

DRAFT ANALYSES FOR TURTLE RPMS IN FRAMEWORK 22

1.1.1 Analysis of more than minor impact

There is no official guidance on how to define more than a minor change. However, based on ESA regulations, a reasonable and prudent measure, along with the term and condition that implement it, 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. After the biological opinion of the scallop fishery came out in 2008 the Scallop Committee requested that the PDT provide an analysis that would help identify what is more than a minor change in the scallop fishery.

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 is 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 Framework 21 Appendix I for more information). In general, the highest meat weights in the Mid-Atlantic are from April through August. About 40% of all fishing in Mid-Atlantic access areas and open areas 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 original term and condition was reasonable and prudent (more than a minor change), but it has also been used more recently to assess whether the alternatives to comply with the revised RPM developed in Framework 22 are expected to have more than a minor change on the scallop fishery. The differences in fishing mortality, yield, and revenue impacts can be compared.

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.

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 in detail in Section 5.3.2 of FW21. Assumptions include: seasonal and spatial composition of both open area and access area effort, effort displacement of 100%, and shifts in scallop meat weights by season. Some of these assumptions were updated with more recent data and some were the same used as last year.

1.1.1.1 Threshold for more than minor

Last year Framework 21 included an analysis with a threshold of effort shift and change in fishing mortality (F) of 0.01 as a possible threshold for more than a minor change. 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 ($0.12 \times 0.08 = 0.0096$). A threshold could be set anywhere, but last year the PDT identified 0.01 because it is 5% of the current fishing mortality target. This threshold is what was recommended for the specific time period and associated meat weight changes from the biological opinion last year (June 1-Oct 31 and an estimated loss of 8% yield shifting effort from that period to the remaining months of the year).

It is important to note that in this Framework there are several different seasons under consideration and each have a different meat weight change – so the same 0.01 change in F threshold cannot apply to all seasons. Therefore, for this framework having the same overall value of change in F is not useful since the time periods and measures under consideration are very different. Instead it may be more useful to consider the amount of effort shifting from the Mid-Atlantic during the turtle season to the remainder of the year and what that expected impacts on catch and revenue are. Percent effort shift is actually the original factor the PDT identified originally as what should be the threshold for more than a minor change. Ultimately, identifying what is more than minor is a policy decision, but ESA stipulates that, “a reasonable and prudent measure, along with the term and condition that implement it, cannot alter the basic design, location, scope, duration, or timing of the action and may involve only minor changes.

Ultimately, when the Scallop Oversight Committee considered all this related to the original biological opinion in 2008 the 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 above such as concern about safety at sea, changes in bycatch, 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.

The next section assesses the RPM alternatives currently in FW22 compared to status quo. A summary of potential impacts of each RPM is assessed separately. **Again, there is no threshold set in stone, but the PDT presented and the Committee agreed that a measure that causes more than 10% of effort to shift from the Mid-Atlantic during the various turtle seasons under consideration would be a reasonable threshold for more than a minor change.**

The Committee supported 10% to be used in this action because these analyses are based on assumed fishing behavior responses and historical fishing patterns, so impacts could be very different if the fishery responds differently than assumed. Specifically, if effort shifts mostly to November and December, then impacts on *F* will actually be higher than the results suggest. If effort shifts only to the summer when meat weights are higher impacts on *F* will be reduced, thus overall impacts from the measure may be lower or even positive in some cases. Ultimately, the Committee voiced that 10% seems to be a reasonable level of effort shift to use as a standard since actual impacts could be higher or lower.

However, when the Committee reviewed impacts of measures with higher amounts of effort shift the associated impacts on landings and revenue were higher. Additional issues were identified with these measures making them unreasonable or having more than minor impacts because they are expected to have high distributional impacts on the fleet; some will be impacted greatly and others not at all. Ultimately, since these impacts are difficult to predict because they are based on changes in fishing behavior and issues not in the model such as changes in price, and other unknowns, implementing something that could have the potential to have much higher impacts on *F* due to effort shifting into seasons with lower meat weight yields is risky and could have more than minor impacts on *F* and the fishery. In addition, the Committee voiced that shifting 10% of effort from that area and season is a considerable amount of total effort and should have beneficial impacts on turtles and that is an important element of this process.

Therefore, the tables below provide the results for shifting 10% of effort in the MA during the turtle season under consideration to the remainder of the year. The tables also provide the results if all effort expected to happen in the MA in the turtle season for that RPM is shifted (100%) to provide a sense of the maximum value of potential impacts on effort, *F*, landings and revenues.

1.1.1.2 Results

1.1.1.2.1 RPM Options for Alt.1: 2011

Table 1. RPM options for year 2011 for allocation alternative 1 (Alt-1)

