

**REPORT ON THE 36TH NORTHEAST REGIONAL STOCK
ASSESSMENT WORKSHOP (SAW-36)
STOCK ASSESSMENT REVIEW COMMITTEE (SARC)
MEETING**

by

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Executive Summary and Recommendations

SARC-36 met in the first week of December 2002, and six stocks were addressed, along with an initial review of the stock structure of yellowtail flounder off the east coast of the USA. The meeting arrangements were very good, but I have two clear recommendations: **(1) to ensure the provision of a large-scale locator map in the meeting room (for those not familiar with the geography or sampling areas); (2) to ensure that all electronic material provided prior to and at the SARC meeting is in a single format and that all panellists have access to that same format before and at the meeting.**

Those charged with assisting me in my capacity as Chair (Terry Smith, Pie Smith) did a superb job, and the meeting would not have been near so successful without their totally committed input. A further crucial adviser at the meeting was Dr Steve Murawski, whose knowledge of SARCs and of the assessment and advisory system was extremely valuable to all present. The assembled panellists were a competent and disciplined group from across the stakeholder spectrum. Supplemented by two numerically astute scientists from outside the USA (Heath Stone and John Wheeler), the panel was both efficient and fair, resulting in a productive meeting.

The terms of reference supplied were adequate, and were adhered to in most instances (rigidly, in the case of Atlantic striped bass), but I do recommend that **(3) in future, these terms of reference could be less a "wish list" and more rigorously developed and agreed with the SARC Chair prior to the meeting.**

Once the discussion of yellowtail stock structure had been completed satisfactorily, discussion of the six designated stocks proceeded without a hitch. Five of these discussions followed traditional paths, reviewing the assessments, pointing to areas where the assessments could be improved through research, stating uncertainties, and providing the best advice possible with the tools currently available. The sixth stock (Atlantic striped bass) was treated differently, by sticking rigidly to the terms of reference supplied and commenting on research inadequacies and likely ways forward. Of the other five stocks reviewed according to traditional patterns, four (southern New England/mid-Atlantic yellowtail flounder, southern New England/mid-Atlantic winter flounder, Gulf of Maine winter flounder, northern shrimp) yielded support for the assessments presented. The fifth stock (Cape Cod/Gulf of Maine yellowtail flounder) required a re-run of the assessment with slightly changed assumptions; this alternative assessment was accepted by the panel.

I have no criticisms of the process followed. Indeed, I was sufficiently impressed to feel motivated to hold out the SARC process as an example of the way to work in my part of the world. What was particularly gratifying was that, in chairing the meeting, I did not feel once that scientific objectivity was being compromised by political expedience. In fact the spirit of compromise and the will to reach consensus was very strong throughout the meeting. After the meeting, I was given opportunity by Terry Smith to read the draft advisory report, and I valued that opportunity.

Background, preliminaries and documentation

The panel met from 2 to 6 December 2002 in the Aquarium Room of the NEFSC Woods Hole Laboratory, with a Chair and 11 panellists (along with two advisers), as listed in Appendix 1. The terms of reference of SARC-36 are outlined in Appendix 2, the Bibliography consulted in Appendix 3, and the Statement of the Task in Appendix 4.

The documentation for the meeting started to arrive on 15 November and all background bibliography was available by 18 November. An immediate problem encountered was that some of the electronic material sent was in a format not customarily used in the UK - Word Perfect. Fortunately, owing to my editing experience, I had a copy of the software and was able to read the material provided in that format. My contacts at the time were Terry Smith (SAW Chairman) and Pie Smith, who between them facilitated the distribution and circulation of the documentation and were responsible for the "housekeeping" arrangements, as well as ensuring the timely arrival of panellists and presenters and a ready supply of refreshments at the meeting. They also ensured that electronic links were available for all panellists and advisers at the meeting, restricting the costly and time-consuming need to produce hard copy. The Word Perfect issue arose again at the meeting, and this time I was unable to read (or, more importantly, screen-edit) the material because the software I had in the UK was not licensed to my laptop (this is clearly a situation that needs attention for future meetings if chairs are to be selected from organizations that do not use Word Perfect software). This overall situation needs to be rectified for future meetings; everyone must have electronic access to documentation in a single format without having to resort to time-consuming software translations, with their inevitable loss of symbols and format. A totally paperless meeting was not achieved, but every effort to move in that direction was made.

Between 15 November and my departure for the meeting, I delved into the submitted material and familiarized myself with its contents. Terry Smith and Pie Smith gave me valuable background on the standard meeting procedures and clear direction of what was expected as output from the meeting itself. They also engaged me in electronic discussion about the meeting agenda, specifically the order in which I wished to conduct discourse on the various stocks, allowing for the presence of all the relevant staff and working group members at their times of availability. This electronic discussion was followed up by an evening meeting with the SAW Chair on 1 December in Woods Hole, at which final arrangements were made and clarifications given.

The only concern that I had as Chair was with the terms of reference, which I felt were more of a "wish list" than rigorously debated and accepted by all stakeholders. Perhaps in future, the draft terms of reference can be more rigorously derived (through debate at the working group) and shown to the SARC Chair before he has to convene the meeting.

