Summary Report

TOR 8. Review, evaluate and report on the status of the SARC and Working Group research recommendations listed in most recent SARC reviewed assessment and review panel reports. Identify new research recommendations.

Progress has been made to address research recommendations from the assessment (SARC-50). Various survey programs plan to undertake collection of data so it is important that the work is coordinated to maximise the benefits but also to consider whether field work can be adjusted to address some of the recommendations/comments from the reviewers. (E.g.. develop better understanding of the effects of environmental factors on recruitment success, improve estimates of natural mortality). New work that the IS has identified is well placed to address some of the knowledge gaps and improve accuracy in model inputs and assumptions, especially the following three:

- Investigate methods for better survey coordination between the various survey programs.
- Evaluate effects of uncertainty in identifying dead scallops in optical surveys and improve procedures for identifying dead scallops.
- Collect data to refine estimates of incidental mortality.

In addition, further analysis of data to test the hypothesis of different growth patterns at different time periods is recommended. Further work to improve estimates of natural mortality and stock-recruitment parameter is also recommended. Finally, work to identify the best way to capture interdependencies among the different sub-areas (e.g. through transfer of young scallops) would be recommended.

B11 - RESEARCH RECOMMENDATIONS (TOR 8)

Progress on recommendations from SARC-50 (NEFSC 2010)
1. Look into a way to fit discarded scallops, which have a different length frequency from the rest of the population, into the model.
No progress.

2. Evaluate the effect of the four-inch rings on incidental mortality. Now that a larger fraction of small scallops are traveling through the mesh, has incidental mortality increased or are the scallops relatively unscathed?
Incidental mortality calculations were improved for this assessment to account for fishery selectivity. Several field projects were funded in 2014 to investigate the extent of incidental mortality from the currently configured fishing gear.

3. Consider finding a better way to express the variation in the HabCam abundance data (the data were kriged for this assessment, and the variance was calculated by summing the variance of each of the kriged grids).
Two-stage GAM/Kriging models and stratified mean methods were introduced in this assessment, and several methods for calculating variance were investigated and compared in this assessment by simulation and analysis of actual data.

4. Look at the historical patterns of the "whole stock"; how the spatial patterns of scallops and the fishery have changed over time.
These topics are handled in the description of survey and fishery data to the extent they are relevant.

5. Estimate incidental mortality by running HabCam or an AUV along dredge tracks.
Several projects were funded this year to do work along these lines.

6. Effort should be made to make sure the survey dredge is fitted with a camera at some point during the survey to record the movements of the dredge. This will help answer some questions about when the dredge starts and stops fishing, and the determination of tow times.
Five survey dredge tows were conducted with a camera mounted to the dredge that allowed improved interpretation of dredge sensor data.

7. Seasonal patterns in scallop shell growth need to be analyzed and this data incorporated into the model.
No progress; the assessment team did not feel this is a high priority.

8. Stock-recruit relationships should be calculated for various sub-sections of the stock, smaller areas than just MAB and GBK to look for possible patterns or relationships.
Appendix B8 examined the relationship between recruitment in the southern Mid-Atlantic and biomass in the entire stock.

9. Further refine the estimate of the extent of scallop habitat relative to that of the survey.
New VIMS dredge and HabCam and SMAST optical surveys were used to identify stock boundaries and improve understanding of the relationship between the dredge survey and stock areas.

10. Age archived scallop shells from the 1980s and 1990s.

Archived shells from 1988 and 1993 were used to estimate growth matrices to represent growth when fishing mortality was high in the CASA models. However, additional years should be analyzed as described in a new research recommendation.

11. Continue to look at patterns of seasonality in weight of the meats and gonads, and timing of spawning.
Annual meat weight anomalies used to adjust mean body weight of individual scallops in the fishery and to compute catch numbers were substantially improved. Shell height meat weight relationships based on survey data were updated.

New recommendations
The Invertebrate Subcommittee identified the following research topics while preparing this assessment. The topics listed below are all considered worthwhile and are not listed in order of priority.

1. Investigate methods for better survey coordination between the various survey programs.
2. Evaluate effects of uncertainty in identifying dead scallops in optical surveys and improve procedures for identifying dead scallops.
3. Collect data to refine estimates of incidental mortality. Analytical procedures were improved this assessment but further progress awaits collection of more data.
4. Improve training of annotators used in optical surveys to identify and count specimens. For example, develop and consistently apply criteria for identifying inexact shell height measurements. Formalize QA/QC procedures including revaluation of annotator accuracy. Develop and maintain reference images for training and testing.
5. Continue work to improve and simplify survey design and analytical procedures for HabCam. Ideally, procedures might be automated to the extent possible and integrated into routine survey operations.
6. Quantify and improve accuracy of SAMS projection models used to specify harvest levels. Recent projections appear to overestimate stock size to some extent.
7. Reduce uncertainty about stock size estimates from surveys and the CASA model. In particular, continue work on density dependent natural mortality for small scallops in stock assessment, reference point and projection models.
8. Collect additional biological data on a regional basis including growth increments from shells collected during historical dredge surveys, seasonality of spawning based on observer data, natural mortality on large scallops due to disease and senescence, and size specific reproductive output.
9. Refine models that predict scallop recruitment based on chlorophyll and predator data in order to improve estimates from stock assessment and projection models. Investigate statistical approaches to estimating year class strength directly from survey data.
10. Investigate and quantify the utility of multiple scallop surveys.