Row #	2011	DMV Closure Sept-Oct	DMV Closure Jul-Oct	1 trip max. in MA June15-Oct.31 (or combination with DMV)	Reduce open MA DAS July-Sept.
-------	------	----------------------	---------------------	---	-------------------------------

				closure)	
1	Column	A	B	C	D
2	Projected # of trips in window PRE RPM TW	121	248	295	3.7
3	Projected # of trips in window POST RPM TW	36	116	186	1.1
4	Difference in # of trips in MA AA during window	85	132	109	-2.6
5	Total landings in MA AA in window PRE RPM	2,183,527	4,456,687	5,312,530	3,144,881
6	Total landings in MA AA in window POST RPM	653,947	2,080,049	3,342,467	943,464
7	Difference in landings in MA AA during window (negative)	(1,529,580)	(2,376,639)	(1,970,063)	(2,201,417)
8	Projected DAS used in MA AA during win. PRE RPM	863	1618	1987	1271
9	Projected DAS used in MA AA during win. POST RPM	258	755	1250	381
10	Difference in projected DAS used in MA AA during win.	-605	-863	-737	-890
11	% reduction in MA AA effort during window	-70%	-53%	-37%	-70%
12	Total effort during window (DAS-used in MA+GB)	3310	8404	9922	7063
13	Total effort shift in MA (AA +OA) during window	18.3%	10.3%	7.4%	12.6%
14	Change in MW in window	-6.6%	5.5%	2.2%	3.7%
15	% Change in F	-1.199%	0.562%	0.167%	0.461%
16	Change in fishing costs	-61,755	76,045	26,583	0
17	Change in landings	0	0	0	(78,422)
18	Change in revenue	Positive	Uncertain	Uncertain	(598,822)
19	% shift of from June 15-Oct.31 window assuming all effort shifts out of this season	6.1%	8.7%	7.4%	9%
20	% shift of removed effort to June 15 - Oct.31st	67%	15%	0%	10%
21	Number of trips shifts to June15-Oct.31	57	20	0	NA
22	Shift of effort (DAS) to June 15 - Oct.31st	-405	-129	0	-89
23	Net shift off effort from June 15-Oct.31	-200	-733	-737	-801
24	B. % Net shift of effort	-2.0%	-7.4%	-7.4%	-8.1%

Row 2 to 18 shows the results of each RPM option for specific the window shown in each column. The row 19 estimated the % shift assuming that all effort removed from a specific window shifted to out of turtle season (June 15 – Oct. 31st). Gray shaded area (rows 19-24) represents the shift out of the Turtle season (June 15 – Oct. 31st) based on several assumptions.

DMV closure from September to October: This alternative would remove about 85 trips, or 605 DAS-used (Row 10-column A), from these months, which is equivalent to a shift of 18.3% (row 13 – column A) of effort from Sept-Oct. However, 605 days represents a shift of 6.1% from the total turtle season assuming that none of these 605 days are shifted to June 15-Aug.31st (605 DAS-used / 9922 DAS-used (row 10– column A / row 12– column C). This is obviously an unrealistic assumption representing the upper limit for effort shift:

- Since this DMV closure window is shorter and included in the overall turtle season (June 15 – Oct. 31st), some part of the effort is likely to shift outside of that window to the remaining months of the season.
- For example, closure of DMV during Sept-Oct. is estimated to remove 85 trips (Row 4- Column A) or 605 DAS-used (Row 10) from these months. According to the preliminary

data for 2010, 67% of the effort normally taken during Sept-Oct was shifted to June to August. If the same % shift was applied, 57 of the 85 trips, or 405 out of 605 of days, removed from Sept to Oct. would shift to the Turtle season (row 22 of column A).

- Thus, the net change in effort during the overall window would 28 less trips in Sept-Oct, or a 200 less days used (Row 23=Row 10- Row 22). This would correspond to a 2% shift in effort to outside of the turtle season with limited benefits for the turtles (row 23 of Col.A/row 12 of Col.C).
- Because the meat-weights are lower in September-October compared to the rest of the year, closing DMV could have positive impacts on the yield and could benefit fishermen if they receive higher prices for the larger scallops outside of this window.
- Fishing outside of this window would also lower the fishing costs because the higher meat weights could result in shorter fishing time. If all the effort removed from this window was used outside of the turtle window distributed somewhat evenly during those 7.5 months (Nov-June 14), estimated fishing costs would decline by about \$61,755 for the fishery as a whole.
- However, some fishermen may prefer to fish during these months if they think they can get a better price when the supply is relatively lower. For example, both the average price and the price of U10 scallops were higher in September-October 2009 compared to the summer months and some fishermen probably increased their revenue by fishing during this window (Table 1). Therefore, although the impacts of this alternative on the scallop fishery are expected to be somewhat positive, these impacts will probably be small. In addition, late opening of the HC area in 2011 could encourage fisherman to take most of their DMV trips before July and reserve months of September and October for the HC trips, further reducing any impacts this closure may have.

DMV closure from July to October:

Without any effort shifts to June 15-July 1st, a 4-month closure of DMV from July to the end of October could remove about 132 out of 144 trips expected during this window. This would constitute an 8.7% shift in effort from the entire turtle window to the remaining months of the year with positive effects on turtles.

- Similar to a 2 month DMV closure, however, it is reasonable to expect that some effort removed from this would be directed to the last two weeks of June, reducing the benefits of this closure depending on the extent of the shift. In 2010, Sept-Oct closure of DMV resulted in 15% of the trips removed from these two months to move to June 15-July 1st window. With a longer closure from July to October, it is possible for more than 15% effort to shift to June 15-July window, however. Using the lower estimate of 15% as an example, a four month closure of DMV could result in about 20 of these trips to shift to June 15 – July 1st, with a net reduction 112 trips from the entire window. This reduction corresponds to net effort reduction of 733 days (Row 23 Col. B) and a 7.4% (row 24, Col.B) effort shift out of the entire Turtle season, which is similar in magnitude to the effort shift with the “maximum 1-trip” alternative, estimated to remove 109 trips and about 737 days from the turtle season.
- If more than 15% of the effort removed from the July - October window was shifted to June 15-July, then the benefits of the 4-month closure alternative on turtles would decline. For example, if 25% of the 132 trips removed from this window were shifted to the last two weeks of June, the net decline would be 99 DMV trips (132- 33). This

would constitute a 6.5% shift in effort from the entire turtle season, which is less than the shift in effort with the maximum trip alternative.

