SEDAR 22 Review Workshop of Gulf of Mexico Yellowedge Grouper and Tilefish

Center for Independent Experts (CIE) Independent Peer Review Report

by

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Executive Summary

The assessments of tilefish and yellowedge grouper (YEG) in the Gulf of Mexico were evaluated. For both of these deep sea species it was considered that they constituted one stock each, but that the both recruits and adults were split into two area components, an eastern and a western. The work on data and assessment done prior to the review meeting was very extensive, careful and well done. The data available were rather unique in that they covered the catches from when the fishery started, i.e. catches from virgin stocks at least for YEG. A large effort has been applied to reconstruct this time series of catches back to the start of the fishery and it was regarded as very valuable for assessing the population dynamics of the stocks. Age and length data of the commercial catch were however not available until some years after the fishery started, except for special studies which however allowed for unique catch curve estimations of natural mortality. In the past 10 years, age and length data have improved substantially, and CPUE data are also available from both commercial and research vessels surveys. Still the stocks have to be regarded as relatively data poor and there has been relatively little contrast in the data in the past, as the stock has been only lightly exploited.

Two types of assessment models were applied: SRA, a simple model not using age or length information for exploratory runs as a kind of quality assurance approach; and SS3, a more complicated model able to use all data types available, for the base case run. Several sensitivity runs were made with both models. Both models were appropriate and well applied. The SS3 model revealed conflicting signals in the age and length data compared to the CPUE data. The Panel had difficulties accepting the automatic – though mathematical stringent results of the SS3 model which favored the age and length data. Alternative runs with a more (subjectively decided by the Panel) balanced weight between the age and length data and the CPUE data were run. The Panel agreed that for each stock several assessments were equally valid and in total reflect the stock status and its uncertainty. Regarding projections, the method applied was the obvious choice: using the projection part of the SS3 (supplemented with SRA projections). However the Panel suggested that for the future a more Harvest Control Rule approach should be explored and probably used when running projections, as there in fact is a HCR in the current management of the stocks. Also the mixed nature of the catches of the fleets fishing for tilefish and YEG means that for the future this should be taken better into account, maybe by using fishery-based approaches rather than stock-based ones. The uncertainties around the runs were obtained by MCMC approach of the SS3 models. Some runs of the projections had to be done after the close of the meeting because errors were observed during the last session of the meeting and because MCMC runs take a long time (days) to run.

The logistics of the meeting went well and the working conditions were very good, so that the participants could focus fully on the work tasks. The meeting was conducted in a good spirit.

The amount of material for the reviewers to read before the meeting was very substantial. The amount of time allotted to the total review appeared to be on the low side. The Data Workshop report and background literature might be sent to the reviewers earlier in advance of the review Panel meeting. That probably means that the Panel members have to be appointed at a slightly earlier stage. It was not very obvious how the work of the Review Panel fits into the chain of work leading to the final advice to managers. A short description of that, maybe including a diagram of the structure, would be helpful for the external reviewers to understand their role.

Background

Prior to the present meeting, a SEDAR 22 Data Workshop (DW), held in Tampa, Florida from March 15-19, 2010, was the first step in the assessment of two important fish species, yellowedge grouper (*Epinephelus flavolimbatus*) and tilefish (*Lopholatilus hamaeleonticeps*) in the Gulf of Mexico (GOM). The purpose of the workshop was to identify, evaluate and compile the information on their life history parameters, abundance indices, and commercial and recreational catch based on data from fishery-dependent and fishery-independent sources. The quality and quantity of the data were evaluated for the assessment of these two fisheries in the DW and reviewed by an external reviewer.

After the DW meeting, the SEDAR 22 Assessment Process was held via a series of webinars between May and November 2010. The purpose was to apply the most appropriate method to the data and information available in order to estimate stock status and make projections. Furthermore, uncertainties in the parameters were estimated and sensitivity analysis conducted. This was later reviewed by an external peer reviewer.

In 2002 the first comprehensive assessment for the YEG stock in the GOM was conducted (Cass-Calay and Bahnick, 2002). No formal stock assessment has been done prior to the SEDAR 22 for the GOM tilefish stocks. The SEDAR 22 represents a major effort to come up with an assessment and projection for management advice of the GOM YEG and tilefish stocks.

All documents were made available to the Review Panel (RP) in time for the review.

An FTP site was also available with the same documents and was used as a common working space for the RP before, during and after the meeting.

