Review Report for SARC 39

Din Chen

Prepared for

University of Miami

Independent System for Peer Review

EXECUTIVE SUMMARY

SARC 39 was designed to review assessments for black sea bass (*Centropristis striata*), sea scallop (*Placopecten magellanicus*), and bluefish (*Pomatomus saltatrix*). The assessment reports for these three species were provided by email from the SAW Chair (Dr. Terry Smith) before the SARC meeting. The meeting was carried out from the 7th to the 10th of June, 2004 at the Northeast Fisheries Science Center, Woods Hole, Massachusetts. The assessment for black sea bass was presented to the panel on Monday, June 7th, followed by sea scallop on Tuesday, June 8th, and bluefish on Wednesday, June 9th. Discussions proceeded section by section after the presentations.

In summary, discussions from the Panel and the meeting participants focused mainly on the appropriateness of the fishery/survey data and the associated uncertainties, the tagging experiment and its modeling, and the stock assessment models and their assumptions and conclusions. Recommendations were given by the Panel on the GLM/GAM approach for a comprehensive analysis for combining all possible data into a standardized index, a more appropriate model for the tagging data, and other issues for model improvement and developing sensible fishery management parameters.

There also were discussions concerning the terms of reference from the present assessments and the previous assessments.

1. BACKGROUND

Designated by the Center for Independent Experts (CIE) at the University of Miami, the author was invited as a panelist (Appendix 5) to the 39th Stock Assessment Review Committee (SARC) to review the stock assessments for black sea bass (*Centropristis striata*), sea scallop (*Placopecten magellanicus*) and bluefish (*Pomatomus saltatrix*). Before the meeting, Dr. Terry Smith, the Stock Assessment Workshop (SAW) Chair, provided the author with six documents (Appendix 4), including the stock assessment documents and the associated summary documents for the three stocks.

The meeting to review the assessments took place at the Woods Hole Laboratory of the Northeast Fisheries Science Center in Woods Hole, Massachusetts during the second week of June (June 7-10, 2004).

2. REVIEW ACTIVITIES

The meeting started with a brief welcome speech from the Center Director (Dr. John Boreman), followed by Dr. Terry Smith (the SAW Chair) providing an introduction to the meeting and some of the logistics. The SARC Chair (Dr. Andy Payne) outlined the agenda and the procedures for the meeting. The first species reviewed was black sea bass on Monday afternoon (June 7th) followed by sea scallops on Tuesday (June 8th) and bluefish on Wednesday (June 9th).

The meeting was well arranged and progressed smoothly, which should be credited to the SAW and SARC Chairs (Drs. Terry Smith and Andy Payne, respectively).

2.1. Black sea bass

The author was appointed by the SARC as the panel leader (Appendix 3) for black sea bass and consequently a more detailed summary is provided for this stock assessment. The review activities for this stock started on Monday, June 7th. Dr. Gary Shepherd presented the draft stock assessment (Appendix 4) and discussions followed each section. The main points of discussions were on: a) developing a fishery abundance index with recommendations to use a GLM or GAM approach for combining the various surveys into a standardized index; b) accuracy of catch data and reliability of the commercial and recreational catch data with recommendations for developing an adequate sampling design to cover all the landings and provide more information on commercial discarding; and c) the tagging experiment and the well implemented procedures for estimation of the tag shedding rate, the tagging mortality rate and the tag reporting rate. However, the simple Peterson model that was presented, developed by pooling all data from all areas, was questioned because of the fish movement among areas and different fishing mortality rates by area.

2.2. Sea scallops

Dr. Paul Medley was assigned to be the leader for the sea scallop stock assessment. The general assessment was presented on Tuesday by Dr. Dvora Hart in the morning. Dr. Larry Jacobson gave his presentation on the CASA model development in the afternoon. Four sections of Dr. Hart's presentation were discussed: Section (1), which provided a general overview for movement between the GBK and MAB areas and different exploitation patterns and sampling coverage; section (2), which concerned growth patterns in the scallops, environmental effects, and the natural mortality rate; section (3) that presented estimations of fishing mortality for discard and uncertainty estimation; and section (4) which discussed the reference points with questions about sensitivity analysis for the reference point definition of overfishing. The Panel requested that uncertainty measures be presented and added to the assessment document.