- Furthermore, the 4 month DMV closure alternative would have the largest impact on overall fishing mortality. It is estimate to increase F by 0.48% if there was no shift in effort and by 0.40% if 15% of the effort removed shifted to June 15-July window.
- In terms of impacts on the fishery, time-area closures tend to increase costs and lower fishing profits by reducing the flexibility for the vessels to optimize their incomes by choosing where and when to fish in response to the resource and market conditions. If all the effort removed from this window was used outside of the turtle window distributed somewhat evenly during these 7.5 months (Nov-June 14), the fishing costs are estimated to increase by about \$76,045 for the fishery as a whole.
- Although the impacts of this alternative on the scallop fishery are expected to be somewhat negative, these impacts will probably be small. Closing this area coupled with the possibly delayed opening of the HC area in 2011 will probably encourage fisherman to take most of their DMV trips before July and reserve months from July to October for the HC trips, reducing the negative impacts from this closure to some extent.

Maximum one-trip alternative:

- This alternative encompasses the entire turtle season (June 15 – Oct. 31st). It is estimated that 295 trips, 151 in HC and 144 in DMV, would be taken during this window in the HC and DMV areas. Reducing trips from 2 to 1 is equivalent to a 37% reduction in effort during this window, i.e., by 109 trips and by 737 days. In other words, total number of trips would decline from 295 trips to 186 trips. This reduction corresponds to a 7.4% shift of effort from the turtle season to the period November 1 to June 14.
- Because the meat weight is about 2.2% higher during this season compared to rest of the year, this alternative would increase fishing mortality slightly by 0.167% and the fishing costs by a small amount (\$26,583 for the entire scallop fishery), less than compared with the July-Oct. DMV closure alternative.
- Without any closures, it is possible that some fishermen will take less DMV and some will take less HC trips during this season. The delay in HC opening in 2011 will probably encourage fisherman to take most of their DMV trips before July and reserve the summer months for the HC trips. For example, vessels could choose to take all of their HC trips (151 trips) and only 35 DMV trips (out of 144 trips estimated – a decline 109 trips)) during these months. Therefore, this scenario could lead to larger reduction in DMV effort than closing DMV alone in Sept-Oct. window, or a similar reduction in DMV effort than closing DMV alone in Jul-Oct. window (reduction in DMV effort by 109 trips with maximum trip alternative versus reduction in DMV effort by 99 to 112 trips with 4-month DMV closure assuming respectively 25% and 15% shift of effort).
- The “maximum one-trip” alternative has lower risks for the turtles compared to a DMV closure; because with the restriction on trips, the effort could not be shifted to the other months during the Turtle season.
- Maximum “1-trip” alternative without a DMV closure would provide more flexibility to fishermen, however, in terms of when and where (HC or DMV) to fish depending on the changes in market and resource conditions. As a result, the impacts of this alternative on costs and profits are expected to be lower than a 4-month closure of DMV.

- It is important to note that the analyses of the 1 trip max alternative assume no trading of trips. The number of vessels expected to take one or two trips during the turtle season is based on historical trends of effort in ETA in 2007 and 2008 using Table 68 of the Framework 21 document. The percent of vessels that took one or multiple trips during the season were used to predict the amount of effort that would be shifted due to a one trip max restriction. This calculation indicated that the number of trips during the Turtle season could decline by about 37% if the number of trips are restricted at one trip per vessel. In 2011 and 2012 some vessels will receive only one MA trip, two or even three depending on the results of the lottery. In addition, some vessels may trade in additional MA trips, so impacts could actually be higher for those vessels if a one trip max is selected reducing the amount of time those trips can be taken during the year.

Combination of maximum one-trip alternative with DMV closures:

- Maximum one trip alternative would reduce the number of estimated trips from 295 to 186 during the entire turtle season assuming that there will be no trading of GB access trips for Mid-Atlantic trips. If DMV was closed in September to October, 85 trips would be removed from that window and some of these trips could be shifted to either June 15-August 31st or to the outside of turtle window.
- If all of these trips were shifted to Nov-June 14 window, this means that the vessels could take 151 HC trips during the turtle season, which is in accordance with the previous seasonal activity in that area. In addition to these trips, the vessels could take about 36 trips in DMV during the June 15-August window, which is less than the number trips (57 trips = Row 21 of Column A) expected to shift if DMV was closed in September to October without any limits on the maximum number of trips. Therefore, the combination alternative would limit the number of DMV trips that can be shifted from the September-October window. If, however, the vessels would choose to shift 57 DMV trips from the September-October window to June 15-August window, that means they will take less HC trips (129) during the entire window. Therefore, the total number of trips are not expected to exceed 186 trips when number of trips were limited to one-trip during the turtle season, total effort removed from the turtle season (737 days) with the combination alternative is equivalent to the total effort removed by the maximum one-trip alternative without any DMV closure. Both the combination and the maximum one trip alternative would result in a 7.4% effort shift from the turtle window.
- Only difference is that combination alternative would limit DMV effort to the June 15-August window, and there would be less DMV trips during the entire turtle season. However, given that turtle intakes are higher in DMV during Sept-Oct relative to the other seasons, combination alternative may have higher benefits on turtles than maximum one-trip alternative.
- The impacts of the combination alternative with a two month DMV closure are expected to be uncertain and small on the scallop fishery. As indicated above, closing DMV and shifting some of the trips out of Sep-Oct. would lower the fishing costs because the higher meat weights could result in shorter fishing time. The fishing mortality rate could slightly decline as well for the same reasons. However, pushing some DMV trips to the June 15-August window can have some negative impacts on prices during that season. In addition, combining maximum one-trip option with DMV closure would also reduce the flexibility for the vessels to optimize their incomes by choosing where and when to fish

