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Council Response to the 2008 ESA Section 7 Endangered Species Act Consultation for continued authorization of the scallop fishery under the Atlantic Sea Scallop FMP (Biological Opinion)

November 2008 Council Meeting

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1.0 COUNCIL CHARGE

1. Council should take the opportunity to develop measures to meet RPM#1 through FW21 taking into consideration the impacts of possible effort shifts of the fishery and other potential impacts (April 9, 2008 letter)
2. Council should conduct an analysis to: (a) Determine whether the RPM and Term and Condition provided in the March 14, 2008, Opinion is reasonable and prudent in light of the regulatory and statutory guidance provided, and if not, then (b) identify what revisions are necessary to make it reasonable and prudent or identify why there is no acceptable revision that would make it meet the standard. (August 1, 2008 letter)

RPM #1
NMFS must limit the number of open area scallop DAS and the number of allocated access area trips that can be used in Mid-Atlantic waters within the action area during the months of June through October or May through November each year.

Term and Condition #1
No later than the 2010 scallop fishing year, NMFS must limit the number of open area scallop DAS that can be used and the number of access area trips that can be taken each year in waters south of the northern boundaries of statistical areas 612, 613, 533, 534, 541-543, such that the total open area scallop DAS used and the total access area trips taken within such waters: (1) for the period of June through October, will not exceed 50% of the average number of open area DAS used, and the average number of access area trips taken for June through October in waters south of the same line during the 2004-2007 scallop fishing years, or (2) for the period of May through November, will not exceed 70% of the average number of open areas DAS used, and the average number of access area trips taken for May through November in waters south of the same line during the 2004-2007 scallop fishing years.

2.0 BACKGROUND ON BIOLOGICAL OPINIONS IN THE SCALLOP FISHERY

On March 14, 2008, NMFS completed an Endangered Species Act (ESA) Section 7 Consultation on the Atlantic Sea Scallop Fishery Management Plan.[1] Under the ESA, each federal agency is required to review its actions to determine whether such actions may affect listed species or critical habitat. Five biological opinions have been completed for the scallop fishery to date. All five have had the same conclusion: the scallop fishery may adversely affect, but is not likely to jeopardize, continued existence of four sea turtles (loggerheads, green, Kemp's ridley, and leatherback). Thus, NMFS is required to identify and implement reasonable and prudent measures (RPMs) necessary to minimize impacts of any incidental take. Five RPMs were identified in this biological opinion (BiOp). One RPM requires a limit of effort in the Mid-Atlantic during times when sea turtle distribution is expected to overlap with the fishery; the

[1] The full biological opinion can be found at http://www.nero.noaa.gov/prot_res/section7/.

other four are related to ongoing research needs and identification of measures to reduce interactions.

This section includes a brief summary of the main findings of the opinion. Section 6.0 of the opinion describes the effects of the fishery on ESA listed sea turtles. Section 8.0 is the overall conclusion of the opinion; Section 9.0 includes the incidental take statement (ITS), which includes the anticipated amount of "takes" in the scallop fishery as well as the measures that are required to minimize interactions of sea turtles. Any text in *italics* is pulled directly from the biological opinion.

Section 6.0 of the BiOp – Effects of the Proposed Action on ESA Listed Sea Turtles

This section identifies how the fishery affects the four turtle species. It provides information on the gear, number of turtles affected, how they are affected, and factors influencing risk of take. This section also describes the information used to determine the number of anticipated takes. The paragraph below is extracted from the biological opinion. In general, the Scallop FMP is not likely to strike sea turtles and the fishery does not reduce the availability of prey for the four turtle species.

> *Sea turtles are known to be killed and injured as a result of being struck by vessels on the water. Fishing vessels operating as a result of the continued authorization of the scallop fishery under the Scallop FMP are unlikely to strike loggerhead, leatherback, Kemp's ridley, or green sea turtles in the action area given that: (a) scallop fishing vessels operate at a relatively slow operating speed, (b) a portion of the fishing occurs in areas in which sea turtles are less likely (e.g., Georges Bank) or not likely (e.g., northern Gulf of Maine) to be present in comparison to Mid-Atlantic waters, (c) a portion of the fishing occurs at times when sea turtles are not likely to be present (the winter period in Mid-Atlantic waters and the late-fall through mid-spring in New England waters) (NMFS 2003; 2004a; 2004b), (d) sea turtles spend part of their time at depths out of range of a vessel collision with boats used in the scallop fishery, (e) the proposed action is not expected to increase the amount of vessel traffic in areas where sea turtles occur, and (f) the fishery will continued as a limited access fishery, and the number of participants are expected to be further constrained by Amendment 11 to the Scallop FMP.*

Section 8.0 of BiOp – Conclusion

The statement below is the overall conclusion of the opinion for this fishery at this time.

> *After reviewing the current status of loggerhead, leatherback, Kemp's ridley, and green sea turtles, the environmental baseline and cumulative effects in the action area, the effects of the continued authorization of the Scallop FMP (including the seasonal use of chain mat modified scallop dredge gear in Mid-Atlantic waters), it is NMFS' biological opinion that the proposed activity may adversely affect but is not likely to jeopardize the continued existence of loggerhead, leatherback, Kemp's ridley and green sea turtles.*

Section 9.0 of the BiOp – Incidental Take Statement

Section 9 of the Endangered Species Act and Federal regulations pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, unless a special exemption has been granted. Take is defined as "to harass, harm, pursue, hunt, shoot, capture, or collect, or to attempt to engage in any such conduct." Incidental take is defined as take that is incidental to, and not the purpose of, the execution of an otherwise lawful activity. Under the terms of Sections 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

When a proposed NMFS action is found to be consistent with section 7(a)(2) of the ESA, section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of incidental taking, if any. It also states that reasonable and prudent measures necessary to minimize impacts of any incidental take be provided along with implementing terms and conditions. The measures described below are non-discretionary and must therefore be undertaken in order for the exemption in section 7(o) (2) to apply. Failure to implement the terms and conditions through enforceable measures, may result in a lapse of the protective coverage section of 7(o) (2).

Anticipated Amount or Extent of Incidental Take

Based on data from observer reports for the scallop fishery, and the distribution and abundance of turtles in the action area, NMFS anticipates that the continued implementation of the Scallop FMP, may result in the taking of sea turtles as follows:

*- for scallop **dredge** gear, NMFS anticipates the **biennial** take of up to 929 loggerheads of which up to 595 will be lethal takes (includes serious injuries), as well as the annual take of 1 leatherback sea turtle (non-lethal), 2 Kemp's ridley (lethal or non-lethal), and 2 green sea turtles (lethal or non-lethal; and,*

*- for scallop **trawl** gear, NMFS anticipates the annual take of up to 154 loggerhead sea turtles of which up to 20 will be lethal takes, as well as 1 leatherback, 1 Kemp's ridley, and 1 green sea turtle, all of which may be lethal or non-lethal takes.*

The number of loggerhead sea turtles expected to be killed or suffer serious injuries as a result of interactions with scallop dredge gear is based on data collected in the 2003 fishing year, prior to the use of chain mats. Therefore, while the estimated 595 loggerhead takes, biennially, resulting in immediate death or serious injury is based on the best currently available information, it is also likely the worst case scenario.

Anticipated Impact of Incidental Take

NMFS has concluded that the continued operation of the scallop fishery may adversely affect but is not likely to jeopardize loggerhead, leatherback, Kemp's ridley, or green sea turtles. Nevertheless, NMFS must take action to minimize these takes. The following Reasonable and Prudent Measures (RPMs) have been identified as ways to minimize sea turtle interactions with the scallop fishery now and to generate the information necessary in the future to continue to minimize incidental takes. These measures are non-discretionary and must be implemented by NMFS. Many of these measures were included as RPMs with the September 18, 2006 Opinion. They are repeated here because they still meet the criteria for an RPM and reflect work in progress to minimize the taking of sea turtles in scallop dredge and/or scallop trawl gear.

Reasonable and Prudent Measures

NMFS has determined that the following reasonable and prudent measures are necessary or appropriate to minimize impacts of incidental take of sea turtles:

1. *NMFS must limit the number of open area scallop DAS and the number of allocated access area trips that can be used in Mid-Atlantic waters within the action area during the months of June through October or May through November each year.*
2. *NMFS must continue to investigate and implement, as appropriate, gear modifications for scallop dredge and trawl gear to reduce the capture of sea turtles and/or the severity of the interactions that occur.*
3. *NMFS must review available data to determine whether there are areas (i.e., "hot spots") within the action area where sea turtle interactions with scallop dredge and/or trawl gear are more likely to occur.*
4. *NMFS must quantify the extent to which chain mats reduce the number of serious injuries/deaths of sea turtles that interact with scallop dredge gear.*
5. *NMFS must determine (a) the extent to which sea turtle interactions with scallop dredge gear occur on the bottom vs. within the water column and (b) the effect on sea turtles of being struck by the scallop dredge.*

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, and regulations issued pursuant to section 4(d), NMFS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. *No later than the 2010 scallop fishing year, NMFS must limit the number of open area scallop DAS that can be used, and the number of access area trips that can be taken each year in the waters south of the northern boundaries of statistical areas 612, 613, 533, 534, 541-543 such that the total open area scallop DAS used, and the total access area trips taken within such waters: (1) for the period of June through October, will not exceed 50% of the average number of open area DAS used, and the average number of access area trips taken for June*

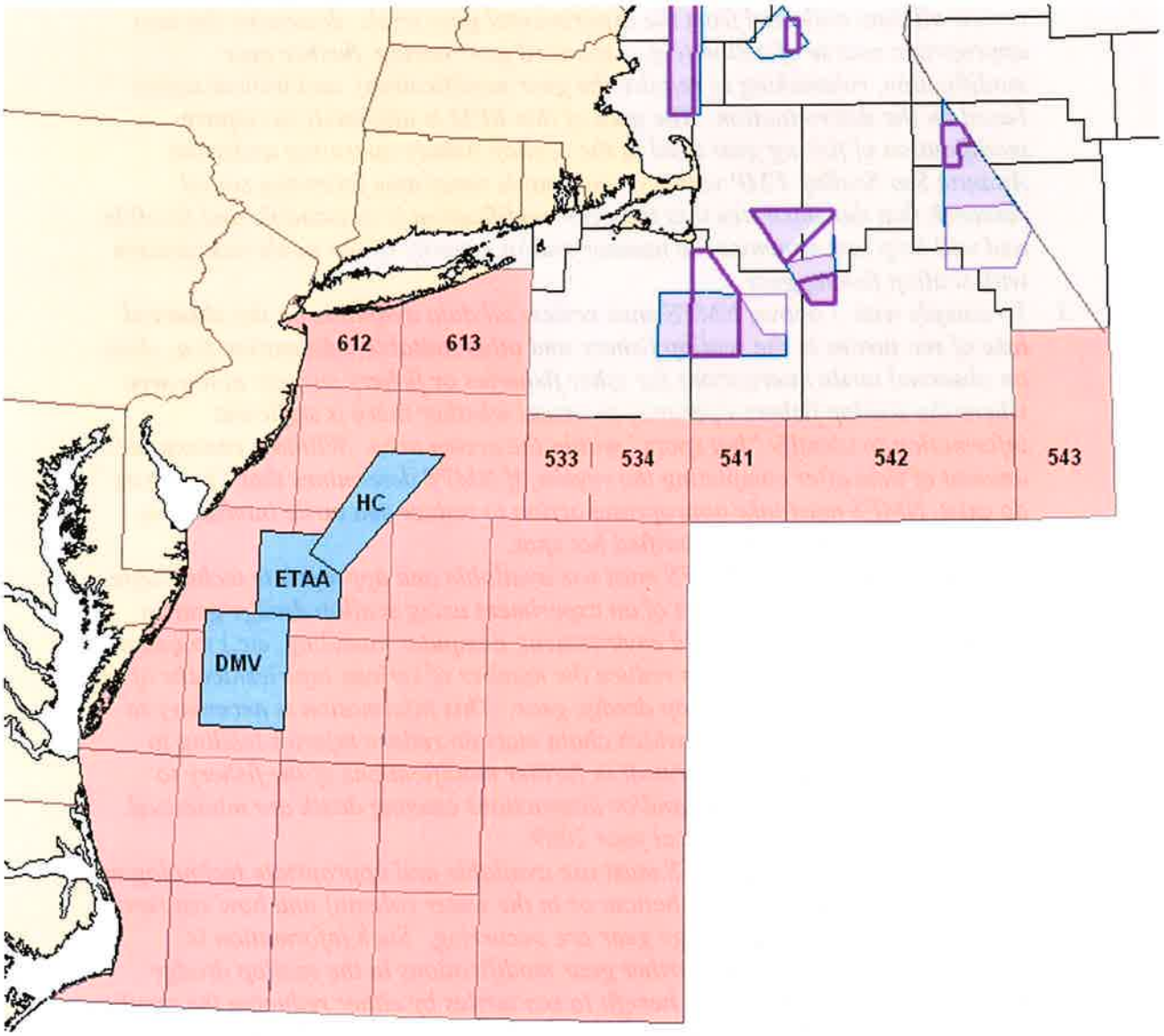
through October in waters south of the same line during the 2004-2007 scallop fishing years, or (2) for the period of May through November, will not exceed 70% of the average number of open area DAS used, and the average number of access area trips taken for May through November in waters south of the same line during the 2004-2007 scallop fishing years.

2. *To comply with 2 above, NMFS must continue to investigate modifications of scallop trawl and dredge gear. Within a reasonable amount of time following completion of an experimental gear trial from or by any source, NMFS must review all data collected from the experimental gear trials, determine the next appropriate course of action (e.g., expanded gear testing, further gear modification, rulemaking to require the gear modification), and initiate action based on the determination. The goal of this RPM is ultimately to require modification of fishing gear used in the scallop fishery operating under the Atlantic Sea Scallop FMP within a reasonable timeframe following sound research that demonstrates that the gear modification is reasonable and feasible and will help tom minimize the number and/or severity of sea turtle interactions with scallop fishing gear.*
3. *To comply with 3 above, NMFS must review all data available on the observed take of sea turtles in the scallop fishery and other suitable information (i.e., data on observed turtle interactions for other fisheries or fishery surveys in the area where the scallop fishery operates) to assess whether there is sufficient information to identify "hot spots" within the action area. Within a reasonable amount of time after completing the review, if NMFS determines that "hot spots" do exist, NMFS must take appropriate action to reduce sea turtle interactions and/or impacts within any identified hot spot.*
4. *To comply with 4 above, NMFS must use available and appropriate technologies (e.g., underwater video as part of an experiment using scallop dredge gear in either the natural or controlled environment, computer modeling, etc.) to quantify the extent to which chain mats reduce the number of serious injuries/deaths of sea turtles that interact with scallop dredge gear. This information is necessary to better determine the extent to which chain mats do reduce injuries leading to death for sea turtles and may result in further modifications of the fishery to ensure sea turtle interactions and/or interactions causing death are minimized. Initiate study no later than fiscal year 2009.*
5. *To comply with 5 above, NMFS must use available and appropriate technologies to better determine where (on bottom or in the water column) and how sea turtle interactions with scallop dredge gear are occurring. Such information is necessary to assess whether further gear modifications in the scallop dredge fishery will actually provide a benefit to sea turtles by either reducing the number of interactions or the number of interactions causing mortal injuries. Initiate study no later than fiscal year 2009.*

The report also includes other requirements for monitoring as well as several conservation recommendations. Conservation recommendations are discretionary activities designed to minimize or avoid adverse effects of an action, to help implement recovery plans, or to develop information. They are recommendations, not requirements like RPMs.

The figure below depicts the area that is referenced in the first Terms and Conditions. It is referenced as the "Mid-Atlantic" within this document.

Figure 1 – Area defined in the turtle biological opinion
Waters south of the northern boundaries of statistical areas 612, 613, 533, 534, 541, 542, and 543. In this memo this area is sometimes described as the "Mid-Atlantic".



2.1 PREVIOUS BIOLOGICAL OPINIONS FOR THE SCALLOP FMP

This section summarizes the previous four biological opinions that have been completed for the continued authorization of the scallop fishery. The first opinion was completed in February 2003 and the fifth opinion (the one the Council is currently responding to) was completed in March 2008. This section is an overview of the main reasons why each opinion was initiated, the findings of each opinion, and some additional information about the current opinion.

Consultation 1 The first formal section 7 consultation on the continued authorization of the scallop fishery was initiated December 21, 2001. The Opinion concluded on February 24, 2003, that the continued authorization of the scallop fishery would not jeopardize the continued existence of loggerhead, leatherback, Kemp's ridley, and green sea turtles, or any other ESA-listed species under NMFS jurisdiction (NMFS 2003). An ITS of 97 turtles was provided based on the estimated annual capture of turtles in fishing gear used in the scallop dredge and trawl fisheries. Twenty-nine of the turtles captured were expected to die as a result of capture. RPMs were provided.