Conduct of the meeting

The meeting was convened at 13:00 on 2 December with all panellists and advisers present. The SAW Chair opened the meeting with a welcome to all present and an introduction and warm welcome of the non-US members of the panel, I as the Chair, and the two Canadians, one of whom was representing the CIE. He then handed the meeting over to me, and I explained what I wanted to achieve (as per the Terms of Reference - Appendix 2), and how I wished to get there. Specifically, I saw as key outputs the

written contributions to the draft advisory reports for the six stocks (if the panel agreed with the new grouping of southern New England and Mid-Atlantic yellowtail flounder stocks) plus the standard contributions to the consensus summary report that the SAW Chairman traditionally collates at the end of the SARC meeting with the aid of the experts on each stock and using the bibliography provided (Appendix 3), as well as the results of discussion at the SARC meeting.

After the preliminaries of personal identification by panel members, the agenda was confirmed and the order of debate throughout the week stayed the same as initially agreed. Thus, the meeting commenced with a presentation on yellowtail flounder stock structure by Steve Cadrin (Papers A1-A5), followed by in-depth discussion by panellists. Once consensus on that aspect had been achieved, the meeting moved immediately to the presentation and discussion of the southern New England/mid-Atlantic stock of yellowtail flounder (again presented by Steve Cadrin). At the end of the discussion on that stock, a few new issues had been raised, which were scheduled for discussion after some re-runs of the assessment the following morning. The following two days were given over to a similar process for each of the other five stocks designated for debate at SARC-36, sequentially southern New England/mid-Atlantic winter flounder (presenter Mark Terceiro), Gulf of Maine winter flounder (presenter Paul Nitschke), northern shrimp (presenter Maggie Hunter), Cape Cod yellowtail flounder (presenter Steve Cadrin), and Atlantic striped bass (presenter Alexei Sharov, assisted by Stuart Welsh).

For each stock (and for the stock identity discussion), one panellist was designated as SARC leader (to liaise with myself as SARC Chair, the presenters, and the rapporteurs in ensuring that the targeted output was achieved to time and quality). The rapporteurs were selected from the observers (of whom there were many) and presenters. The SARC leaders and rapporteurs were respectively Heath Stone and Ralph Mayo (yellowtail flounder stock structure), Heath Stone and Susan Wigley (southern New England/mid-Atlantic yellowtail flounder), John Wheeler and Paul Nitschke (southern New England/mid-Atlantic winter flounder), Erik Williams and Mark Terceiro (Gulf of Maine winter flounder), Laura Lee and Bob Glenn (northern shrimp), Andrew Applegate and Jeremy King (Cape Cod yellowtail flounder), and Paul Piavis and Megan Gamble (Atlantic striped bass). This system (tried and tested at previous SARCs) worked very well and allowed me as Chair to concentrate solely on whatever issue was on the table in the knowledge that the various write-ups and re-runs of presented stocks were in capable hands and would be presented in good time.

A short period on the Wednesday afternoon and the whole of the final two days were devoted to reading and commenting on the various SARC contributions (by stock) to the draft advisory report and the consensus summary report for the meeting. For each stock, the meeting considered progress on the recommendations made since the previous SARC consideration of stock status, and noted the result of that analysis in the consensus summary report along with any new recommendations. I was fully satisfied with the manner in which the latter part of the meeting was conducted. There were inevitably a few sticking points and some counter views, but the spirit of consensus-seeking prevalent throughout the meeting was followed to the end, and by early Friday afternoon, the task was complete and I could adjourn the meeting in time for those who had to travel far to get away in daylight.

Two specific points deserve mention here: The first is a request, whereas the second is a comment. First, from my UK perspective, I found it a little hard to know always the geographic area (and particularly the location of the sampling square) being referred to by the presenters and in discussion. I did try to prepare myself for this eventuality before the meeting (I also successfully learned the acronym jargon that I knew would be used!), but I often found myself lost geographically during the meeting. Some of the presentations had locator maps included, others did not. It is therefore my recommendation that future SARC meetings provide a large-scale locator map that is available at all times for participants to refer to, particularly the Chair, who seems traditionally to be contracted from outside the US. The second point is a comment only. As I made clear when I advanced my name to CIE for consideration for this contract, I am no longer a practicing stock assessment scientist; indeed I have not practiced in that discipline for several years. These days, my exposure to assessments is in the form taken at this SARC meeting, namely chairing discussion groups reviewing the outputs from the assessment process. I do know the structure of the VPA and ADAPT models currently used generally for the US assessments, and I am also at home with the production model approaches and XSA-type assessments applied in South Africa and Europe respectively (my previous and current appointments). However, on several occasions during the meeting, I did privately question my own ability to contribute meaningfully and as much as I wished at a technical level to the discussion. Fortunately, though, two very competent practicing assessment scientists were provided from outside the USA, and I was advised throughout by Steve Murawski and Terry Smith, both of whose command of the numeric scientific discipline was excellent. Having these four persons on or advising the panel at all times, along with the fact that all other members of the panel and the presenters were very competent in the same discipline, allowed me to handle the meeting the way I wished and to drive it through to a timely conclusion.

Summary of the meeting content

A comprehensive report of the meeting conclusions is provided in the Draft Advisory Report and the Consensus Summary Report, but for the purpose of completeness, a summary is presented here (based on the consensus summary reports drafted at the meeting), highlighting the aspects I personally consider to be most important. For ease of reference, the summary is divided into the seven sections into which the meeting was subdivided (yellowtail flounder stock structure, followed by the six stocks).

