition, but make area-specific DAS and trip allocations to distribute effort where provides the best benefits and achieve OY. Unlike the existing allocation mechanism, limited access scallop vessels would have to use controlled access DAS and trip allocations only in controlled access areas, and could not use these DAS allocations in regular, open fishing areas.

The Council selected two provisions that will maintain fairness and equity: pooling and exchanges. Even though their use in regular, open fishing areas would be prohibited, the controlled access areas allocations could be used in any controlled access area, up to the limit on the number of trips that a limited access may make in that area. For example, a vessel might be authorized to make 3 controlled access area trips. The maximum number of trips might be 3 in the Hudson Canyon Area and 2 in the Nantucket Lightship Area. A vessel with 3 controlled access area trips, might take all three in the Hudson Canyon Area, or 2 in the Nantucket Lightship Area and 1 in the Hudson Canyon Area. For the

most part, the pooling benefits part-time and occasional vessels because they are allocated and likely to use less trips than might be authorized for a given area.

The other procedure to mitigate the effects of area-specific allocations and achieve fairness and equity are a provision for one-to-on exchanges. In this procedure, a vessel may exchange area-specific trip allowances with another limited access vessels to obtain a better geographical distribution of its trip allocations. This procedure might enable a VA vessel to fish all of its controlled access area trips in the Hudson Canyon Area, rather than being forced to fish in Closed Area I and Nantucket Lightship Area, for example, by exchanging controlled access area trips with a MA vessel. Since a vessel cannot accrue more total controlled access area trips than another under this exchange procedure, it avoids allowing an entity or individual from receiving an excessive share of the allocation.

One other change is that part-time and occasional vessels will now receive a different amount of controlled access areas trips as a full-time vessel. Although a part-time or occasional vessel couldn't actually take as many controlled access area trips as a full-time vessel, the difference now is that the controlled access trips must be taken in a controlled access area and DAS must therefore be allocated in 12 DAS blocks to be consistent with the DAS tradeoff and automatic DAS charge for controlled access area trips.

As a result, unless there were 12 controlled access area trips, the FMP cannot make a 40% allocation to part-time a $1/12^{th}$ allocation to occasional vessels. Instead, the FMP will allocate 40% and $1/12^{th}$ of a full-time controlled access area allocation to part-time and occasional vessels, rounded down to the nearest trip, but no less than one controlled access area trip may be allocated if controlled access areas are open for limited access scallop fishing. In some cases, this allocation method sometimes disfavors part-time and occasional vessels and sometimes favors them.

By pooling controlled access area trips and DAS allocations, the FMP is able to minimize the effect of rounding the controlled access allocations to the nearest trip and DAS block, while promoting conservation of scallops on controlled access areas and encouraging a rational, more easily managed use of the resource. Other options such as having different scallop possession limits and/or DAS tradeoffs for part-time and occasional scallop vessels would have been administratively complex, difficult to enforce, and create new (but different) inequities.

The DAS allocations for regular, open fishing areas will remain proportionally the same as they had been in the past.

A primary objective of Amendment 10 is to introduce a formal, but adaptive area rotation management system, which inherently implies periodic area closures. At times, these area closures may be close to the ports in a state, but limits on the size and configuration of these rotation management area closures limit the effect on local ports, especially given the relative mobility of the large-boat scallop fleet. Rotation management area closures could affect customary fishing characteristics of smaller boats, many with general category scallop permits. The flexible boundary rotation area management system that the Council approved is able however to take these considerations into account when rotation management area closures will be close to shore.

Although periodic rotation area management closures could have local effects that disadvantage fishermen from a given state, these effects will be temporary in nature and these same fishermen will likely benefit from the closure when it re-opens under controlled access rules. The purpose of a rotation area management closure is to promote conservation and achieve OY in terms of the size, value, market price, and economic and social benefits.