Consultation 2 Consultation was reinitiated on November 21, 2003, for two reasons: First, new information on the capture of sea turtles in gear used in the scallop fishery revealed that the continued authorization of the scallop fishery may affect listed species or critical habitat in a manner or to an extent not previously considered and, second, the agency action was proposed to be modified by Amendment 10 to the Scallop FMP in a manner that caused an effect to the listed species or critical habitat not considered in the previous opinion. NMFS subsequently modified the proposed action when it initiated an emergency action for the scallop fishery on January 20, 2004. The consultation was, therefore, revised to consider the effects to ESA-listed species from the modified proposed action. The Opinion concluded (on February 23, 2004) that the continued authorization of the scallop fishery, including implementation of Amendment 10 and emergency measures, would not jeopardize the continued existence of loggerhead, leatherback, Kemp's ridley, and green sea turtles, or any other ESA-listed species under NMFS jurisdiction (NMFS 2004a). An ITS of 111 turtles was provided for the scallop dredge gear and scallop trawl gear combined. Thirty-three of the turtles captured were expected to die as a result of capture. RPMs were provided.

Consultation 3 On September 3, 2004, consultation was reinitiated to consider new information on the effects of the Atlantic sea scallop fishery on sea turtles that was received from the NEFSC. This was the first consultation for which there was an NEFSC estimate of the take of loggerhead sea turtles in the fishery based on observer coverage within and outside of access areas. Consultation was completed on December 15, 2004, and concluded that the anticipated capture of 753 turtles (752 loggerheads and 1 leatherback sea turtle) in the scallop fishery, resulting in death of up to 482 loggerheads and 1 leatherback, was not expected to result in jeopardy to loggerhead and leatherback sea turtles (NMFS 2004b). RPMs were provided.

Consultation 4 Consultation was reinitiated on November 1, 2005, based on new information on the number of observed turtle takes in the trawl component of the Atlantic sea scallop fishery, as well as new information on the species that interact with scallop fishing gear, and the area(s) where interactions occur. NMFS concluded that consultation on September 18, 2006, with the determination that the continued authorization of the fishery was not likely to result in jeopardy

to any ESA-listed species under NMFS jurisdiction (NMFS 2006a). However, sea turtles were expected to interact with scallop dredge and trawl gear used in the fishery such that turtles would come into physical contact with the gear (be struck by or swim into) and would be captured, with the exception that chain-mat equipped dredge gear would prevent most captures of turtles struck by such gear. In accordance with the regulations (50 CFR 402.02), such interactions are considered "incidental takes." As described in the ITS, up to 760 sea turtles (752 in scallop dredge gear and 8 in scallop trawl gear) were anticipated to be taken annually as a result of the continued authorization of the Atlantic sea scallop fishery. Of these, up to 490 (482 in scallop dredge gear and 8 in scallop trawl gear) were anticipated to result in death. Nearly all of the takes (749 of 752 for dredge gear and 5 of 8 for trawl gear) were anticipated to be loggerhead sea turtles. RPMs were provided.

Consultation 5 (current BiOp). Consultation was reinitiated on April 3, 2007. On February 23, 2007, the NEFSC released NEFSC Reference Document 07-04 (Murray 2007). Based on observer data for the scallop trawl fishery for 2004 and 2005, Murray (2007) provided the first estimates of the average annual bycatch of loggerhead sea turtles in scallop trawl gear. NMFS NERO determined that the reference document presented new information regarding the capture of sea turtles in scallop trawl gear that reveals effects of the action that may affect listed sea turtles in a manner or to an extent not previously considered. Therefore, in accordance with the regulations at 50 CFR 402.16, formal consultation was reinitiated on April 3, 2007, to reconsider the effects of the Atlantic sea scallop fishery on ESA-listed sea turtles. Consultation was completed on March 14, 2008.

As described above, and in the March 14, 2008 Biological Opinion, loggerhead sea turtles are the turtle species most commonly observed captured in or retained upon scallop dredge and trawl gear. Nearly all of the known interactions to date are of loggerhead sea turtles. During the course of the five consultations, NMFS has received new information on the status and or trend of loggerhead sea turtles in the western Atlantic. The most recent Biological Opinion considered the trend for loggerheads in the western Atlantic to be declining. In past consultations, the trend was based on some of the identified nesting groups – most notably the northern nesting group and the south Florida nesting group. While the northern nesting group has previously been described as declining (in earlier scallop biological opinions as well as other opinions prepared by the agency), the south Florida nesting group has been considered to be increasing. Nesting trend data for both nesting groups in recent years has shown a decline in nesting. The south Florida nesting group is the second largest loggerhead nesting group in the world and the largest nesting group in the Atlantic.

The December 15, 2004 biological opinion referred to the results of modeling conducted by the Southeast Fisheries Science Center (SEFSC) that suggested that the trend for loggerhead sea turtles originating from beaches of the northern nesting group would improve (i.e., move from declining to stable or declining to increasing) with the requirement to use turtle excluder devices (TEDs) with larger opening in the Southeast Atlantic and Gulf of Mexico shrimp fishery. Since the other western Atlantic nesting groups were believed to have a more positive trend than the northern nesting group, changes to the TED requirements that improved the trend for the northern nesting group would be expected to improve the trend of all of the nesting groups, and to a greater degree than that predicted by the modeling for the northern nesting group. The

September 18, 2006, biological opinion also referred to these model results while noting that new information had been presented regarding declines in nesting for loggerheads of the south Florida nesting group.

Additional information on nesting trends for the western Atlantic loggerhead nesting groups has become available since completion of the September 18, 2006, Opinion. As described in section 3.1.1 of the March 14, 2008, biological opinion, nest counts for four of the five western Atlantic loggerhead nesting groups show a declining trend. No trend is apparent for the fifth nesting group. The Loggerhead Turtle Expert Working Group (TWEG) has examined the nesting data and concluded that the declines in nest counts are real (Loggerhead TEWG 2007). The cause(s) of the decline in nesting, and the impact to the loggerhead nesting groups is unknown (Loggerhead TWEG 2007). In light of this information, NMFS has chosen not to rely on the conclusions of NMFS SEFSC (2001) since the modeling has not been re-run using the new nesting trend data, and since it is unknown whether it is correct to assume that the northern nesting group has the least favorable status compared to the other western Atlantic nesting groups.

2.2 REGULATORY GUIDANCE

Conclusions from BiOp and regulatory guidance to keep in mind when considering a response:

- Under ESA NMFS is required to review an action under their authority (a fishery) to determine if it affects listed species or critical habitat
- Analysis in this opinion showed that continued authorization of scallop fishery will not appreciably reduce the survival of the turtle species in the Atlantic
- Opinion concluded that the scallop fishery may adversely affect but is not likely to jeopardize the continued existence of four sea turtle species
- A reasonable and prudent measure is a nondiscretionary measure that is necessary and appropriate to minimize impacts (amount or extent of incidental take)
- Terms and conditions set out the specific methods by which the reasonable and prudent measures are to be accomplished
- A reasonable and prudent measure, along with the terms and conditions that implement it, cannot alter the basic design, location, scope, duration, or timing of the action and may involve only minor changes

3.0 PDT INPUT

3.1 ANALYSIS OF EXISTING TERM AND CONDITION FOR RPM#1

The PDT analyzed the existing term and condition two ways to determine if it is reasonable and prudent. First, fishing effort data was summarized to evaluate if the term and condition (both alternatives: 50% reduction of effort in June-Oct and 30% reduction of effort in May-Nov) would cause more than a minor change in the fishery based on the threshold suggested by NMFS (at least one trip per vessel) (Section 3.1.1). Second, the PDT also developed and recommends a different "more than a minor change" threshold based on a request from the Scallop Committee, which is described in Section 3.1.2. This section also evaluates whether the existing term and condition is reasonable and prudent based on this threshold for more than a minor change to the fishery. Appendix 2 to this document includes a more detailed discussion of this analysis. Lastly, Section 3.1.3 is a summary of the overall input from the PDT on the existing RPM and term and condition (T&C), suggestions for revised RPM and term and condition language, and input about why it is important to consider all these issues and impacts in the full framework process.

3.1.1 Based on more than minor threshold provided by NMFS

In order to assess whether the first T& C is reasonable and prudent, the PDT analyzed fishing effort data from the baseline period and combined it with what is projected from 2010. Data from limited access vessel monitoring systems (VMS), vessel trip reports (VTR) and day-at-sea (DAS) databases were pulled for fishing years 2004-2007. Trips with any time spent fishing in the Mid-Atlantic were summarized.

3.1.1.1 Access Areas

In terms of access areas, an average of 5.5 access area trips was allocated each year for the 2004-2007 baseline period; an average of 2.5 in the Mid-Atlantic (MA) and 3 in Georges Bank (GB). But it is very important to note that each year varied significantly in terms of where access area trips were allocated and where new access areas were closed. In 2010, FW19 projected that 6 access area trips would be allocated; 5 in the Mid-Atlantic (3 in ET, 2 in Delmarva) and 1 on GB. It is possible that after scallop surveys are conducted in these areas in 2009, the 2010 projections could change. For example, preliminary results from the 2008 surveys suggest that 2 trips in Delmarva may not be feasible. It is also important to note that these trips are allocated by year, not season, and fishermen choose during which months to fish, outside of the 2 month closure in ETA for turtles and the season restrictions in GB to minimize impacts on YT flounder.

The number of access area trips taken was analyzed by summarizing the count of trips by access area code using VMS data. They were further summarized by month. For ETA, the area was only open to fishing in 2007 and most trips were taken outside of the two season windows suggested in the BiOp (out of a total of 900 trips, 100 were taken during J-O and 270 during M-N). It needs to be pointed out that a 2 month seasonal closure was already in place to minimize interactions with sea turtles from September 1 through October 31 in 2007. For Hudson Canyon, it varied more by year, but about half of the total trips were taken during the shorter time window and over 75% of trips during the longer window. Delmarva was an open area for most of the

baseline period (2004-2006), and was closed in 2007. This area will be open for one trip in 2009 and potentially 2 trips in 2010.

In a letter the agency sent the Council in August, it was explained that the agency believes that allocating less than one trip in the summer/fall would be more than a minor change for the fishery. NMFS included two time windows in case it was found that the shorter time window with a 50% reduction did not provide sufficient trips for each vessel to get one trip between June-Oct. Therefore, a longer timeframe (May-November) with a 30% reduction in access area trips used was offered as an option if the shorter window was too restrictive.

Based on the analyses completed by the PDT, if the fishery is limited to use 50% less trips during June-Oct or 30% less trips from May-Nov compared to the baseline average of trips used in access areas from 2004-2007, there will not be enough trips to allocate at least one trip to each limited access vessel based on the current number (325) of full-time equivalent limited access vessels (Table 1). For example, a total of 586 access area trips were used in the Mid-Atlantic from 2004-2007 for an average of 147 trips per year. A 50% reduction from 147 would result in a total of 73 trips available for the June-Oct time period. For the May through November time period, a total of 973 access area trips were taken, an average of 243 trips per year, so a 30% reduction from that would be 160 trips. Currently there are about 325 full-time equivalent limited access vessels in the scallop fishery. Therefore, neither 73 trips for the shorter time period nor 160 trips for the longer time period would allow each limited access vessel to use one trip during either window of time, regardless of which areas are expected to open in 2010 and how many Mid-Atlantic access areas trips are allowed. If the equivalent of 73 18,000 pound trips were allocated for the 5 month window that equals approximately 1.3 million pounds – divided by 325 vessels would provide approximately one 4,000 pound trip per limited access vessel. Similarly, 160 trips for the 7 month period multiplied by 18,000 pounds equals 2.9 million pounds – divided by 325 vessels equals about one 8,800 pound trip per vessel.

Table 1 – Summary of Mid-Atlantic access area trips taken from 2004-2007

	June-Oct	May-Nov	Total Year
All MA access areas	**586**	**973**	**1830**
2004-2007 average	147	243	458
% limit	73 (50% less)	160 (30% less)	
Elephant Trunk	**108**	**271**	**909**
2004-2007 average	27	68	227
% limit	13 (50% less)	45 (30% less)	
Hudson Canyon	**486**	**703**	**921**
2004-2007 average	122	176	230
% limit	61 (50% less)	123 (30% less)	
Delmarva	?? – This area was an open area during 2004-2007 and closed in 2008		

3.1.1.2 Open Areas

Overall, from 2004-2007, an average of about 19,000 open area DAS were allocated to the limited access fishery (46 per individual FT vessel). On average, about 15,700 DAS were used in open areas for this same time period. For trips that spent any time in the Mid-Atlantic, the average DAS used from 2004-2007 was 8,250 DAS per year (3,505 during June-Oct and 5,353

for May-Nov). On average, 42% of MA open area DAS were used during J-O and about 63% for M-N. If the BiOp requires a 50% reduction from average DAS used from J-O, that equals 1,753 DAS; a 30% reduction for the longer time frame would be a total of 3,747 DAS used permitted for May-Nov (Table 2).

When the PDT first began working on this issue it used the 2010 projections presented in FW19. Those projections included a total estimate of 8,000 open area DAS. This amount was based on several assumptions; primarily that HC would be closed on March 1, 2008 (which was delayed several months), 6 access area trips would be allocated in 2010 (in reality it looks like only 5 will be allocated), and HC would be open in 2010 (most likely this area will remain closed because significant recruitment was seen in that area in 2008). The PDT discussed at it's meeting in October that the projected allocations for 2010 will more likely be similar to 2009, compared to the 2010 projections from FW19. This is one of the reasons that it is very difficult to identify precise measures for this type of issue (Term and Condition) before updated projections are available.

Therefore, if 2010 allocations are similar to 2009 then the fishery will likely be allocated 5 access area trips (3 in ETA, 1 in Delmarva, and one on GB) as well as approximately 42 open area DAS per full-time limited access vessel (13,650 DAS total). The distribution of DAS is expected to divide evenly between the Mid-Atlantic and Georges Bank, about 6,825 DAS in each area. This is different compared to the values presented at the first Committee meeting because open area DAS is expected to be slightly less in the MA (FW19 projected 7000 DAS would be used in MA in 2010). If the same usage percentages by season are applied from the baseline period (42% of MA DAS used during Jun-Oct and 63% during May-Nov) the expected DAS used for both scenarios in 2010 would be 2,867 MA DAS in June-Oct (42% of 6825) and 4,300 MA DAS in May-Nov (63% of 6825). Both these values are greater than the values generated from 50% or 30% less DAS used during the baseline years: 1,753 DAS and 3,747 DAS respectively. Therefore, in order to comply with the current term and condition, restrictions would have to be put in place to restrict open area usage during these time windows.

Table 2 – Summary of open area DAS used from 2004-2007 compared to 2010 projections

	Average DAS used (2004-2007)	DAS used in FY2010 (projected)	Compared to baseline average	% limit recommended in BiOp
Mid-Atlantic Open Area DAS				
Total	8,250	6,825	↓1425	
J-O	3,505 (42% of 8250)	2,867 (42% of 6825)	↓638	1,753 (50% of 3,505) (1,114 DAS less than projected use)
M-N	5,353 (63% of 8250)	4,300 (63% of 6825)	↓1053 (18% less baseline)	3,747 (30% of 5,353) (553 DAS less than projected use)

The agency did not provide an explanation or recommendation for the threshold that should be used for open area effort in terms of what limit would be more than a minor change to the fishery. Therefore, the PDT used the same logic and assumed that if vessels were not able to take at least one open area trip during the time window that would be more than a minor change.

Restrict each vessel to one open area trip during turtle window
Using the same logic as the access area approach, if at least one *open area* trip could be taken during the various windows of time, then that would not be more than a minor change. For example, if 325 vessels were permitted to take one open area trip during the summer/fall in the Mid-Atlantic, then the rest of open area DAS could be used in either GB or in the MA outside the turtle window of June-Oct or May-Nov. If an average open area trip is 10 DAS, that would equal about 3,250 DAS; that value is above the expected DAS used for June-Oct in 2010 (2,867). One trip during May-Nov would be less than DAS projected to be used in 2010 (4,300 DAS projected). However, the average trip length for open areas from 2004-2007 was closer to 7 DAS based on DAS data. Trip length in open areas has reduced in the fishery overall and does vary by year (i.e. in 2005 the average was 5.5 DAS for open area trips and in 2007 the average was over 8 DAS). Multiplying 325 vessels by 7 DAS equals 2,275 DAS, which is above the recommended June-Oct maximum of DAS (1,753 DAS) but below the M-N maximum DAS value (3,747 DAS).