in response to the resource and market conditions as discussed above in relation of the DMV area-time closures. Therefore, the impacts of the combination alternative on the scallop fishery will depend whether the positive impacts on costs, meat-weight and prices would outweigh the negative impacts. In addition, late opening of the HC area in 2011 could encourage fisherman to take most of their DMV trips before July and reserve months of September and October for the HC trips, further reducing any impacts this closure may have.

- As discussed above, maximum 1-trip” alternative would remove a similar number of trips from the turtle window compared to a Jul-Oct DMV closure depending on which months the removed effort shifts. Again the total number of trips is expected to decline to 186 trips with the maximum one-trip alternative. Combining this option with a July-October DMV closure will limit number of DMV trips to 36 trips during the turtle season if vessels prefer to take all the HC trips (151 trips) they were planning to take during this season. Because DMV will be closed during July to October however, these 36 trips could only take place during the last 2 weeks of June. This means shifting about 648,000 lb. of landings (36 access trips at 18,000 lb.) to a narrow window with possibly negative impacts during June 15th- July 1st. Without the closure, the same amount of landings could be distributed to the entire turtle season. Furthermore, shifting the effort from July to October would reduce the meat weights by 5.5%, increase costs and lower prices. In short, combining “maximum 1-trip” alternative will probably have some negative impacts on the fishery although these impacts cannot be quantified with certainty.

Reducing Open Area DAS allocations in Mid-Atlantic: Reducing 70% open area DAS from the MA open areas (Column D) from July to September would require limiting use of open area DAS to about 5 DAS per FT vessel and would result in approximately 8.1% shift of effort to the period Nov-June 15 (using the distribution of effort provided in Table 65, p.186 of the Framework 21 document). If, however, that some of the Mid-Atlantic DAS removed from July to September was shifted to October-June period, the percentage shift in effort out of the turtle season will be less than 8.1%. A limit of 5 DAS per vessel is very restrictive because that is shorter than a typical trip, so many vessels would not fish at all. As described in FW21, this option is expected to have high distributional impacts, thus less favorable compared to other options.

1.1.1.2.2 RPM Options for Alt.1: 2012

Table 2. RPM options for year 2012 for allocation alternative 1 (Alt-1 -- 1.5 trips for HC and 0.5 trips for DMV)

Row #	2012	DMV Closure Sept-Oct	DMV Closure Jul-Oct	HC Closure Aug-Sept	HC Closure Jul-Sept	June15-Oct.31 Combine B and C	1 trip max. in MA June15-Oct.31 (or combination with DMV closure)	Reduce open MA DAS July-Sept.
1	Column	A	B	C	D	E	F	G
2	Projected # of trips in window PRE RPM TW	97	239	77	185	298	298	3.9
3	Projected # of trips in window POST RPM TW	54	173	28	39	220	188	1.2
4	Difference in # of trips in MA AA during window	42	66	77	146	78	111	-2.7
5	Total landings in MA AA in window PRE RPM	1,745,710	4,308,392	1,902,192	3,324,092	5,364,000	5,371,250	3,321,126
6	Total landings in MA AA in window POST RPM	980,920	3,120,073	507,321	696,233	3,967,274	3,379,412	996,338
7	Difference in landings in MA AA during window (negative)	(764,790)	(1,188,319)	(1,394,871)	(2,627,858)	1,396,726	(1,991,839)	(2,324,788)
8	Projected DAS used in MA AA during win. PRE RPM	730	1654	755	1291	2,122	2125	1355
9	Projected DAS used in MA AA during win. POST RPM	410	1198	201	270	1,569	1337	406
10	Difference in projected DAS used in MA AA during win.	-320	-456	-554	-1021	-553	-788	-948
11	% reduction in MA AA effort during window	-44%	-28%	-73%	-79%	-26%	-37%	-70%
12	Total effort during window (DAS-used in MA+GB)	3328	8837	4761	7415	10526	10526	7471
13	Total effort shift in MA (AA +OA) during window	9.6%	5.2%	11.6%	13.8%	5.2%	7.5%	12.7%
14	Change in MW in window	-6.6%	5.5%	1.3%	4.3%	2.2%	2.2%	3.7%
15	% Change in F	-0.6303%	0.2825%	0.1498%	0.5893%	0.1177%	0.1678%	0.465%
16	Change in fishing costs	-32,653	40210	11409	70432	36,460	28,423	0
17	Change in landings	0	-	-	-	-	0	(82,817)
18	Change in revenue	Positive	Uncertain	Uncertain/Negligible	Uncertain	Uncertain	Uncertain	(632,381)
19	% shift of from June 15-Oct.31 window assuming all effort shifts out of this season	3.0%	4.3%	5.3%	9.7%	-5.2%	7.5%	9%
20	% shift of effort to June 15 - Oct.31 st	67%	15%	80%	25%	15% for DMV-80% for HC	0%	10%
21	Number of trips shifts to June15-Oct.31	28	10	62	36		0	
22	Shift of effort (DAS) to June 15 - Oct.31 st	-214	-68	-443	-255		0	-95
23	Net shift off effort from June 15-Oct.31	-105	-388	-111	-766	-553	-788	-853
24	B. % Net shift of effort	-1.0%	-3.7%	-2.3%	-7.3%	-5.2%	-7.5%	-8.1%