Description of the Individual Reviewer's Role in the Review Activities

Due to the large extent of the material to go through, the Review Panel was in meeting sessions from 13:00 on the first day to the end of the meeting at midday the last day, except for one hour the second to last day when the drafting was done. The material to read was sent to the reviewers some weeks prior to the meeting and according to the schedule. Several analyses (mainly the MCMC projections which are very time demanding and some corrections of errors discovered) were performed after the end of the meeting and the Reviewers worked with these as well as with the development of the Summary Report by email correspondence. The writing of the first draft of the Summary Report was split up between the reviewers, where Robin Cook took ToRs 1 and 2, Paul Medley took ToRs 3 and 4, Henrik Sparholt took ToRs 5 and 6, Stephen Szedlmayer took ToRs 8 and 9. Each participated equally in the discussion and review of the work presented to the Review Panel and in the Summary Report editing.

Summary of Findings for each ToR

Yellowedge Grouper:

1. *Evaluate the adequacy, appropriateness, and application of data used in the assessment.*

   The catch analysis was very carefully considered and given the uncertainties in the early period of the time series the approach of an upper and lower bound of catches seems appropriate.

   Discards and recreational catches are minor and appropriately dealt with.

   The commercial catch data indicated large changes from year to year in areas of high abundance and good fishing– that seems somewhat contradictory to the territorial behavior of the YEG.

   The LL East CPUE decline in 2009 was questioned by the fishers' representative. There was no explanation for this. The Panel requested further clarification on the CPUE calculations. This was given and did not indicate of any problems with data.

   Fig 2.15 west and east NMFS indices was mis-labeled and the labels should be swapped. The Panel was reassured that the right indices were used in the analysis.

   GLM models were used for the CPUE using log normal distribution (plus binominal – delta distribution). Log normal models are generally not as robust for well designed surveys as simple mean by means of strata (area weighted if strata have largely different areas), see e.g. ANON. 1992. Report of the Workshop on the Analysis of Trawl Survey Data. ICES C. M. Doc., No. D:6: 1–96. This is probably due to the fact that areas with low CPUEs are probably more variable than areas with high CPUEs, but are getting equal weight in the GLM log normal analysis. Empty cells could be a problem however, and some decision on what to use for these will have to be made. This however is not in principle different from the GLM, where the model makes the "decisions". Some improvement in indices might be obtained by changing the approach to such a simple "mean by means by strata" approach.

   The age determinations were quite substantial in recent years, but low in previous years. They were verified with bomb C14 in a convincing way. In spite of that, reading the age rings is not easy and there are relatively large uncertainties in these.

   Natural mortality was well estimated. This assessment is fortunate to have age data from the start of the fishery on a pristine stock. Catch curve Z from that should therefore is equal to M. Also there are quite a few observations of very old YEG (some more than 80 years old) and this means that M cannot be very large. Both sources of information gave M around 0.045 to 0.065.

   Growth in the west seems to be higher than in the east (fish are about 5 cm larger at age for ages 10-20) and the use of separate growth curves for the two areas seems justified.

   There is a large black hole in the knowledge of YEG. It is unknown where the juveniles are distributed. Maybe they already at a young age occupy the same areas as the adults and thus are competing for the same space.

   All in all the basic data were very well treated and prepared for the further analysis.

2. *Evaluate the adequacy, appropriateness, and application of methods used to assess the stock.*

   An SS3 model was the principal model used. This was supplemented by a simpler SRA model as a kind of quality assurance and sensitivity approach. This was regarded as a suitable approach.

   Both models were applied in a skilful and suitable way living up to the standard of best available science. However, due to several internal conflicting signals in the data, it was not easy to reach a consensus of the best way of applying the models.

   For stock recruitment modeling a B&H was used. Bias correction was used for periods where there are data on age, after a recommendation from the creator of the SS3 method, Rick Methot. This seems fine as the variation around the S-R model is very small for these periods in the way the model has been applied. The rather arbitrary fixing of sigma R was a matter of discussion as it was not obvious how to choose that optimally. It had a large effect on the outcome of the model in terms of stock status and exploitation rate. The assumption of assuming R to be similar in the two areas could be the reason for this if there are different age signals in the two areas. Alternatively, two assessments could be considered.

   It was discussed whether a Ricker S-R model should be considered, as we have to do with a stock exploited from a pristine state. This is unlike most other stocks assessed in the world, which I agree all seems to be better modeled by a B&H model. I have not seen a single case with good data where a Ricker model is appropriate. However, that might be because all stocks I have looked at only have data time series for periods where the stocks have been exploited. On request from the Panel a Ricker run was done. This did not show an expected decrease in R at large S, and it did not improve the model fit to data and was therefore rejected.

   Selectivity of handline fishing was strange in that it dropped to zero at large length: it would probably have been more sensible to assume an asymptotic selectivity. However, due to the very large fish size this concerns and the relatively small handline fishery, I do not consider this as a major problem – more a “cosmetic” one.

   The model estimate of the shift from female to male was quite different from the input data and was unexpected. However, the panel did not go further into this because it was decide to use the combined SSB of males and females in the management advice runs and therefore this did not matter much.