Therefore, based on the average trip length from 2004-2007 (7 DAS) each vessel could not be allocated one trip during the June-Oct time period and still meet the recommended maximum of 1,753 DAS. However, each vessel would likely be able to take at least one trip during the longer time period (May-Nov) in open areas and still be below the recommended maximum of 3,747.

3.1.1.3 PDT response based on agency threshold for more than minor

No, the term and condition for RPM #1 is not reasonable and prudent, based on guidance from NMFS that defines more than a minor change as less than one access area trip available per vessel during either time window. Based on reductions in the term and condition only 73 trips would be available for the June-Oct period in access areas and 160 for the longer time window. A total of 325 would be necessary for each vessel to be allocated at least one access area trip. Section 3.1.1.1 describes the analysis for access areas and Section 3.1.1.2 describes the analysis for open areas.

3.1.2 Based on PDT recommendation of more than minor threshold

There is no official guidance on how to define more than a minor change. We know that based on ESA regulations, a reasonable and prudent measure, along with the terms and conditions that implement them, cannot alter the basic design, location, scope, duration, or timing of the action and may involve only minor changes. But, how to define a minor change is not specified. The Committee requested that the PDT provide an analysis that would help identify what is more than a minor change in the scallop fishery for this particular biological opinion. The PDT has met several times on this issue and after much discussion provides the recommendation below.

The scallop fishery is managed under an adaptive rotational management plan. A substantial portion of total fishing effort is allocated into specific areas to maximize yield. Outside constraints on how effort is allocated and used over time or space can have impacts on the overall effectiveness of the program and fishing mortality. Therefore, the PDT recommends that the threshold for more than a minor change should be based on an amount of "effort shift" imposed by the RPM and Term and Condition. Spatial and/or temporal shifts in effort can increase overall fishing mortality, and depending on the nature and extent of the effort shift

imposed by the RPM, more than minor changes can result if fishing mortality increases causing noticeable changes in yield, landings and revenue. In terms of this biological opinion, the premise seems to be to limit scallop fishing effort during the time of year and area where the overlap of turtles and scallop fishing activity is most likely to occur. Under area rotation fishing effort is allocated in certain areas when yield is expected to be higher, and shifting that effort to other times and areas can reduce landings per unit of effort, and thus can have impacts on EFH, bycatch, revenue loss etc, and most importantly for this purpose, will increase fishing mortality. In both the short and long term, increases in fishing mortality that are more than a small amount will cause more than a minor change in the fishery.

Based on scallop meat weight analysis by month, it is shown that there are seasonal effects on relative fishing mortality (See Appendix 1 for more information). In general, the highest meat weights in the Mid-Atlantic are from April through August. On average, 42% of all fishing in the Mid-Atlantic has occurred between the months of June-October. If effort is limited during that period to reduce impacts on turtles, then that effort will be displaced to the other months of the year when meat weights are lower. Depending on the season and amount of effort that is displaced the change in yield is expected to vary by 5-10% based on changes in average meat weights by month.

The PDT developed a model that estimates changes in fishing mortality, effort shift and impacts on revenue when limitations are placed on the scallop fishery by season and/or area. This model was first developed to assess whether the existing term and condition is reasonable and prudent, (more than a minor change) but it can also be used to help compare measures that would limit effort and cause some level of effort shift. The differences in fishing mortality, yield and revenue impacts can be compared. See Appendix 2 for more information on this model.

In addition to the primary threshold for more than minor (percent change in effort shift) the PDT included a description of other factors that should also be considered when identifying a more than minor change that would also be affected by a shift of effort including: concern about safety at sea (shift to winter months), changes in bycatch (i.e. fluke bycatch increases in winter months because it overlaps with the scallop fishery offshore), revenue impacts because of reduced catch and changes in price, costs, markets, supply, etc., impacts on ability of observer program to maintain coverage from surges and shifts in effort, and general impacts of altering rotational area management and compromising the ability to achieve optimum yield.

3.1.2.1 Description of model used to assess more than minor change

A model was developed to estimate changes in fishing mortality, effort shift and impacts on revenue when limitations are placed on the scallop fishery by season and/or area. It includes several important assumptions that are described below. Appendix 2 is a more detailed description of the model used and various outputs it generates.

1) The seasonal composition of effort in the Mid-Atlantic is assumed to be equal to the average percentage distribution of effort during 2004-2007: 42% during June-Oct, 48% during Nov-May. The model assumes that effort will be distributed by these percentages in 2010 as well.

2) Effort Displacement for Open Areas: 100%

It is assumed that if open area DAS in the Mid-Atlantic are reduced by 50% or by some other proportion during the closure window of either July-Oct, or May-Nov, the vessels will use these days at other times or in the GB open areas. The current estimate of open area DAS in 2010 is 42 DAS for full-time vessels, of which half is expected to be used in GB and the other half in the Mid-Atlantic areas. Based on the historical distribution of effort by season, 9 of 21 days are assumed to be used in Mid-Atlantic open areas during June to October with no turtle RPM. Even with a 50% reduction in open area DAS (compared to 2004-07 baseline), the number of days that would be shifted to other seasons or areas would be less than 4 days per full-time vessel. Therefore, this model assumes that vessels will have the opportunity to use these 4 days outside the turtle window.

3) Effort Displacement for access areas: 100%

In 2010 it is estimated that full-time vessels will be allocated 4 access area trips in the Mid-Atlantic, and it is assumed that 42% of these trips (average 1.68 trips per FT vessel or 546 total trips) will be used in this area during June to October in the absence of RPM restrictions. With the existing RPM restriction, it is assumed that the number of these trips will be reduced to 0.2 trips per vessel (or 74 trips total) (50% reduction from average number of trips taken during baseline). However, given that these pounds can not be landed from other areas, it is highly likely that the vessels will attempt to take their access area trips during months when the areas are open to fishing, i.e., either outside of the June-October or May-November window. It is noted that assuming 100% displacement is high, and it reflects the best case scenario in terms of potential impacts. The PDT discussed that it may not be realistic that all vessels will take multiple trips in the months outside the proposed turtle windows.

4) The reduction in meat weight

Shifting effort from June-October to November–May will result in an 8% loss in the meat-weight. This is based on an analysis of changes in meat weight yield by season (Appendix 1). Some months will have higher losses and some lower depending on the length of the closure and when effort is displaced, but average yield will be 8% less during Nov-May compared to June-Oct. The impacts of this loss on landings, fishing mortality and revenues would depend on which of the two management scenarios are considered. Letting vessels land 18,000 lb. and take the same number of access area trips would result in an increase of fishing mortality since meat-weights will be lower outside the window for turtle closure, thus vessels would have to harvest a higher quantity of scallops. Since Framework 21 will take this fact into account, either the possession limit would need to be lowered, or the number of trips should be reduced so that there will be no overfishing due to the shift of effort to November-May window. This model assumes an 8% reduction in landings from the access areas to account for the estimated loss of yield. The reduction in meat-weight will lower landings in the open areas because LPUE would be lower during November-May as compared to June-October. The analyses provided below are based on the assumption that there will be adjustments in the possession limit or the number of trips to prevent overfishing.

5) Meat weight assumptions

The economic model uses the LPUE estimates for open and access area trips from the biological model results. These estimates are provided as an average for the year. For example, LPUE for

Mid-Atlantic access areas is assumed to be 2081 pounds per day-at-sea used on an annual basis. In order to estimate average LPUE for June-Oct, the average LPUE is multiplied by 104%, and to estimate for Nov-May the average LPUE is multiplied by 96%. These adjustments correspond to 8% less meat-weight during the Nov-May season compared to June-Oct.

Staff presented a threshold of effort shift and change in fishing mortality (F) in order to evaluate whether the current RPM and term and condition are reasonable and prudent (more than minor change). For example, an increase in fishing mortality of 0.01 was evaluated as a threshold for more than a minor change for this biological opinion. An increase in fishing mortality of 0.01 is equivalent to a 12% effort shift multiplied by the assumed 8% loss of yield when effort is shifted from June-Oct to Nov-May (0.12*0.08 = 0.0096). Ultimately, Committee decided that identifying a precise threshold for more than minor is not preferred; instead during development of FW21 the PDT should evaluate what limit on effort will not result in more than a minor impact on fishing mortality or the fishery using updated information and considering all the issues described later in Section 3.1.3.

The next section assesses the existing RPM compared to status quo – what is currently expected for 2010. It is important to note that specifications for 2010 will not be known until fall 2009, after the 2009 scallop surveys have been conducted and results combined with 2008 results. Therefore, DAS and access area trips used in this analysis may change when more updated biomass information is available.

3.1.2.2 Assessment of existing term and condition

The PDT concluded that the existing term and conditions would not meet the agency recommended standard for a change that is less than minor because based on effort data during the baseline there would not be enough trips to allocate one trip to each vessel during either turtle window (Section 3.1.1). This section assesses the existing term and conditions based on the revised standard for more than minor as described above and focuses on the June-Oct alternative only for simplicity; however, both options have been analyzed and are summarized in Appendix 2.

The analysis shows the existing RPM will result in a shift of effort from June-October season to November-May season. Without the RPM restrictions, 51% of the total scallop fishing effort is estimated to occur during June-October and the remaining 49% from November-May, which is slightly different from the historical average of 54% and 46% respectively for the same seasons for 1999-2007 (See Table 3 in Appendix 2). If effort is reduced by 50% during June-October in accordance with the existing term and condition for RPM#1, the composition of effort would change significantly compared both to the status quo and historical average. It would result in a more than minor effort shift of 5,163 days-at-sea used, or 19% of the total effort estimated to occur during the 2010 fishing year to the November – May season. As a result of this shift, only 32% of the total effort will take place during June-October, instead of 51% estimated under status quo during the same season: 68% of the effort will occur during November to May instead of 49% expected to occur without the turtle restrictions (status quo) (See Table 3).

This effort shift is expected to have a more than minor effect on the fishing mortality if there was no adjustment in possession limit or the number of access area trips, and same amount in total

pounds of scallops were landed. Because the meat weight is estimated to be about 8% lower during November-May compared to the June-October season, the fishing mortality would increase by about 0.015 as vessels attempt to catch more scallops (smaller in size) to make up for the loss in meat weight and still land 18,000 lb. per trip. This change in F caused by shifting 19% of 2010 effort will have more than a minor impact because it will change the location and timing of effort and overall F will be higher compared to status quo.

Table 3. Effort shifts and impacts on F

Scenarios	Data	June-Oct	Nov-May	Total
Historical Average (1999-2006)	Percentage DAS-used (%)	54%	46%	100%
Status quo	DAS-used	13,898	13,587	27,486
	Percentage DAS-used (%)	**51%**	**49%**	**100%**
RPM Restrictions (50 % Reduction in effort during June-Oct)	DAS-used	8,736	18,750	27,486
	Percentage DAS-used (%)	**32%**	**68%**	**100%**
	Shift in effort (DAS) to Nov-May	5,163 (or 37% of total DAS-used in June-Oct)		
	Shift in effort to Nov-May as % of total effort	**19% of the total DAS-used estimated for FY2010**		
	Change in F	**0.015**		

Since Framework 21 will take into account this fact, however, either the possession limit would need to be lowered, or the number of trips should be reduced so that there will be no overfishing due to the shift of effort to November-May window. As a result, both access and open area landings would be lower than expected under status quo and without the turtle restrictions. The reduction in meat-weight will lower landings in the open areas because LPUE would be lower during November-May as compared to June-October. Therefore, overall scallop landings are expected to decline by 784,098 lbs and be composed of smaller sized scallops relative to the status quo landings (Table 4).

Table 4. Effort Shifts and impacts on landings

Scenarios	Data	June-Oct	Nov-May	Total
Historical Average	Percentage landings (%)	53%	47%	100%
Status quo	Scallop Landings (lb.)	25,235,817	21,722,537	46,925,525
	Percentage landings (%)	54%	46%	100%
RPM Restrictions (50 % Reduction in effort during June-Oct)	Scallop Landings (lb.)	15,042,541	31,131,715	46,141,426
	Percentage landings (%)	**33%**	**67%**	**100%**
	Change in landings compared to Status quo (lb)	**-10,193,276**	**9,409,178**	**-784,098**
	Landings shifted to Nov-May as a % of landings in June-October	**40%**		
	Shift in landings to Nov-May as % of total landings	**22%**		

These estimates were based on a best case scenario, which assumed that all scallop vessels will be able shift their trips to the November - May window, and that there will be a 100% effort displacement. The actual reduction in landings is expected to exceed the amount shown in Table 4 for the following reasons:

- Although it would be reasonable to expect that vessels would be more inclined to shift their effort to May, if scallop fishermen are already fishing the maximum that they can in May because that is the peak time for meat weights, there may not be time during the month of May to absorb any effort shift.
- This would mean that vessels would have to shift their effort to relatively less productive months, including the winter months of December, January and February. During these months average meat-weight may even be even lower compared to the average meat-weight from November to May. In addition, some vessels may not be able to take their trips during late fall or winter months due to weather constraints.
- The decline in scallop landings (by 784,098 lbs.) is estimated by taking into account the reduction in meat-weight during the November-May window. There would be an additional decline in LPUE, however, due to changes in fishing areas during the colder and/or winter months. For example, in winter months vessels may want to fish in areas closer to their ports, while summer months could make it possible to fish optimally in areas further away that have higher stock abundance.

Even though the impacts on landings cannot be quantified with certainty, there is no question that RPM restrictions will result in a more than minor change in the seasonal composition of landings. Under status quo, 54% of landings are expected to occur during June to October, which is similar to the historical average for this period. RPM measures will reduce landings by 10.1 million pounds, or by 40% during June to October window. In terms of annual landings, 10.1 million pounds comprise 22% of total landings. Therefore, close to 1/4th of annual scallop landings would be shifted from June to October to the November to May window due to the RPM measures. As a result, seasonal composition of landings will change from 54% to 33% for June to October and from 46% to the 67% of total landings during November to May window.

This substantial seasonal shift in effort (19%) and landings (22%) are expected to have important effects on the scallop markets, prices and costs, even though these impacts cannot be quantified with certainty at this time. The impacts on prices will partly depend on the seasonal distribution of the displaced effort. The reduction in landings during the closure window is expected to increase prices during these months (for example, during July to October), but expected to reduce prices outside of the closure window. It is uncertain, however, if the increase in prices during summer will offset, less than offset or more than offset the reduction in prices during the Nov-May season. This would depend on the timing and the magnitude of the effort shifts. For example, if a majority of the vessels take their trips within the previous month or immediately in the next month after the closure ends, this would lead to a spike in landings and could result in a significant decline in price during that month and could lower overall average price for the year. If effort shifts were uniformly distributed to the remaining 7 months, however, the price impacts would be smaller.

Another scenario would be when vessels try to maximize their revenue by taking their trips during months when prices are higher because of lower landings, such as what happens during

the winter months. Although this would increase the safety risks, the impacts on prices would be lower. Thus, under some situations, turtle measures overall may not change annual average price significantly. If there was no change in prices and costs and landings declined only by -784,098 pounds (or by 1.7%) as the best case scenario showed, then the fleet revenue would decline by 1.7% or by $5.9 million and profits by 2.7% or by $2.7 million (Table 5).

Table 5. Scenario 1: Changes in Landings, Revenue and Profits with 50% Reduction of effort in the Mid-Atlantic open and access areas during June-October and no change in prices.

Options	SQ-No turtle RPM	June-Oct Turtle RPM	% Change from STATUS QUO
Total landings (lb.)	46,925,525	46,141,426	-1.7%
Decline in landings (lb.)		-784,098	
DAS-used in open areas	13,658	13,658	0.0%
DAS-used in access areas	13,827	13,827	0.0%
Total DAS-used	27,486	27,486	0.0%
LPUE	1,707	1,679	-1.7%
Total Revenue ($)	354,287,710	348,367,769	-1.7%
Decline in Tot. Revenue		(5,919,941)	
Total trip costs	43,977,297	43,977,297	0.0%
Total fixed costs	61,626,864	61,626,864	0.0%
Producer Surplus	310,310,414	304,390,473	-1.9%
Crew income	150,880,944	147,624,976	-2.2%
Boat Share	159,429,470	156,765,496	-1.7%
Fleet Profits	97,802,606	95,138,632	-2.7%
Decline in fleet profits		(2,663,974)	

On the other hand, if all the displaced effort and landings occurred in November or in May, for example, the price could decline by as much as 15% during that month, resulting in an overall decline in average price by 7.5% for this period. This decline in prices during the November to May season could be partly offset by an increase in prices during the closure window of June to October. If the reduction in effort is evenly distributed during this period, prices would increase by about 4% each month. Combining the worst case scenario of an entire shift of effort to a one month period during the November – May window resulting in a price decline of 7.5% and a relatively moderate increase in prices during the June-October season by 4%, would lead to a potential decline in overall price by 3.5%. Because of the impacts of cold weather and wind, the fishing costs per DAS could be higher during the November to May window as well. Table 6 shows a scenario analysis by assuming an increase in costs by 10%. Combining the price and cost estimates by a 1.7% reduction in overall landings due to the loss in meat-weight would result in an $18 million, or 5% loss in total revenue and an $8 million or an 8% decline in profits.