Lastly, Amendment 10 will prohibit limited access vessels from fishing for scallops under general category rules while not on a DAS. Because it is only economic to fish on 400 lb. per trip on near shore scallop resources, this measure could affect vessels from states where scallops are close to the coastline, particularly NJ, MA, and ME.

Nonetheless, this management measure was needed to close a loophole that exists in no other fishery and that threatened a control on fishing mortality through DAS allocations. There is no other fishery that allows limited access vessels to continue fishing for commercial sale on the managed resource when not fishing under limited access rules. Secondly, increasing effort by limited access vessels while not on a DAS had the potential to undermine the conservation tools, if more and more limited access vessels began fishing under general category rules. Although this measure could disadvantage limited access scallop vessels from certain states, these same vessels will benefit from maintaining a higher DAS allocation than might be possible if the general category catches increase.

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."*

Amendment 4 to the FMP implemented limited access, which facilitates mortality control, monitoring, and enforcement. Limited access vessels will be allocated area-specific trips and/or DAS which must be tracked to ensure compliance to achieve the fishing mortality objectives and achieve OY. As a result of limited access, vessels have become considerably more profitable and consumers have benefited from lower scallop prices as landings have increased, both benefiting the nation. Especially important for area-specific DAS monitoring, a substantial majority of limited access scallop vessels are required to use vessel monitoring system (VMS) equipment, facilitating the use of DAS allocations to manage the fishery and enforcement of the regulations. VMS effort data have also become very useful for analysis of effort patterns with respect to other marine resources and coastal activities.

On the other hand, the FMP limits the amount of crew that vessels may have onboard with on a scallop DAS trip and requires vessels to shuck all but 50 US bushels of scallops at sea. At times of high abundance, it would be more efficient for vessels to carry more crew to shuck the scallops, but that would increase the mortality associated with a DAS. Raising the crew limit to achieve greater onboard efficiency and use of capital per DAS would require the FMP to reduce the DAS allocations or force vessels from the limited access fishery to rectify another type of inefficiency.

Measures which promote efficiency are DAS allocations, common scallop possession limits, and rotation management areas with linear boundaries. The limited access DAS allocations promote efficiency because unlike fleet-wide quota management, it does not force vessels to invest more capital to catch scallops more quickly than the next vessel. Vessel owners have and will invest capital to make the vessel more efficient and productive per DAS, for example by reducing the time that crew handles gear and moves scallops on deck, but this investment increases efficiency because more scallops are caught per DAS.

Although the catch rates vary by area, the possession limits are the same for all controlled access areas. This promotes compliance by making the rule easy to understand, widely-known, and enforceable. Thus the costs associated with enforcing a trip limit are reduced compared with enforcing different possession limits for each controlled access area.

Another management measure that promotes efficiency is a provision in the flexible boundary rotation area management system to use linear boundaries along lines of latitude and longitude. Although the scallop resource does not follow nice and neat boundaries, using linear boundaries promotes compliance and eases law enforcement burden.

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."

Atlantic sea scallops are a very dynamic and variable resource. The historic variation in landings, particularly since 1957 when it appears that scallop fishing began to expand and cause a shrinking of the age structure (see Section 7.1) attests to this variability. Several strong year classes in the last 40 years have driven landings and supported the fishery.

The FMP and Amendment 10 will not stabilize the wide variation in recruitment exhibited by the scallop stocks, but rotation area management will allow the Council and NMFS to respond to changing environmental and biological conditions. In fact, rotation area management is expected to take advantage of the strong year classes and abundant recruitment when it occurs to boost average yield and minimize adverse impacts on the environment by focusing fishing effort where it most efficiently captures yield from the resource. Although rotation area management appears to increase variability in landings, the Council has selected several adaptive strategies to mitigate this higher variability, including adaptive management of controlled access areas to stabilize landings through time-averaged mortality targets and/or adjustments that will take into account the near-term outlook of the resource.

