

April 28, 2004

CIE Chair report

SEDAR5 Review Workshop, King Mackerel Atlantic and Gulf of Mexico
Migratory Units, Miami, Florida 5-8 April 2004

To:

University of Miami Independent System for Peer Review.

Henrik Sparholt, Dr.Sc.

1. Synopsis/summary of the meeting

Overall, the meeting was well arranged, the participants were dedicated, and the support from SEFSC and the SEDAR Secretariat was effective. The Panel was pleased with the effective support from the NMFS SEFSC scientists, and impressed by the open-minded attitude and willingness to support the Panel with additional information and analysis. Also, the computer and network support was excellent. The small local network established by the SEFSC staff proved very effective for the exchange of data files and sharing of information among the Review Panel members.

Day 1 was spent listening to presentations and taking the first round of discussions of the stock assessment of each of the two stocks and of the mixing issue between the two stocks in the mixing zone southeast to southwest of Florida. The presentations were done by SEFSC staff.

Day 2 was spent with detailed review of the assessments and the mixing issue, and during the evening appointed members of the Panel drafted text for the Consensus Report.

This text was discussed on the morning of Day 3. The main issue discussed was the mixing and whether the Panels agreed that the current assumption about mixing used in the assessment was the best possible. An alternative was suggested. There was an extended discussion about whether this should mean that the alternative mixing assumption should be used in the baseline assessment, and the general opinion was that it was premature, because several other aspects of the assessment (growth, fecundity, FADAPT model vs. more statistically robust methods for stocks where F is not much larger than M as in this case, mixing outside the mixing time, and uncertainties about the actual mixing values), were also in need for revision. Sensitivity analysis showed that these revisions gave quite different results from an assessment with the new mixing rates. It was, therefore, regarded as prudent to wait with changing the baseline assessment method until these other issues were also included. However, two Panel members disagreed and made a minority statement that the new mixing rates should be used already this year.

In the afternoon of Day 3, the advisory reports were discussed and in the evening the first drafts were produced by appointed Panel members.

On the last morning (of Day 4), all three reports were discussed in plenary and appointed Panel members agreed to work further on the reports after the end of the meeting.

The reports were finalised via e-mail correspondence within three weeks after the end of the meeting.

2. Views on the meeting process, including recommendations for improvements

The amount of reports and other material to read before the meeting was extensive. There was only little time to do this, about two weeks. It would be useful if some of the material were sent out as early as possible. It should be possible to send out previous assessment reports, background articles, and the Data Workshop report, several weeks earlier.

A complete description of the assessment with all the input data files and the precise settings of the model would be nice to have in one document. It was a bit difficult to find precisely in which document to look for the various details. The level of details and data files should allow for an exact and easy repeat of the calculations.

Fishers (and nongovernmental organizations (NGOs)) contributed during the meeting some information on CPUE series, the fishery and the management regulations effects on this, and the like. It is, however, important that political issues do not enter the discussions. It might, however, be important for the entire process that fishers participate, or at least get the opportunity to observe what is done, in order to secure transparency and trust in the system. However, extra time would need to be spent on explaining things to non-scientists and in balancing the statements put forward so that fishers and NGOs correctly understand the issues.

My task as Chair for the meeting was a bit difficult because most panel members were more familiar with the process than I was. Maybe a bit more information about the duties of the Chair would be useful. Alternatively, another member of the Panel could be the Chair, and one of the CIE Experts could be appointed as the lead expert and perhaps still be responsible for the reporting.

Maybe the reviewers (and other Panel members) could, to the extent possible, state before the start of the meeting what sensitivity runs they want to see in addition to what has been presented in the documents sent to the Panel. This will allow SEFSC staff more time to prepare the runs, and it will make mistakes less likely.

3. Other observations on the meeting process.

The timing of the whole process from the last data sampled in 2001/02 and until now (start of 2004) with the aim of giving advice for 2005/2006 could be improved. It is a very long time span, and there is a large risk for the things in the fishery and the stock to have changed in between meeting processes. It should be possible to shorten this time span so that the advice for 2005/2006 can be based on data from 2003/2004.

Appendix 1

STATEMENT OF WORK

Consulting Agreement between the University of Miami and Dr. Henrik Sparholt

General:

South East Data, Assessment, and Review (SEDAR) is a joint process of the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils, NOAA Fisheries SEFSC and SERO, and the Atlantic and Gulf States Marine Fisheries Commissions for stock assessment and review. The program provides a framework for independent peer review of stock assessments undertaken jointly by NMFS-SEFSC, three Regional Fishery Management Councils, two Interstate Fishery Commissions, and state fishery agencies in the southeast. SEDAR uses a three-phase approach: a data workshop, an assessment workshop, and a peer review panel workshop. The peer review panel is composed of stock assessment experts, other scientists, and representatives of council, fishing industries, and non-governmental conservation organizations. Final SEDAR documents include a stock assessment report produced by the data and assessment workshops, a review panel report evaluating the assessment (drafted during the review panel workshop), a report that presents the peer-reviewed assessment results, and collected stock assessment documents considered in the SEDAR process.

NMFS-SEFSC requests the assistance of two assessment scientists from the CIE: one to serve as Chair and one to serve as a technical reviewer for the SEDAR 5 Review Panel that will consider assessments for Atlantic and Gulf migratory groups of king mackerel. No consensus opinion between the two CIE panelists is sought.

These migratory groups of king mackerel under assessment are within the jurisdiction of the South Atlantic and Gulf of Mexico Fishery Management Councils and respective southeastern states and fishery commissions. The review workshop for SEDAR 5, Atlantic and Gulf king mackerel stock assessments, will take place at the SEFSC Miami Laboratory, Miami FL from April 5, 2004 (beginning at 2:00 pm) through April 8, 2004 (ending at 1:00 pm). Meeting materials will be forwarded electronically and in hard copy. Please contact John Carmichael (SEDAR Coordinator; 843-571-4366 or 252-728-8708 or John.Carmichael@safmc.net) for additional details.

SEDAR Assessment Review Panel Tasks:

The SEDAR Assessment Review Panel will evaluate the king mackerel stock assessments, input data, assessment methods, and model results as put forward in stock assessment reports. The Assessment Review Panel will:

1. Evaluate the adequacy and appropriateness of fishery-dependent and independent data used in the assessment (i.e. was the best available data used in the assessment).
2. Evaluate the adequacy, appropriateness and application of models used to assess these species and to estimate population benchmarks (MSY, Fmsy, Bmsy and MSST, i.e. Sustainable Fisheries Act items).
3. Evaluate the adequacy, appropriateness, and application of models used for rebuilding analyses.
4. Develop recommendations for future research for improving data collection and the assessment.
5. Prepare a Peer Review Panel Report summarizing the peer review panel's evaluation of the king mackerel stock assessments. (Drafted during the Assessment Review Panel workshop with a final report due two weeks after the workshop ends.)
6. Prepare a Draft Summary Stock Status Report. (Drafted during the Assessment Review Panel workshop with a final report due two weeks after the workshop ends.)

The Assessment Review Panel's primary duty is to review the assessments presented. In the course of this review, the Chair may request a reasonable number of sensitivity runs, additional details of the existing assessments, or similar items from technical staff. However, the review panel is not authorized to conduct an alternative assessment or to request an alternative assessment from the technical staff present. If the review panel finds that an assessment does not meet the standards outlined in Items 1 through 3, above, the panel will outline in its report the remedial measures that the panel proposes to rectify those shortcomings.