Row 2 to 18 shows the results of each RPM option for specific the window shown in each column. Gray shaded area (rows 19-24) represents the shift out of the Turtle season (June 15 –

Oct. 31st) based on several assumptions. It should be noted that percentage effort shifts that were assumed in Row 20, for columns A and B (for DMV) were based on the 2010 data. For HC effort shifts, however, the values in row 20 are just assumed as a part of a scenario analysis. The spreadsheet model could be used to analyze the results with other assumptions about the likely shifts of effort when one area is closed to fishing for a specific period of time.

DMV closure from September to October: The results of the analysis are similar to the closure of DMV in 2011 except that the impacts would be lower, about one-half of the levels for 2011 because there will be one half trips allocated for this access area. This alternative would remove about 42 trips, or 320 DAS-used (Row 10-column A), from these months, which is equivalent to a shift of 9.6% (row 13 – column A) of effort from Sept-Oct. This represents a shift of 3% from the total turtle season assuming that none of these 320 days are shifted to June 15-Aug.31st (320DAS-used / 10526 DAS-used (row 10– column A / row 12– column C). This is obviously an unrealistic assumption representing the upper limit for effort shift:

- According to the preliminary data for 2010, 67% of the effort normally taken during Sept-Oct was shifted to June to August. If the same % shift was applied, 214 out of 320 of days removed from Sept to Oct. would shift to the Turtle season (row 22 of column A) and the net change in effort during the overall window would be 200 days (Row 23=Row 10- Row 22). This would correspond to a 1% shift in effort to outside of the turtle season (row 23 of Col.A/row 12 of Col.C).
- Because the meat-weights are lower in September-October compared to the rest of the year, closing DMV could have positive impacts on the yield and could benefit fishermen if they receive higher prices for the larger scallops outside of this window.
- Fishing outside of this window would also lower the fishing costs because the higher meat weights could result in shorter fishing time. If all the effort removed from this window was used outside of the turtle window distributed somewhat evenly during those 7.5 months (Nov-June 14), estimated fishing costs would decline by about \$32,563 for the fishery as a whole.
- Therefore, although the impacts of this alternative on the scallop fishery are expected to be somewhat positive, these impacts will probably be small.

DMV closure from July to October:

Again, the results of the analysis are similar to the closure of DMV in 2011 except that the impacts would be lower, about one-half of the levels for 2011 because there will be one half trips allocated for this access area. Without any effort shifts to June 15-July 1st, a 4-month closure of DMV from July to the end of October could remove about 66 DMV trips expected during this window. This would constitute a 4.3% shift in effort from the entire turtle window to the remaining months of the year with positive effects on turtles. However, if it was assumed that 15% of the effort removed from this window might shift to June 15-July, net effort reduction would be 388 days (Row 23 Col. B) and 3.7% (row 24, Col.B) of the total effort during the entire Turtle season. This option have the same pros and cons discussed above for 2011 RPM alternatives with the exception that the impacts on the fishery would be smaller because of the half number of trips that could be allocated to this area.

HC closure from August to September:

This alternative would remove 77 HC trips from this window without any shift of effort to the other months in the turtle season. If, however, it was assumed that 80% of these trips shifted to June 15-July 31st and to October, the net reduction in trips in the entire window would be quite small, 15 trips, which corresponds to a 2.3% effort shift from the turtle window resulting in negligible effects on turtles and the scallop fishery.

HC closure from July to September:

Without any shift of effort this option would remove 146 HC trips or 79% of the effort from this window, which would increase F by 0.58% (largest impact compared to other alternatives) and would shift 9.7% of the effort from the turtle season. If 25% of these 146 trips were shifted to June 14-July 31st and October, total effort shift would decline to 766 days. This corresponds to a 7.3% effort shift from the entire turtle season. In terms of impacts on the fishery, time-area closures tend to increase costs and lower fishing profits by reducing the flexibility for the vessels to optimize their incomes by choosing where and when to fish in response to the resource and market conditions. If all the effort removed from this window was used outside of the turtle window distributed somewhat evenly during these 7.5 months (Nov-June 14), the fishing costs are estimated to increase by about \$70,432 for the fishery as a whole.

Combining HC closure in August to September with the DMV closure in July-August:

Combining HC and DMV closure will reduce the number of trips during the turtle season less compared to a one trip maximum if the vessels shift 15% of the reduced DMV trips to June 15-Aug. and if they shift 80% of the reduced HC trips to June 15-July plus October. This is because there are restrictions on the total number of trips that can be taken during the Turtle season.