Table 6. Scenario 1: Changes in Landings, Revenue and Profits with 50% Reduction in effort in the Mid-Atlantic open and access areas during June-October. Decline in average price by 3.5%

Options	SQ-No turtle closures	June-Oct Turtle closure	% Change from STATUS QUO
Total landings (lb.)	46,925,525	46,141,426	-1.7%
Decline in landings (lb.)		784,098	
DAS-used in open areas	13,658	13,658	0.0%
DAS-used in access areas	13,827	13,827	0.0%
Total DAS-used	27,486	27,486	0.0%
LPUE	1,707	1,679	-1.7%
Total Revenue ($)	354,287,710	336,174,897	-5.1%
Decline in Tot. Revenue	0	(18,112,813)	
Total trip costs	43,977,297	46,176,161	5.0%
Total fixed costs	61,626,864	61,626,864	0.0%
Producer Surplus	310,310,414	289,998,736	-6.5%
Crew income	150,880,944	138,720,032	-8.1%
Boat Share	159,429,470	151,278,704	-5.1%
Fleet Profits	97,802,606	89,651,840	-8.3%
Decline in fleet profits		(8,150,766)	
Price	7.6	7.3	
% ch. in price		-3.5%	
Cost per DAS	1600	1760	
% ch. in cost		10%	

There are several other factors that would affect the change in prices, such as a change in import or export prices in response to changes in the seasonal composition of landings, the change in numbers of U10 or U12 scallops as a proportion of monthly landings, fluctuations in monthly disposable income and changes in seasonal demand. Many of these factors are unknowns at this point making it difficult to accurately estimate the impact of effort shifts on prices. These impacts will be examined further during the development of Framework 21 as new analyses about the likely composition of scallops during and outside of the turtle closure window becomes available. There is no question that the uncertainties created by these shifts in the seasonal composition of effort and landings will make it difficult for vessel-owners to make their plans about where and when to fish and could possibly lead to reduced economic efficiency and profits.

The analyses provided above does not take into account the distributional impacts of turtle measures and effort shifts for various ports, states and vessels of different size categories. Because turtle measures will require a reduction in effort in the Mid-Atlantic areas, they are expected to have greater negative impacts on vessels homeported in the Mid-Atlantic areas, particularly those that are smaller vessels that have less mobility to travel to other fishing grounds and are more vulnerable to the weather conditions.

In addition to the primary measure of "more than minor" (percent change in effort shift) the PDT included a description of other factors that should also be considered when identifying a more than minor change that would also be affected by a shift of effort including:

— concern about safety at sea (shift to winter months),

— changes in bycatch (i.e. fluke bycatch increases in winter months when overlap with scallop fishery offshore),
— revenue impacts because of reduced catch and changes in price, costs, markets, supply, etc.,
— impacts the ability of the observer program to maintain coverage from surges and shifts in effort, and
— general impacts of altering rotational area management and compromising the ability to achieve optimum yield.

The analyses in Section 3.1.1 and 3.1.2 support the general input provided by the PDT in the next section.

3.1.3 Overall PDT input on existing RPM and Term and Condition

The PDT provided seven overall statements for the Committee to consider. These were not consensus statements, but represent general feedback from most of the PDT members on these issues. The first had to do with the existing baseline period of 2004-2007. The sea scallop fishery is managed under an adaptive rotational management plan, where the levels of fishing and the number of access trips vary widely from year to year. Given this management, the PDT does not believe that comparisons of current fishing effort to an historical baseline of fishing years are meaningful, and restrictions based on such a baseline would substantially alter the basic design, location, scope and timing of scallop fishing in the Mid-Atlantic area and would cause changes to the fishery that are more than minor.

The second statement is regarding the seasonal turtle window; the PDT believes that it is not appropriate to restrict fishing effort in May and/or November to reduce turtle takes. There are no documented turtle takes in the scallop fishery during those months, and analysis of sea surface temperatures (a factor shown to be correlated with bycatch rates) indicates that turtle takes are less likely in these months. Bycatch rates of sea turtles in Mid-Atlantic sea scallop fisheries have typically been correlated with sea surface temperature (Murray 2007, 2004, 2004a).[2] Bycatch analyses to date suggest that there is a higher probability of bycatch in warmer surface waters. Generally, rates have been higher in surface waters warmer than 18°C, though this temperature threshold has varied from year to year (and has not been lower than 18°C). An examination of 15-year average sea surface temperatures by month in the Mid-Atlantic revealed that temperatures during May and November are typically cooler than 18°C down to the NC region. No observed sea turtle interactions have historically occurred in May or November in either the dredge or trawl fisheries. Therefore, the PDT believes that it is not appropriate to restrict fishing effort in May and/or November to reduce turtle takes because analysis of sea surface

[2] **Murray, K.** 2007. Estimated bycatch of loggerhead sea turtles (*Caretta caretta*) in U.S. Mid-Atlantic scallop trawl gear, 2004-2005, and in sea scallop dredge gear, 2005. US Department of Commerce, NEFSC Reference Document 07-04; 30 p. http://www.nefsc.noaa.gov/publications/crd/crd0704/index.htm
Murray, K. T. 2004. Magnitude and distribution of sea turtle bycatch in the sea scallop (*Placopecten magellanicus*) dredge fishery in two areas of the northwestern Atlantic Ocean, 2001-2002. Fish. Bull. 102:671-681.
Murray, K. 2004a. Bycatch of sea turtles in the Mid-Atlantic sea scallop (*Placopecten magellanicus*) dredge fishery during 2003. 2nd ed. US Dept. of Commerce, NEFSC Reference Document 04-11; 25 p. http://www.nefsc.noaa.gov/publications/crd/crd0411/index.htm

temperatures indicates that turtle takes are less likely in these months, and no interactions in the scallop fishery have been observed during those months.

The third statement concludes that the existing term and condition is not reasonable and prudent based on the suggested threshold for more than a minor change provided by NMFS; it would not provide at least one access area trip per vessel during either window of time. Therefore, The PDT provided a different recommendation for evaluating whether a measure is reasonable and prudent based on whether it would cause more than a minor change in the fishery. The PDT recommends that the evaluation of whether a measure is reasonable and prudent (more than a minor change) for this fishery at this time should be based on expected impacts on fishing mortality (F) caused by shifting effort from areas and/or seasons when it would have normally occurred. An impact on F was chosen because it best describes what happens to the resource when effort is shifted temporally and spatially based on changes in meat weights throughout the seasons. Expected changes in F are tied to "more than minor" because an increase in F as a result of shifting effort will alter the basic design, location, duration, or timing of the fishery. Overall, since meat weights vary monthly, to get the same poundage (i.e. 18,000 lbs per trip) from the resource, the number of scallops landed must increase if effort is limited during higher meat weight periods. This will increase F, and that will have more than a minor impact on the fishery because some reduction will be needed to compensate for that increased F (reduce possession limits in access areas or DAS in the same year or subsequent years to compensate for higher F levels).

The PDT suggests that there are other factors that should be considered as well in determining if a restriction would cause more than a minor change in the fishery including: concern about safety at sea, changes in bycatch, revenue impacts, impacts on ability of observer program to maintain coverage from surges and shifts in effort, and general impacts of altering rotational area management and compromising the ability to achieve optimum yield.

Using both the threshold suggested by the agency and the PDT-recommended threshold for more than minor (based on change in F from effort shift), the PDT concludes that RPM#1 in the 2008 biological opinion, as well as the Term and Condition that would implement it, will result in more than a minor change to the fishery; therefore these measures should be replaced. It will be difficult to determine whether any other specific reduction in effort during June through October will result in more than a minor change to the fishery without detailed knowledge of the proposed action and a full analysis of its effects. Therefore, the PDT believes the appropriate time to consider specific turtle take reduction measures is during the development of Framework 21 when a range of alternative measures can be analyzed and given opportunity for public comment. For example, the PDT expects that this type of limit of effort in space and time will impact vessels differently; vessels homeported in the Mid-Atlantic may be impacted more than vessels from the north. These distributional impacts will have to be carefully considered in the framework.

Overall PDT input (not consensus statements):

1. The sea scallop fishery is managed under an adaptive rotational management plan, where the levels of fishing and the number of access trips vary widely from year to year. Given this management, the PDT does not believe that comparisons of current fishing effort to an historical baseline of fishing years are meaningful, and restrictions based on such a baseline would substantially alter the basic design, location, scope and timing of scallop fishing in the Mid-Atlantic area and would cause changes to the fishery that are more than minor. In particular, about 2.5 access area trips were allocated in the Mid-Atlantic during the 2004-2007 baseline, compared to 4-6 anticipated for 2010-2011, so that a reduction relative to the baseline translates into a much more severe reduction relative to the anticipated 2010-2011 allocation.
   (*See Appendix 3 on fishing effort during the baseline, which illustrates why each year is different, and reducing future effort compared to a baseline of years is not appropriate for this fishery*).

2. The PDT believes that it is not appropriate to restrict fishing effort in May and/or November to reduce turtle takes. There are no documented takes of turtle takes in the scallop fishery during those months, and analysis of sea surface temperatures (a factor shown to be correlated with bycatch rates) indicates that turtle takes are less likely in these months. Moreover, shifts of fishing effort from May to the December-April period would likely cause substantial economic losses due to reduced meat weights during the winter months, and might reduce safety-at-sea. Therefore, the PDT recommends that if the Committee includes a specific window of time in a new term and condition, it should not include the months of May and November. (*See second paragraph in Section 3.1.3 above*)

3. Although reductions in effort in the Mid-Atlantic area during June through October would likely reduce the number of turtle takes, a 50% reduction in the number of access trips compared to the 2004-2007 period would result in less than one access area trip per vessel, compared to an anticipated allocation of 4 or 5 in 2010. A shift of all, or nearly all, of the access trips away from the June to October period would seriously alter the location and timing of the scallop fishery, and cause loses in meat yield that would likely reduce scallop yields and economic benefits. *(See Section 3.1.1)*

4. Given 1-3 above, the PDT believes that the threshold for what is "more than a minor change" for this fishery at this time should be based on the percent change of effort shift caused by a specific limitation on effort, and the resulting impact that shift would have on overall fishing mortality. In addition, there are other factors that should be considered as well such as including: concern about safety at sea (shift to winter months), changes in bycatch (i.e. fluke bycatch increases in winter months when overlap with scallop fishery offshore), revenue impacts because of reduced catch and changes in price, costs, markets, supply, etc., impacts on ability of observer program to maintain coverage from surges and shifts in effort, and general impacts of altering rotational area management and compromising the ability to achieve optimum yield. (*See Section 3.1.2 and Appendices 1 and 2)*

5. Using the PDT recommended threshold for more than minor, the PDT concludes that RPM#1 in the 2008 biological opinion, as well as the Term and Condition that would implement it, will result in more than a minor change to the fishery; therefore these measures should be replaced. (*See Section 3.1.2.2*).

6. It will be difficult to determine whether any other specific reduction in effort during June through October will result in more than a minor change to the fishery without detailed knowledge of the proposed action and a full analysis of its effects. Moreover, a change to the fishery that is deemed to be minor would also clearly be practicable, so that these same changes would be required under the MSA to reduce turtle bycatch to the extent practicable.

7. Therefore, the PDT believes the appropriate time to consider specific turtle take reduction measures is during the development of Framework 21 when a range of alternative measures can be analyzed and given opportunity for public comment. Thus, the PDT recommends that the Council propose the following as substitutes for RPM#1 and Term and Condition #1 that are currently included in the 2008 biological opinion.

RPM #1:
NMFS must limit the amount of allocated scallop fishing effort that can be used in the area and during the time of year when sea turtle distribution overlaps with scallop fishing activity.

Term and Condition #1:
No later than 2010, NMFS must limit allocated limited access scallop fishing effort in the area(s) and period(s) in which turtle takes in the scallop fishery have commonly occurred. The total amount of effort that can be limited will be restricted by a maximum amount of effort that can be shifted to other areas and/or seasons without having a substantial impact on overall fishing mortality and/or cause more than a minor change to the fishery.

3.1.4 Measures currently in place that minimize interactions and impacts on turtles

The PDT was tasked with identifying a threshold for more than minor for this biological opinion and suggesting a different RPM and T&C if the existing ones were found not reasonable and prudent. The PDT also notes that there are several measures currently in place in the Scallop FMP that help minimize interactions and impacts on turtles. These measures will be summarized in more detail in Framework 21: turtle chains, seasonal closure in ETA, research set-aside program that has funded turtle research and could be used as an avenue of funding in the future. In addition, rotational area management in general has increased catch per unit of effort, thus time that gear is in the water and could impact turtles has reduced dramatically. The PDT supports that the combination of these measures already in place have helped and will continue to help minimize impacts on sea turtles from scallop fishing.

4.0 COMMITTEE INPUT

The Scallop Committee met on November 3, 2008 and reviewed the analyses the PDT completed on defining more that a minor change in the scallop fishery and assessing whether the existing RPM and term and condition are reasonable and prudent.[3] The analyses the Committee reviewed are summarized in Section 3.0 of this document. The Committee passed the following motions for the Council to consider when deciding how to respond to the NMFS biological opinion.

Overall, the Committee finds that the first RPM and Term and Condition are not reasonable and prudent and suggested revised measures. In addition, the Committee requests that the Council consider recommending two additional RPMs for the agency to add to this opinion.

MOTION 1: Committee finds the first term and condition of the biological opinion is not reasonable and prudent because it would cause more than a minor change in the fishery in terms of shifts in effort with adverse impact to yield, F, landings, and potentially safety at sea in the scallop fishery. Vote: 7:0:1, motion carries.

MOTION 2: ***Replace existing RPM with:***
NMFS must limit the amount of allocated scallop fishing effort and/or its impacts on sea turtles that can be used in the area and during the time of year when sea turtle distribution overlaps with scallop fishing activity. Vote: 7:0:1, motion carries.

MOTION 3: ***Committee proposes the following term and condition to replace what is currently in the biological opinion.***
No later than 2010, NMFS must limit the amount of allocated LA scallop fishing effort that can be used in waters south of the northern boundaries of statistical areas 612, 613, 533, 534, 541-543 during the periods in which turtle takes have occurred. Restrictions on fishing effort described above shall be limited to a level that will not result in more than a minor impact on fishing mortality or the fishery. Vote: 7:0:1, motion carries.

MOTION 4: ***Add a new term and condition that:***
NMFS must review data with respect to scallop distribution and abundance to identify areas of high abundance, and in consultation with NEFMC, identify areas for new alternative access areas to increase the catch-per-unit of effort in the scallop fishery during seasons when the scallop fishery and sea turtles overlap. Vote: 7:1:0, motion carries.

MOTION 5: ***Add a new term and condition that:***
NMFS must also investigate and quantify reductions in fishing effort in the Mid-Atlantic during the June-October period, using 2003 as the baseline, that has already resulted from implementation of A10 and A11. Vote: 7:0:1, motion carries.

5.0 COUNCIL RESPONSE TO NMFS REQUEST

(To be completed after Nov 20 Council meeting)

[3] The meeting summary for this Committee meeting is available on the Council website and has been copied as Document #4 for the November 2008 Council meeting.

Appendix 1

Effects of sea scallop seasonal management on meat-weight yields in the Mid-Atlantic

The PDT analyzed seasonal changes in scallop meat-weight yields to assess the potential impacts of restricting effort in the Mid-Atlantic during the time windows identified in the turtle biological opinion (June-October and May-November). Meat weights in the Mid-Atlantic are highest in July and decrease rapidly after the animals have spawned in September. Meat weights remain lower through the winter and grow again in the spring. From April through August, meat weights are highest. Scallop landings also vary by season to take advantage of this pattern as well as other factors such as weather and price.