Statement of Tasks for Review Panel Chair:

The CIE designee shall serve as Chair of a SEDAR Stock Assessment Review Panel workshop for SEDAR 5, Atlantic and Gulf migratory groups of king mackerel, April 5 - 8, 2004 (See attached agenda.). The workshop panel shall review stock assessments for Atlantic and Gulf migratory groups of king mackerel in the jurisdiction of the South Atlantic and Gulf of Mexico Fishery Management Councils and applicable southeastern states and fisheries commissions. Roles and responsibilities of the Chair include:

- (1) Prior to the Assessment Review Panel workshop the Chair shall be provided with the stock assessment reports and associated documents for Atlantic and Gulf migratory groups of king mackerel. The Chair shall read and review all documents to gain an in-depth understanding of the stock assessments under consideration and the data and information considered in the assessments.
- (2) During the Assessment Review Panel workshop the Chair shall control and guide the meeting, including the coordination of presentations, discussions, and document flow.
- (3) The Chair shall facilitate the preparation and writing of the Peer Review Panel Report (Item 5 above) and a Draft Summary Stock Status Report (Item 6 above). Review panel members, SEFSC staff and stock assessment scientists present at the meeting will assist the Chair as needed. The Chair shall be responsible for the editorial content of the two review panel reports, and the Chair shall be responsible for overseeing that both reports are produced and distributed to appropriate contacts on schedule (see "Final Reports" below).
- (4) The SEDAR coordinator shall assist the Assessment Review Panel Chair prior to, during and after the meeting to ensure that all final documents with results are distributed in a timely fashion.
- (5) No later than April 28, 2004, the Chair shall submit a written chair report¹ 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. See Annex 1 for the contents of the Chair's report.

It is estimated that the Chair's duties shall occupy up to 17 days: several days prior to the Review Panel meeting for document review, four days during the meeting week, and several days following the meeting to ensure that the final documents are completed and to prepare the Chair's report for the CIE.

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

Appendix 2. Bibliography of material provided for the meeting

Document List of material send out to CIE 2 weeks before the start of the meeting.

Document #	Title	Authors
Documents Reviewed at the Data Workshop		
SEDAR5-DW-1	Estimating Catches and Fishing Effort of the Southeast United States Headboat Fleet, 1972-1982.	Dixon, R.L. and G.R. Huntsman
SEDAR5-DW-2	2003 Report of the MSAP	MSAP
SEDAR5-DW-3	Regulatory Overview of South Atlantic and Gulf of Mexico King Mackerel	Carmichael, J.T.
SEDAR5-DW-4	A general description of the SEAMAP larval king mackerel dataset with indices of larval occurrence and abundance, 1982 to 2000	Lyczkowski-Shultz, J. and D. S. Hanisko
SEDAR5-DW-5	A review of the stock structure of king mackerel off the southeastern US.	DeVries, D. and W. Patterson
SEDAR5-DW-6	A literature review of the growth of king mackerel in the Southeastern United States	Cummings, N. J., D. DeVries, and C. Palmer
SEDAR5-DW-7	A summary of king mackerel <i>Scomberomorus cavalla</i> age data from the Panama City Laboratory, NOAA Fisheries, 1997 – 2003.	Palmer, C. and D. DeVries
SEDAR5-DW-8	Review of the catch sizing and sexing and ageing of king mackerel <i>Scomberomorus cavalla</i> from US Gulf of Mexico and South Atlantic fisheries	Ortiz, M., P. L. Phares, and N. J. Cummings
SEDAR5-DW-9	Preliminary analysis of king mackerel tag data from the cooperative tagging center	Diaz, G. A.
SEDAR5-DW-10	A method for analyzing the abundance and mortality of Atlantic and Gulf king mackerel when the two stocks are presumed to intermix	Porch, C. E.
SEDAR5-DW-11	Discrimination between Gulf of Mexico and Atlantic Ocean king mackerel with otolith shape analysis and otolith microchemistry: A progress report	Patterson, W. E., T.R. Clardy, D. A. DeVries, Z. Chen, and C. Palmer
SEDAR5-DW-12	Estimates of king mackerel discards for the Atlantic and Gulf Migratory groups	Poffenberger, J.
SEDAR5-DW-13	Standardized Catch rates of king mackerel from US Gulf of Mexico and South Atlantic recreational fisheries	Ortiz, M. and P. L. Phares
SEDAR5-DW-14	Standardized catch rates of king and Spanish mackerels from US Gulf of Mexico and South Atlantic recreational fisheries	Ortiz, M.
SEDAR5-DW-15	Standardized catch rates of Spanish and king mackerel from the North Carolina commercial fisheries	Ortiz, M. and L. Sabo
Documents Reviewed at the Assessment Workshop		
SEDAR5-AW-1	Estimated von Bertalanffy growth curves for king mackerel stocks in the Atlantic and Gulf of Mexico	Brooks, E. N., Ortiz, M.
SEDAR5-AW-2	Sensitivity of stock assessment analysis of Gulf of Mexico king mackerel to alternative methods for estimation the historic catch at age matrix 1981-2002	Ortiz, M.
SEDAR5-AW-3	Stock Assessment Analysis on Gulf of Mexico King Mackerel	Ortiz, M.
SEDAR5-AW-4	Virtual Population Analyses of Atlantic and Gulf King Mackerel Using Tag-Recapture data and Alternative Models of Migration.	Porch, C. E., G. A. Diaz
SEDAR5-AW-5	Revision and Update of the stock assessment analyses on King Mackerel stocks 2003	Ortiz, M.
SEDAR5-AW-6	Release locations of tagged king mackerel	Diaz, G.
SEDAR5-AW-7	Discrimination Amount US South Atlantic and Gulf of Mexico King Mackerel with Otolith Analysis and Otolith Microchemistry. Summary of MARFIN Grant No. NA17FF2013	Shipp, R. L. and W. F. Patterson III.
SEDAR5-AW-8	Stock Assessment analysis on king and Spanish mackerel stocks. Report to the MSAP, 2003. SFD Cont. SFC-2003-008.	anon.
MARFIN NA57-FF-0295	Genetic analysis to determine mixing proportions by season of Western Atlantic and Gulf of Mexico stocks of king mackerel.	Gold, J. R.

Fisheries Research 57(2002):51-62	Using otolith shape analysis to distinguish eastern Gulf of Mexico and Atlantic Ocean stocks of king mackerel	DeVries, D. A., C. B. Grimes, and M. H. Prager.
MSAP/98/10	What if mixing area fish are assigned to the Atlantic Migratory Group instead of the Gulf of Mexico Migratory Group	Legault, C. M.
Documents Provided for the Review Workshop		
SEDAR5-AR-1	Stock Assessment of Atlantic and Gulf King Mackerel	anon.

Documents tabled at the start of the meeting:

Legault, Christoffer, M. (probably 2000 but not stated). Status Review of King Mackerel in the Gulf of Mexico. Feature Article. NMFS Southeast Fisheries Science Center, Miami, Florida.

Legault, C.M., Powers, J.E. Restrepo, V.R. 2002. Mixed Monte Carlo/Bootstrap Approach to Assessing King and Spanish Mackerel in the Atlantic and Gulf of Mexico: Its Evolution and Impact. American Fisheries Society Symposium, 27:37-44.