Maximum one-trip alternative:

The maximum one trip alternative (Col. F) encompasses the entire turtle season (June 15 – Oct. 31st). It is estimated that 298 trips would be taken during this window in the HC and DMV areas. Reducing trips from 2 to 1 is equivalent to a 37% reduction in effort during this window, i.e., by 111 trips. In other words, total number of trips would decline from 298 trips to 188 trips.

If we assume that vessels choose to take only HC trips during this window (226 trips PRE-RPM, 188 POST-RPM), this means that they would take rest of their 38 HC trips during Nov- June 14 and would take all of their DMV trips out of the turtle season. On the other hand, if vessels choose to take DMV trips during this season first, then it is estimated that 72 DMV trips would be taken during this season, and the rest of the 116 (188-72) trips would be taken in the HC area. Therefore, this option provides flexibility to the vessels to choose which area and when to fish to optimize their revenue and reduce their costs.

Again, it is important to note that the analyses of the 1 trip max alternative assume no trading of trips. The number of vessels expected to take one or two trips during the turtle season is based on historical trends of effort in ETA in 2007 and 2008 using Table 68 of the Framework 21 document. The percent of vessels that took one or multiple trips during the season were used to predict the amount of effort that would be shifted due to a one trip max restriction. This calculation indicated that the number of trips during the Turtle season could decline by about 37% if the number of trips are restricted at one trip per vessel. In 2011 and 2012 some vessels

will receive only one MA trip, two or even three depending on the results of the lottery. In addition, some vessels may trade in additional MA trips, so impacts could actually be higher for those vessels if a one trip max is selected reducing the amount of time those trips can be taken during the year.

Combining DMV closure in September to October with the maximum one-trip alternative:

- Maximum one trip alternative would reduce the number of estimated trips from 298 to 188 during the entire turtle season again assuming that there will no trading of access area trips (less number of trips with trading). If DMV was closed in September to October, 42 trips would be removed from that window and some of these trips could be shifted to either June 15-August 31st or to the outside of turtle window.
- If all of these trips were shifted to Nov-June 14 window, this means that the vessels could take 173 HC trips during the turtle season, which is in accordance with the previous seasonal activity in that area. In addition to these trips, the vessels could take about 15 trips in DMV (188-173) during the June 15-August window, which is less than the number of expected shift of trips (28 trips =Row 21 of Column A) if DMV was closed in September to October without any limits on the maximum number of trips. Because the total number of trips are not expected to exceed 188 trips, total effort removed from the turtle season (788 days) with the combination alternative could be equivalent to the total effort removed by the maximum one trip alternative without any DMV closure. In other words, both the combination and the maximum one trip alternative would result in a 7.4% effort shift from the turtle window.
- Only difference is that combination alternative would limit DMV effort to the June 15-August window, and there would be less DMV trips during the entire turtle season. However, given that turtle intakes are higher in DMV during Sept-Oct relative to the other seasons, combination alternative may have higher benefits on turtles than maximum one-trip alternative.
- The impacts of the combination alternative with a two month DMV closure are expected to be uncertain and small on the scallop fishery. As indicated above, closing DMV and shifting some of the trips out of Sep-Oct. would lower the fishing costs because the higher meat weights could result in shorter fishing time. The fishing mortality rate could slightly decline as well for the same reasons. However, pushing some DMV trips to the June 15-August window can have some negative impacts on prices during that season. In addition, combining maximum one-trip option with DMV closure would also reduce the flexibility for the vessels to optimize their incomes by choosing where and when to fish in response to the resource and market conditions as discussed above in relation of the DMV area-time closures. Therefore, the impacts of the combination alternative on the scallop fishery will depend whether the positive impacts on costs, meat-weight and prices would outweigh the negative impacts.

Reducing Open Area DAS allocations in Mid-Atlantic: Reducing 70% open area DAS from the MA open areas (Column D) from July to September would require limiting use of open area DAS to 5 DAS per FT vessel and would result in approximately 8.1% shift of effort to the period Nov-June 15 (using the distribution of effort provided in Table 65, p.186 of the Framework 21 document).

1.1.1.2.3 RPM measures for 2013

Because the number of access area allocation in DMV and HC areas in 2013 are going to be exactly the same in 2012, the same analyses that were done for 2012 is valid for the 2013 fishing year as well. The original 2013 projections included a 35 open area DAS, again very close to the projected DAS allocation for 2012 (34 days). The open area DAS allocations for 2013 may be set at a lower level (26 DAS), however, as a precaution to prevent vessels exceeding potential DAS allocations that may be lower than 35 DAS based on the updated assessments in 2012. If, during the entire 2013 fishing year open area DAS allocations were set 26 (or any value below 34 days), the impacts of the various RPM options in terms of the % effort shifts from the turtle window will be higher. This is because, the access area effort and landings will constitute a higher proportion of total effort during the turtle season.

Table 3 – Summary of 2013 allocations suggested by the Committee for Scenario 1. The original projection included 35 open area DAS

	CA1	CA2	NL	HC	DMV	ET	Total	Channel	OA DAS
2013	-	1	1	1.5	0.5	-	4	open	26

	CA1	CA2	NL	HC	Del	ET	Total	Channel	OA DAS
Option 1									
2011	1.5	0.5	-	1	1	-	4	open	32
2012	0.5	1	0.5	1.5	0.5	-	4	open	34

1.1.1.2.4 Conclusions

For 2011-2013, closing DMV alone in September –October area is probably well below the threshold “for more than minor”. Similarly, in 2012-2013 closing DMV in July-October or HC area alone in Aug-Sept will probably be well below the threshold “for more than minor”. Closing HC in July to Sept could result in an increase in fishing mortality close to 0.5% if no more than 25% of the removed effort could be shifted to June and to Oct. Combination alternative with HC and DMV closures in different time periods (E) is less likely to work because the effort removed from the short windows could be shifted to the other months in the Turtle season in absence of restrictions on the maximum number of trips.