Dr. Jacobson's presentation in the afternoon on the appendices with emphasis on the Catch At Size Analysis (CASA) model was well organized and well presented. The development and application of the CASA model were illustrated for the MAB area, based on the greater amounts of available data, even though the CASA model runs were carried out for the MAB and GBK areas. The results were not combined because the Invertebrate Subcommittee did not discuss methods for combining the estimates. The Invertebrate Subcommittee intended that the CASA results would only be for use in reviewing the modeling methods. The panel agreed that the CASA model is promising and should be used in the next assessment.

2.3. Bluefish

Dr. Mike Armstrong was assigned by the panel as the leader for the bluefish stock assessment. The assessment was presented by Dr. Jessica Coakley. There were questions from the panel about the reliability of the recreational data, the effort measure used in calculation of the recreational CPUE, and the validity of the model fit to the data. The panel reached the conclusion that this assessment was not appropriate at this point, and the assessment was consequently rejected. Advice for CPUE calculation and combining multiple survey indices and modeling were discussed during the afternoon discussion. As a side note, even though the assessment for this stock was rejected by the Panel, the author would like to commend the highly professional presentation delivered by Dr.Coakley.

3. FINDINGS/RELATED RECOMMENDATIONS

3.1. Black sea bass

The author was impressed by Dr. Gary Shepard's presentation to the Panel. The subsequent discussions focused mainly on the fishery abundance index, accuracy of the catch data, the tagging experiment, and associated modeling, with more discussion on the tagging experiment than on the other topics. The studies for the tagging experiment on the tag shedding rate, the tagging mortality rate and the tag reporting rates were well scientifically implemented. Specific findings and Panel recommendations consisted of the following:

1. A GLM/GAM approach should be implemented for developing a comprehensive analysis that combines all surveys and gear types into a standardized index.
2. The commercial and recreational catch data were not reliable. Questions came up on an appropriate sampling design that would be adequate to cover all the landings. The Panel recommended that an adequate procedure be designed for sampling the commercial and recreational catch and the commercial discards. The sampling program should provide estimates of the level of uncertainty around the catch and discard estimates.
3. A simple Petersen model is not appropriate for this experiment because of the fish movement and different fishing mortalities among regions. An improved tagging

model should be used for the modeling, such as the Brownie et al. (1985) model with the migration extension, with which one could estimate the migration patterns among regions with corresponding fishing mortality rates. It is feasible for this stock to develop a selectivity function from data on tag release at length. More discussion on the extended model is outlined in the ‘Conclusions/Additional Recommendations’ section of this report...

4. With respect to the Terms of Reference, a scientific workshop is needed to evaluate appropriate state and federal survey indices and consider methods for combining indices for use in index-based assessments.
5. The Panel recommended that an age-based model be developed for this stock, but age structures will need to be re-examined and processed in order to proceed with this type of model.
6. The conclusion on page 15 in the draft assessment report was in fact not correct, which leads to the recommendation to use or develop a more appropriate tagging model to estimate fishing mortality rate; for example, a model that incorporates multiple area movement (e.g., Brownie et al. 1985). This model is outlined in the ‘Conclusions/Additional Recommendations’ section of this report..

3.2. Sea scallops

Drs. Dvora Hart and Larry Jacobson gave their sea scallops presentations on Tuesday with the discussions focusing mainly on fishery/biological data and modeling. For the fishery/biological data, questions were raised about sampling of landings, movement among areas, different growth rates by areas, environmental effects on growth, and predation. Four models were presented by Dr. Hart, and a length-based, Catch at Size Analysis (CASA) model was presented by Dr. Jacobson for estimating the fishing mortality rates. The findings and the related recommendations were:

1. The assessment was done for a unit stock requested for management purposes. The Panel concluded that this is not appropriate based on the facts from the presentation that there are large movements between the GBK and MAB areas. In addition, the fishing mortalities were not even across areas with much higher numbers in MAB than in GBK. The weighting scheme for combining data from different areas did not make sense. Therefore, the Panel recommended that a multiple area assessment (at least for the GBK and MAB) should be done based on the area-specific scallop distributions, different growth patterns, and different exploitation rates. In fact, data were available by area, and the CASA model could have been used to produce a multiple area assessment.
2. The estimated fishing mortality F depends on the mean population number in the survey, which was found to be subject to measurement errors. Therefore, for the estimated Fs, a sensitivity analysis is required on measurement errors from the data and process error from the model structures.
3. Even though the presented CASA model showed estimates that were compatible to the conventional rescaled catch-biomass model, the CASA model had the ability to incorporate more of the available information and is recommended for further development and as a possible replacement for the conventional model.