Power, J.E. and Restrepo, V.R. 1993. Evaluation of Stock Assessment Research for the Gulf of Mexico King mackerel: Benefits and Costs to Management. North American Journal of Fisheries Management, 13:15-26.

Powers, J.E. 1996. Benchmark Requirements for Recovering Fish Stocks. North American Journal of Fisheries Management, 16:495-504.

SEDAR5-AW-/Appendix. Sensitivity of Stock Assessment Analysis of the Gulf of Mexico King Mackerel to Alternative Growth Parameters.

SEDAR
SouthEast Data, Assessment, and Review

SEDAR5 Review Workshop

Consensus Summary

King Mackerel
Atlantic and Gulf of Mexico Migratory Units

April 30, 2004

I. Workshop Information

SEDAR Review Workshops provide an independent peer review of the input data, methods, and results of stock assessments. This Review Workshop Panel (RW Panel) considered an assessment of south Atlantic and Gulf of Mexico (hereafter Gulf) migratory groups of king mackerel developed through the SEDAR process, including both data and assessment workshops. The Southeast Fisheries Science Center, Miami Laboratory, served as the lead assessment agency for this assessment.

The SEDAR 5 Review Workshop was held at the Southeast Fisheries Science Center, Miami Florida, between April 5 and 8, 2004. The Review Panel consisted of regional and international assessment scientists, fisheries researchers, and commercial and recreational fishermen.

SEDAR 5 Review Panel Composition:

Henrik Sparholt	<i>CIE Chair</i>
Jon Volstad	<i>CIE Reviewer</i>
Rick Hart	<i>SEFSC Galveston</i>
Mark Terceiro	<i>NEFSC Woods Hole</i>
Will Patterson	<i>University of West Florida, GMFMC SSC</i>
Andy Strelcheck	<i>SERO, GMFMC FAP</i>
Albert Jones	<i>GMFMC SSC</i>
Joe Grist	<i>NC DMF, SAFMC SSC</i>
Bob Zales II	<i>GMFMC AP</i>
William Gibson Jr.	<i>GMFMC AP</i>
Ben Hartig	<i>SAFMC AP.</i>

II. Terms of Reference

1. Evaluate the adequacy and appropriateness of all data used in the assessment. State whether or not the data are scientifically sound and the best available.
2. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population parameters such as abundance, biomass, and exploitation. State whether or not the methods are scientifically sound and the best available, and recommend appropriate values of population parameters.
3. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population benchmarks (MSY , F_{MSY} , B_{MSY} , $MSST$, $MFMT$, etc.). State whether or not the methods are scientifically sound and the best available, and recommend appropriate values for benchmark criteria.
4. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding. State whether or not the methods are scientifically sound and the best available, and recommend probable values of future population condition and status.
5. Provide a recommended range and best point estimate of the mixing rate of Atlantic and Gulf Migratory Groups in the mixing zone.
6. Develop recommendations for improving data collection and assessment and future research (both field and assessment).
7. Prepare a Consensus Summary addressing the Terms of Reference and documenting the Panel's discussion of the assessment.
8. Prepare an Advisory Report summarizing stock status, future condition, and management benchmarks.

9. Submit final Consensus Summary and Advisory Report documents within 3 weeks of the conclusion of the Review Workshop. Reports should be submitted on or before April 30, 2004.

III Review

The review covered Terms of Reference 1-6.

Term of Reference 1

The Data Workshop Panel (DW Panel) for the SEDAR5: Atlantic and Gulf of Mexico King Mackerel Assessment was provided with documents (SEDAR5-DW1-15) which summarized data and gave overviews on stock structure; growth; catches; discards; catch sizing, sexing and ageing; fishery dependent and fishery independent indices; tagging results; and methods of discriminating between and analyzing mixed stocks.

The DW Panel members evaluated these documents and summarized their conclusions and recommendations concerning use of the data in assessments under three categories (life history, catch-at-age, and indices). In addition to reviewing the data, the DW Panel made recommendations for additional work to be done in preparation for the Assessment Workshop. The stock assessments made at the Assessment Workshop and later reviewed at the Review Workshop took note of and used the results of the Data Workshop and the subsequent work that was carried out.

In the opinion of the RW Panel the data used in the assessments for king mackerel are appropriate and adequate for offering management advice. The RW Panel recognized and discussed the uncertainty and incompleteness of certain data sets. Recognizing that these limitations were considered in the assessments through sensitivity analyses and statistical procedures, the RW Panel determined that the data as used, are scientifically sound and the best available.

In general, catch and landings data are adequate for assessment purposes; life history information on fecundity and natural mortality is limited but not result-restricting; new growth information for the Gulf of Mexico was reanalyzed for the Assessment Workshop and shown to impact analytical results; and tagging, otolith shape, and microchemistry data were shown to impact assessment results with respect to mixing rate and consequent predicted stock status.

Stock Distribution

The Management unit is defined as King Mackerel in the Gulf and south Atlantic specified as a single stock and managed as two independent migratory groups. Current stock assessments for king mackerel assume separate Atlantic and Gulf of Mexico stocks, with a "mixing zone" off south Florida that has boundaries defined by season. The RW Panel recognized that other assumptions on stock distribution have been proposed (separate groups in eastern and western Gulf). Limited data up to this time has not allowed carrying these assumptions into a modeling approach. For example, a need to consider management of the Gulf migratory group in relation to mixing between the eastern and western Gulf has been limited by the paucity of information from the western Gulf (catches are smaller there than in the eastern Gulf) and the lack of information on fisheries in Mexico, which possibly interact with western Gulf fish. Likewise, information on mixing between Atlantic and Gulf migratory groups presented to the RW Panel was considered inconclusive or preliminary. Tagging data from early tagging studies were used to test a new modeling approach. Recent data on otolith shape and microchemistry was presented. These data provided qualitative indications that there are fish from both Atlantic and Gulf groups in the mixing zone, but quantitative estimates of the ratios were imprecise. Microsatellite DNA data indicated mixing in the zone, but at present the information could not be used to quantify mixing rates.

Catch and Landings

King mackerel catch and landings information from 1981-2002 was utilized in the assessments. Commercial landings data are collected by trip tickets and logbook programs, which give a nearly complete census of total landings. Recreational catch data are collected under the Marine Recreational Fishery Statistics Survey (MRFSS), NMFS Headboat Survey, and Texas Parks and Wildlife Coastal Creel Survey, which give sample estimates of recreational catch based on creel and telephone surveys. The Panel noted that the precision of MRFSS estimates has improved over time (figures reported during the meeting indicated percentage standard errors of 21-64% in the years 1981-85 decreased to 6-8% in years 1992-2002 for the GOM king mackerel).

Discards

Discards of king mackerel in the directed commercial fishery were measured by a self-reporting logbook program carried out by a 20% sample of permit holders over a survey period of two years. Results were used to estimate discards in 1998-2002 for both Atlantic and Gulf migratory groups. Results indicated discards represented only a small percentage of total landings. The RW Panel agreed with the decision not to include this estimate in the assessment on the basis that inclusion would not significantly improve the assessment results. The Panel did note that new estimates of discards might be appropriate to include in future analyses.