Stock Structure of Yellowtail Flounder

We reviewed a summary of available information on the subject, specifically focusing on spatial distribution patterns, geographic variation in growth and maturity, morphometric variation, and larval transport. Until this meeting, yellowtail flounder off the northeast coast of the United States had been managed as four units: Georges Bank, Cape Cod, southern New England, and mid-Atlantic. In addition, the resource is distributed in the western Gulf of Maine, primarily in statistical area 513 adjacent to the Cape Cod management unit. Most scientific evidence suggests that yellowtail flounder on the Georges Bank are distinct from those in adjacent areas. However, there appears to be a considerable degree of mixing and similarities in biological characteristics between the southern New England and mid-Atlantic stock units. In the past, the two units were considered to be a single stock, and were apparently split for ICNAF jurisdictional, rather than biological, reasons. Although data on stock structure in the Gulf of Maine are

sparse, the available information suggests that there is no basis to maintain a distinction between the Cape Cod stock unit and the remaining distribution of the resource in the Gulf of Maine.

The SARC therefore considered the working group proposal to define three stock units: Georges Bank, southern New England/mid-Atlantic, and Cape Cod/Gulf of Maine. Although the literature and recent studies are comprehensive, there were several areas of concern and these were pointed out to the scientists working on the stocks. Examples were the conclusions based on differences in biological characteristics that may simply reflect different environmental regimes in the various locations or changes in exploitation over time, and the relevance of the historical tagging experiments, which were not adjusted for fishing effort and for which the number of tag returns was in some areas quite low. However, the evidence was considered sufficient to warrant future assessments of yellowtail flounder being based on the three stock units proposed.

We also recommended that further investigation be carried out to evaluate the degree of mixing between the Georges Bank and Cape Cod stocks and made a few suggestions on how to refine the analysis of stock boundaries, including: Evaluating the spatial scale at which data are presented for distribution of life history stages; incorporating information on larval size composition better to delineate possible spawning areas; and performing statistical tests for differences in biological characteristics.

Southern New England/Mid-Atlantic Yellowtail Flounder

A major first issue discussed for this stock was the poor sampling of commercial landings in 1999 for the entire area. Also, where some areas were not sampled, it was suggested that the impact of pooling areas be evaluated, using years where adequate samples exist for both stock unit areas. It was also noted that the discard ratio used to estimate yellowtail flounder discards in the scallop fishery may not be suitable, so it was suggested that an effort-based ratio be applied in the mid-Atlantic area, where scallop effort and yellowtail flounder distributions overlap, and a discard/kept ratio in the southern New England area, where the distributions overlap less.

Comment was also made on the declining mean weights at age in the commercial catch in recent years, and it was suggested that scientists look at the mean weights at age from the NEFSC survey. Another issue discussed was the lack of consistency over the entire time-series in the spatial coverage of the NEFSC autumn survey. However, after some discussion and comparison of VPA outputs with hindcast estimates of recruitment and ASPIC, the analyses conducted with the spatially restricted series were accepted. It was clear that there had been a consistent pattern of underestimating F and overestimating SSB since 1995, and that the retrospective pattern was a key element of the stock assessment results that needed to be included in the management advice, because the direction of the retrospective pattern changes the perspective of stock biomass and fishing mortality from year to year. However, such an admission would not change the understanding that the stock was currently seriously overfished.

It was still felt that the YPR-SPR approach was appropriate for estimating biological reference points for this stock, so discussion focused on establishing the most appropriate time-series of recruitment. That selected as most credible was the long-term

(1963-2001) series, and it was further proposed that a range of biological reference points be given to provide boundaries about the most credible estimate.

There were several sources of uncertainty in the assessment. One was related to the estimates of previous catch at age (particularly 1999) as a result of the poor sampling intensity, meaning that VPA- and age-based projections may be imprecise. A second was associated with the likely over-optimism of the VPA estimates of biomass and F (future analyses may show that SSB was lower and F higher for 2001 than calculated currently). A third was that estimates of landings and discard ratios since 1994 are based on preliminary logbook data applied on a *pro rata* basis, and are subject to change.

Summary recommendations made for the southern New England/mid-Atlantic yellowtail flounder stock were to: Explore the use of effort-based and discard/kept ratios for the scallop fisheries; analyse the impacts of applying southern New England samples to mid-Atlantic landings for years where adequate samples exist for both areas; consider using a forward projection model that allows for error in catch at age; investigate changes in maturity at age over time; examine the mean weights at age derived from surveys to confirm the trends observed in commercial mean weights at age; and incorporate data from the entire stock area for the autumn survey calibration index.

Cape Cod/Gulf of Maine Yellowtail Flounder

For this stock, the original ADAPT run presented to the SARC exhibited a severe retrospective pattern for SSB and F. Much discussion centered on the reason for this, and an alternative ADAPT run that truncated the catch at age to age-5⁺ was made. This alternative run reduced the magnitude of the retrospective patterns for fully recruited F and SSB, fully recruited F decreasing and SSB increasing. The revised selectivity pattern was thought to be a major contributor to the change.

Age determination did not seem to be a problem for this stock, especially for young fish, but the level of catch sampling was considered problematic, particularly in the Gulf of Maine. Further, the lack of contrast in the VPA time-series (which only began in 1985 owing to the scarcity of commercial samples prior to that) could lead to an imprecise estimate of survey catchability.