4. If there is further development of length based models, such as the length-based yield-per-recruit model and the CASA model, the length (shell height) to weight (meat weight) relationship will become important for converting the measured length to the mean meat weight. The bias correction associated with this conversion, outlined in the 'Conclusions/Additional Recommendations' section, should be used.

3.3. Bluefish

The bluefish stock assessment was rejected by the Panel because of errors in the data and flaws in the proposed model.

The findings and the recommendations were as follows:

1. The reliability of the recreational data was questioned, and the Panel recommended a re-examination of the data from the commercial and recreational fisheries used in the assessment.
2. The ASPIC model was deemed not appropriate for the data and there was an obvious time-series pattern in the model residuals.
3. The ASPIC model was concluded to be too sensitive for the population growth parameter *r*[1].

[1] I had an opportunity to experiment with this model. With a slight change from $r = 0.53836$ (the best estimate presented) to r=0.53835, the ASPIC model produced extremely different results for the estimated biomass. This makes it a very difficult problem for the modeler to find the best solution. I recommended using global search algorithms, such as genetic algorithms (GA) (Chen et al. 2000), and simulated annealing if there is continued use of the ASPIC model.

I also made a simple GA version of the ASPIC model after the meeting. Starting with r = 0.9, the GA search algorithm produced the following set of estimates: r = 0.512923777103424 and *B0*=88,474 and k = 400986.4375 with a smaller *LL*=7.692. This finding illustrates that the ASPIC model is very sensitive to the growth parameter, and the negative log-likelihood surface has multiple minima. This result is not surprising for fishery models; it illustrates another source of uncertainty associated with model fitting.

4. A re-evaluation of the age-based model with age data from the otolith-based ageing method was recommended.
5. The re-initiation of a multiple year tagging study should be commenced as soon as possible. The new study should be combined with the analyses of the existing tagging data in order to design an efficient tagging experiment.

4. CONCLUSIONS/ADDITIONAL RECOMMENDATIONS

In general, this meeting was organized professionally and progressed smoothly. The presentations were well prepared and presented. I wholly appreciate the time and effort expended by participants in each assessment group.

Below, I provide three additional recommendations that can be implemented to improve future stock assessment efforts in the SARC process:

4.1. Bias and bias correction of back-transformation from the estimated length-weight relationship

The assessments for both black sea bass and scallops used back transformation from estimated length-weight relationships. For the black sea bass assessment, back-transformation was referred to on page 5 and in Figures 2 and 5 of the assessment report. For the scallop assessment, back-transformation was referred to on page 5 and pages 77-78 of the assessment report. It is not clear to me regarding black sea bass whether the bias was corrected when the length-weight relationship was estimated. But it is obvious that bias correction was not done correctly with the scallop length-weight relationship (page 78).

In order to evaluate the magnitude of the bias, I requested additional data; however, due to my short visit, I could not be provided the requested data on time. Therefore, I will make some general comments here.

Usually, the length-weight relationship is assumed to be $wt = a \times len^b$ with a log-normal error. A log-transformation is commonly used to linearize the equation and cast the estimation problem into the simple linear regression as:

$$\ln(wt) = \ln(a) + b \times \ln(len) = \alpha + \beta \times \ln(len). \tag{4.1}$$

With estimated parameters: $\hat{\alpha}, \hat{\beta}$, the predicted weight ($w_0$) from a specific length (len_0) is then calculated:

$$\hat{w}_0 = e^{\hat{\alpha} + \hat{\beta} \times len_0} \tag{4.2}$$

(see page 78 in the scallops assessment).