The FMP and Amendment 10 uses all four National Standard 6 approaches to establish a suitable conservation buffer: reducing OY, establishing a reserve, adjusting management techniques, and highlighting habitat conditions that have a bearing on the health and reproduction of the scallop resource. Moreover, Amendment 10 introduces a more adaptive management system using rotational closures through the FMPs framework adjustment process to respond to unpredictable events. The rotation area management system includes criteria to act as guidelines for managing the scallop resource that allow the Secretary to open and close fishing grounds through the Council's adaptive framework adjustment process.

The overfishing definition provides guidance and incorporates a risk-adverse annual fishing mortality target to account for scientific uncertainty. The target OY is derived from a target fishing mortality rate that is 80% of the F_{MSY} proxy. The F_{MSY} proxy is F_{max}, which is estimated to maximize yield-per-recruit, but there is uncertainty in this value due to variations in growth, mortality, and size selectivity by the fishery. Also, the DAS allocations are derived to achieve this annual fishing mortality target, but changes in DAS utilization, changes in fishing power per DAS, and activity by vessels with general category permits all add uncertainty about whether the management plan achieves the target and prevents overfishing (i.e. does not exceed a fishing mortality rate that truly maximizes yield-per-recruit). Another factor is that F_{max} does not achieve MSY due to a stronger stock-recruitment relationship than current data predict. The Council therefore reduced OY to 80% of F_{max} in response to scientific and management uncertainty.

The FMP and Amendment 10 rotation area management establish reserves in two ways. First, rotation area management involves a series of periodic closures targeting concentrations of small scallops. This action protects scallops from fishing where the benefits are greatest, i.e. where the biomass will grow

quickest from a closure. Second, Habitat Alternative 6 which will close parts of the Georges Bank groundfish closures to scallop fishing to preserve sensitive and complex habitat also contains significant areas of scallop productivity. While it does not appear that the scallop resource is spawning-limited, especially when the stock is above $\frac{1}{2}B_{MSY}$, these areas may offer a buffer against stock collapse, either through continued spawning activity of the larger scallops in the long-term habitat closures or through special access programs if equivalent habitat can be preserved in other areas.

Both area rotation and the DAS tradeoff inherently allow the Council to change the management techniques to respond to changing environmental and resource conditions. If stock biomass declines or recruitment increases, the FMP could respond by changing the amount and location of rotation area management closures. Also, if the controlled access programs are not achieving the desired results, the FMP could change the DAS tradeoff in response and guard against drastic changes in fishing patterns, allocations, or practices. Lastly, management of the controlled access areas includes setting annual, area-specific fishing mortality targets that vary over time. To guard against drastic changes in effort allocations and landings, the Council could vary these annual targets. If more effort and landings are needed in the short-term, the FMP would allow the Council to increase the fishing mortality targets for controlled access areas in the short-term and lower them toward the end of the controlled access period. An example of this strategy would be to set a constant fishing mortality target for a 3-year controlled access period (e.g. annual fishing mortality targets of 0.4, 0.4, and 0.4). An alternative strategy might be employed when landings and effort increases are not needed in the short-term, but are needed further in the future to balance rotational closures. An example of this strategy would be to set an increasing annual fishing mortality target for a 3-year controlled access period (e.g. annual fishing mortality targets of 0.32, 0.40, and 0.48, or 0.2, 0.4, and 0.6).

Lastly, the FMP and Amendment 10 highlight types of environmental conditions that are known to be adverse to scallop reproduction, settlement, and growth. Section 7.2.1 describes these conditions as those that cause a degradation in water clarity, and increase in sedimentation, or thermal shock. At this time, there are no such problems thought to exist, but coastal activities near scallop beds such as dredge disposal, sand mining, and other large-scale seabed activities could pose a risk.

6.1.7 National Standard 7: Cost and Duplication

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

The Atlantic Sea Scallop FMP has managed the scallop fishery since 1982 and successfully rebuilt the resource, increasing biomass in 1994 by five-fold to the target. Scallops are a very valuable marine resource, contributing substantial economic benefits to fishing communities, coastal states, and the nation.