The possibility that Georges Bank and/or southern New England stocks of yellowtail flounder move to the Cape Cod/Gulf of Maine stock was discussed in terms of both adult migrations and recruitment. Given the relative sizes of the stocks, especially the Georges Bank and Cape Cod stocks, any transfer among stocks could be overwhelming the signal from Cape Cod alone.

The revised ADAPT formulation required re-estimating the yield per recruit and biological reference points. Despite some concern about including the partially recruited age 3 in the average of fully recruited F, the yield per recruit and biological reference points were re-estimated using that age as fully recruited in order to be consistent with the revised ADAPT configuration. After examining stock-recruit observations and F at various levels of replacement, the SARC was satisfied that the stock could replace itself at an F greater than $F_{40\%}$ (i.e. $F_{med} > F_{40\% \text{ MSP}}$); so $F_{40\%}$ remained a conservative proxy for F_{MSY} . Consequently, the $F_{40\%}$ reference point was not amended.

Again, several sources of uncertainty were noted and listed. Very few length samples were currently available from the relatively small Gulf of Maine catch. Further, there was an apparent increase in survey availability in the autumn 1999 and spring 2000 surveys, which have a large influence on the ADAPT calibration. It was also clear that relative year-class strength was not tracked well over time by the surveys, indicating that survey availability was variable throughout the time-series. Current SSB calculations are based on a constant maturity-at-age assumption, but changes in maturity at age have not been investigated. In addition, the potential for substantial mixing between stocks may confound population estimates, and the lack of contrast in the recruitment time-series limits the perception of SSB_{MSY} .

Six specific research recommendations were made: Tagging studies should be planned to examine movements and to estimate F independently (early tagging studies may have been conducted during different temperature regimes); commercial length and age samples from the Gulf of Maine region need to be collected; the use of parametric models to estimate MSY -based reference points should be explored; a forward-projection statistical catch-at-age model should be considered; State of Maine inshore survey data should be incorporated in the assessment; and alternative indices of abundance should be explored (industry surveys, study fleets and a flatfish survey).

Southern New England/Mid-Atlantic Winter Flounder

The assessment of this stock was affected by a decision on which survey index, or indices, were used to tune the VPA, so the SARC recommended that a combination of the survey indices on a spatial scale or weighting them by survey area be done for future assessments. Since five such indices were available, randomization tests were suggested.

As for other stocks, a retrospective pattern of underestimating F and overestimating SSB was clear from the current VPA. Possible causes advanced for this pattern included a change in survey catchability (though not on some surveys), misclassification of landings by area, underestimation of the discarded portion of the catch, and/or under-reporting/ underestimating of the landings. Despite these concerns, the SARC still felt that the current VPA gives the best available determination of stock status.

There were several uncertainties inherent in the assessment. The first concern related to the stock-specific landings data, which are currently derived from vessel trip report data, which can thus only be provisional. Further, length frequency sampling of commercial and recreational landings and commercial fishery discard sampling have been low in some recent years, adding to the uncertainty in the assessment. Additionally, there is uncertainty relating to the size/age at maturity from different sources. Finally, the retrospective pattern mentioned above is itself a source of uncertainty.

Several recommendations for future research were made, notably: to evaluate the maturity at age in NEFSC winter and autumn surveys; to find a means of resolving the age/size at maturity differences between surveys; to hold a maturity staging workshop; to compare confidence intervals for maturity ogives; to increase commercial fishery discard length sampling; to incorporate some of the State samples in estimating recreational fishery landings and discards; and to try to use a forward projection (statistical catch-at-age model) in future assessments.

Gulf of Maine Winter Flounder

The VPA shows some rebuilding of the stock since 1995 (mainly off the coast of Maine), as evidenced by a relatively high SSB and apparently low F. However, there is a retrospective pattern of underestimating F and overestimating SSB during the period 1993-1998 (probably caused by inaccurate catch estimates). Nevertheless, there was some confidence that the VPA better reflects stock status than survey indices alone.

The SARC requested that stock-specific parameters for length-weight be used rather than a single one per winter flounder stock in future. The proposed biological reference points derived from the Beverton & Holt stock/recruitment model were recommended rather than Ricker model estimates, these to be adopted as the basis for defining overfishing.

Several sources of uncertainty were unearthed. The first concern related to the stock-specific landings data, which are currently derived from vessel trip report data, which can thus only be provisional. Additionally, there is a lack of a time-series of survey coverage in certain inshore areas where winter flounder are known to be abundant, as well as poor levels of length frequency sampling and observer sampling in certain areas. There is also a difference in age at maturity between some similar-season surveys, and also a current lack of age determination of all survey material. Finally, the retrospective pattern mentioned above is itself a source of uncertainty.

As a result, a number of research recommendations were made: To determine the age of all material collected on surveys; to increase the number of tows inshore on certain surveys; to improve length frequency and observer sampling of the stock; to investigate the discrepancy in age at maturity between surveys; to initiate age determination workshops; to derive and use stock-specific length-weight parameters; and to investigate the appropriateness and use of a forward-projection model.

Northern Shrimp

The estimated biomass of 9,200 tons is above the proposed biomass threshold of 9,000 tons, i.e. 50% of B_{MSY} . However, the SARC endorsed the working group concern that management advice based on the results of biomass dynamics models may not provide sufficient detail relative to the unique life history characteristics of the species. The usefulness of a single reference point estimate, when simple interpretation of empirical data (fishery-independent indices) may provide more reliable management advice, was questioned.