The RW Panel noted that recreational data (MRFSS) included estimates of live releases and that the declining recreational catches in more recent years probably indicated higher release rates due to management action, mercury concerns, angler ethics and other possibilities. However, because discards are poorly estimated and the underlying age distribution of discards is unknown the RW Panel supported not including recreational discards in the assessment.

Indices of Abundance

Six indices of abundance were used for the Atlantic assessment and nine abundance indices were used for the Gulf assessment. Procedures for deriving indices of abundance were similar to those of previous assessments and took into consideration technical decisions made during former Mackerel Stock Assessment Panel (MSAP) reviews of Gulf and Atlantic king mackerel migratory groups. A general linear model approach was used to standardize CPUE series in order to account for variability in CPUE that is independent of abundance.

The RW Panel agreed that indices of abundance were the best available. Several recommendations were made to potentially improve indices, including: 1) pre-smoothing within indices to reduce variability related to sampling, 2) combining indices where appropriate to reduce the number of indices, and 3) accounting for changes in fishing power (“technical creeping”). The panel recognized that some indices could not be combined because they are applied to different age groups or to different harvest areas (e.g. Florida Charter NW index). It was also discussed that fishing power is not likely to have changed over the time series, at least for commercial fisheries, because the primary gear used in the fishery is hook-and-line. For the recreational fishery, GPS technology may have contributed to increases in fishing power, but it was recognized that the change in fishing power would be difficult to quantify.

The RW Panel discussed the recreational MRFSS index for the Gulf of Mexico, which included only trips targeting or successfully catching king mackerel during July-December. One RW Panel member noted that this index did not account for a substantial recreational fishery in the Panhandle of Florida from April – June. The RW Panel also recommended that recreational indices should consider changes over time in fishing seasons.

Life History Parameters

Natural Mortality

Estimates of natural mortality are 0.15 for the Atlantic migratory group and 0.20 for the Gulf migratory group. The DW Panel recommended a range of 0.15-0.25 be used for both subgroups, with a mean natural mortality of 0.20. The RW Panel did not support this recommendation because there was no evidence to support this change and the change would affect the continuity of results between the current assessment and previous assessments.

Age and Growth

Estimates of growth are used to calculate production parameters and the catch at age and affect stock assessment analyses in several ways (e.g., relation of length, weight, and fecundity to age; recruitment size; differences between sexes, areas). The RW Panel reviewed older growth curves used for the Atlantic (Collins et al. 1989) and for the Gulf (Manooch 1987), based on 683 and 210 fish, respectively. These studies relied on whole otoliths for ageing, which have been determined to underestimate ages of older fish (Collins et al. 1989; Devries and Grimes 1997). As was recommended by the DW Panel Brooks and Ortiz (2004) estimated updated migratory group- and sex-specific growth functions based on 12,159 (Atlantic) and 17,813 (Gulf) sectioned otoliths from currently available samples. The RW Panel examined the impact of applying the updated growth models on catch at age, which resulted in a shift towards greater numbers of the youngest age groups (ages 0-2) and a decrease of about one year in the age of full selectivity. The RW Panel, however, decided to retain the earlier growth curve information for the BASE model. The RW Panel rejected the new growth parameters based on the most recent data because MSY was estimated to be higher than levels that drove down the size of the stock and because of suspect impacts of the updated curves on a fecundity at age relationship. Additionally, the estimate of t_0 was larger for the new growth model when compared to the older growth models. The RW Panel discussed the lack of small fish (< 24 inches) in the new growth model, which likely inflated the estimate of t_0 and increased the size/biomass at age for younger fishes. The new growth information also reduced the age at maturity and indicated that some fish were mature by age 0. The RW Panel recommends independent sampling of sub-legal fish (< 24 inches) to obtain a more accurate fit of t_0 for the growth curve.

Fecundity

Estimates of fecundity at age vectors were the same as used in previous assessments. Age-specific fecundity values were estimated in millions of eggs. Fecundity at age was derived from age-length relationships (Gulf – Manooch et al. 1987; Atlantic - Collins et al. 1989), a linear spline fit of maturity at age (data from Finucane et al. 1986), and an egg-length relationship (Finucane et al. 1986).

The RW Panel agreed that the data used for estimating fecundity were the best available. The RW Panel noted that reproductive biology data are nearly 20 years old and need updating. Several recommendations were made, including: 1) updating fecundity estimates and 2) updating maturity at age estimates. In addition, the egg-length relationship is derived from a small sample size ($n = 65$) that covered a wide spatial distribution. The RW Panel discussed whether differences existed in fecundity at age between subgroups, as has been demonstrated for growth among subgroups. The RW Panel believed that a direct relationship of fecundity at age, which accounts for spatial variability, needed to be developed for future assessments.

Term of Reference 2.

Assessment Workshop Panel members for the SEDAR5 were provided with documents (SEDAR5-AW1-8, MARFIN NA57-FF-0295, Fisheries Research 57(2002): 51-62, MSAP/98/10), which summarized data and gave overviews on growth curve models, stock assessment analyses, alternative assessment models, sensitivity runs, and mixing proportions. At the Review Workshop, panelists were provided these same documents and one additional document (SEDAR-AR-1), which reviewed decisions and recommendations made during the Data and Assessment Workshops.

The RW Panel considered the FADAPT VPA method employed to be appropriate given the available data, although it is suggested that alternative methods, that potentially are more stable when dealing with VPA type situations like here where F is not much larger than M , should be tested. Discussions of modeling methods and results focused on potential bias and precision in the input parameters and tuning indices, and did not evaluate model fits in great detail. Residual plots of the model fits, for example, were not provided for this review. The RW Panel recommends that such model diagnostics information be provided in future reviews. For instance, inspection of the residuals of the VPA model fits can reveal bias in the catch-at-age data, for example resulting from significant discards not accounted for, or from biased catch sampling. The RW Panel considered the stock-recruitment relationship and the abundance indices used for tuning to be adequate and appropriate.

The possibility of combining survey indices outside the VPA model was discussed. The RW Panel agreed that the use of composite estimators to combine multiple surveys potentially could yield more reliable tuning indices. Instead of the current use of equal weights, indices might be combined using weights that, for example, depend on precision and population coverage. The RW Panel cautioned that the combination of indices across surveys that cover different cohorts is problematic. Concerns were raised that fishery-dependent data may not be reliable for tracking trends in abundance because of factors such as targeted fishing, incomplete spatial coverage, changes in fishing practices, and size selectivity, although it was recognized that the assessment and data analysis took some of these aspects into account. A potential systematic shift in catchability related to technological improvements could introduce bias in estimated abundance trends.

Sensitivity analyses of the VPA model demonstrated that the stock assessments are dependent on the input growth parameter estimates. The RW Panel recognized that population length at age estimates based on fisheries dependent samples are likely to be biased because faster growing fish recruits sooner to the fishery. Such bias in growth models also affects fecundity because of conversion from size to age. The use of a stochastic growth model to estimate catch-at-age for early years (1981-1985) with no length-at-age was questioned. Following a request from the RW Panel, a sensitivity analysis was conducted to assess the effect of excluding these early years from the VPA runs. The results demonstrated that the model output is sensitive to deleting data on catch-at-age for the early years. The VPA model based on 1986/87 to 2001/02 catch at age data resulted in lower

estimates of stock size, and in contrast to the Base run indicated that over fishing might occur. Collectively, the sensitivity analyses suggested that the current FADAPT model does not fully capture the variability in input parameters.