In 2002, the scallop fishery was the fifth most valuable fishery in the nation ($203.7 million) and the second most valuable fishery in the Northeast region (Van Vorhees and Pritchard 2003), following the American lobster fishery ($293.3 million). The scallop fishery also was a major contributor to the national ranking of Northeast region ports, including New Bedford, MA ($169 million, ranked 1st), Hampton Roads Area, VA ($67.8 million, ranked 3rd), Cape May, NJ ($35.3 million, ranked 13th), and Point Pleasant, NJ ($19.7 million, ranked 35th).

Now that the scallop stocks have rebuilt to the biomass targets, the FMP is needed to maintain stock biomass near the targets and produce optimum yield. Without active federal management, fishing effort would rapidly increase and would probably cause a fairly rapid decline in stock biomass and long-

term yield. Net benefits would be diluted by the extra capital that would enter the fishery, scallop prices would decline from a rapid but short term increase in landings, average scallop size would decline, and long-term benefits would be sacrificed. With the exception of coastal scallop populations in ME, there are no state plans or regulations that would replace the FMP. Therefore the benefits of managing the fishery with a federal FMP greatly outweigh the costs.

Adaptive rotation area management with flexible boundaries increase administrative, monitoring and enforcement costs. Just as important, closures of areas to protect small scallops will be a burden on fishermen that customarily fish those areas and nowhere else. Also the allocation of area-specific DAS allocations will restrict the ability of a limited access scallop vessel to fish in various areas.

The Council considered other types of rotation management that do not require the level of monitoring by cooperative industry surveys or enforcement of fixed straight boundaries that would be required by the proposed action. Funding for cooperative industry surveys will be available through TAC and DAS set asides, but this funding comes at a cost – it reduces the allocations that would have occurred without the set asides. Simpler area rotation management strategies that could be supported by existing resource surveys were analyzed and found to have positive biological and economic benefits (see Sections 8.2.1.3 and 8.7.3). The simplest strategy using mechanical rotation of fixed boundaries would have the least cost, but higher benefits could be achieved through adaptive management strategies that are event driven. Because the existing scallop surveys are somewhat course measures of regional or stock-wide abundance and biomass, the survey could not be used to administer the proposed alternative using smaller, flexible boundaries. Based on a statistical analysis of recruitment distribution patterns, the PDT estimated that use of flexible boundaries could increase yield by about 5% of that achieved by fixed, pre-set boundaries having straight borders. Depending on the extensiveness of the cooperative industry survey program, targeted samples of a defined area could allow definition of smaller areas containing small scallops at a modest cost, fully or partially supported by a portion of the research TAC and DAS set-asides. Although a quantitative analysis was not possible, the Council considered these tradeoffs and decided that fully-adaptive rotation area management with flexible boundaries would have net positive benefits over the alternative forms of area management.

To achieve the conservation objectives using area rotation, closures are a necessary evil. Other methods of reducing mortality on small scallops (for example, increasing ring size more than recommended or lowering crew limits) to change fishing behavior and avoid areas of small scallops could require measures that have greater costs to industry and could have negative net benefits. Therefore to achieve the yield gains associated with reducing mortality on well-defined beds of small scallops, targeted area closures based on ad hoc intensive industry-based surveys achieves the highest benefits at the lowest burden to fishermen.

To some extent, increasing the ring size to a 4" minimum diameter could reduce the need for rotation closures and mitigate impacts on fishermen that customarily fish where these future closures might occur.

To capture the benefits of area rotation, area-specific DAS allocations were needed to focus fishing effort where it would be most efficient in capturing large scallops, although catch rates for smaller scallops may be higher elsewhere. This allocation mechanism will increase the burdens on vessels that are ill-suited to fish in distant scallop grounds, but one-to-one exchanges are expected to alleviate this type of burden.