There was concern that the value of M (0.25) used in the approach presented is uncharacteristically low for a short-lived shrimp species. The regression method estimate of M of 0.25 and the Z-based estimate of M (0.17) derived when the fishery was closed in 1978 are less than or equal to the value currently used. The calculated Z in 2002, a year of minimal fishing effort, is 0.25. The SARC therefore proposed that alternative methods of estimating M, such as maximum expected lifespan, size-dependent mortality, life-history based approaches, and deriving Z from the ratio of female 2 to females 1 and 2 in the previous year, be investigated. The current method of determining F from the harvest rate was agreed to be best.

Although biomass estimates from the current assessment do not match historical estimates, this discrepancy was attributable to changes in empirical data, including correction of the 1987 summer trawl survey indices, and updating the time-series of catch data. Revisions were also made to partitioning the recruits and fully recruited shrimp.

The sources of uncertainty in the assessment of northern shrimp were related to the poor definition of M , the late and often incomplete catch data, the poor estimation of growth (on which GPR and YPR are estimated), and the fact that northern shrimp are not consistently available to the NEFSC autumn survey because of diurnal variation and seasonal migration patterns.

The SARC's recommendations for future research were to: Explore further the assumptions of M used in analyses (i.e. constant over the lifespan, magnitude); develop the assumptions of growth consistent with the shrimp life history; consider alternative estimators of F ; consider development of a two-stage control rule; investigate survey selectivity for both the NEFSC autumn bottom trawl and State/Federal summer shrimp surveys; explore alternative assessment models, especially statistical catch-at-length methods; consider the potential to use length-frequency distributions to develop management advice; explore utilizing the ratio of stage 2 to stage 1 females for estimating Z ; and investigate the appropriate weighting of port sample data for estimates of mean weight.

Atlantic Striped Bass

For this stock, the SARC decided after consultation (including with industry) not to concentrate on the assessment and the advice, as done for the other stocks, but rather to stick to its terms of reference. The report follows the same procedure.

To characterize the commercial and recreational catch including landings and discards

The total catch in numbers including landings and discards dropped about 14%, from 5.04 million fish in 2000 to 4.3 million in 2001. Ages 4 to 7 represented 62% of the total catch and ages 8+ represented 24%. The modal age in 2001 was 5, and the 1993-1997 year-classes dominated the 2001 total catch. Recreational fisheries accounted for 71% of the total 2001 catch in numbers, or 46% in landings and 25% in dead discards. Commercial fisheries accounted for the balance of the 2001 catch, with 22% in landings and 7% in dead discards.

Review the VPA-based stock assessment and provide guidance on determining the best, most appropriate model configuration. Provide specific guidance on plus grouping, as well as an evaluation of the fishery-independent surveys and the ages on which to base the last true age F

In terms of age structure, the SARC suggested that assessments reconsider the selection of fully recruited ages for F estimation. Using age 7 striped bass as the first fully recruited age appears to be more appropriate than age 5, under the assumption of a flat-topped partial recruitment pattern. There is clearly a problem with age determination (scales and otoliths) of the species, and once this problem has been rectified, the assessment may need to be re-run. Atlantic striped bass are taken in a composite of

fisheries, exploiting various age-classes. Under those circumstances, the use of a flat-topped PR model specification may not be appropriate; the proportional dominance of ages 4, 5 and 6 in the catch, tagging information, slot limits, and the movement of large fish offshore where there is less fishing, may justify the use of alternatives. Tag analyses also imply a dome-shaped PR, because the F is higher on 18"+ fish than on 28"+ fish. The SARC also stressed that care was needed when calculating F on the oldest true age. Including ages 5 and 6 may be valid early in the time-series when there were not many age 7+ fish, but it is less appropriate as the age structure expanded. It may be possible to use the previous age to estimate the F on the first age in the plus group (e.g. use age 10 to estimate the F on age 11), allowing a greater potential for doming. There may be an even stronger dome if the age range used to estimate F for the oldest true age in VPA were 4-10 rather than 5-10. Determination of the status overfishing is sensitive to the choice of plus group. For example, in the 13+ run, the $F_{\text{age 7-10}}$ in 2001 is 0.4, above the threshold of 0.38. The candidate VPA had some diagnostic problems, so it was suggested that residual time-series be used to judge the quality of fit. The SARC considered that there was a clear need for consistency between the stock assessment and reference points. Finally, it was suggested that objective methods for the selection of a parsimonious set of tuning indices be considered. These could include randomization approaches and data reduction techniques, and indices needed to be scrutinized for spatial and temporal compatibility with stock migration patterns.

Estimate fishing mortality rates for specific components of the coastal stock complex using tagging data

Tagging data are currently used to estimate survival and recovery rates from recapture data, and these methods are used independently to estimate F for four mixed coastal stocks, using alternative models. It was noted that exclusion of some models could reduce the degree of uncertainty in the estimate of fishing mortality. The SARC was concerned about the extent of mixing between stocks, something not covered adequately in the presentation.