An alternative two-area VPA model (SEDAR 5 AW-4) that accounts for mixing between the South Atlantic and Gulf migratory groups was presented to the RW Panel. This model simultaneously examines catch, indices of abundance and tagging data in order to estimate rates of intermixing between king mackerel subgroups in the mixing zone off of southeast Florida. The two-area VPA allowed for two alternative box transfer models to account for the mixing. DW Panel preferred the 'overlap model' to the 'diffusion model' (Porch and Diaz 2004). The overlap model assigns fish to a particular stock or subgroup upon birth and assumes that the two stocks have overlapping ranges, but seldom interact. The overlap model initially was applied to catch and abundance information. Tagging data was incorporated in a second model run. In the absence of reliable tagging data, the best model fit was obtained using an assumption of zero overlap between the two migratory groups. The two-area model was sensitive to levels of overlap, resulting in poor fits to abundance indices and noticeably different abundance trends. Inclusion of tagging data and estimation of the degree of overlap between subgroups appears to have a minor influence on assessment results, except in the last few years in which more optimistic population estimates were observed. These observed differences result from very poor estimation of recruitment during the last four years of the assessment (1998-2001). The RW Panel supported SEFSC staff's attempt to account for mixing using a two-area VPA model, but agreed that the model was not adequate or appropriate for estimating king mackerel population parameters based on the data currently available. The original purpose of the tagging data incorporated into the model was not to evaluate levels of mixing and the RW Panel was concerned that tagging fish in a concentrated area (as done in the tagging studies off southeast Florida) did not lend itself to estimation of mixing rates. Overall, the RW Panel agreed with the authors that a three-area assessment model would be more appropriate. A three-area model would allow examination of the mixing zone as a separate area with intermixing of king mackerel restricted only to that area. Assessment at a finer spatial resolution, however, is constrained by the sample sizes for statistically based catch per unit effort indices and age-length data.

The RW Panel recommended that stock assessment methods that estimate fishing mortality for the oldest age class in each year back in time be evaluated as an alternative to the current VPA model. The current assessment is based on a model which estimates F in the last data year and uses a fixed F -ratio between age 9 and 10 to obtain F at age and year for those cohorts that are not represented in the last data year. Also, methods that do not assume that catch at age is known with 100% precision, like ICA, or AMCI could be tried. These methods have the advantage that they are more stable over time, especially regarding the historical stock number and F estimation for cases like the king mackerel where F is not much higher than M . The current base model is more suitable in situations where F is significantly larger than M , by a factor of say 3-4. One of such alternative models could eventually replace the current base model. Alternative methods could initially be tested and included as part of the sensitivity analysis.

Mixing in the mixing zone during "summer" time, where all king mackerel are assumed to belong to the Atlantic migratory group, was not dealt with. Very little data were presented which could be used to estimate the amount of Gulf king mackerel in the mixing zone in "summer" time. It was, however, clear from tagging experiments off east Florida during the summer period (see e.g. SEDAR5_DW5) that these king mackerel are not 100% of the Atlantic migratory group.

In conclusion, the RW Panel, except two members (a minority statement from the two RW Panel members is included in Appendix 1), agreed that the base model should provide the principal criteria for management advice. It has been the model used in the past (historical

consistency). The RW Panel, except two members, decided there was only weak scientific justification to change the model or its input parameters. A majority of RW Panel agreed that to change the model at this point would not add any certainty to the management advice.

The RW Panel discussed the effect of mixing rate estimates on the interpretation of the model. Preliminary data provided on mixing rate indicate that fish in the "winter" mixing zone may include both Atlantic and Gulf group fish. Quantitative estimates of mixing rates were imprecise, subject to bias, and seemingly variable from year to year. A majority of the RW Panel, therefore, judged these mixing rate estimates to be scientifically unacceptable at this point in time. The management strategy presently assigns "winter" mixing zone fish totally to the Gulf group. Assigning some of these fish to the Atlantic group would change the estimates of stock status for each group (e.g., more of a change for the Gulf than for the Atlantic), as previously noted and further explained below under TOR 5.

The RW Panel also discussed the effects of growth and fecundity estimates on the interpretation of the model. The RW Panel decided not to change the growth estimates used in the base model because the lack of growth information for small fish cast doubt on the size-at-age relationship for young fish. The RW Panel noted that fecundity data were from a study done a number of years ago and no new data were available. Furthermore, the FADAPT method vs. more robust alternative methods and the sensitivity of the base model to the above mentioned issues adds an un-quantified level of uncertainty to the results of the model and therefore to the precision of the management advice that can be offered. Some of these uncertainties were potentially able to more than counterbalance the uncertainty in the mixing assumption.

Term of Reference 3

The procedures used to estimate population benchmarks (MSY , F_{MSY} , B_{MSY} , $MSST$, $MFMT$) were regarded as scientifically sound and the best available.

It was, however, recommended that the direct methods of estimating MSY using the adopted hockey stick stock-recruitment model combined with a standard yield per recruit analysis should be attempted for comparison with the MSY proxies in terms of $F_{30\%SPR}$ used in the assessment. This analysis was performed for the Gulf migratory group and showed that F_{MSY} calculated in this way was 0.35 and thus not very different from the proxy which for the Gulf migratory group is 0.26.

Although somewhat outside the TOR 3, the RW Panel had a brief discussion on the overall framework for the definitions and standards of the biological reference points. Various United Nations (UN) Agreements (see e.g. UN Fish Stock Agreement Annex II, 1995, FAO Code of Conduct of Responsible Fishing, 1995) state that stock specific limit and target reference points regarding fishing mortality and stock size should be defined and "...management strategies shall ensure that the risk of exceeding limit reference points is very low". It is further stated that MSY "...should be regarded as a minimum standard for limit points". The biological reference points defined for the two king mackerel migratory groups – the threshold $MSST$ and $F_{30\%SPR}$ and the target OY and $F_{40\%SPR}$ are thus in accordance with the request to define a limit and a target reference point for both fishing mortality and biomass. However, the definition of $MSST$ as $(1-M)B_{MSY}$ is in apparent conflict with the guidelines of using B_{MSY} minimum standard for a limit point. It was noted that while some fishery management bodies argue that their limit points live up to this definition (the International Council for the Exploration of the Seas, ICES CM 2003/ACFM:09, and its associated management bodies like the European Union and the International Baltic Sea Fishery Commission), other management councils obviously do not (Both

the New England Fishery Management Council [Northeast Multispecies FMP, Amendment 13 ([NEFMC Amendment 13](#)) and Mid-Atlantic Fishery Management Council, Summer Flounder, Scup, and Black Sea Bass FMP, Amendment 12 ([MAFMC Amendment 12](#)) use $1/2 * B_{MSY}$ as the biomass thresholds below which the stocks are classified as overfished]. Furthermore, the adoption by the GMFMC of using the 50% probability value for not exceeding the threshold/limit values cannot be regarded as a “very low” risk of exceeding a limit values. Other management bodies in the North Atlantic area, for example have used 5%, 10%, and 20% probabilities of exceeding a limit to depict “very low” risk. The 50% probability is fine in relation to achieving a target such as OY, because “... management strategies shall ensure that target reference points are not exceeded on average”, according to UN agreements.