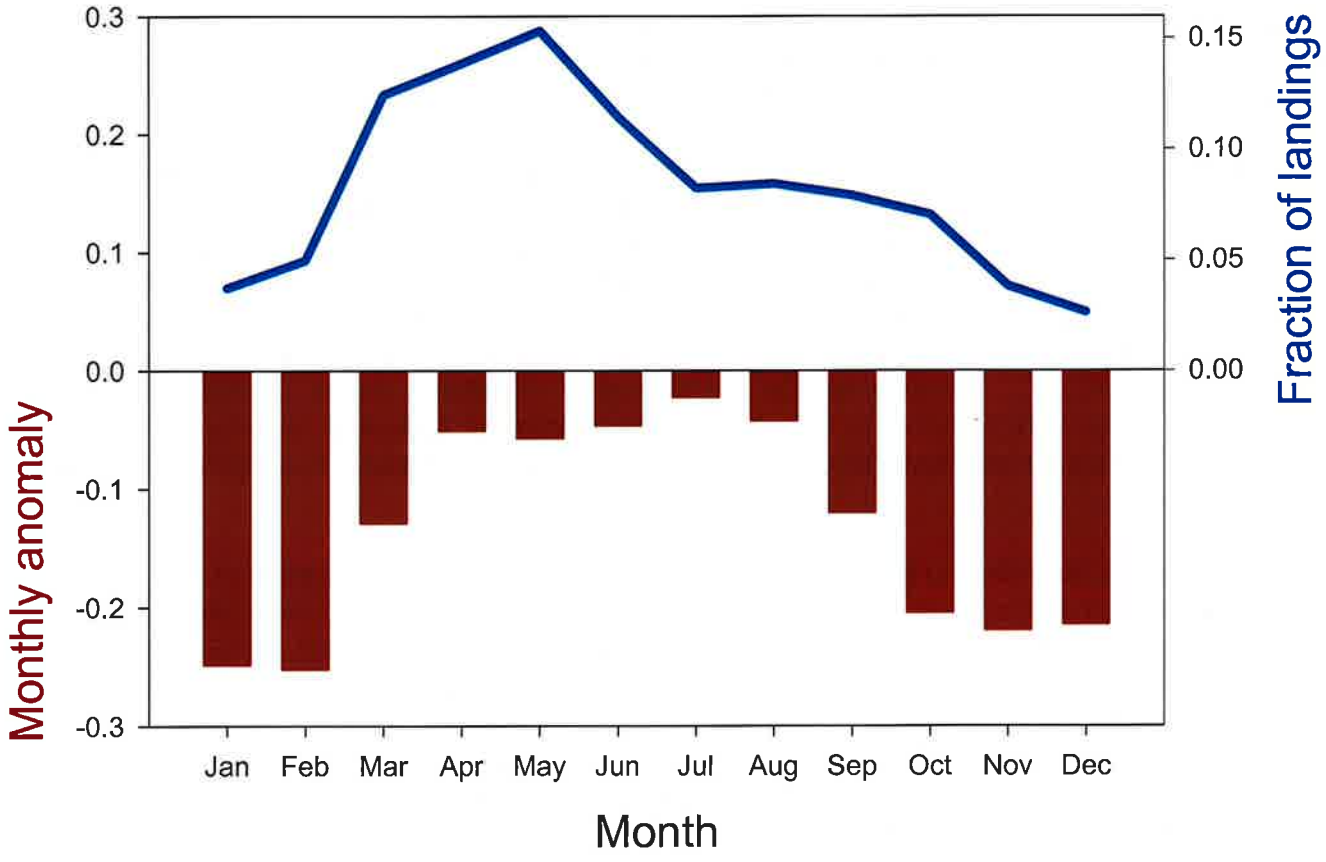
Seasonal meat weight variations can be quantified by comparing shell height/meat weight (volume) data collected by observers on commercial vessels to that collected on the annual research vessel survey conducted in the Mid-Atlantic in July, when meat weights are the highest. The seasonal meat weight anomaly is defined as $(MW_{observed} - MW_{rv}) / MV_{rv})$. The smaller the anomaly, the closer the yield is to maximum yield from July when the survey collects meat weights. Figure 1 depicts the fraction of landings by month from 2001-2006 and the monthly meat weight anomaly. For some months like November – February, scallop yields are over 20% less than if they were harvested in July. Yields from March and September are over 10% less; the other months are less than 5% less. Not surprisingly, catch in the Mid-Atlantic is highest in March-July.

An analysis of the effects of seasonal effort displacements require an assumption as to when the displaced effort will be used. The PDT assumed that displaced effort will redistribute itself proportionally to the mean fraction of landings that have occurred historically (2001-2007) in each month. The seasonal closure in the Elephant Trunk Area from September 1 through October 31 actually has a positive impact on yield because the area is closed when meat weights are lower after spawning. This two month seasonal closure is expected to have a meat weight gain of about 7% because the Sept-Oct anomaly is 16% and the anomaly for the other months is 9%, a difference of 7%. If that closure remains in place and an additional restriction is placed on the fishery for June-August, that would cause a loss of yield over 10%. For example, if 1 trip (6.0 million pounds) was shifted from June-August to Nov-May, the loss would be 600,000 pounds because the Jun-Aug anomaly is 3.8% and Nov-May is 14%, a difference of about 10%. The PDT considered this approach for both seasonal windows in the biological opinion and concluded that any version of seasonal effort shift is expected to result in losses in meat weights of between 5-10%, likely reducing long-term yields and economic gains. Thus, neither option provided by the RPM is economically beneficial for the industry nor are they biologically beneficial to the scallop resource.

If area rotation intends to increase yield per scallop, displacing effort from the spring and summer is not beneficial and likely hampers the FMPs effectiveness in achieving OY. Restricting access in September and October when meat weights are lower is beneficial for both scallops and turtles, and perhaps that season could be expanded to provide more benefit for turtles. But, limiting access in months when meat weights are highest (i.e. spring and summer) is

not ideal when one goal of area rotation is to promote fishing when yield per unit of effort is highest. Fishing during May should be encouraged, given its combination of good weather, good meat yields, and no or low probability of turtle takes.

Figure 1 – Fraction of scallop landings in the Mid-Atlantic by month (2001-2006) and monthly meat weight anomaly



Appendix 2

1.0 BIOLOGICAL AND ECONOMIC IMPACTS OF EXISTING TURTLE RESTRICTIONS

This section provides an analysis of the impacts of Turtle Restrictions included in the March 14, 2008 Biological Opinion for the scallop fishery. It analyzes the impacts on the seasonal distribution of effort, fishing mortality, landings, revenues and profits using a spreadsheet model that incorporates various assumptions about effort displacement, changes in the meat-weight, in prices and costs.

1.1 DESCRIPTION OF THE MODEL

The following model is developed to analyze changes in fishing mortality, effort shift and the impacts on landings, revenue, producer surplus, crew income and profits when limitations are placed on the scallop fishery by season and/or area. This model was first developed to assess whether the existing term and condition is reasonable and prudent, (more than a minor change) but it can also be used to help compare measures that would limit effort and cause some level of effort shift. Table 6 compares the impacts of RPM measures with the status quo using June to October and November to May windows and Table 10 compares the results for May to November and December to April windows.

Status quo is defined as the management action that would take place without the turtle restrictions, in terms of DAS allocated for the open areas and the number of trips for the access areas. Under the status quo option, it is assumed that the vessels will be allocated 42 days for the open areas, and 5 trips for the access areas including 1 trip for GB, 2 trips for ETA and 1 trip for Delmarva.

1.1.1 Table 6 (June-October window) and Table 10 (May-November window):

The model assumptions and the methods used in estimating for DAS, landings, revenue, profits for Table 6 and Table 10 could be described as follows:

PART A (Parameters and Assumptions): The first block of rows of either in Table 6 or in Table 10 show the assumptions and the parameters of the model. It includes the number of full-time equivalent vessels (325), price estimate for 2010 ($7.55), LPUE in open and access areas of Georges and Mid-Atlantic and trip costs per DAS, all are either obtained from the biological model results or from the analyses conducted for Framework 19 and 2007 SAFE report. This is because the recent biological estimates show that the DAS and trip allocations for 2010 will be similar to what had been shown for 2009 in Framework 19. The assumptions made about displacement of effort in open and access areas outside the RPM window are included in the last two rows of column 1. The second column of Part A includes seasonal adjustments made to LPUE for various turtle restriction windows. The following describes some of these assumptions in greater detail:

1) Effort Displacement for Open Areas: 100%
It is assumed that if the Mid-Atlantic open area days are reduced by 50% during July-Oct window or by 30% during the May-November window, the vessels will use these days at other

times or in the Georges Bank open areas. This is because vessels will be allocated a small number of days, about 42 days (for full-time vessels) in the open areas, of which half is expected to be used in GB (21 days) and the other half (21 days) in the Mid-Atlantic areas. Based on the historical distribution of effort, 9 of out 21 (13 of 21) days are assumed to be used in Mid-Atlantic open areas during June to October (May to November) without the Turtle restrictions. Even with a 50% reduction in open areas days (compared to 2004-07 baseline), the number of days that would be shifted to other seasons or areas would be less than 4 days per full-time vessel. Therefore, the vessels are expected to have opportunity to use these 4 days outside the restrictions window. The spreadsheet analysis is set-up, however, so that the impacts of other effort displacement assumptions could easily be analyzed.

2) Effort Displacement for access areas: 100%
RPM Turtle restrictions would reduce the number of trips taken either during the June-October or May to November window compared to the number of trips with status quo and without RPM measures. However, given that these pounds can not be landed from other areas, it is highly likely that the vessels will attempt to take their access area trips during months when the areas are open to fishing, i.e., either outside of the June-October or May-November window. Again, the spreadsheet analysis is set-up so that the impacts of other effort displacement assumptions could easily be analyzed.

3) The reduction in meat weight: It is assumed that shifting effort from June-October to November – May will result in an 8% loss in the meat-weight based on the biological model results. The same assumption is used for shifting effort from May-November to December-April window. The impacts of this loss on landings, fishing mortality and revenues would depend on which of the two management scenarios are considered:

> 4A) Letting the vessels to land 18,000 lb. and take the same number of access area trips would result in an increase of fishing mortality since meat-weights will be lower outside the window for turtle restrictions. Since Framework 21 will take into account this fact, either the possession limit would need to be lowered, or the number of trips should be reduced so that there will be no overfishing due to the shift of effort to November-May window. This assumption would result in reduced landings from the access areas. The reduction in meat-weight will lower landings in the open areas because of LPUE would be lower during November-May as compared to June to October.
>
> 4B) The vessels will be allowed to land the same amount of pounds from access areas after the turtle restrictions which would lead to overfishing and reduced yield in the future years. Obviously, Assumption B will minimize revenue loss in the short-term, but increase the loss in the long-term. Given that long-term projections are not available for this scenario at this point, it is not possible to quantify the results with assumption 4B.

The model results are based on the first assumption (4A) although the impacts could be analyzed by using assumption (4B) as well.

4) Meat weight assumptions: The economic model uses the LPUE estimates for open and access area trips from the biological model results. These estimates are provided as an average for the

year. For example, LPUE for Mid-Atlantic access areas is assumed to be 2081 pounds per day-at-sea used on an annual basis. In order to estimate average LPUE for June-Oct, the average LPUE is multiplied by 104%, and in order to estimate for Nov-May is average LPUE is multiplied by 96%. These adjustments correspond to an 8% less meat-weight during the Nov-May season compared to June-Oct. The same adjustments are made for LPUE for the December –April and May to November windows.

PART B (OPEN AREAS): The second block shows the results for open areas. DAS-used and landings estimated for status quo are compared with the levels corresponding to the original RPM that requires a 50% cut in the effort in Mid-Atlantic open areas during the June to October window (Table 6). Table 10 compares the DAS and landings with status quo and with 30% reduction in DAS during the May to November window. The DAS-used by area and season are calculated based on the following assumptions:
1) It is assumed 47% of the open area effort will take place in Georges Bank and 53% will take place in Mid-Atlantic in accordance with the historical patterns.
2) The seasonal composition of effort in Mid-Atlantic is assumed to be equal to the average percentage distribution of effort during 2004-2007:

- 42% during June-Oct, 48% during November - May
- 63% during May-November and 37% during December – April

Based on these assumptions and after rounding, out of the total 42 days, roughly about 21 days (for full-time vessels) is expected to be used in GB in the open areas and 21 days in the Mid-Atlantic areas. Nine of out 21 (13 of 21) days are assumed to be used in Mid-Atlantic open areas during June to October (May to November) without the Turtle restrictions With a 50% reduction in open areas days (compared to 2004-07 baseline), the number of days that would be shifted to other seasons or areas would be less than 4 days per full-time vessel, and even less with the 30% reduction during May to November window (Table 6 and Table 10). The DAS-used in the last column of PART B (corresponding to the unrestricted window of months) is calculated assuming that these days will be shifted to the months outside of the Turtle restriction windows both in Table 6 and Table 10.

The landings by area and by season are estimated by multiplying DAS-used with the LPUE relevant for each area and after adjusting it with the expected changes in meat-weight for each window. For example, Mid-Atlantic landings for the June to October window for status quo is calculated by multiplying 2808 days by 1205 (LPUE) and by 104% (adjustment for meat weight), or 2808*1205*104%=3,519,453 lb. (Table 6). The landings by area, season and scenario are estimated with the same method for each area and time period. Total revenue from open areas is estimated by multiplying landings with the price estimate ($7.55).

PART C (ACCESS AREAS): The third block of rows shows the results for access area effort and landings. Under the status, it is assumed that the vessels will be allocated 5 trips for the access areas including 1 trip for GB, 2 trips for ETA and 1 trip for Delmarva.
The full-time vessels are allocated 4 trips in Mid-Atlantic, and are assumed to take 42% of these trips (average 1.68 trips per FT vessel or 546 total trips) in these areas during June to October. With the RPM Turtle restrictions, it is assumed that the number of these trips will be reduced (by 50% from original baseline) to 0.2 trips per vessel (or 74 trips total) during the June-October

window (Table 6). Similarly, full-time vessels are assumed to take 2.52 trips per vessel during May to November without RPM measures, and 0.5 (30% less from the original baseline) with the Turtle restrictions during the same window (Table 10). However, given that these pounds can not be landed from other areas, it is highly likely that the vessels will attempt to take their access area trips during months when the areas are open to fishing, i.e., either outside of the June-October or May-November window. The number of access area trips in the last column of PART C (corresponding to the unrestricted window of months) is calculated assuming that these trips will be shifted to the months outside of the Turtle restriction windows both in Table 6 and in Table 10.

The landings by area and by season are estimated by multiplying total number of access trips with 18,000 lb (possession limit) and after adjusting it with the expected changes in meat-weight for each window. For example, Mid-Atlantic landings for the November to May window for RPM scenario is calculated by multiplying 1227 trips by 18,000 and by 96% (adjustment for meat weight), or 1227*18000*96%=21,193,920 lb. (Table 6). Therefore, this analysis assumes that either possession limit or the number of trips will be adjusted such that there will be no increase in fishing mortality because of shift of effort from RPM window to the months where there are no turtle restrictions in place. For consistency in the results, the same assumption is made for the status quo, which would mean that either possession limit or the total number of trips would be determined by taking into account the seasonal changes in the meat weight. The landings by area, season and scenario are estimated with the same method for each area and time period. Total revenue from access areas are estimated by multiplying landings with the price estimate ($7.55).

1.1.2 Table 7 (June-October window) and Table 11 (May-November window): The impacts on effort shifts, fishing mortality and changes in the seasonal composition of effort and landings

The comparative impacts of RPM measures on effort shifts, seasonal composition of effort and landings are shown in Table 7 for June to October restrictions and in Table 11 for May to November restrictions. The resulting changes in the composition of effort and landings are compared historical averages given in Table 3 and Table 4.

1.1.3 Table 8 and Table 9 (June-October window) and Table 12 and Table 13 13 (May-November window): Economic Impacts

The impacts on revenues, producer surplus, crew income and profits are shown in Table 8 for June to October window and assuming no change in overall prices. Table 9 shows the results for a 3.5% decline in prices and a 10% increase in fishing costs assumed to result from the changes in the composition of effort and landings. Finally, the economic impacts for the May to November window are presented in Table 12 and Table 13 corresponding to similar assumptions regarding prices and costs. The assumptions regarding prices and costs could be described as follows:

1) The impact of restrictions on scallop prices: The reduction in landings during the restrictions window is expected to increase prices during these months (for example, during July to October), but expected to reduce prices outside of the restrictions window. It is uncertain, however, if the increase in prices during summer will offset, less than

offset or more than offset the reduction in prices during the Nov-May season. This would depend on the timing and the magnitude of the effort shifts. For example, if majority of the vessels take their trips within the previous month or immediately in the next month after the restrictions ends, this would lead to a spike in landings and could result in a significant decline in price during that month and could lower overall average price for the year according to the results of a preliminary price model.

2) This model estimated annual average scallop ex-vessel price by market category (PEXMRKT) as a function of

    - Meat count (MCOUNT)
    - Average monthly price of all scallop imports (PIMPORT)
    - Per capita monthly personal disposable income (PCDPI)
    - Total monthly scallop landings (in million lb.)
    - Total monthly exports (in million lb.)
    - Percent share of landings by market category in total monthly landings (PCTLAND)
    - A dummy variable for 2005 (D2005)
    - Lagged ex-vessel price (PEXMRKT1)

Because relatively reliable data on scallop landings and revenue by meat count categories were mainly collected since 1999 through the dealers' database. The analysis included the 1999-2007 period and four meat categories shown in Table 2. All the price variables are corrected for inflation and expressed in 2006 prices by deflating current levels by the consumer price index (CPI) for food. The ex-vessel prices are estimated in semi-log form to restrict the estimated price to positive values only.