Gains from the proposed alternatives include economic gains from capturing more yield with less fishing activity, and from reducing adverse impacts on bycatch and habitat. These gains are estimated and discussed in Section 8.7, including a formal benefit-cost analysis comparing the alternatives with no

action and the status quo (Section 8.7.2.1). Gains that are realized in other fisheries will result from reductions in bottom contact and fishing time, as wells as required changes in gear (twine top mesh and minimum ring size) and closures that encompass areas with concentrations of sensitive and complex habitat. Reducing adverse impacts on bycatch and EFH is expected to produce benefits from other managed fisheries, but these gains are difficult to quantitatively predict. An evaluation of the effects of scallop management measures on bycatch is provided in Section 8.3 and on habitat in Section 8.5.

6.1.8 National Standard 8: Communities

> *"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 the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities."*

The characteristics and participation of fishing communities involved in the scallop fishery are discussed in Section 7.1.1.3 and impacts of the proposed and non-preferred alternatives are evaluated in Section 8.8. Both large and small fishing ports depend on scallop fishery revenue and activity for a substantial part of their fishery income. These ports range from New Bedford/Fairhaven, MA; Cape May, NJ; and Hampton Roads area, VA. Smaller ports include Chatham/Provincetown, MA; Stonington, ME; and Wanchese, NC.

Primarily, the proposed alternatives are expected to benefit these communities by increasing yield to the fishery, but closures could have a localized impact. Section 8.8 includes an evaluation of the impacts of various management measures on fishing communities and their social structure. Habitat closures, which may have the greatest local impacts on specific communities were analyzed in Section 8.5.4.14.2. The economic impacts associated with habitat closure alternatives were estimated for each community with scallop landings, assuming that scallop fishing vessels in that community would continue to fish without the closures as they had in the past. Alternatives that would have greater impacts in particular communities were ranked lower than those that spread the impacts more evenly across communities, a factor that was considered in evaluating various habitat closure alternatives.

6.1.9 National Standard 9: Bycatch

> *"Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch."*

In addition to reducing fishing mortality on scallops and rebuilding the scallop resource, scallops management in the last decade has also significantly reduced bycatch. While DAS use had been halved from levels prevalent in the early 1990's, fishing time (measured as bottom contact time or area swept), has decline by around 80 percent. Because bycatch amounts are directly related to the amount of fishing time, selectivity by the fishing gear, and where and when the fishery occurs, bycatch has also declined substantially since Amendment 4 when the Council initiated limited access and DAS management.

Recent management of the other two factors, gear and location fished, has also favored reductions in bycatch. Since the 1994 implementation of Amendment 4, minimum ring size has increased from 3 to 3 ½ inches and is slated to rise to a minimum 4" ring size by September 1, 2004 if Amendment 10 is approved. Research on the characteristics and effectiveness of dredges outfitted with 4" rings has also

collected data on finfish and invertebrate bycatch. For most species, bycatch with a dredge using 4" rings is substantially lower than with a dredge outfitted with 3 ½ inch rings that the commercial fishery currently uses (Section 8.2.8).

Over the same period, the FMP has also increased the minimum twine top mesh which allows escapement of many species, especially of smaller, unmarketable sizes. Since discard mortality of many species is high, escapement through larger twine top mesh and/or larger ring spacing is an important management component to minimize bycatch and bycatch mortality. During the recent decade, the minimum twine top mesh has risen from 5 ½ inches, to 6 inches, and to 8 inches. Amendment 10 will increase the minimum twine top mesh in all scallop dredge gear to 10 inches, because research has shown that substantial reductions of bycatch for many finfish species can be achieved with larger twine top, if installed in a way that does not mitigate the effects of larger mesh size.

Why hasn't the FMP implemented 10 inch twine top mesh earlier? Large twine top mesh also allows escapement of scallops. When smaller scallops (i.e. 70 – 90 mm shell height, 30 to 50 count) predominate, a larger twine top mesh decreases gear efficiency for these size classes, which were the predominant scallop sizes available to the fishery in the early to mid-1990's. If the larger 10-inch twine tops and 4" rings had been required at that time, greater amounts of fishing time would have been required to catch scallops – mitigating the effects of the larger mesh and rings, possibly even increasing the bycatch of larger finfish species.