It is well-known that (4.2) is biased high as an estimate $w_0 = e^{\alpha + \beta \times len_0}$ since

$$E(\hat{w}_0) = E\left(e^{\hat{\alpha} + \hat{\beta} \times len_0}\right) = e^{E\left(\hat{\alpha} + \hat{\beta} \times len_0\right) + V\left(\hat{\alpha} + \hat{\beta} \times len_0\right)/2} = e^{\alpha + \beta \times len_0} \times e^{V\left(\hat{\alpha} + \hat{\beta} \times len_0\right)/2} = w_0 \times e^{V\left(\hat{\alpha} + \hat{\beta} \times len_0\right)/2}$$

The bias correction under different scenarios has been developed accordingly. For example, Hayes et al. (1995) discussed the bias correction for the estimated model parameters with the estimated variance $\hat{\sigma}^2$. However, when the estimated length-weight relationship is used for prediction from the observed length distribution, the bias correction is quite different than just correcting the bias from parameters with the estimated variance $\hat{s}^2$, such as: $\hat{w}_0 = e^{\hat{a}+\hat{b}\times len_0-\hat{s}^2/2}$. It can be shown easily that

$$\begin{aligned} E(\hat{w}_0) &= E\left(e^{\hat{a}+\hat{b}\times len_0}\right) \\ &= e^{E\left(\hat{a}+\hat{b}\times len_0\right)+V\left(\hat{a}+\hat{b}\times len_0\right)/2} \\ &= e^{a+b\times len_0} \times e^{V\left(\hat{a}+\hat{b}\times len_0\right)/2} \end{aligned}$$

Therefore this bias correction is not only dependent on the estimated model variance $\hat{s}^2$, but is also dependent on the estimated correlation between the parameters. In addition, the bias is dependent on the specified length (len_0) to be predicted with the smallest bias at len_0 = (mean observed length). This means that the prediction bias is not constant over the data range (contrary to the common bias correction $wt_0 = e^{\hat{a}+\hat{b}\times len_0-\hat{s}^2/2}$). In the case of extrapolation to large lengths, this bias could be remarkably significant. In the situation of recruitment prediction, Chen (2004) has shown that the prediction bias could exceed 5%. Since I do not have the length-weight data used in the assessments, I cannot judge the magnitude of the bias for these particular cases; however, I can safely assume that the bias could be at the 5% level. I recommend that an appropriate correction be done.

4.2. Tagging experiment

In the black sea bass assessment, a well-designed tagging experiment was reviewed, and the analysis of the tagging data was carried out using the simple Petersen model. Questions were asked about fish movement and mixing and their effects on the estimated exploitation rate. Similar questions were also asked about the bluefish assessment since there were several years' of tagging experiments conducted for this stock.

It is now a common practice for fish stock assessments to include the movement of fish in the process for estimating fish-stock abundance (Quinn et al. 1990). Bias can be reduced by incorporating migration and mixing. Quinn and Deriso (1999) comprehensively reviewed different forms of movement models, such as diffusion models (Hilborn 1987; Deriso et al. 1991; Fournier et al. 1998); generalized movement estimation (Ishii 1979, Sibert 1984, Anganuzzi et al. 1994; Xiao 1996, Xiao et al. 1999; Xiao and McShane 2000); and movement-estimation mark–recapture methods (Seber 1982, Brownie et al. 1985, Schwarz et al. 1993).
As a recommendation for the black sea bass assessment, the Brownie et al. model can be easily extended to incorporate fish movement among the three regions (NE, NJ&DE, MD&VA). Since this is a multiple year experiment, a natural mortality estimate can also be obtained along with the fishing mortality rate. The author was provided some data from this experiment. Some analysis will be conducted in the future.

A sensitivity analysis was conducted in the assessment for different tag reporting rates. There were some discussions on the effect of the tag-reporting rate on the estimation of the fishing mortality rate. My recommendation is to use a recent development in mark-recapture analysis for dealing with unreported tags. McGarvey and Feenstra (2002) discuss the analysis of mark-recapture data with the problem of non-reporting, and they develop an estimator of movement rates that does not use the number originally tagged but is fitted to the relative proportions recaptured in each cell in each time step subsequent to release. With the use of these proportions, rates of processes that occur in the tag-release spatial cell (such as short-term tagging mortality and survival) cancel from the predicted likelihood probabilities. Similarly, rates in the recapture cell for processes of ongoing tag loss (natural mortality and tag non-reporting) also cancel if they can be reasonably approximated as being uniform across cells.

I also recommend that this experiment be carried out for additional years to obtain more data for producing better estimates of fishing mortality rates, movement, and natural mortality. The results from the tagging experiment can serve as an independent source of information to corroborate results from other assessment models.