The coefficients of this preliminary model are shown in Table 1. The estimated model provides a good fit to the actual data for annual ex-vessel prices. The F-test shows that the overall relation is statistically significant ($P<0.0001$), meaning that the explanatory variables as a whole have a significant influence on ex-vessel price. Adjusted R2 indicates that changes in meat count, composition of landings by size of scallops, domestic landings net of exports, average price of all imports, disposable income, explain 88 percent of the variation in ex-vessel prices by market category. Table 2 also verifies that the estimated values of ex-vessel prices closely track the actual values. The model will be updated during the development of Framework 21.

Table 1. Estimates (GLM) for price model

Dependent Variable	LNPRICE
N	418
Multiple R	0.942
Squared Multiple R	0.887
Adjusted Squared Multiple R	0.885
Standard Error of Estimate	0.085

Analysis of Variance

Source	Type III SS	df	Mean Squares	F-ratio	p-value
Regression	23.179	8	2.897	400.832	0.000
Residual	2.956	409	0.007		

Regression Coefficients $B = (X'X)^{-1}X'Y$

Effect	Coefficient	Standard Error	Std. Coefficient	Tolerance	t	p-value
CONSTANT	0.707	0.128	0.000	.	5.521	0.000
PEXMRKT1	0.119	0.004	0.715	0.454	28.974	0.000
PIMPORT	0.039	0.005	0.142	0.712	7.219	0.000
MCOUNT	-0.002	0.000	-0.092	0.801	-4.951	0.000
PCTLAND	-0.099	0.019	-0.093	0.887	-5.253	0.000
PCDPI	0.003	0.001	0.075	0.259	2.296	0.022
SCLAND	-0.018	0.002	-0.164	0.570	-7.436	0.000
SCEXP	0.030	0.011	0.092	0.226	2.642	0.009
D2005ONLY	0.050	0.015	0.064	0.738	3.297	0.001

Table 2. Actual and predicted prices as an average of 1999-2007 monthly prices.

MARKETCAT	Price (06)	Predicted price (06)	% Difference of predicted from actual price
<=10 count	7.2	7.1	-1.4%
11-20 count	6.0	6.0	0.0%
21-30 count	5.8	5.6	-3.4%
>30 count	5.7	5.5	-3.5%
Grand Total	6.2	6.0	-1.4%

There are other factors that would affect the change in prices, such as a change in import or export prices in response to effort shifts, the change of U10's or U12's as a proportion of monthly landings, and fluctuations in monthly disposable income. Many of these factors are unknowns at this point making it difficult to accurately estimate the impact of effort shifts on prices. For these reasons, the impact on prices is addressed qualitatively although some preliminary price estimates are provided as scenario analyses. These impacts will be examined further during the development of Framework 21 as new analyses about the likely composition of scallops during and outside of the turtle restrictions window becomes available.

3) The impacts on fishing costs: The trip costs per days at sea are presumably higher during the November – May season compared to the costs during the months of June to October. These changes in the trip costs could not be taken into account quantitatively at this point, but are discussed qualitatively. The impacts of the season on trip costs will be analyzed further during the development of Framework 21.

Table 3. Seasonal Composition of Landings (Dealer Data)

	June-Oct	Nov-May
1999	54%	46%
2000	53%	47%
2001	51%	49%
2002	52%	48%
2003	54%	46%
2004	47%	53%
2005	52%	48%
2006	60%	40%
Average	53%	47%

Table 4. Seasonal Composition of Days fished (excluding trips with less than 400 lbs.)

CALENDAR_YEAR	June-Oct	Nov-May	Grand Total
1999	56%	44%	100%
2000	66%	34%	100%
2001	54%	46%	100%
2002	52%	48%	100%
2003	54%	46%	100%
2004	48%	52%	100%
2005	53%	47%	100%
2006	56%	44%	100%
2007	55%	45%	100%
Grand Total	54%	46%	100%

Table 5. Percentage composition of landings by month and monthly prices (in 2006 inflation adjusted prices.

Month	Average monthly landings as % of annual landings	Average monthly price
1	3%	6.23
2	4%	6.08
3	7%	5.63
4	10%	5.34
5	13%	5.24
6	13%	5.07
7	13%	5.22
8	11%	5.77
9	8%	6.13
10	8%	6.17
11	6%	6.20
12	5%	6.31

1.2 DISCUSSION OF THE RESULTS

Table 6 provides estimated DAS and landings in the open areas and number of trips, DAS-used and landings in the access areas for GB and Mid-Atlantic by season of fishing using the June to October and November to May windows.

The results indicate that landings would decline by about 1% in the open areas and by about 2% in the access areas due to the loss in meat weight with effort shift from the June-October window to November-May window (Table 6).

Table 7 examines the magnitude of the effort and landings shifts and impacts on fishing mortality. The first part of the Table shows that without Turtle restrictions, 51% of the total scallop fishing effort is estimated to occur during from June to October and the remaining 49% from November to May. This is slightly different from the historical average of 54% and 46% respectively for the same seasons for 1999-2007. With turtle restrictions, however, there would be a major change in the seasonal composition of effort to 32% for June to October window and to 68% from November to May. In other words, 37% of the effort that normally would occur during June to October would be shifted to the November – May window.

Table 8 shows the impacts on total landings, revenues, costs, crew shares and profits at constant prices and Table 9 shows the results by assuming a 3.5% decline in prices (based on the estimates of a preliminary price shown in the above section) and 10% increase in costs.

The consequences of this shift could be summarized as follows:

- The change in the composition of effort would lead to a loss of meat-weight for the scallops that would be otherwise landed during the June-Oct window by 8%. If there were no further restrictions on the effort, this would result an increase in Fishing Mortality by 0.015(8%*19%).
- As the second part of Table 7 shows, the restrictions will change the seasonal composition of landings substantially from 54% to 33% during the June to October season, and from 46% to 67% during November to May. As a result, the landings in the first period will decline by more than 10 million lb. and increase it in the second period by 9.4 million lb.
- Total landings would decline by 784,098 pounds or by about 1.7% because of the meat-weight loss of scallops during November- May window. If there was no change in prices, this would reduce total fleet revenue by 1.7% or by $5.9 million and profits by 2.7% or by $2.7 million.
- The reduction in landings during the restrictions window is expected to increase prices during these months (during July to October), but expected to reduce prices outside of the restrictions window. Whether the increase scallop prices in the first period will offset the decrease in prices in the second period will depend on the magnitude of the shift and when the displaced effort takes place.
- Under the original RPM restrictions for June-October and 50% reduction in DAS in the Mid-Atlantic open areas, about 9.5 million more pounds of scallop would be landed during November to May season (Table 7). This represents the maximum amount of landings that could be displaced from June-October window compared to other scenarios.

- According to preliminary monthly price model shown, if all of these 9.5 pounds were landed immediately in November or right before the restrictions, for example, the price could decline by as much as 15% during that month, resulting in overall decline in average price by 7.5% for this period. If on the other hand, these 9.5 million pounds were to be landed evenly during each of the 7 months from November to May, the price impacts would be much lower, 2% lower each month.
- This decline in prices during November to May season could be partly offset by an increase in prices during the restrictions window of June to October. Again with original RPM restrictions, the landings during June to October would decline from 25.2 million pounds to 15 million pounds, or by more than 10 million pounds. As a result, the prices would increase during this season by about 4 % each month if the reduction in effort is evenly distributed during this period. Combining the worst case scenario of an entire shift of effort to a one month period during November – May window resulting in a price decline of 7.5% and a relatively moderate increase in prices during the June to October season by 4%, would lead to a decline in overall price by 3.5%. Also taking into account about a 2% reduction in overall landings due to the loss in meat-weight would result in a 5% loss in total revenue and an 8% decline in profits with this scenario. Table 9 also shows the impact of increase in costs by effort shifts which affect in this case the crew shares.
- There is a lot of uncertainty, however, about the possible impacts of these major shifts in effort from one season to another. Another scenario would be when vessels try to maximize their revenue by taking their trips during months when prices are higher because of lower landings especially during the winter months. In addition, there could be a small upward impact on prices due to decrease in total landings (because of reduction in meat-weight) by 1.7%. Thus, there are several situations under which overall annual average price may not change significantly as a result of turtle restrictions (as was assumed in Table 8 and Table 12) These impacts will be examined further during the development of Framework 21 as new analyses about the likely composition of scallops during and outside of the turtle restrictions window becomes available.

Table 10 provides estimates for RPM restriction for May to November window and compares the results with status quo:

- Applying a 30% reduction in effort during this window would lead to a larger shift in effort, 23% of the total effort from the RPM window to December – April season.
- Because the meat weight is estimated to be about 8% lower during the later season compared to May to November season, the fishing mortality would increase by about 0.018 as vessels attempt to catch more scallops (smaller in size) to make up for the loss in meat weight and still to land 18,000 lb. per trip (Table 11).
- Therefore, RPM measures that would reduce effort in the Mid-Atlantic areas by 30% during May to November would have larger impacts on effort shifts and fishing mortality compared to the measures that would reduce effort by 50% during June to October.
- Similarly, RPM measures that restrict effort during May to November window would have larger negative impacts on landings, revenues and profits as compared to measures that restrict effort during the June to October window. The landings and

revenues are estimated to decline by 2.1% and profits by 3.4% with this window even without a change in prices (Table 12). If there was a decline in average annual price and if costs increased by 10% for example, the negative impacts would be larger, with a 5.5% decline in revenues would decline by and 8.9% decline in profits (Table 13).

- Finally, the results for status quo DAS, landings and revenue are slightly lower for June to October window from the May to November window. This is because the same values for LPUE's were applied to each of these windows even though they cover a different number of months because separate biological estimates were not available at this time. Therefore, the absolute value of the total estimated landings should be compared only to the values with the same RPM restriction window. Because, the results for landings are higher both for the status quo and the RPM, the model results could still be used in comparing the differences and percentage change in landings under status quo and RPM measures for different windows. In other words, there is no question that RPM measures that would reduce effort in the Mid-Atlantic areas by 30% during May to November would have larger impacts on effort shifts, fishing mortality, landings, revenues and profits compared to the measures that would reduce effort by 50% during June to October.

There is no question that economic analyses that are presented in this section would underestimate the impacts on revenues and profits if average prices declined and costs increased by a larger proportion than estimated here. In fact, the landings, revenue and profit estimates corresponding to the different RPM windows were based on a best case scenario, which assumed that all scallop vessels will be able shift their trips to November - May window, and that there will be a 100% effort displacement. The actual reduction in landings, revenues and profits is expected to exceed the reductions shown in these analyses for the following reasons:

- Although it would be reasonable to expect that vessels would be more inclined to shift their effort to May, if scallop fishermen are already fishing the maximum that they can in May because that is the peak time for meat weights, there may not be room for the month of May to absorb any effort shift.
- This would mean that vessels would have to shift their effort to relatively less productive months, including the winter months of December, January and February. During these months average meat-weight may even be lower compared to the average meat-weight from November to May. In addition, some vessels may not able to take their trips during late fall or winter months.
- The decline in scallop landings is estimated by taking into account the reduction in meat-weight during the RPM windows. There would be an additional decline in LPUE, however, due to changes in fishing areas during the colder and/or winter months. For example, in winter months vessels may want to fish in areas closer to their ports, while summer months could make it possible to fish optimally in areas further away but with higher stock abundance.

Table 6. Comparing Status Quo Effort and Landings with the RPM Restrictions: June to October

A. PARAMETERS AND ASSUMPTIONS					
Number of vessels	325		LPUE DAS:		
Price estimate for 2010	7.55	June-Oct.	104%	Higher mW	
LPUE in all open areas in 2010	**1292**	Nov-May	96%	Lower MW	
LPUE in all open GB areas	**1375**	May-Nov.	104%	Higher mW	
LPUE in all open MA areas	1205	Dec-April	96%	Lower MW	
Trip costs Per Day-at-sea	1600	LPUE-GB access	2265		
Possession limit	18000	LPUE-MA access	2081		
Displacement Open areas	100%				
Displacement Access areas	100%		% Reduction	0.5	
Distribution of effort by area		47%	53%	42%	58%
B. OPEN AREAS	**Open area Totals**	**Georges Bank open**	**Mid-Atlantic Open**	**Mid.At. June-Oct (42%)**	**Mid.At-Nov-May (58%)**
Baseline (2004-07) –DAS	15,700	7,450	8250	3465	4785
50% Reduction from baseline (June-Oct)	13,968	7,450	6518	1733	4785
2010-DAS: Status Quo (F19)	13,658	6972	6686	2808	3878
DAS per vessel	42	21	21	9	12
Open area landings –F19 -2010	17,591,285	9,585,496	8,005,788	3,519,453	4,486,336
Open area revenue –F19	132,814,198				
RPM: 50% reduction in DAS	13,658	6972	6686	1733	4953
DAS per vessel	42	21.5	20.6	5.3	15
Open area landings -50%	17,487,586	9,585,496	7,902,090	2,171,377	5,730,714
Decline in open area landings	(103,698)				
% decline in open area landings	-1%				
Open area revenue -50%	132,031,277				
Decline in open area revenue	(782,921)				
% decline in open area revenue	**-1%**				
C. ACCESS AREAS	**Total access areas**	**GB access areas**	**MA access areas**	**Mid.At. June-Oct**	**Mid.At. Nov-May**
Baseline (2004-07):# of trips	5.5	3	2.5	32%	68%
Baseline (2004-07): total # trips	1433	975	458	147	311
50% Reduction from baseline (June-Oct)	1360	975	385	74	311
Status quo (F19)					
F19 a trips per vessel	5	1	4.00	1.68	2.32
Total trips -2010 -F19	1625	325	1300	546	754
Total landings 2010 -F19	29,100,240	5,850,000	23,250,240	10,221,120	13,029,120
Total rev.F19 from access-no adj.	219,706,812	44,167,500	175,539,312		
DAS-used	13,827	2,583	11,245	4723	6522
RPM: 50% Reduction, # of trips		1.0	4.0	0.2	3.8
Total trips .2010 access June-Oct	1,625	325	1,300	74	1227
Total landings 201, access, June-Oct	28,419,840	5,850,000	22,569,840	1,375,920	21,193,920
Decline in total landings	(680,400)				
% decline in total landings	**-2%**				
Total rev.2010 access June-Oct	214,569,792	44,167,500	170,402,292	10,388,196	160,014,096
Decline in rev. in access June-Oct	(5,137,020)				
% Decline in rev. with June-Oct cl.	**-2%**				
DAS-used	13,827	2,583	11,245	636	10609

Table 7. Seasonal effort shifts and changes in F and landings – 50% Reduction in effort Mid-Atlantic in open and access areas during June-October

Seasonal Distribution of Effort (DAS)			
No RPM restrictions	**June-Oct**	**Nov-May**	**Total**
GB open (21 days)	3,785	3,188	6,972
GB access (1 trip)	2,583		2,583
MA-open (9 days in June-Oct)	2,808	3,878	6,686
MA-access (1.68 in June-Oct)	4,723	6,522	11,245
All areas	13,898	13,587	27,486
% of total	51%	49%	
Average Monthly Fleet DAS	2,780	1,941	
RPM restrictions (June-Oct)			
GB open (21 days)	3,785	3,188	6,972
GB access (1 trip)	2,583	-	2,583
MA-open (5.3 days June-Oct)	1,733	4,953	6,686
MA-access (0.2 trips in June Oct)	636	10,609	11,245
All areas	8,736	18,750	27,486
Percentage of total DAS	**32%**	**68%**	-
Average Monthly Fleet DAS	1,747	2,679	
Historical Average	**54%**	**46%**	
Change in % effort from hist.avg.	22%	38%	
Shift in effort to Nov-May as % of total effort	**19%**		
Change in F	**0.015**		

Seasonal Distribution of Scallop Landings			
No Restrictions	**June-Oct**	**Nov-May**	**Total**
GB open	5,411,244	4,207,082	9,585,496
GB access	6,084,000		6,084,000
MA-open	3,519,453	4,486,336	8,005,788
MA-access	10,221,120	13,029,120	23,250,240
All areas	25,235,817	21,722,537	46,925,525
% of total	54%	46%	
Average monthly landings	5,047,163	3,103,220	
Turtle Restrictions (June-Oct)			
GB open	5,411,244	4,207,082	9,585,496
GB access	6,084,000	-	6,084,000
MA-open	2,171,377	5,730,714	7,902,090
MA-access	1,375,920	21,193,920	22,569,840
All areas	15,042,541	31,131,715	46,141,426
% of total landings	**33%**	**67%**	
Average monthly landings	3,008,508	4,447,387	
Hist.average	**53%**	**47%**	
Shift in landings	**(10,193,276)**	**9,409,178**	-784,098

Table 8. Changes in Landings, Revenue and Profits with 50% Reduction in effort Mid-Atlantic in the open and access areas during June-October.