As the scallop resource has rebuilt, particularly since 1998, larger scallops (i.e. > 100 mm) have become more abundant and available to the fishery, particularly in formerly closed scallop rotation and special access areas. Even in the regular, open fishing areas, scallop biomass and size have increased in the last five or so years, because fishing mortality has declined. Particularly if Amendment 10 implements rotation area management to reduce fishing on smaller scallops and focus fishing in areas where larger scallops exist, a 10-inch minimum twine top mesh will minimize bycatch and bycatch mortality without increasing fishing time.

Quantitative assessments of bycatch changes in response to management have not been possible, primarily due to a lack of data. Sampling frequency by the Sea Sampling Observer Program have been low due to a lack of funding and belief that interactions with marine mammals and turtles were rare. Sea sampling funding is greater for fisheries that have higher levels of interactions with marine mammals and turtles, because the funds are more readily available for monitoring protected species. Vessel trip report (VTR) data are less than useful for this purpose because fishermen rarely report discards (only 9% of 2001 VTRs from the scallop fishery reported discards of any species, including scallops) and with such low reporting rates the data may be biased by area, time, or type of vessel.

Two issues became more important in recent years and have caused the FMP and NMFS to increase sea sampling in the scallop fishery: finfish bycatch in the groundfish closed area access programs and interactions with sea turtles in the Hudson Canyon Area and other parts of the Mid-Atlantic region. Because the Georges Bank closed areas were in place to reduce groundfish catches and enhance rebuilding, it was important to NMFS and the Council to carefully monitor bycatch by increasing sea sampling. In 1999, the FMP provided funds for more sea sampling activity through a TAC set-aside. Part of the target TAC for Closed Area II was set-aside to provide a mechanism and funds for vessels to pay for observers on their vessels, and recapture some of the observer cost from the TAC set-aside. Vessels fishing in Closed Area II and carrying mandatory observers were authorized to land more than the scallop possession limit, and the proceeds from the extra landings allowed the vessel to recover some or all of the observer cost. As a result of this program, over 20 percent of the trips were monitored, but due to training issues and the focus on yellowtail flounder catches, the initial program recorded only the scallop and yellowtail flounder catches.

In 2000, this TAC set-aside program was continued and expanded to all controlled access areas, including Closed Areas I and II, and the Nantucket Lightship Area, recording the catches and discards of all finfish species. This was the first year that relatively reliable bycatch estimates were available and the expanded estimates are provided in Section 7.2.4.1.1. These bycatch estimates, however, apply only to the controlled access areas that were open in 2000, and are not representative of bycatch in other open fishing areas. Three reasons that these estimates are not applicable to other areas are that the geographical distribution of species in the bycatch varies especially with respect to the groundfish closed areas, the amount of time fished per DAS was much different in the controlled access areas than in other open fishing areas, and the FMP required vessels fishing in the controlled access areas to use 10-inch, rather than 8-inch minimum twine top mesh. Ideally, a comparative sample in open fishing areas would have provided data to analyze the effects on bycatch from the management measures discussed above.

In 2001 to 2003, the FMP continued the TAC set-aside and enhanced Sea Sampling Observer Program sampling frequency for the area access program, but the groundfish closed areas were no longer open and this program applied to the Hudson Canyon and VA/NC Areas, which had been closed in 1998 to protect small scallops. Although groundfish catches were much less of an issue, the Council wanted to continue the observer TAC set-aside program to improve bycatch data collection. These Hudson Canyon and VA/NC Areas data are used in this document (Section 7.2.4.1.1) to estimate and characterize finfish bycatch amounts, but again these data can not be extrapolated to other areas, even in the Mid-Atlantic region.