Term of Reference 4

The RW Panel supports conclusions in the Assessment Report that results of the current Gulf assessment indicates the Gulf king mackerel migratory group is rebuilding, while the Atlantic migratory stock has rebuilt and remains stable. The RW Panel cautioned, however, that the BASE model for Gulf king mackerel appeared very sensitive to changes in input parameters tested with sensitivity analyses. For example, the BASE model incorporates a simplification of the true mixing between the two stocks which may have significant effects on estimates of population productivity, hence status. Furthermore, other sensitivity analyses detailed above demonstrated a wide range in stock productivity and status estimates depending on the choice of input parameters.

Term of Reference 5

The SEDAR Review Workshop, consistent with both the Data and Assessment Workshops, devoted significant discussion and effort toward resolving stock allocation within the mixing zone. The RW Panel discussions mirrored many of the same concerns voiced by the other workshops.

The tagging studies for South Atlantic and Gulf King mackerel were not designed to answer the stock mixing question and it is difficult to interpret raw tagging data beyond consideration of simple indicators, such as relative fishing effort and recovery rates. The SEFSC, based on Data Workshop recommendations, reconsidered mixing rates through updated analysis of tag data and developed an alternative assessment framework to incorporate tag-based mixing estimates into a VPA framework (Porch and Diaz 2004). The SEFSC also developed stock production and status estimates with the base assessment configuration for a variety of mixing rates between Atlantic and Gulf stocks within the mixing zone. The RW Panel determined that no consistent stock allocation is evident based on tagging data. Other tagging discussion dealt with the question of stock mixing outside the temporal/spatial zone and the impacts that may result if significant movement occurs during this time.

The majority of the RW Panel concurred with both the Data and Assessment Workshops that analysis of otolith shape and microchemistry offer a promising approach to resolving stock mixing. However, the majority felt that it was premature to base mixing zone estimates on otolith analyses. The SEDAR Workshop unanimously recommended that otolith analysis should be monitored on a continuing basis to provide additional information on stock mixing rates and to evaluate consistency in results between years.

The genetic population structure of king mackerel has been investigated by a number of researchers (May 1983, Johnson et al. 1994; Gold et al. 1997, 2002; Broughton et al. 2002). The results of these studies ranged from no genetic differences between eastern Gulf and Atlantic fish to a weak

genetic difference between eastern Gulf and Atlantic fish. The microsatellite work, which has shown promise in other fisheries, was not consistent with the current spatial and temporal boundaries used in assessing and managing king mackerel in the US. The SEDAR workshop concluded that the current genetic research could not be used to evaluate king mackerel mixing rates.

The RW Panel concurred with the opinion of the Assessment Workshop Panel that both migratory groups contribute to winter landings in the mixing zone. Mixing scenarios within the range of 25 to 75% Gulf group catch from the mixing zone appeared consistent with tagging data and preliminary results from otolith shape and micro-constituent studies, and were perceived more likely than the 100% used in the base line assessments. However, a majority of the RW Panel felt the alternate mixing scenarios suggested were based on imprecise mixing rates, and not developed and therefore premature to consider in the base model assessment, preferring instead to consider their effects by means of sensitivity analysis.

Term of Reference 6

The RW Panel noted that major concerns remain about the growth curves used to age the catch in some years and areas, the fecundity-length relationship used to estimate spawning stock, and the degree of mixing of the Gulf and Atlantic migratory groups in the winter fishery mixing zone. The RW Panel also expressed concern about the limited number of fishery independent indices of abundance available for VPA calibration.

The following is a more detailed and specific list of research issues, which are judged by the RW Panel to be important for improving the assessment and management advice for the two king mackerel stocks:

- The RW Panel recommends enhancing ongoing research programs and implementing new research programs to collect fishery independent data (e.g., length measurements, age structures, fecundity measurements) to improve the accuracy and precision of current estimates of growth, fecundity, and stock mixing. Spatial variability in size at maturity and fecundity at age should be evaluated among regions/migratory groups.
- The data collection program should also be designed to provide fisheries independent indices of abundance for the full age range in the stock. This consideration should have a strong influence on the design aspects [gear, season] of the recommended research programs. These programs might include research sampling targeting spawning aggregations, research sampling targeting juveniles, tagging studies specifically designed to provide information on mixing rates, and hydro-acoustic sampling. Scientists should seek the advice of members of the commercial and recreational fishing communities in the design of these programs.
- The RW Panel suggested that the MRFSS indices of abundance could be recompiled to address two issues: 1) consider incorporation of the January-June intercept data in addition to the current July-December data, and 2) consider restriction of the sample data to the age classes most likely to contribute to the respective catch types (i.e., recompile the indices including only Catch Types A, and restrict the corresponding length composition to legally landed fish).
- The RW Panel also recommended the future application of different assessment models to provide alternative perspectives on the status of king mackerel stocks (e.g., those including estimation of the likely degree of error in the fishery catch-at-age, and/or those which employ forward-projecting computation approaches).

- One growth model should be developed for the splitting of catch at length data into catch at age data and another one that can be used for stock related data like weight at age in the stock, maturity at age in the stock and the like.
- Available sex ratio at size data needs to be evaluated to determine how sex ratios vary by size.
- Western Gulf king mackerel catches need to be aged for use in age length key analysis.
- The commercial fishery tuning indices should be further developed and it seems important that this is done in cooperation with fishers with an intimate knowledge of the way the fishery is prosecuted.
- Age composition of commercial and recreational discards is needed.
- Discard mortality rates are needed.
- Tuning indices should be weighted according to their internal variability, the part of the stock covered by the index, correlation with other indices etc. For instance it is realized that using their individual degree of correlation to the VPA stock abundance estimates could be problematic due to the circular logic feature of this approach.
- Data from Mexican catches need to be obtained, probably via initiatives for closer cooperation with Mexico. In this connection there is a need to look into whether the eastern and western Gulf King Mackerel are separate stock components.
- Tagging programs specifically designed to examine the mixing should be developed. Otolith shape and microchemistry and maybe micro-satellite DNA analysis are promising methods that should be pursued.
- Mixing of the stocks in the mixing zone should be investigated also the during summer period.

IV. General Comments

RW Panel Statements. The RW Panel was pleased with the effective support from the NMFS SEFSC scientists, and impressed by the open-minded attitude and willingness to support the RW Panel with additional information and analysis. Also, the computer and net work support was excellent. The small local network established by the SEFSC staff proved very effective for the exchange of data files and sharing of information among the RW Panel members.

Scientists. The scientists of the RW Panel except one (see statement by Joe Grist in Appendix 2) were of the opinion that the review was soundly based on science and not biased because of management and socio-economic considerations. RW Panel scientist, Will Patterson, presents his personal view in Appendix 3.

Constituents or fishers. One RW Panel member, William Gibson Jr., representing the commercial fishers said in his closing remark that he was pleased with the meeting and that it had been a clearly scientific meeting. RW Panel fisher, Bob Zales II, presents his personal view in Appendix 4.

IV. SEDAR Review

The overall SEDAR process worked well.

All the documentation and guidelines to the RW Panel members were received about 2 weeks before the meeting, except to one of the CIE reviewers who got it only 5 days before the start of the meeting.

The amount of documentation and issues to be dealt with are significant. Some of the documentation could have been sent out earlier to the RW Panel, for instance background material and the data workshop material. That would have eased the task of getting deeply into the substance of the material, especially for the external reviewers, who (almost by definition) were not beforehand familiar with the assessment.