Options	SQ-No turtle restrictions	June-Oct Turtle restrictions	% Change from STATUS QUO
Total landings (lb.)	46,925,525	46,141,426	-1.7%
Decline in landings (lb.)		-784,098	
DAS-used in open areas	13,658	13,658	0.0%
DAS-used in access areas	13,827	13,827	0.0%
Total DAS-used	27,486	27,486	0.0%
LPUE	1,707	1,679	-1.7%
Total Revenue ($)	354,287,710	348,367,769	-1.7%
Decline in Tot. Revenue		(5,919,941)	
Total trip costs	43,977,297	43,977,297	0.0%
Total fixed costs	61,626,864	61,626,864	0.0%
Producer Surplus	310,310,414	304,390,473	-1.9%
Crew income	150,880,944	147,624,976	-2.2%
Boat Share	159,429,470	156,765,496	-1.7%
Fleet Profits	97,802,606	95,138,632	-2.7%
Decline in fleet profits		(2,663,974)	
Price	7.6	7.6	
% Change in price		0%	
Cost per DAS	1600	1600	
% Change in cost		0%	

Table 9. Changes in Landings, Revenue and Profits with 50% Reduction in effort Mid-Atlantic in the open and access areas during June-October. Decline in average price by 3.5% and increase in costs by 10%

Options	SQ-No turtle restrictions	June-Oct Turtle restrictions	% Change from STATUS QUO
Total landings (lb.)	46,925,525	46,141,426	-1.7%
Decline in landings (lb.)		784,098	
DAS-used in open areas	13,658	13,658	0.0%
DAS-used in access areas	13,827	13,827	0.0%
Total DAS-used	27,486	27,486	0.0%
LPUE	1,707	1,679	-1.7%
Total Revenue ($)	354,287,710	336,174,897	-5.1%
Decline in Tot. Revenue	0	(18,112,813)	
Total trip costs	43,977,297	46,176,161	5.0%
Total fixed costs	61,626,864	61,626,864	0.0%
Producer Surplus	310,310,414	289,998,736	-6.5%
Crew income	150,880,944	138,720,032	-8.1%
Boat Share	159,429,470	151,278,704	-5.1%
Fleet Profits	97,802,606	89,651,840	-8.3%
Decline in fleet profits		(8,150,766)	
Price	7.6	7.3	
% Change in price		-3.5%	
Cost per DAS	1600	1760	
% Change in cost		10%	

Table 10. Comparing Status Quo Effort and Landings with the RPM Restrictions: May to November

A. PARAMETERS AND ASSUMPTIONS					
Number of vessels	325		LPUE adjust.		
Price estimate for 2010	7.55	May-Nov.	104.0%	Higher MW	
LPUE in all open areas in 2010	**1292**	Dec-April	94.0%	Lower MW	
LPUE in all open GB areas	**1375**	May-Nov.	104.0%	Higher MW	
LPUE in all open MA areas	1205	Dec-April	94.0%	Lower MW	
Trip costs Per Day-at-sea	1600	LPUE-GB access	2265		
Possession limit	18000	LPUE-MA access	2081		
Displacement Open areas	100%				
Displacement Access areas	100%			0.3	reduction
Distribution of effort by area		47%	53%	63%	37%
B. OPEN AREAS	**Open area Totals**	**Georges Bank open**	**Mid-Atlantic Open**	**Mid.At. May-Nov (63%)**	**Mid.At-Dec-Apr (37%)**
Baseline (2004-07) –DAS	15,700	7,450	8250	5198	3053
30% Reduction from baseline (May-Nov)	14,141	7,450	6691	3638	3053
2010-DAS: Status Quo (F19)	13,658	6972	6686	4212	2474
DAS per vessel	42	21.5	20.6	13	8
Open area landings –F19 -2010	17,726,648	9,585,496	8,141,152	5,279,179	2,861,973
Open area revenue –F19	133,836,193				
RPM: 50% reduction in DAS	13,658	6972	6686	3638	3048
DAS per vessel	42	21.5	20.6	11.2	9
Open area landings -50%	17,671,318	9,585,496	8,085,822	4,559,891	3,525,931
Decline in open area landings	(55,330)				
% decline in open area landings	-0.3%				
Open area revenue -50%	133,418,453				
Decline in open area revenue	(417,740)				
% decline in open area revenue	**-0.3%**				
C. ACCESS AREAS	**Total access areas**	**GB access areas**	**MA access areas**	**Mid.At. May-Nov**	**Mid.At. Dec-Apr**
Baseline (2004-07):# of trips	5.5	3	2.5	1.58	0.93
Baseline (2004-07): total # trips	1433	975	458	243	215
30% Reduction from baseline (May-Nov)	1360	975	385	170	215
Status quo (F19)					
F19 a trips per vessel	5	1	4.00	2.52	1.48
Total trips -2010 -F19	1625	325	1300	819	481
Total landings 2010 -F19	29,493,360	5,850,000	23,643,360	15,331,680	8,311,680
Total rev.F19 from access-no adj.	222,674,868	44,167,500	178,507,368		
DAS-used	13,827	2,583	11,245	7084	4160
RPM: 50% Reduction, # of trips		1.0	4.0	0.5	3.5
Total trips .2010 access June-Oct	1,625	325	1,300	170	1130
Total landings 201, access, June-Oct	28,558,944	5,850,000	22,708,944	3,184,272	19,524,672
Decline in total landings	(934,416)				
% decline in total landings	**-3%**				
Total rev.2010 access June-Oct	215,620,027	44,167,500	171,452,527	24,041,254	147,411,274
Decline in rev. in access June-Oct	(7,054,841)				
% Decline in rev. with June-Oct cl.	**-3%**				
DAS-used	13,827	2,583	11,245	1471	9773

Table 11. Seasonal effort shifts and changes in F and landings – 30% Reduction in effort Mid-Atlantic in open and access areas during May-Nov

Seasonal Distribution of Effort (DAS)			
No RPM restrictions	**June-Oct**	**Nov-May**	**Total**
GB open (21 days)	3,785	3,188	6,972
GB access (1 trip)	2,583		2,583
MA-open (9 days in June-Oct)	4,212	2,474	6,686
MA-access (1.68 in June-Oct)	7,084	4,160	11,245
All areas	17,664	9,822	27,486
% of total	**64%**	**36%**	
RPM restrictions (June-Oct)			
GB open (21 days)	3,785	3,188	6,972
GB access (1 trip)	2,583	-	2,583
MA-open (5.3 days June-Oct)	3,638	3,048	6,686
MA-access (0.2 trips in June Oct)	1,471	9,773	11,245
All areas	11,477	16,009	27,486
Percentage of total DAS	**42%**	**58%**	-
Shift in Effort (DAS)	**6,187**		
Historical Average	**54%**	**46%**	
Change in % effort from hist.avg.	13%	63%	
Shift in effort to Nov-May as % of total effort	**23%**		
Change in F	**0.018**		

Seasonal Distribution of Scallop Landings			
No Restrictions	**June-Oct**	**Nov-May**	**Total**
GB open	5,411,244	4,207,082	9,585,496
GB access	6,084,000		6,084,000
MA-open	5,279,179	2,861,973	8,141,152
MA-access	15,331,680	8,311,680	23,643,360
All areas	32,106,104	15,380,734	47,454,008
% of total	**68%**	**32%**	
Turtle Restrictions (June-Oct)			
GB open	5,411,244	4,207,082	9,585,496
GB access	6,084,000	-	6,084,000
MA-open	4,559,891	3,525,931	8,085,822
MA-access	3,184,272	19,524,672	22,708,944
All areas	19,239,407	27,257,685	46,464,262
% of total landings	**41%**	**59%**	(989,746)
Average monthly landings	3,847,881	3,893,955	
Hist.average	**53%**	**47%**	-2.1%
Shift in landings	**-12,866,696**	**11,876,950**	**-989,746**

Table 12. Changes in Landings, Revenue and Profits with 30% Reduction in effort Mid-Atlantic in the open and access areas during May-November.

Options	SQ-No turtle restrictions	June-Oct Turtle restrictions	% Change from STATUS QUO
Total landings (lb.)	47,454,008	46,464,262	-2.1%
Decline in landings (lb.)		989,746	
DAS-used in open areas	13,658	13,658	0.0%
DAS-used in access areas	13,827	13,827	0.0%
Total DAS-used	27,486	27,486	0.0%
LPUE	1,726	1,690	-2.1%
Total Revenue ($)	358,277,761	350,805,180	-2.1%
Decline in Tot. Revenue	0	(7,472,581)	
Total trip costs	43,977,297	43,977,297	0.0%
Total fixed costs	61,626,864	61,626,864	0.0%
Producer Surplus	314,300,465	306,827,883	-2.4%
Crew income	153,075,472	148,965,552	-2.7%
Boat Share	161,224,993	157,862,331	-2.1%
Fleet Profits	99,598,129	96,235,467	-3.4%
Decline in fleet profits		(3,362,662)	
Price	7.6	7.6	
% Change in price		0%	
Cost per DAS	1600	1600	
% Change in cost		0%	

Table 13. Changes in Landings, Revenue and Profits with 30% Reduction in effort Mid-Atlantic in the open and access areas during May-November. Decline in average price by 3.5% and increase in costs by 10%

Options	SQ-No turtle restrictions	June-Oct Turtle restrictions	% Change from STATUS QUO
Total landings (lb.)	47,454,008	46,464,262	-2.1%
Decline in landings (lb.)		989,746	
DAS-used in open areas	13,658	13,658	0.0%
DAS-used in access areas	13,827	13,827	0.0%
Total DAS-used	27,486	27,486	0.0%
LPUE	1,726	1,690	-2.1%
Total Revenue ($)	358,277,761	338,526,999	-5.5%
Decline in Tot. Revenue	0	(19,750,763)	
Total trip costs	43,977,297	48,375,026	10.0%
Total fixed costs	61,626,864	61,626,864	0.0%
Producer Surplus	314,300,465	290,151,972	-7.7%
Crew income	153,075,472	137,814,823	-10.0%
Boat Share	161,224,993	152,337,149	-5.5%
Fleet Profits	99,598,129	90,710,285	-8.9%
Decline in fleet profits		(8,887,843)	
Price	7.6	7.3	
% Change in price		-3.5%	
Cost per DAS	1600	1760	
% Change in cost		10%	

Appendix 3
Summary of fishing effort from the suggested baseline period (2004-2007)

The sea scallop fishery is managed under an adaptive rotational management plan, where the fishing levels and the number of access trips vary widely from year to year. Under area rotation, allocations may vary by year and area, but the overall fishing mortality rate is designed to be more constant. The overfishing threshold is F=0.29, and allocations are given so that level of F is not exceeded. In recent years, the target has been F=0.20. In a given year the limited access fishery is allocated open area DAS and access area trips. The number of open area DAS vary depending on how many access area trips are allocated because, to prevent overfishing, the overall fishing mortality cannot exceed a certain level. So in a year where several access area trips are allocated, open area DAS will be lower. Furthermore, in some years, many areas may be completely closed to fishing because those areas have high levels of small scallops. Thus, those areas are closed for several years and when they reopen, fishing mortality will be higher in that area.

Given this management, the PDT does not believe that comparisons of current fishing effort to an historical baseline of fishing years are meaningful, and restrictions based on such a baseline would substantially alter the basic design, location, scope and timing of scallop fishing in the Mid-Atlantic area and would cause changes to the fishery that are more than minor. During the years identified (2004-2007) there were some years that areas were completely closed, some were fished more heavily, and other years when access was allocated on Georges Bank. When all these factors are combined and averaged, the end result masks what actually went occurred in the fishery in terms of when and where gear was in the water.

With respect to the total allocated DAS, the allocations fluctuate yearly. The years of 2004 and 2006 both had a higher number of total allocated DAS than 2005 and 2007, and 2008-2009 are much lower. These allocations are based on available biomass and mortality estimates, which vary depending on the expected biomass and how much fishing mortality is being allocated in access areas. In some years, open area effort may be lower because more effort is being allocated in access areas. When more effort is allocated in access areas, open area effort must be reduced to keep overall effort levels below overfishing thresholds. Comparing 2004 to 2009, the number of total DAS allocated has declined by 39%. The average DAS allocated from 2004-2007 was 19,182, which is about 29% more than the estimate of allocated DAS for 2009. However, this does not take into account the fact the FMP does not dictate where open area effort can be used. Most years, open area effort is split evenly between the Mid-Atlantic and Georges Bank, but that fluctuates depending on where catch rates are higher in the open areas.

Table 1 – Scallop DAS allocated and used in recent years

Year	Total DAS allocated	FT	PT	Occ	Total DAS used
2004	22462	42	17	4	15987
2005	15344	40	16	3	14436
2006	20343	52	21	4	17344
2007	18577	51	20	4	15192
2008	11410	35	14	3	
2009	13692	42	17	3	

Based on which access areas are open during which years, the number of trips varies greatly. Allocated numbers of trips are based on biomass estimates and the basic principles of area rotation. For the baseline period, roughly 50% of the trips were allocated to the Mid-Atlantic for 2004-2007, except in 2006, when no trips (other than Hudson Canyon carry-over trips) were allocated (Table 2). Subsequently, for 2008-2009, 80% of the trips have been allocated to the Mid-Atlantic. It is important to note that when using the baseline, the fact that no trips were allocated in 2006 gets lost in the average. Overall, about 2.5 access area trips were allocated in the Mid-Atlantic during the 2004-2007 baseline, compared to 4-6 anticipated for 2010-2011, so that a reduction relative to the baseline would translate into a more severe reduction relative to the anticipated 2010-2011 allocation.

Putting Georges Bank allocations aside, the number of trips per access area in the Mid-Atlantic varies annually. For 2004-2005, trips were only allocated to Hudson Canyon, while carry-over trips were allowed from Hudson Canyon in 2006-2007. This was not an allocation, so another way to look at that is 3 trips were allocated to Hudson Canyon from 2005-2007, many of which were used in 2005. Then, 3 to 4 trips were allocated per year from 2007-2009 in the Elephant Trunk, although the allocation may change with updated biomass numbers for 2009. Delmarva has only one trip allocated in 2009 and was closed during the baseline period. Thus, if using a baseline, the fact that ETA and Delmarva were closed for much or all of the time is not apparent because it is lost in the average.

Table 2 – Access area allocations from 2004-2009

Access Areas		GB			Mid-Atlantic		
	Total trips for FT	CA1	CA2	NL	HC	ET	Del
2004	7		2	1	4		
2005	5	1	1		3		
2006	5		3	2	carry-over		
2007	5	1		1	carry-over	3	
2008	5			1		4	
2009	5		1			3	1

In terms of where limited access effort is used, Figure 1 (2nd panel) depicts limited access fishing in 2005, 2006, and 2007 (data not complete) on separate charts. For 2005, more open area effort occurred in the Mid-Atlantic, and effort was concentrated in the Hudson Canyon area. However, in 2006 more open area effort was used in the Great South Channel between the Nantucket Lightship and Closed Area I access areas. The figure is not complete for 2007, but a substantial amount of effort shifted back to the Mid-Atlantic when Elephant Trunk opened on March 1, 2007.