   SS3 Model results:

   Fig 3.94, the retrospective plot, missed the present assessment. That error was created during the Panel meeting.

   Maybe because the age and length data sets contain 10 000 observations or so and the CPUE series only a handful of observations, this seems to mean that the model is largely ignoring the CPUE series.

   The various sensitivity runs made before hand gave a confidence over the uncertainty in the data and model specification. However, the Panel found it important to explore a handful of alternative settings.

   New SS3 runs:

   1. Stronger fit to the indices runs. The weight was increased on the CPUE data and decreased on the age and length data. There was no objective way to do this and

the way we did it was subjective and using expert judgment. This is not unusual for this type of problem in fish stock assessments.

2. Runs with variable sigmaR. Not easy to interpret the results that showed the best model fit was for sigmaR=0 while most often 0.6 is recommended. It cast a little doubt about the model.
3. Removing the age composition in west and east respectively did not clearly improve the model fit.
4. Ricker S-R. Gave reduced recruitment in recent years. Gave a worse fit for the CPUEs. The S-R plot seems maybe better than the B&H plot, while the latter had an initial slope which better fit meta-data for slopes. The SS3 estimated Ricker curve seems not to reflect the R "observations" properly, maybe due to the model having to fit a lot of other parameters at the same time. It however leaves me with a suspicion of an inappropriate estimation process. If others for instance take the S and R data from such an assessment and conduct a meta- analysis they will get a different S-R model than the one estimated here.
5. Production model version of the SS3 gave strange results where the stock development did not follow the CPUEs and not even the mean for two of them.
6. Excluding the 1991 and 1992 handline data points, which were judged especially uncertain, only resulted in a slightly better fit to the CPUE indices.

Confidence limits will be obtained by MCMC runs of the SS3 model after the meeting – they take several days.

In conclusion, the SS3 model is appropriate and three run versions were evaluated to be equally valid: the base case, the Low M run (because there were several observation of very old YEG which pointed towards a low M) and the up-weighted CPUE run (which gave a better balance between CPUE data and the length/age data).

SRA model runs:

A small error was discovered in Table 3.1. For the S min and max it is not 0.2 that is added or subtracted, but 0.02.

Generally the SRA results were a confirmation of the SS3 results.

3. *Recommend appropriate estimates of stock abundance, biomass, and exploitation.*

   The estimates from the 3 runs: the base run, the low M run and the CPUE up-weighted run, and their confidence intervals, were regarded as equally valid and therefore the combined spread represents the real uncertainty in the estimates of stock abundance, biomasses and exploitation.

4. *Evaluate the methods used to estimate population benchmarks and management parameters (e.g., MSY, OFL, Fmsy, Bmsy, MSST, MFMT, or their proxies); recommend appropriate management benchmarks and provide estimated values for management benchmarks, a range of ABC, and declarations of stock status.*

   The issue of proxies for Fmsy was discussed. Often Fspr30% and Fspr40% are used as proxies around the world. I expressed my reservation of accepting these as proxies for Fmsy, because they are generally too low compared to Fmsy when these have

been estimated from data rich stocks. It is fine if the manager's choice is Fspr30% and Fspr40% in order to have low risk for overexploitation, but it is not okay when scientists claim these as proxies for Fmsy. Mace and Sissenwine (1993, "How much spawning per recruit is enough?" Can. Spec. Publ. Fish. Aquat. Sci. 120 (**1993**)) surveyed 91 well-studied European and North American fish stocks with sufficient data to construct stock-recruitment plots and conduct yield per recruit and spawning per recruit analyses to obtain estimates of reference points such as $F_{0.1}$, F_{max}, F_{med} and associated levels of %SPR. They estimated the average %SPR corresponding to F_{max} was 21%. This was even ignoring ecosystem and multispecies aspects. A very simple analysis done on some high profile stocks in the ICES areas shows that Fspr3% to Fspr10% are appropriate as proxies for Fmsy for these stocks. The table below shows a simple analysis on some ICES stocks where the Y/R and SSB/R and the implicit S-R model from a Hockey-stick S-R model with Blim as the breakpoint are taken from ICES Advisory Report 2010:

Stock	SSB - highest ever observed	SSB - at F35%SSB/R *	F at highest SSB ever observed
Cod North Sea	0.27 million t	2.9 million t	F3%SSB/R = 0.78
Cod 2224	52 000 t	218 000 t	F8%SSB/R = 0.77
Plaice North Sea	448 000 t	1.8 million t	F9%SSB/R = 0.41

*assuming averaged R for SSB above Blim.

From this it can be seen that F35%SSB/R gives very high SSB estimates. For North Sea cod is estimated at more than 10 times the highest ever observed, which was under the so-called "Gadoid-outburst". Clearly, this 2.9 million t will never be realized, because cannibalism and density dependent population mechanisms will take completely over long before any such event; even if it were fully realized there would be no room for other fish in the North Sea on that trophic level (like whiting, haddock, saithe, monkfish, etc.), and prey items like the commercially important Norway lobster, prawns, etc. would be completely mowed down.