4.3. CPUE standardizations

The Panel recommended that all the assessments use the GLM approach for standardizing fishery/survey CPUE data. Because the CPUE standardization is the first step for these stock assessments, any questionable analyses and assumptions in the process of standardization may introduce additional uncertainties into the assessment results besides the uncertainties arising from the well-discussed data issues.

I outline the general procedures here. The simplest method for combining different sources of data is the general linear model (GLM) approach, including interactions among factors if the data are well behaved. The next extension is to use a generalized linear model (also referred to as GLM sometimes) and include non-normal error distributions such as the Poisson, binomial, negative binomial, etc. Both types of GLM can then be extended to include random effects for some interaction terms (i.e. GLM/GLMM) by assuming that the error distributions are log-normal, delta lognormal, or negative binomial.

An obvious fault with all these models is the assumption that the fishery/survey data are independent spatially even though most of the fishery/survey data are collected in the spatial domain. The statistical theory behind these methods assumes that the observed CPUE data are independent. This is obviously invalid for fish population since it is common sense that fish move together, and the closer the observed fish abundance measurements, the more similar the measurements become. Nishida and Chen (2004) developed a procedure to incorporate spatial autocorrelation into the GLM/GLMM.

There is a special issue in press from Fisheries Research on using GLM to standardize fishery/survey data, which will serve as a reference for this type of analysis.

5. REFERENCES

Anganuzzi, A., Hilborn, R., and Skalski, J.R. 1994. Estimation of size selectivity and movement rates from mark–recovery data. Can. J. Fish. Aquat. Sci. **5**1: 734–742.

Brownie, C., Anderson, D.R., Burnham, K.P., and Robson, D.S. 1985. Statistical inference from band-recovery data—a hand-book. 2nd ed. U.S. Fish Wildl. Serv. Resour. Publ. No. 156.

Chen, D. G. 2004. Bias and bias correction in fish recruitment prediction. North American Journal of Fisheries Management, 24:724-730.

Chen, D. G., B. Hargreaves, Ware, D. M and Liu, Yingnan 2000. A fuzzy logic model with genetic algorithms for analyzing fish stock-recruitment relationship, Canadian Journal of Fishery and Aquatic Sciences, 57:1878-1887.

Deriso, R.B., Punsly, R.G., and Bayliff, W.H. 1991. A Markov model of yellowfin tuna in the eastern Pacific Ocean and some analyses for international management. Fish. Res. **1**1: 375–395.

Fournier, D.A., Hampton, J., and Sibert, J.R. 1998. MULTIFAN-CL: a length-based, age-structured model for fisheries stock assessment, with application to South Pacific albacore, *Thunnus alalunga*. Can. J. Fish. Aquat. Sci. **5**5: 2105–2116.

Hilborn, R. 1987. Spatial models of tuna dynamics in the western Pacific: is international management of tuna necessary? *In* Modelling and management of resources under uncertainty. *Edited by* T.L. Vincent, Y. Cohen, W.J. Grantham, G.P. Kirkwood, and J.M. Skowronski. Lecture notes in biomathematics. No. 72. Springer-Verlag, Berlin. pp. 276–286.

Hayes, D. B., Brodziak, J.K.T. and O'Gorman, J.B. 1995. Efficiency and bias of estimators and sampling designs for determining length-weight relationships of fish. Can. J. Fish. Aquat. Sci. 5284-92.

Ishii, T. 1979. Attempt to estimate migration of fish population with survival parameters from tagging experiment data by the simulation method. Investig. Pesq. **4**3: 301–317.

McGarvey, R. and Feenstra, J.E. 2002. Estimating rates of fish movement from tag recoveries: conditioning by recapture. Can. J. Fish. Aquat. Sci. 59:1054-1064.

Nishida, T and Chen, D. G. 2004. Incorporating spatial autocorrelation in the General Linear Model with application to the yellowfin tuna (Thunnus albacares) CPUE standardization of longline fisheries in the Indian Ocean. Fisheries Research (re-submitted after the first revision).

Quinn, T.J., II, and Deriso, R.B. 1999. Quantitative fish dynamics. Oxford University Press, New York.