One of the surprises that the Hudson Canyon and VA/NC Areas observer program revealed was that interactions with sea turtles were higher than anticipated, particularly in the Hudson Canyon Area. No one knew whether the high sea turtle interaction rates were due to anomalous sea turtle distribution during 2001, due to the effect that the more intense fishery in the Hudson Canyon Area had on sea turtles that might be attracted to animals that feed on discarded scallop viscera, or due to differences in vessel activity when they stopped fishing to allow the crew's scallop shucking to catch up with the scallop catches.

As a result of this surprising observation from the 2001 Sea Sampling Observer Program, NMFS expanded the sea sampling activities aboard scallop vessels fishing during the late summer and early fall in the Mid-Atlantic region. Observed trips funded by the protected species observer program, however, may not have time to identify and record finfish discards, since the program may not allow observers to spend time recording finfish bycatch in lieu of observing interactions with protected species.

Because of this data gap and concerns about bycatch in the scallop fishery, Amendment 10 proposes to expand the set-aside program to include trips that occur in controlled access and regular, open fishing areas. To do this, Amendment 10 will continue a one-percent TAC set aside to help defray the costs of mandatory observers in controlled access areas, including the groundfish closed areas access and the Hudson Canyon Area access program. A new program, to set-aside one percent of the DAS use targets, before allocating limited access DAS, will allow more trips to be observed in regular, open fishing areas.

Therefore to comply with National Standard 9, the FMP and Amendment 10 will enable the development of an improved bycatch data base to evaluate the effectiveness of management to minimize bycatch and bycatch mortality. Section 8.3 assesses the effects on the amount and type of bycatch and bycatch mortality, although quantitative measures are not available at this time, except where relevant research exists or through inference from data collected in the controlled area access program. In addition, Amendment 10 proposes implementation of management alternatives that are expected to have a very favorable effect on minimizing bycatch and bycatch mortality. With greater Sea Sampling Observer

Program coverage, provided by the TAC/DAS set asides, future SAFE Reports will include better monitoring and analysis of bycatch.

6.1.10 National Standard 10: Safety

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

The last analysis of at-sea casualties in the sea scallop fishery was completed for the 2000 SAFE Report (NEFMC 2000). This analysis, prepared by USCG staff and in consultation with industry advisors, noted that commercial fishing is a relatively dangerous profession, but there were no discernable adverse safety trends associated with scallop industry conservation measures. The one problem that was identifiable; gear stowage regulation, was promptly revised when it became apparent that the regulation was a hazard to fishermen. Casualty statistics show a general downward trend in casualties in the scallop fleet. This might be due to a smaller scallop fleet, less time each vessel spends at-sea, increased fleet profitability, and commercial fishing vessel safety initiatives. However, we have noticed that personal injuries in the scallop fleet were more serious (broken bones, amputations) than in other sectors of the fishing industry, most likely due to the type of gear used (heavy dredges, shucking knives) and the overall nature of the scallop fishery.

These conditions remain in place and are probably having a favorable effect on safety. One issue however remains a concern and warrants careful monitoring. Since 1998, scallop catches have risen substantially and in some open areas and nearly all controlled access areas the catches are exceeding the vessel and crew's ability to shuck scallops. As a result, vessels must often slow down fishing while the on-board processing catches up, an action that has a favorable effect on conservation. It reduces fishing power per DAS and induces vessels to seek out larger, more easily shucked scallops, which in turn improves size selectivity and yield. Nonetheless, some crews are working long watches and shucking scallops nearly 24 hours a day, with shorter than normal breaks for sleep and food. Many vessels have added a shucking cabin by the bridge that the master often uses to shuck scallops. This can present a hazard by virtue of the fact that a proper look-out may not be posted. Casualty statistics do not reflect a significant increase in casualties due to this management measure, however.

Several management measures in the FMP and in Amendment 10 help alleviate this concern. First and foremost, the DAS tradeoff system allows a vessel to operate at a more deliberate pace, because most crews would be able to shuck 18,000 lbs. of scallops in less than 12 DAS. As a result, a vessel on a controlled access area trip can take longer breaks and keep more normal watches without exceeding the automatic DAS charge. Even if the vessel exceeds 12 DAS on a controlled access area trip, it would still be charged 12 DAS under Amendment 10 rules.