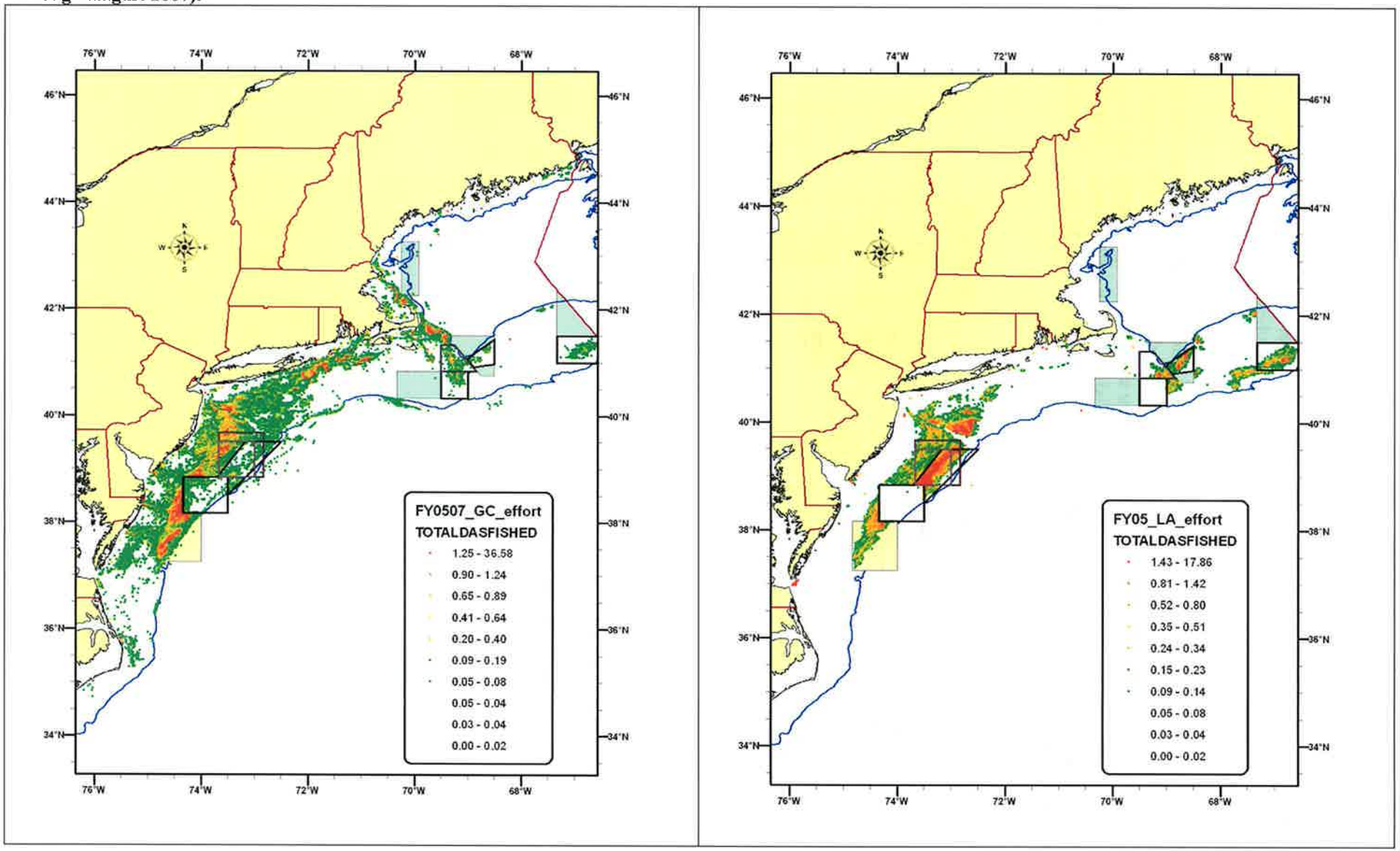
The general category fleet is permitted to take a fleetwide maximum number of trips in access areas. The allocation has varied by year; in the earlier years the general category fleet was allocated approximately 2% of the target TAC per area, 5% in more recent years for some areas, and 0% for other areas like Closed Area II that are farther offshore. It is important to point out that the Hudson Canyon access area was not closed to the general category fleet, so that fleet was permitted to fish in that area during the full baseline period. Therefore, for the baseline period, the general category vessels did not receive any access area trips in the Mid-Atlantic until 2007

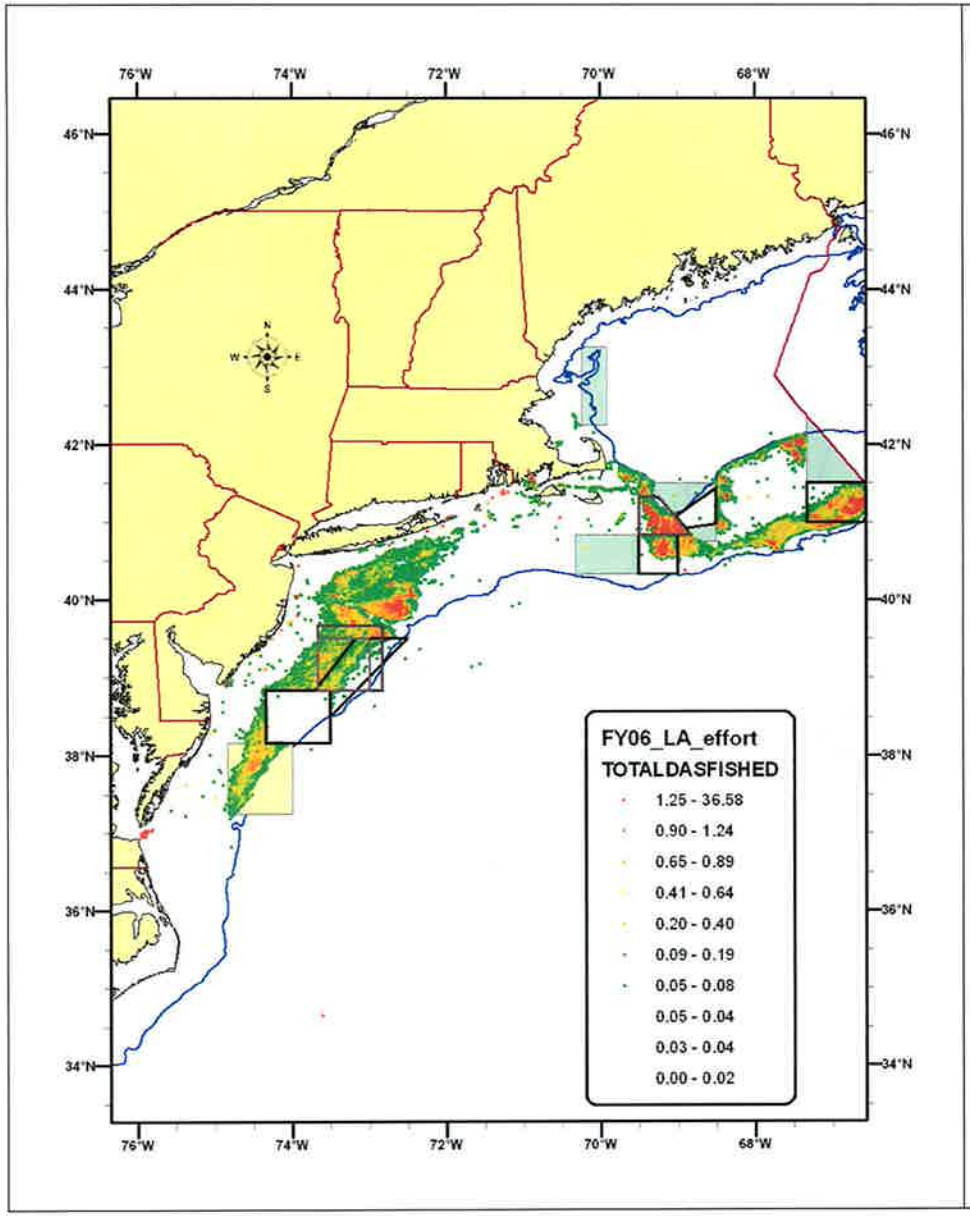
in the ETA. However, general category vessels were not prevented from fishing in the Hudson Canyon area, so their effort was actually substantial in Mid-Atlantic access areas during the baseline period.

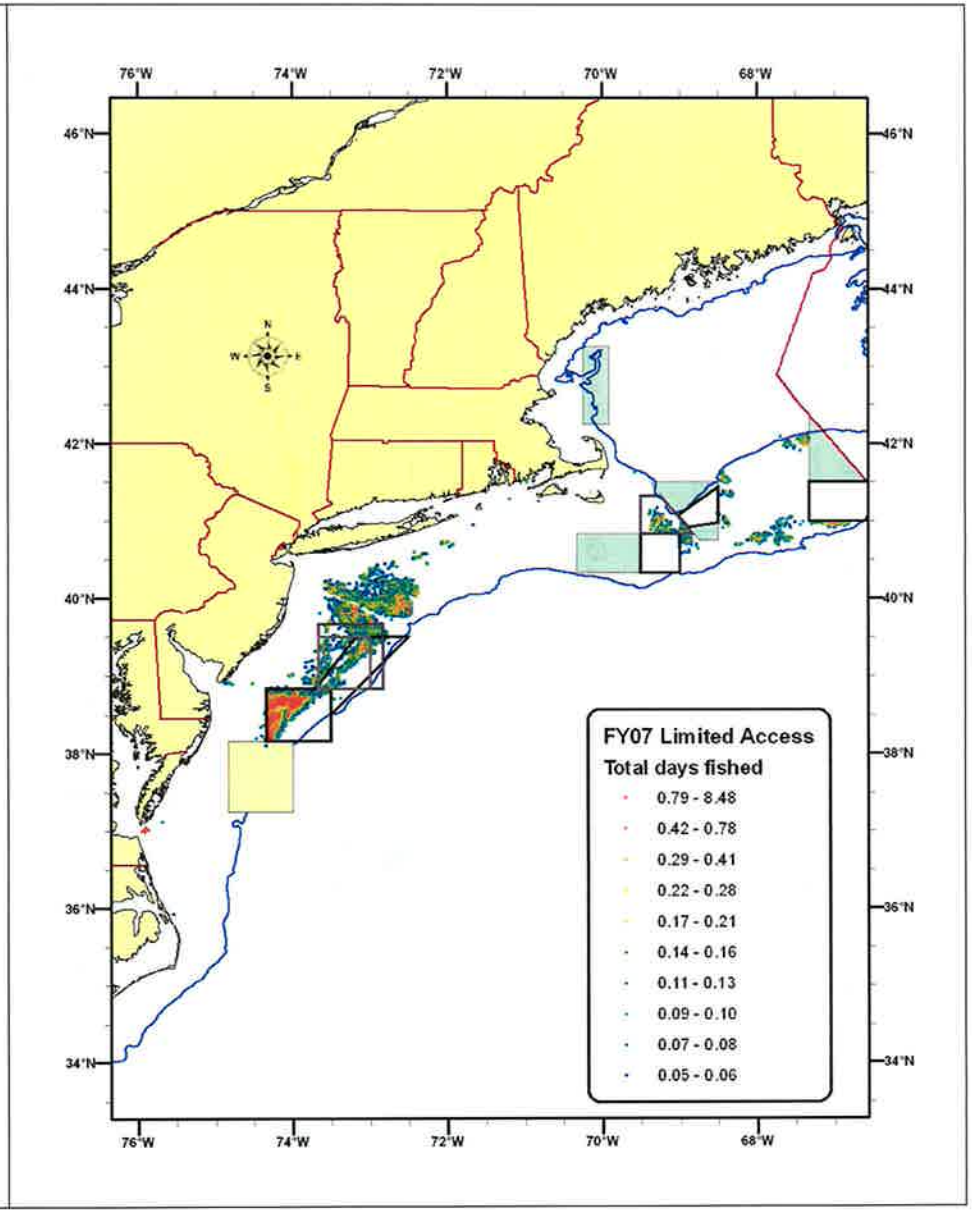
In 2008-2009 the general category fishery will be limited to a maximum number of trips in access areas in both the Mid-Atlantic and Georges Bank. Overall, general category fishing will be very different than during the baseline because a limited entry program has been adopted as well as an IFQ program (Amendment 11). The fishery will be allocated a fleetwide number of trips in access areas. In the future, this will most likely be limited to some fleetwide total number of trips.

General Category		GB			Mid-Atlantic		
	Total AA trips	CA1	CA2	NL	HC	ET	Del
2004	806		420	386	open		
2005	547	162	385		open		
2006	1142		565	577	open		
2007	1475	216		394	open	865	
2008	3327			665		2662	
2009	2692					1964	728

Figure 1 – Cumulative days fished in each block for general category vessels (2005-2007 combined) and limited access vessels for 2005, 2006, and 2007 (VMS data through August 2007).

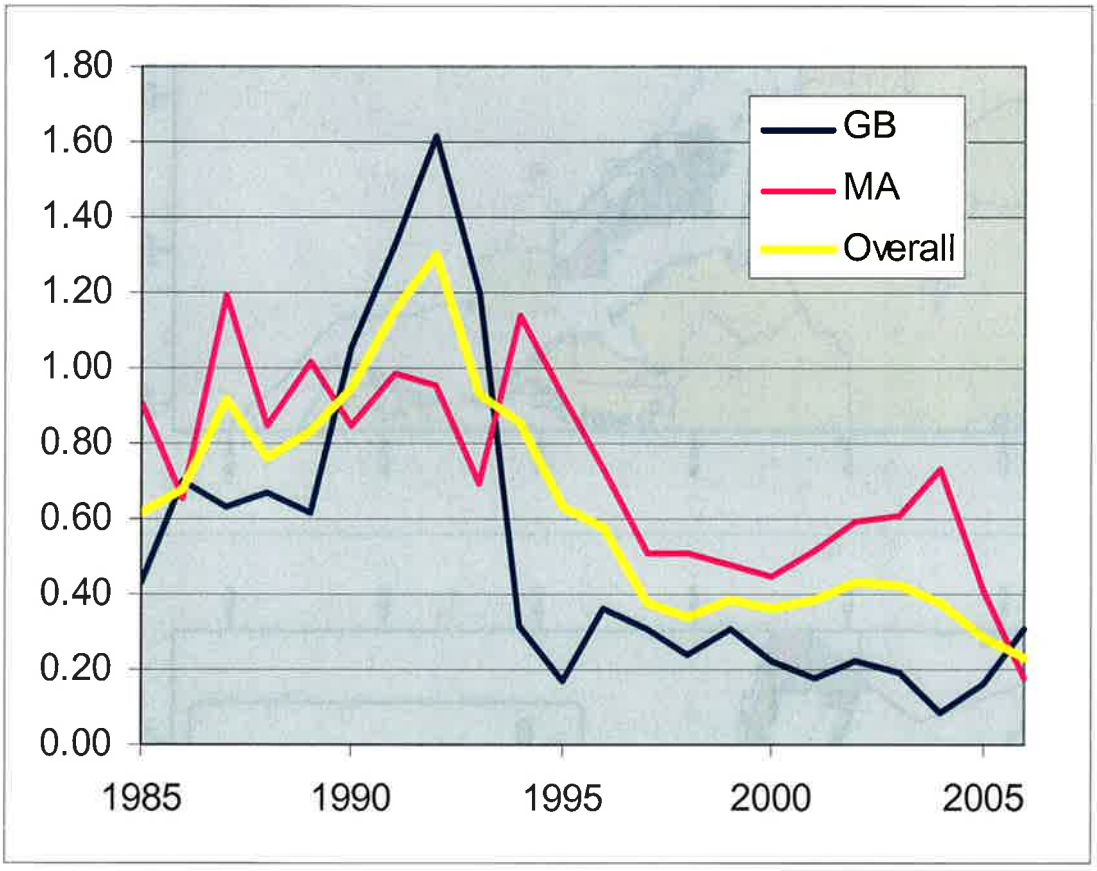



76°W
74°W
72°W
70°W
68°W
46°N
44°N
42°N
40°N
38°N
36°N
34°N
FY06_LA_effort
TOTALDASFISHED
1.25 - 36.58
0.90 - 1.24
0.65 - 0.89
0.41 - 0.64
0.20 - 0.40
0.09 - 0.19
0.05 - 0.08
0.05 - 0.04
0.03 - 0.04
0.00 - 0.02


76°W
74°W
72°W
70°W
68°W
46°N
44°N
42°N
40°N
38°N
36°N
34°N
FY07 Limited Access
Total days fished
0.79 - 8.48
0.42 - 0.78
0.29 - 0.41
0.22 - 0.28
0.17 - 0.21
0.14 - 0.16
0.11 - 0.13
0.09 - 0.10
0.07 - 0.08
0.05 - 0.06

Fishing mortality peaked in the early 1990s, but has decreased substantially since then and, in general, has remained stable since 1999 (Figure 2). In recent years, fishing mortality has been higher for the Mid-Atlantic than for Georges Bank. Georges Bank saw a significant decrease in fishing mortality from 1993-1995 and has remained very stable since 1995. However, the Mid-Atlantic fishing mortality, although in decline, is not as stable as Georges Bank. The threshold for overfishing is F=0.29.

Figure 2 – Fishing mortality in the scallop fishery overall (and in Georges Bank and Mid-Atlantic) from 1983 -2006



The estimate of turtle takes was based on fishing effort levels in 2003 and 2004. Fishing mortality in the Mid-Atlantic declined during and since the baseline period. Since 2004, F has been reduced by about 50% overall, as well as during the months of June-October, when turtles are more likely present in the Mid-Atlantic (Figure 3).

Figure 3 – Estimate of fishing mortality in the Mid-Atlantic (blue) and during the months of June-October (red). Fractions in projections assume June-October fishing mortality is 42% of annual F.

F estimates for 2003-2006 from SAW Report and projections for 2007-2011 from FW19 projections