Discuss the validity of averaging stock-specific estimates from several separate tagging programmes as a means of estimating total stock exploitation

Although an overall estimate of F for the whole coastal population was desirable, differences among tagging programmes definitely made averaging problematic. Therefore, the SARC questioned the relevance of assuming a constant tag-reporting rate. Further, fish captured more than once could introduce biases into estimates of F derived through the recapture of discarded tagged fish, which needed to be accounted for in models. Fish caught once and discarded still experience mortality, although multiple recaptures are apparently rare.

Review the discard estimation methodology and the validity of using tag returns as an adjustment to the reporting rate

In the absence of direct estimates of reporting rates by fishery, gear and State, commercial discards are currently estimated as a catch-adjusted ratio of tag returns. This estimation methodology appears useful and should be considered for application on a gear- and State-specific basis, and estimates of variability should be included.

Additional studies on discard mortality by gear could provide valuable information for future analyses.

Provide a comparison of tag- and VPA-derived estimates of F. If possible, provide guidance on the most comparable aspects of the VPA output and the tag-derived F. Also provide guidance on which of the tagging programmes (or average of programmes) would be most comparable to the VPA-derived F

Both VPA and tagging estimates of fishing mortality show the same increasing trend over time. The VPA Fs tend to be slightly higher than the average coastal tag Fs, but the VPA estimate is not statistically different from any other estimate. With the information provided, the SARC was unable to advise on which tagging programme, or combination of programmes, provided the most appropriate derivation of F for comparison with VPA. The SARC was also unable to advise on the appropriate age range and weighting scheme to derive an F from VPA, for comparison with a tag-derived F. It was pointed out that estimates of F from tagging and VPA may not consistently index the same age-classes, so further research to restrict the comparison needs to be conducted. The aim was obviously to incorporate tagging and VPA estimates into a single assessment model, so the age range from the VPA should be consistent with the size range of the tagged fish. As a benchmark, it was noted that striped bass of 28" (at tag and release) are assumed to be about age 7.

Finally several recommendations for future research came out of the discussion: To conduct a workshop to evaluate the appropriateness of using scales in age determination of older fish; to explore Bayesian estimation approaches as a means to improve the treatment of uncertainty in the assessment; to develop empirical estimates of weights at age from 1997 onwards; to develop a model to combine VPA and tagging data; and to investigate the use of age-based tagging models.

Final comments

During the course of the meeting, it became very clear to me that there were two main objectives and one subsidiary one. The first main objective, and in some ways the more interesting scientifically, was to evaluate the assessments provided for the stocks in question. I have no doubt that such an objective had already been set and carefully considered by the researchers who gave the presentations, along with their immediate colleagues, again by the working groups responsible for considering the assessments as a group, and finally by other (partially independent, and in some cases international) groups of scientists mandated specifically to look at the data, at the models being applied and the assumptions made, to see if other alternatives were more appropriate or available. Nevertheless, a totally independent group such as the SARC was perfectly capable of advising on the same subject. The fact that, except for one stock, Cape Cod/Gulf of Maine yellowtail flounder (for which the assessment advised by the SARC only differed slightly from that presented), the basis for the assessment presented was considered the most appropriate given the data currently available, is indeed a reflection of the quality of assessment expertise available in-house to the US. That in itself is gratifying, because the SARC was then able to look to the future, and to advise new lines of research and analysis, including models, that should enhance the assessments in years to come, especially if the data identified as prerequisite are indeed forthcoming.

The second main objective was to prepare for the presentation of advice to a "political" forum. This is always a difficult task given the uncertainties inherent in any scientific assessment, but it was nevertheless a valuable exercise for all present. There was tremendous benefit in having present some "representatives" from the other side of the fence, and both sides hopefully derived benefit from listening to the views of the other. I most certainly did. I firmly believe that all presenters, panellists and advisers made their points in a constructive fashion, and rarely was it necessary for one or other to raise their voices even slightly in mild frustration. Consensus ruled, and that is the only way for such meetings to be held. I also did not feel that scientific objectivity was compromised in favour of political expedience, something that happens quite regularly in certain scientific/advisory circles elsewhere in the world. The system of a SAW and the SARC, plus the various working groups feeding the process, is therefore one that works well, and I will certainly take that message back with me to Europe!

Finally, the meeting overall was conducted in excellent spirit, despite rigorous and probing debate being the order of the day. Pie Smith organized a much appreciated reception on the Tuesday evening, at which I was able to talk to many panellists, presenters and observers on an informal basis. I can therefore say that I wholeheartedly enjoyed the meeting and consider myself privileged to have been selected to assist in some small manner. My personal thanks are due to Joy Yoshina of CIE, who efficiently organized my travel and accommodation (not a single problem was encountered), to Terry Smith and Pie Smith for their efficiency in making and delivering the meeting arrangements and reference material, to Steve Murawski, for providing such wisdom and advisory acumen to the gathering especially when we seemed to be stuck in a *cul de sac*, and to all participants (panellists, presenters and observers) for their valuable, personally hugely appreciated, contributions to the meeting. Without everyone's contributions, the meeting output would not have been as comprehensive and scientifically rigorous as it turned out to be.

After the meeting, I was given opportunity by Terry Smith to see the draft advisory report as a single collated document, formatted and virtually complete. I valued that opportunity.