Secondly, there are three management measures that help to reduce the vessel's catch rates and keep it in balance with the shucking capacity: increasing the minimum ring size, increasing the twine top mesh, and the small dredge exemption program. A dredge with 4" rings is more efficient at catching large scallops, but also reduces the catch of smaller scallops (i.e. < 110 mm). As a result, fishing in areas with mixed scallop sizes with a dredge having 4" rings is expected to reduce the amount of culling needed when the gear comes aboard. This time-consuming (and back-breaking) culling process can affect shucking capacity and fatigue. Research has shown that a dredge outfitted with 4" rings also catches considerably less benthic invertebrates, often referred to as "trash" by fishermen. Retained scallops must be picked from the pile on deck and the less "trash" and small scallops exist in the pile, the easier it is to cull the scallops and discard the remaining catch. A larger minimum twine top mesh is also expected to

reduce the catches of certain species of finfish, which may also favorably affect culling time. Nothing suggests that a 4-inch minimum ring size will become a safety issue.

Although not required by regulations, some scallop vessels have begun using smaller dredges which are lighter and can help save fuel. A smaller dredge also catches less per hour and can help balance the catch with the crew's shucking ability in areas with high scallop biomass. As an added incentive which some vessels have taken advantage of, part-time and occasional limited access scallop vessels may opt to use a "small dredge" having a total width of no more than 10 ½ feet, and would be bumped up to the next DAS allocation category. This provision coupled with higher catches have made this conversion lucrative for the vessel and may have mitigated crew fatigue, although no statistics verify this potential result.

Another management measure that has a favorable effect on safety is the DAS system itself. Unless required by conservation objectives to minimize bycatch, there are no restrictions on when a limited access scallop vessel can fish. This avoids forcing scallop vessels from fishing when conditions are not suitable, unless the captain chooses to do so.

One related problem has been the ability for a vessel to return early from a controlled access area trip. Up until Amendment 10, vessels that terminated a trip early had to apply for an adjustment of its DAS charges for a broken trips and criteria for granting this adjustment have been rather stringent. Some vessels have decided to continue controlled access area trips during adverse conditions, and other vessels have decided not to take controlled access area trips because of the risk of loosing DAS on a broken trip.

Amendment 10 introduces a new system that will allow a vessel to receive a DAS adjustment based on the amount of scallops landed on the broken trip. At a minimum, a vessel would be charged 2 DAS and would loose 3,000 lbs. of scallop landings from controlled access area trips to prevent inappropriate use of this provision, but the measure reduces the risk of loosing DAS compared to the existing program. Thus vessels facing inclement weather or other adverse conditions that might compromise safety may be able to make a decision that favors a safer course of action. This is a better concept than the existing one, but from a safety perspective it is not as effective as no punitive action for valid trip terminations. If the trip is terminated for valid external reasons, fishermen should not be punished; the perceived punishment may lead to safety misjudgments on the part of fishermen.

Another similar measure that has favorable effects on safety will continue. Limited access scallop vessels are and will be able to carry forward up to 10 unused DAS into the next fishing year. Thus nearing the end of a fishing year, a captain or vessel owner will not feel obligated to make an end of the year trip or loose DAS. Thus inclement weather or other adverse conditions at the end of a fishing year might be avoided.

Finally, another factor that has a positive impact on safety is the management of scallops in controlled access areas without a hard scallop TAC or quota. Under the area-specific DAS allocation system, an area closure to avoid exceeding the scallop TAC is unnecessary. In some cases, area-specific finfish TACs may apply, but the DAS tradeoff system allows vessels time to explore areas or modify fishing behavior to avoid bycatch that would close areas to scallop fishing. These controlled access area measures help to reduce the potential for a derby-style fishery and therefore have a favorable effect on safety.