V. References.

Document #	Title	Authors
Documents Reviewed at the Data Workshop		
SEDAR5-DW-1	Estimating Catches and Fishing Effort of the Southeast United States Headboat Fleet, 1972-1982.	Dixon, R.L. and G.R. Huntsman
SEDAR5-DW-2	2003 Report of the MSAP	MSAP
SEDAR5-DW-3	Regulatory Overview of South Atlantic and Gulf of Mexico King Mackerel	Carmichael, J.T.
SEDAR5-DW-4	A general description of the SEAMAP larval king mackerel dataset with indices of larval occurrence and abundance, 1982 to 2000	Lyczkowski-Shultz, J. and D. S. Hanisko
SEDAR5-DW-5	A review of the stock structure of king mackerel off the southeastern US.	DeVries, D. and W. Patterson
SEDAR5-DW-6	A literature review of the growth of king mackerel in the Southeastern United States	Cummings, N. J., D. DeVries, and C. Palmer
SEDAR5-DW-7	A summary of king mackerel <i>Scomberomorus cavalla</i> age data from the Panama City Laboratory, NOAA Fisheries, 1997 – 2003.	Palmer, C. and D. DeVries
SEDAR5-DW-8	Review of the catch sizing and sexing and ageing of king mackerel <i>Scomberomorus cavalla</i> from US Gulf of Mexico and South Atlantic fisheries	Ortiz, M., P. L. Phares, and N. J. Cummings
SEDAR5-DW-9	Preliminary analysis of king mackerel tag data from the cooperative tagging center	Diaz, G. A.
SEDAR5-DW-10	A method for analyzing the abundance and mortality of Atlantic and Gulf king mackerel when the two stocks are presumed to intermix	Porch, C. E.
SEDAR5-DW-11	Discrimination between Gulf of Mexico and Atlantic Ocean king mackerel with otolith shape analysis and otolith microchemistry: A progress report	Patterson, W., T.R. Clardy, D. A. DeVries, Z. Chen, and C. Palmer
SEDAR5-DW-12	Estimates of king mackerel discards for the Atlantic and Gulf Migratory groups	Poffenberger, J.
SEDAR5-DW-13	Standardized Catch rates of king mackerel from US Gulf of Mexico and South Atlantic recreational fisheries	Ortiz, M. and P. L. Phares
SEDAR5-DW-14	Standardized catch rates of king and Spanish mackerels from US Gulf of Mexico and South Atlantic recreational fisheries	Ortiz, M.
SEDAR5-DW-15	Standardized catch rates of Spanish and king mackerel from the North Carolina commercial fisheries	Ortiz, M. and L. Sabo
Documents Reviewed at the Assessment Workshop		
SEDAR5-AW-1	Estimated von Bertalanffy growth curves for king mackerel stocks in the Atlantic and Gulf of Mexico	Brooks, E. N., Ortiz, M.
SEDAR5-AW-2	Sensitivity of stock assessment analysis of Gulf of Mexico king mackerel to alternative methods for estimation the historic catch at age matrix 1981-2002	Ortiz, M.
SEDAR5-AW-3	Stock Assessment Analysis on Gulf of Mexico King Mackerel	Ortiz, M.
SEDAR5-AW-4	Virtual Population Analyses of Atlantic and Gulf King Mackerel Using Tag-Recapture data and Alternative Models of Migration.	Porch, C. E., G. A. Diaz
SEDAR5-AW-5	Revision and Update of the stock assessment analyses on King Mackerel stocks 2003	Ortiz, M.
SEDAR5-AW-6	Release locations of tagged king mackerel	Diaz, G.
SEDAR5-AW-7	Discrimination Amount US South Atlantic and Gulf of Mexico King Mackerel with Otolith Analysis and Otolith Microchemistry. Summary of MARFIN Grant No. NA17FF2013	Shipp, R. L. and W. F. Patterson III.
SEDAR5-AW-8	Stock Assessment analysis on king and Spanish mackerel stocks. Report to the MSAP, 2003. SFD Cont. SFC-2003-008.	anon.
MARFIN NA57-FF-0295	Genetic analysis to determine mixing proportions by season of Western Atlantic and Gulf of Mexico stocks of king mackerel.	Gold, J. R.
Fisheries Research 57(2002):51-62	Using otolith shape analysis to distinguish eastern Gulf of Mexico and Atlantic Ocean stocks of king mackerel	DeVries, D. A., C. B. Grimes, and M. H.

		Prager.
MSAP/98/10	What if mixing area fish are assigned to the Atlantic Migratory Group instead of the Gulf of Mexico Migratory Group	Legault, C. M.
Documents Provided for the Review Workshop		
SEDAR5-AR-1	Stock Assessment of Atlantic and Gulf King Mackerel	anon.

Documents tabled at the start of the meeting:

Legault, Christoffer, M. (probably 2000 but not stated). Status Review of King Mackerel in the Gulf of Mexico. Feature Article. NMFS Southeast Fisheries Science Center, Miami, Florida.

Legault, C.M., Powers, J.E. Restrepo, V.R. 2002. Mixed Monte Carlo/Bootstrap Approach to Assessing King and Spanish Mackerel in the Atlantic and Gulf of Mexico: Its Evolution and Impact. American Fisheries Society Symposium, 27:37-44.

Power, J.E. and Restrepo, V.R. 1993. Evaluation of Stock Assessment Research for the Gulf of Mexico King mackerel: Benefits and Costs to Management. North American Journal of Fisheries Management, 13:15-26.

Powers, J.E. 1996. Benchmark Requirements for Recovering Fish Stocks. North American Journal of Fisheries Management, 16:495-504.

SEDAR5-AW-/Appendix. Sensitivity of Stock Assessment Analysis of the Gulf of Mexico King Mackerel to Alternative Growth Parameters.

Appendix 1. A minority statement.

Minority Report on Mixing Rates

By Joe Grist and Ben Hartig

The stock of king mackerel south of Volusia County along southeast Florida during November 1 through March 31 (i.e. the mixing zone) is currently allocated to the Gulf Migratory Group. Tagging studies from the 1970's through the 1990's suggested a greater proportion of Gulf migratory fish in the mixing zone, though more recent studies (SEDAR-DW-5, SEDAR-DW-9) suggest relative abundances within the mixing zone has changed. Devries (2003) notes that with the implementation of Amendment One that all king mackerel caught in the mixing zone were from the Gulf group. This implementation was based on a FDEP study that suggested that more than half of the fish along the Florida east coast in the winter were from the Gulf migratory group. The 100% was originally chosen to help shore up the overfished Gulf group in the mid-1980's, a management measure. However, data available during that period suggested a more conservative 40/60 split in the mixing zone for the Atlantic/Gulf stock (Williams, R.O. and M.F. Godcharles 1984). The allocation of 100% fish to the Gulf group has a major impact on stock assessments (Devries 2003). If all fish were assigned to the Atlantic group, the 1998/99 allowable biological catch (ABC), assuming a F30%SPR management strategy, would increase between 400 and 2000 mt, depending on the level of bycatch used (Legault 1998). Correspondingly, Legault (1998) notes that the Gulf ABC would decrease by approximately 550 mt and estimates of fishing mortality would remain similar for both groups when all mixing area fish were assigned to the Atlantic group.