Quinn, T.J., II, Deriso, R.B., and Neal, P.R. 1990. Migratory catch-at-age analysis. Can. J. Fish. Aquat. Sci. **4**7: 2315–2327.

Schwarz, C.J., Schweigert, J.F., and Arnason, A.N. 1993. Estimating migration rates using tag recovery data. Biometrics, **4**9: 177–193.

Seber, G.A.F. 1982. The estimation of animal abundance and related parameters. 2nd ed. Griffin, London.

Sibert, J.R. 1984. A two-fishery tag attrition model for the analysis of mortality, recruitment, and fishery interaction. Tuna and Billfish Assessment Programme, South Pacific Commission, Noumea, New Caledonia. Tech. Rep. No. 13.

Xiao, Y. 1996. A framework for evaluating experimental designs for estimating rates of fish movement from tag recoveries. Can. J. Fish. Aquat. Sci. **5**3: 1272–1280.

Xiao, Y., and McShane, P. 2000. Estimation of instantaneous rates of fishing and natural mortalities from mark–recapture data on the western king prawn *Penaeus latisulcatus* in the Gulf St. Vin-cent, Australia, by conditional likelihood. Trans. Am. Fish. Soc. **12**9: 1005–1017.

Xiao, Y., Stevens, J.D., and West, G.J. 1999. Estimation of fishing and natural mortalities from tag experiments with exact or grouped times at liberty. Can. J. Fish. Aquat. Sci. **5**6: 868–874.

Appendix 1: Panelists

Chair:

Dr Andrew I.L. Payne	(Centre for Environment, Fisheries and Aquaculture Sciences, Lowestoft, UK)

Panel members:

Dr Michael J. Armstrong	(Centre for Environment, Fisheries and Aquaculture Sciences, Lowestoft, UK)
Dr Din Chen	(International Pacific Halibut Commission, University of Washington, Seattle, USA)
Dr Paul Medley	(Consultant, Alne, UK)

Appendix 2: Terms of Reference

A. Black seabass

1. Characterize the commercial and recreational catch data (including length distributions).
2. Update Northeast Fisheries Science Center (NEFSC) survey indices and evaluate appropriate state survey indices.
3. Summarize tagging program results (NEFSC, Virginia, New Jersey).
4. Develop tag-based estimate(s) of exploitation.
5. Evaluate use of index-based methods for estimating relative Fs.
6. Re-evaluate biological reference points.

B. Sea scallop

1. Update status of the Georges Bank, Mid Atlantic Bight and Gulf of Maine sea scallop resources through 2003 using all applicable information fishery dependent information and fishery independent surveys (e.g. NEFSC trawl survey, SMAST video survey and others as appropriate). Provide estimates of fishing mortality and stock size. Characterize uncertainty in the estimates.
2. Evaluate stock status relative to current reference points.
3. Provide short_term projections of stock biomass and catches consistent with target fishing mortality rates.
4. Update estimates of biological reference points (e.g. B_{MSY}, F_{MSY}) using revised biological and fishery data, as appropriate.
5. Evaluate information provided by various current survey approaches and suggest possible ways to integrate their results.
6. Continue the development stock assessment modelling approaches that integrate all appropriate sources of fishery dependent and fishery-independent data.

C. Bluefish

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 and either update or re-estimate biological reference points, as appropriate.
4. Where appropriate, estimate a TAC and/or TAL based on stock status and target mortality rate for the year following the terminal assessment year.
5. If stock assessments 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 and recovery schedules, as appropriate.

Appendix 3: Agenda

39TH NORTHEAST REGIONAL STOCK ASSESSMENT WORKSHOP (SAW 39)
STOCK ASSESSMENT REVIEW COMMITTEE (SARC) MEETING

Aquarium Conference Room - Northeast Fisheries Science Center
Woods Hole, Massachusetts
7-10 June 2004