As in 2011, for 2012-2013 the maximum trip alternative would result in the largest shift (with the exception of the limiting open area DAS use in MA) in effort out of the turtle season. It is important to note that the analyses of the 1 trip max alternative assumes no trading of trips. The

number of vessels expected to take one or two trips during the turtle season is based on historical trends of effort in ETA in 2007 and 2008. The percent of vessels that took one or multiple trips during the season were used to predict the amount of effort that would be shifted due to a one trip max restriction. In 2011 and 2012 some vessels will receive only one MA trip, two or even three depending on the results of the lottery. In addition, some vessels may trade in additional MA trips, so impacts could actually be higher for those vessels if a one trip max is selected reducing the amount of time those trips can be taken during the year. As discussed at the final Committee meeting, the 1 trip maximum alternative does have a higher degree of certainty in terms of the maximum effort that will take place in MA access areas during the turtle season. By restricting the entire fleet to one trip, you are certain about the maximum amount of effort. On the other hand, the seasonal closure alternatives cause effort shifts that are difficult to predict because some effort may be redirected outside of the turtle season, but some of it could be shifted to other months with even higher turtle bycatch rates.

Maximum one- trip alternative can be combined with a DMV closure too without any change in results in terms of effort shifts presented in the tables because this alternative encompasses the entire turtle season. Only difference is that combination alternative would limit DMV effort to the June 15-August window, and there would probably be less DMV trips (but more HC trips) during the entire turtle season. Given that turtle intakes are higher in DMV during Sept-Oct relative to the other seasons and areas, combination alternative may have higher benefits on turtles compared to maximum one-trip alternative alone. In terms of impacts on the scallop fishery, closing DMV and shifting some of the trips out of Sep-Oct. would lower the fishing costs because the higher meat weights could result in shorter fishing time. The fishing mortality rate could slightly decline as well for the same reasons. However, pushing some DMV trips to the June 15-August window can have some negative impacts on prices during that season, but positive impacts outside of these months. In addition, combining maximum one-trip option with DMV closure would also reduce the flexibility for the vessels to optimize their incomes by choosing where and when to fish in response to the resource and market conditions as discussed above in relation of the DMV area-time closures. Therefore, the impacts of the combination alternative on the scallop fishery will depend whether the positive impacts on costs, meat-weight and prices would outweigh the negative impacts.

1.1.2 Discussion of impacts of effort shifts on prices

The proposed measures will lead to a change in the seasonal composition of landings and therefore could lead to a change in prices. In general, the reduction in landings during the turtle window is expected to increase prices during the period from July 15 to October 31, but expected to reduce prices for months outside of the turtle window. Whether the increase in scallop prices in the first period will offset the decrease in prices in the second period will depend on the magnitude of the shift, the timing of the displaced effort, and the change in meat weight of scallops outside of the turtle window. If the shift in effort and landings comprises a small proportion of total effort and landings in the turtle window the impacts on prices will be low. Similarly if the displaced effort is distributed more or less evenly throughout the window it is shifted to, the impacts on prices will be small.

Among the various alternatives under consideration, the maximum shift in landings from the turtle season are expected to happen with the maximum one-trip (about 1.9 million lb. during

2011-2012, or about 6.5%-7.2% of the total landings during the turtle season) and the alternative that would reduce Mid-Atlantic open area DAS (2.3 million lb., or about 7.5% to 7.8% of the total landings during the turtle season). Although, this shift is expected to increase the prices during the turtle season, it is unlikely for this shift to have a significant impact on the scallop prices for the overall year.

- The landings removed from the turtle season, about 1.9 million for the maximum-trip alternative, will be landed in the November – June 14 window. Since total landings from all areas without the RPM measures are expected to be about 26 million pounds in 2011 and 28 million lb. in 2012 during this period, shifting 1.9 million pounds would increase landings by 7.3% (2011) and by 6.7% (2012) outside the turtle window and would probably lower the price of scallops. Again, it is unlikely that this shift will reduce prices significantly during this period, especially if the displaced effort is distributed more or less evenly and if some vessels try to maximize their revenue by taking their trips during months when prices are relatively higher because of lower landings.
- Since the reduction in landings during the turtle window (7.2% for 2011) is about the same as the increase in landings (7.3%) outside of the turtle window, the percentage increase in prices could cancel out the percentage decline in prices outside the turtle window with little impacts on the average annual prices.
- The meat-weights will be slightly lower for the landings that are shifted out of the turtle window and this could have a negative impact on prices depending on when and where the effort removed from the turtle season will be used to fish for scallops. The larger scallops, U10s and U12s are sold at a significant price premium compared to the smaller size scallops and larger scallops caught more in summer months than the rest of the year (Table 5 - Table 7). If effort is shifted to winter months, there will be less of U10s landed with negative impacts on prices. Therefore, it is more likely that a higher percentage of effort will be shifted to the May – June 14 where meat weights are higher even compared to the turtle season. Given that in 2011, HC Canyon area will probably not open to fishing until the summer months of June to July, probably many DMV trips will be taken prior to June-July when the meat weights are large reducing the impacts of DMV closure for a long period or the impacts of a maximum 1-trip option. As a result, composition of annual landings in terms of size categories, thus the annual average prices, may not change significantly.
- Furthermore, if the reduced effort during the turtle window directed more on the areas with higher scallop abundance, meat-weight composition of the landings could increase during this window, resulting in even higher prices. It is also unlikely for this 7% shift in effort and landings to reduce prices significantly during the 7.5 months outside of the turtle window especially if the displaced effort is distributed more or less evenly and if some vessels try to maximize their revenue by taking their trips during months when prices are relatively higher because of lower landings especially during the winter months. The changes in other factors that impact prices such as the quantity of exports, import prices, size composition of scallops during and outside of the turtle window, and seasonal distribution of future landings are unknown at this time. In short, although it is not possible to quantify the impacts of RPM measures on prices with certainty, it is reasonable to expect that these impacts will be rather small.