Andrew I.L. Payne
Chair SARC-36
16 December 2002

Appendix 1: Panellists and advisers

SAW-36 Chair	<i>Andrew I.L. Payne (CIE)</i>
NEFSC Experts	<i>Jon Brodziak Chris Legault Richard Pace Anne Richards</i>
Atlantic States Marine Fisheries Commission	<i>Laura Lee (RI) Paul Piavis (MD)</i>
Regional Fishery Management Councils	<i>Andrew Applegate (NEMFC)</i>
NOAA/NMFS	<i>Jay Hermsen (NERO) Erik Williams (SEFSC)</i>
Outside Organizations	<i>Heath Stone (DFO, Canada) John Wheeler (CIE, DFO)</i>
Resident advisers	<i>Steve Murawski (NEFSC) Terry Smith (SAW Chair)</i>

Appendix 2: Terms of Reference

36th Northeast Regional Stock Assessment Review Committee (SARC)

December 2-6, 2002
NEFSC, Woods Hole MA

A. Yellowtail Flounder

For the Mid-Atlantic, southern New England and Cape Cod areas

1. Investigate stock structure of yellowtail flounder resources off the northeastern United States and identify appropriate stock units for assessment and management.
2. Characterize the commercial and recreational catch including landings and discards.
3. Estimate fishing mortality, spawning stock biomass, and total stock biomass for the current year and characterize the uncertainty of those estimates.
4. Evaluate and either update or re-estimate biological reference points as appropriate.
5. Where appropriate, estimate a TAC and/or TAL based on stock status and target mortality rate for the year following the terminal assessment year.
6. If stock projections are possible,
 - a. provide short term projections (2-3 years) of stock status under various TAC/F strategies and
 - b. evaluate current and projected stock status against existing rebuilding or recovery schedules, as appropriate.

B. Winter Flounder (Draft terms of reference subject to approval by the ASMFC's Winter Flounder Management Board)

For the southern New England/Mid-Atlantic (SNE/ MA) stock

1. Update the status of SNE/ MA winter flounder stock through 2001 providing estimates of fully recruited fishing mortality rate, biomass weighted fishing mortality rate, stock size, mean biomass, spawning stock biomass, and recruitment as appropriate. Characterize uncertainty in SSB and fishing mortality rates.
2. Provide short-term (2002) and medium term projections (2009) of catch and biomass (mean biomass, SSB) under status quo F, and ASMFC's $F_{40\%}$, target and NEFMC's F_{MSY} .
3. Develop research recommendations for improving assessment of winter flounder.
4. Comment on and revise, where necessary, the ASMFC and the NEFMC overfishing definitions for this stock. (Note: Currently ASMFC and the NEFMC have different overfishing definitions. The Board had recommended that the WFTC develop a single overfishing definition for this stock.)

For the Gulf of Maine (GOM) stock

1. Characterize status of GOM winter flounder using the analytical tools that are most appropriate for available data. These may include sequential population analysis, surplus production, survey indices and relative exploitation indices, or length based models.
2. Where possible provide best estimates of exploitation rates (fishing mortality, relative exploitation), mean biomass, spawning stock biomass and characterize uncertainty associated with these estimates.
3. Develop yield per recruit and biological reference points
4. Where possible, provide short-term and medium term projections of catch and stock size under status quo F and various proposed target fishing mortality rates ($F_{20\%}$, $F_{25\%}$, $F_{30\%}$, $F_{40\%}$, $F_{0.1}$, F_{max} , F_{msy}) as appropriate.
5. Develop and recommend an overfishing definition for Gulf of Maine winter flounder that meets the standards of the Sustainable Fishery Act.
6. Develop research recommendations for improving assessment of winter flounder.

C. Northern Shrimp

1. Characterize the commercial and recreational catch including landings and discards.
2. Estimate fishing mortality, spawning stock biomass, and total stock biomass for the current year and characterize the uncertainty of those estimates.
3. Evaluate methodologies for the development of biological reference points for Northern Shrimp.

D. Atlantic Striped Bass

1. Characterize the commercial and recreational catch including landings and discards.
2. Review the VPA based stock assessment and provide guidance on determining the best, most appropriate model configuration. Provide specific guidance on plus grouping, as well as an evaluation of the fishery independent surveys and the ages on which to base the last true age F .
3. Estimate fishing mortality rates for specific components of the coastal stock complex using tagging data.
4. Discuss the validity of averaging stock specific estimates from several separate tagging programs as a means to estimate total stock exploitation.
5. Review the discard estimation methodology and the validity of using tag returns as an adjustment to the reporting rate.
6. Provide a comparison of tag and VPA derived F estimates. If possible, provide guidance on the most comparable aspects of the VPA output and the tag derived F . Also provide guidance on which of the tagging programs (or average of programs) would be most comparable to the VPA derived F .