The terms of reference for the 2004 king mackerel review panel included recommending a range and best point estimate of the mixing rate of Atlantic and Gulf Migratory groups in the mixing zone, based on the best available scientific information. Three additional studies were provided to the review panel that addressed this issue.

Porch and Diaz (2004, SEDAR5-AW4) used tag recapture data and a two-area VPA (VPA-2 Box, Porch 2003b, Porch 2003a SEDAR5-DW10) to estimate mixing magnitude, along with the effect of changes on mixing proportions on Gulf and Atlantic management unit estimates. While the Assessment Panel agreed that inclusion of tagging data and estimates of degree of overlap has a relatively minor impact on the assessment results, it was evident that estimates of overlap from this analysis are not consistent with the hypothesis that 100% of the fish in the mixing area belong to the Gulf Migratory Group. Given the similar estimates of abundance for the two migratory groups, they are rather more consistent with the hypothesis that the Gulf group fraction in the mixing area is between 25 and 75%.

Results of genetic analysis to determine mixing proportions by season of the western Atlantic and Gulf groups were consistent with results of assignment tests, where the proportion of Atlantic and Gulf fish within most samples was approximately 50:50 (Gold 2000). The genetic data presented showed that king mackerel from the Florida Keys cannot be unequivocally assigned to either genetic stock. This study did suggest that the hypothesis that two, very weakly differentiated genetic subpopulations of king mackerel do exist in the peninsular Florida region, and that extensive mixing does occur between the two groups.

Otolith shape analysis was used to distinguish Gulf and Atlantic group female king mackerel collected from 1986 and 1993. Feasibility results for the study showed it's ability to correctly classify 80% of Atlantic and 86% of east Gulf king mackerel with a model based on otolith shape. Composition of the mixing zone stock from a sample of 463 females resulted in an estimate that 99.8% of fish in the winter landings were from the Atlantic and only 0.2% were from the eastern Gulf.

The majority opinion of the king mackerel panel, in spite of the previously referenced studies, was to continue with the assessment assumption that 100% of king mackerel in the mixing zone are from the Gulf Migratory Group. The majority of panel members did acknowledge that the 100% representation of Gulf fish within the mixing zone was an incorrect assumption, however, the lack of an exact calculation of Atlantic/Gulf king mackerel in the mixing zone precluded the majority from making an informed estimate of a current mixing rates to correct a recognized assessment flaw.

The minority opinion of the king mackerel panel, in spite of the lack of an exact calculation of Atlantic/Gulf king mackerel in the mixing zone but based on the best available science, was to take the conservative approach and correct the previously noted flawed assumption in the assessment report that 100% of the mixing zone stock are from the Gulf group. Studies (reviews, tagging, genetics, otolith shape) have shown that the mixing zone is more likely to support a mixing range of at least 25-75% between Atlantic and Gulf fish, with Atlantic fish possibly being the most dominant in more recent time period.

With the best scientific data available and taking the conservative approach, a more appropriate mixing distribution to base the best management recommendations on would be 50/50 Atlantic/Gulf, providing analysis with a sensitivity range of 25-75%. This takes into account that the mixing zone is not likely comprised of 100% Atlantic or Gulf group fish, a fact recognized by previous scientific studies and the SEDAR5 review panel.

Appendix 2. General comment by scientist Joe Grist.

Consensus Report op-ed. by Joe Grist
Scientist sub-section.

My initial experience with the SEDAR process was with SEDAR2, where I had the opportunity to participate in the Assessment Workshop phase and attend the Review Panel phase. In the SEDAR2 workshops, we stayed on the message 'it's about the science and the science only'. We were not to be concerned about management or socio-economic implications, because that was not part of our terms of reference and would be handled in later phases of the process. We were to use the best data available, make the best assumptions available, and produce an assessment report that was scientifically sound.

The SEDAR5 Review Panel got off that message. It was not only about the science this time. Discussions of management and socio-economic implications found their way into the review process. Discussions were not just about the science and the assumptions used to determine the validity of the assessment report, but also the larger impacts of the review panels report on current and future management.

For the SEDAR process to be successful, this issue needs to be addressed and resolved. Stock assessment results, and the assumptions that pertain to achieving those results, cannot be biased by the management implications they may lead to. Discussions on management and socio-economic issues that assessment results could effect are a vital part of developing any fisheries management plan, but they are discussions that fisheries managers and industry (recreational, commercial, environmental) representatives should discuss and pass judgement on, not the stock assessment scientist and reviewers. Otherwise, the credibility of any stock assessment developed in the SEDAR process is automatically jeopardized.

Appendix 3. General comment by scientist Will Patterson.

Scientist Statement: Will Patterson

I feel the Review Workshop for SEDAR5:South Atlantic and Gulf of Mexico King Mackerel provided a thorough and scientifically rigorous review of the king mackerel assessments and the reports produced by the Data and Assessment Workshop Panels. Prior to the Review Workshop, I looked forward to participating in the SEDAR process and wanted to get a sense of how this new review compares with the old Stock Assessment Panel reviews. I was a member Mackerel Stock Assessment Panel for several years, serving as its chairman since 2000, and was impressed with the level of scientific rigor and objective criticism members of that panel injected into the assessment review process. I was equally impressed with objectiveness and thoroughness with which most SEDAR Review Workshop Panel members addressed the Terms of Reference presented to us. In particular, I feel the addition of Center of Independent Experts scientists added fresh perspective to issues other panel members had reviewed many times, or even conducted research on, over the years. The participation of commercial and charter fisherman also added a unique layer of discussion that has been absent in most assessment reviews in which I have participated. Adding an environmentalist or two to the panel really would have broadened our overall perspective; however, I appreciate none of the invited groups were able to send members.

Despite my overall good impression of the Review Workshop for king mackerel, there are some issues I think should be addressed concerning the SEDAR process. Panel members received an immense amount of material to review only two weeks before our meeting. Many of the documents were available months prior and it would have been beneficial to receive them earlier. But along those same lines, it appeared to me we duplicated much of the review already conducted by Data and Assessment Workshop Panels. In the effort to increase transparency of assessment preparation and review, it seems many tasks are being duplicated by various groups during the SEDAR process. Some may take the position that duplicity increases the probability potential problems with the assessment will be caught and corrected, and that may be true. In cases such as when the Review Workshop Panel again reviewed data inputs to the models, however, it seemed to me our time together could have been better spent. For example, one important task for an assessment review should be examining diagnostics of model performance and that subject was addressed only superficially by the panel. I feel the SEDAR process would be more efficient, and potentially even more scientifically rigorous, if the roles of separate panels were more clearly defined and duplicity among workshops was minimized, especially given the fact the Consensus Report produced by the Review Workshop will itself be reviewed by the Standing Statistical Committees of the two councils.

Appendix 4. General comment by fisher Bob Zales II.

To the group,

I want to say I was pleased with the process and the information available. I was also pleased with the way we were all able to discuss the information provided and able to comment as we did. As this is a very controversial subject, I want to also state it was my understanding that the possible separation of the mixing zone fish may not provide an additional biological benefit to the total stock of Gulf and South Atlantic fish as the current management has worked well to rebuild the stock. I am satisfied with the current recommendations and agree that more information is necessary before a definitive separation can occur. As a fisherman, and one who has been involved with the king mackerel fishery management system since 1986, I feel the sedar process was a definite improvement in being able to have constituent participation in the assessment process.

Bob Zales, II