Date and Subject	Presenter	Panel lead	Rapporteur
MONDAY, 7 June (13:00 – 17:30)			
Welcome	**John Boreman**, Center Director		
Introduction	**Terry Smith**, SAW Chair		
Agenda & Conduct of meeting	**Andy Payne,** SARC Chair		
Black Sea Bass (A)	**Gary Shepherd**	**Din Chen**	**Laurel Col**
SARC Discussion	**Andy Payne**		
TUESDAY, 8 June (08:30 - 18:00)			
Sea Scallop (B)	**Dvora Hart**	**Paul Medley**	**Larry Jacobson**
SARC Discussion	**Andy Payne**		
WEDNESDAY, 9 June (09:00 - 17:00)			
Bluefish (C)	**Jessica Coakley**	**Mike Armstrong**	**Laura Lee**
SARC Discussion	**Andy Payne**		
THURSDAY, 10 June (09:00 - finish)			
Close discussion and report preparation			

Appendix 4: Bibliography

A1: **Assessment of the Northern Stock of Black Sea Bass**. Consensus Assessment Summary and Report of the Coastal/Pelagic Working Group Report prepared for the Stock Assessment Review Committee (SARC), May 4, 2004. 3 pp. + 82 pp.

A2: **H. Black Seabass**. *In* 27th Northeast Regional Stock Assessment Workshop (27th SAW). Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. NEFSC Ref. Doc. 98-15.

B1: **Sea Scallop Assessment**. Summary and Report of the Invertebrate Subcommittee prepared for the Stock Assessment Review Committee (SARC), May 25, 2004. 3 pp. + 120 pp.

B2: **B. Sea Scallop Advisory Report**. *In* 32nd Northeast Regional Stock Assessment Workshop (32nd SAW). Public Review Workshop. NEFSC Ref. Doc. 01-04.

C1: **Bluefish Assessment**. Summary and Working Group Report of the ASFMC Bluefish Assessment Committee prepared for the 39th Stock assessment Review Committee (SARC), June 2004. 5 pp. + 63 pp.

C2: **C. Bluefish**. *In* 23rd Northeast Regional Stock Assessment Workshop (23rd SAW). Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. NEFSC Ref. Doc. 97-05.

Appendix 5: STATEMENT OF WORK

Consulting Agreement between the University of Miami and Dr. Din Chen

May 13, 2004

General

The Northeast Regional Stock Assessment Review Committee meeting (SARC) is a formal, multiple day meeting of stock assessment experts who serve as a peer-review panel for several tabled stock assessments. The SARC is the cornerstone of the Northeast Stock Assessment Workshop (SAW) process which includes peer assessment development (SAW Working Groups or ASMFC technical committees), assessment peer review, public presentations, and document publication.

Designee will serve as a panelist on the 39th Stock Assessment Review Committee panel. The panel will convene at the Woods Hole Laboratory of the Northeast Fisheries Science Center in Woods Hole, Massachusetts, the week of 7 June 2004 (7-10 June) to review assessments for sea scallop (*Placopecten magellanicus*), black sea bass (*Centropristis striata*), and bluefish (*Pomatomus saltatrix*).

Specific

A panelist's duties will occupy a maximum of 14 workdays; a few days prior to the meeting for document review; the SARC meeting; and a few days following the meeting to prepare a Review Report. The SARC Review Report will be provided to the SARC chair who will produce a SARC Meeting Report summarizing the individual Review Reports.

Roles and responsibilities:

(1) Prior to the meeting: review the Working Group Reports.

(2) During the meeting: participate, as a peer, in panel discussions on assessment validity, results, recommendations, and conclusions especially with respect to the adequacy of the assessments reviewed in serving as a basis for providing scientific advice to management.

(3) After the meeting: prepare an individual Review Report which provides an executive summary, a review of activities and, for each stock assessment reviewed, a summary of findings and recommendations which emerge from the findings, all in the context of responsiveness to the Terms of Reference for each assessment.

(4) No later than June 25, 2004, submit a written report[2] consisting of the findings, analysis, and conclusions, addressed to the "University of Miami Independent System for Peer Review," and sent to Dr. David Sampson, via e-mail to David.Sampson@oregonstate.edu and to Mr. Manoj Shivlani via e-mail to mshivlani@rsmas.miami.edu.

No consensus opinion between the CIE reviewers is sought and all SARC reports will be the product of the individual CIE reviewer or Chairperson.

Contact person:
Dr. Terrence P. Smith, NEFSC, Woods Hole, SAW Chair, 508-495-2230, Terry.Smith@noaa.gov

[2] 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 NOAA Fisheries and the consultant.

ANNEX I: REPORT GENERATION AND PROCEDURAL ITEMS

1. The report should be prefaced with and 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.