Table 4. Average prices by size category and period (2009)

MONTH	UNDER 10 COUNT	11-20 COUNT	21-30 COUNT	31-40 COUNT	Grand Total
01	8.14	7.24	6.84	6.92	7.31
02	9.08	7.43	6.89	7.29	7.73
03	8.14	6.53	6.21	6.34	6.87
04	7.79	6.00	6.05	6.15	6.55
05	7.76	5.88	5.99	6.33	6.48
06	7.44	5.80	5.61	6.08	6.29
07	7.89	6.27	6.06	5.88	6.69
08	8.18	6.25	6.12	6.43	6.84
09	8.37	6.66	6.31	6.51	7.02
10	8.56	6.66	6.27	6.36	6.99
11	9.18	6.93	6.53	6.67	7.24
12	10.09	7.60	6.33	6.13	7.47
Grand Total	8.17	6.44	6.19	6.33	6.85

Table 5. Average prices by size category and period (2010)

Window	YEAR	UNDER 10 COUNT	11-20 COUNT	21-30 COUNT	31-40 COUNT
Jan - May	2010	10.50	7.28	6.36	6.27
June	2010	10.15	6.86	6.72	6.77
July-Oct.	2010	10.21	8.37	8.26	8.50

Table 6. Landings by size category and period (2010)

	YEAR	UNDER 10 COUNT	11-20 COUNT	21-30 COUNT	31-40 COUNT	Grand Total
July-Oct	2010	2,171,284	15,926,736	5,094,883	69,661	23262564
O-TWIN	2010	870,924	5,202,728	452,111	2,235	6527998
June	2010	5,482,071	10,784,776	2,631,233	11,903	18909983
TWIN(JULY-OCT)	2010					
Grand Total		8,524,279	31,914,240	8,178,227	83,799	48700545

Table 7. Percentage composition of landings by size category and period (2010)

	YEAR	UNDER 10 COUNT	11-20 COUNT	21-30 COUNT	31-40 COUNT	Grand Total
July-Oct	2010	9.33%	68.47%	21.90%	0.30%	100.00%
O-TWIN	2010	13.34%	79.70%	6.93%	0.03%	100.00%
June	2010	28.99%	57.03%	13.91%	0.06%	100.00%
TWIN(JULY-OCT)	2010					
Grand Total		17.50%	65.53%	16.79%	0.17%	100.00%

1.1.2.1 Additional issues to consider

There are several other factors that would affect the change in prices for scallops, 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. For example, if more scallops are imported in response to lower domestic landings during the turtle window, the price of scallops may not increase during these months, or may increase by a negligible amount. 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 to higher costs, reducing vessel profits further.

The analyses provided above do 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.

Overall, it needs to be said that there are many unknowns about these types of measures in terms of what the outcomes will actually be. Impacts may be very different from these measures if assumptions made in these analyses are not realized. For example, if a seasonal closure in Delmarva shifts effort differently than it did in 2007 - 2009 from the ETA closure impacts on scallop fishing mortality, revenue, and turtles could be very different. If more effort is shifted into July and August that will reduce fishing mortality but could increase potential interactions with sea turtles. On the other hand if effort shifts primarily to months like November, December, March and April fishing mortality will be higher than projected and impacts on turtles will likely be more beneficial than projected because all these months are outside the turtle season. Vessels tend to fish to maximize potential revenues when yields are generally highest, but the market is unpredictable and behavior constantly adjusts. Therefore, it is very difficult to know in advance if measures such as these will ultimately have more than a minor impact on the fishery or not.

In addition to the primary measure of “more than minor” (percent change in effort shift) the PDT included a description of other factors that could influence impacts on the fishery that were not directly considered in this analysis. A shift in effort could also affect the following:

- 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 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.

1.1.2.2 Overall PDT input

The PDT did not identify any of these measures as preferred recommendations because there was not time to review the analyses as a group. Some general comments voiced last year are repeated here again:

- Some felt the measures that focus on access area management may have lower distributional impacts.
- Some felt that more impacts could result from these measures than the analyses show due to all the unknown factors such as change in price and markets.
- Some raised concern about how these will ultimately impact turtles, positive or negative.
- Overall, how these measures fit in with the other issues in FW22 such as the potential new closed area in the Channel and YT allocation decisions in Framework 22 is very complex. Several outside factors such as these are likely to have combined impacts on area rotation that will be very difficult to predict.