Appendix 3: Bibliography

SAW-36 SARC Working Papers, including the Working Group reports and other analyses, are listed below. The papers are coded by topic:

A - Yellowtail flounder; B - Winter flounder; C - Northern shrimp; D - Striped bass

<u>Stock</u>	<u>Title</u>	<u>Author(s)</u>
Yellowtail flounder	A-1. Literature Review of Research on Yellowtail Flounder Stock Structure	S. Cadrin
	A-2. Spatiotemporal Patterns in Abundance of Yellowtail Flounder off the Northeastern US	S. Cadrin
	A-3. Geographic Variation in Growth and Maturity of Yellowtail Flounder off the Northeast US	S. Cadrin
	A-4. Morphometric Variation of Yellowtail Flounder	S. Cadrin and V. Silva
	A-5. Exploratory Analysis of Yellowtail Flounder Larval Transport off the Northeastern US	S. Cadrin
	A-6. Stock Assessment of Yellowtail Flounder in the Southern New England – Mid-Atlantic area	SAW Southern Demersal WG ¹
	A-7. Stock Assessment of Yellowtail Flounder in the Cape Cod – Gulf of Maine Area	SAW Southern Demersal WG
Winter Flounder	B-1. Assessment of the Southern New England/ Mid-Atlantic Winter Flounder stock complex for 2002	ASMFC Winter Flounder Technical Committee ²
	B-2. Assessment of the Gulf of Maine Winter Flounder stock for 2002	ASMFC Winter Flounder Technical Committee
Northern Shrimp	C1. Stock Assessment Report for Gulf of Maine Northern Shrimp – 2002	ASMFC
	C-2. Draft Discussion Paper for Northern Shrimp Section to Amendment 1 to the Interstate Fishery Management Plan for Northern Shrimp – 12/18/01	ASMFC
	C-3. An Hierarchical Approach to Determining Reference Points for Pandalid Shrimp	ASMFC
Atlantic Striped Bass	D-1. Atlantic Striped Bass Draft Advisory Report	ASMFC Striped Bass Technical Committee
	D-2. 2002 Stock Assessment report for Atlantic Striped Bass	ASMFC Striped Bass Technical Committee

1. SAW Southern Demersal Working Group: F. Almeida, J. Brodziak, H. Chickarmane, L. Col, A. Hangsterfer, J. King, A. Kuzirian, C. Legault, R. Mayo, T. Nies, L. O'Brien, W. Overholtz, P. Rago, T. Sheehan, V. Silva, S. Sunderland, M. Terceiro (Chair), M. Thompson and S. Wigley
2. ASMFC Winter Flounder Technical Committee: J. Burnett, S. Cadrin, S. Correia, L. Lee, C. Legault, A. Mooney, L. Munger, P. Nitschke, S. Sherman, D. Simpson, K. Sosebee, M. Terceiro and S. Wigley

Appendix 4: Statement of Task

Consulting Agreement between the University of Miami and Dr Andrew Payne

General

The Stock Assessment Review Committee meeting (SARC) is a formal, one-week long meeting of a group of stock assessment experts who serve as a peer-review panel for several tabled stock assessments. It is part of the overall Northeast Stock Assessment Workshop (SAW) process which also includes peer assessment development (SAW Working Groups), public presentations, and document publication within a cycle that lasts six months. The panel is made up of some 12-15 assessment scientists: 4 scientists from the NEFSC; a scientist from the Northeast Regional office, scientists from the staff of the New England and Mid-Atlantic Fishery Management Councils, and Atlantic States Marine Fisheries Commission and additional panelists from state fisheries agencies, academia (US and Canada), and other federal research institutions (US and Canada).

Designee will serve as chairman of the 36th Stock Assessment Review Committee panel. The panel will convene at the Northeast Fisheries Science Center in Woods Hole the week of 2 December 2002 (2 -6 December) to review assessments for yellowtail flounder (*Limanda ferruginea*) (including stock identification issues for nominal Mid-Atlantic, southern New England and Cape Cod stocks), winter flounder (*Pseudopleuronectes americanus*) (southern New England/Mid-Atlantic and Gulf of Maine stocks), northern shrimp (*Pandalus borealis*) and striped bass (*Morone saxatilis*).

Specific

- (1) Prior to the meeting: become familiar with the working papers produced by the SAW Working Groups (total number not final; there will be at least one per stock);
- (2) During the meeting: Act as chairperson where duties include control of the meeting, coordination of presentations and discussion, control of document flow;
- (3) After the meeting: Facilitate the preparation and writing of a Draft Advisory Report and Consensus Summary Report by NMFS personnel. Panelists, NEFSC staff and the SAW Chairman will ensure that documents are made available to the SARC chair, revised according to the SARC Chair's directions, compiled, copied and distributed;
- (4) Review the final Draft Advisory Report and Consensus Summary Report.
- (5) No later than December 20, 2002, submit a written chair report¹ addressed to the "University of Miami Independent System for Peer Review," and sent to Dr. David Die, via email to ddie@rsmas.miami.edu.

The SAW Chairman and SAW Coordinator will assist the Chair prior to, during and after the meeting in ensuring that documents are distributed in a timely fashion. The SARC Chair will be solely responsible for the editorial content of the reports.

¹ The written report will undergo an internal CIE review before it is considered final. After completion, the CIE will create a pdf version of the written report that will be submitted to NMFS and the consultant.

The Chair's duties will occupy a total of two weeks (14 days) - several days prior to the meeting for document review; the week long meeting; several days following the meeting to ensure that the final documents are consistent with the SARC's recommendations and advice, and several days to complete the chair report.

Contact persons: Dr. Terrence P. Smith, NEFSC, Woods Hole, SAW Chairman, 508-495-2230

Mary Jane Smith, NEFSC, Woods Hole, SAW Coordinator, 508-495-2370

Annex: Report generation and procedural items

1. The report should be prefaced with an executive summary of findings and/or recommendations.
2. The main body of the report should consist of a background, description of review activities, summary of findings, conclusions/recommendations, and references.
3. The report should also include as separate appendices the bibliography of all materials provided and a copy of the statement of work.