The very extensive research on multispecies/ecosystem works conducted in the North Atlantic (North Sea, the Irish Sea, the Baltic Sea, the Barents Sea, Georges Bank, Sea around Newfoundland, and the Icelandic Sea) during the past about three decades shows that Fmsy is much higher than estimated in a single species context (see e.g. ICES 2008, WGSAM 2008 /RMC:06, Section 3, for a review of Fmsy in a multispecies context), confirming that Fspr30% and Fspr40% generally are much too low to be proxies for Fmsy.

YEG is a slow growing fish and one would expect the Fmsy to be lower than for the species mentioned above. The actual Fmsy calculated by the present SS model confirms this. The estimate is about Fspr20%. This is still a much lower spr percentage than used in the Fspr30% and spr40% mentioned above. Further confirming that the Fspr5% to Fspr10% mentioned above is a reasonable range for Fmsy proxies for the faster growing species in the North Atlantic.

In conclusion, I am of the opinion that Fspr20% is a better proxy for Fmsy for YEG than Fspr30% and Fspr40%.

The methods used to come up with estimates of population benchmarks and management parameters were otherwise appropriate. Given the uncertainties in the assessment, especially regarding the biomass values, we did not come up with specific benchmark values for biomass.

5. *Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition (e.g., exploitation, abundance, biomass).*

   Both the SRA and the SS models were properly applied in projection runs. These were obvious choices for the projections as they were the basis for the historical stock population dynamic parameters and values. As stated above these models are relatively well tested and commonly accepted in the science world. The SS model is regarded as the most appropriate method because it makes use of the age and length data available from the commercial fishery.

   Of the plus 17 sensitivity SS runs presented to the Panel (Run New - balancing the indices better with the age and length data - was produced during the meeting on requests from the Panel) five were selected as more appropriate for prediction due to their degree of realism to the actual stock population dynamic. These were selected model runs, in order of priority for production of MCMC projection runs:

   - Run1: Base model run
   - New Run: Change in weights run
   - Run 11: Steepness at 0.7 run
   - Run 14: Low landings run
   - Run 15: Low M run

   Deterministic projections were done for these and three runs (Runs 1, 11, 15) were also selected for further stochastic (MCMC) projections as covering uncertainty in the assessment. The Panel judged these to be equally valid.

6. *Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty in estimated parameters. Provide measures of uncertainty for estimated parameters. Ensure that the implications of uncertainty in technical conclusions are clearly stated.*

   The use of the SRA model seems appropriate in order to understand the dynamics of the stock and as a kind of quality assurance approach by applying several methods to the same stock, especially when the SS are applied for the first time. The SS however, seems to be superior when applied properly as it uses more of the data available (i.e. length and age data).

   The SS model was run with more than 17 different set ups. This gave a very good feeling of the uncertainties in the data and in the population dynamic parameters and values estimated. The Panel requested additional runs (including Run New) where the CPUE indices got a higher weight and the age and length data a lower weight in order to balance the importance of these input data or observation in the model. Ideally, the SS model should be able to do that but it was regarded as a realistic possibility that the vast amount of age and length data swamped the model and that autocorrelation in these input data might be underestimated by the SS model. This phenomenon has

been observed in other cases where the SS has been applied. As it is difficult if not impossible to account for this autocorrelation in a stringent way it was accepted to apply expert judgment in the weighting.

As several Runs (1, 11, 14, 15, and New) were regarded as equally valid, and as Runs 1,11,14, and 15 were quite similar in terms of deterministic projection, only Run 1 (representing Run 11, 14, and 15) and Run New were used in MCMC projections to yield confidence intervals. The Panel agreed that these gave the most appropriate representation of the stock dynamics and its uncertainties.

7. *Ensure that stock assessment results are clearly and accurately presented in the Stock Assessment Report and that reported results are consistent with Review Panel recommendations.*

   The RP checked and are confident that the Stock Assessment Report clearly presents the assessment results and that it is consistent with the RP recommendations.

8. *Evaluate the SEDAR Process as applied to the reviewed assessments and identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops.*

   The ToRs were adequately addressed by both the Data and the Assessment Workshops, with the exception of Assessment ToR 6 in that a range of ABC recommendations were not made. This was due to the judgment of the Assessment Workshop that the assessment was too unreliable to be the basis of a projection. This was a fair judgment, but the Review Panel decided that three runs could be used to inform management – see above.

9. *Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted. Clearly denote research and monitoring needs that could improve the reliability of future assessments. Recommend an appropriate interval for the next assessment, and whether a benchmark or update assessment is warranted.*

   Due to time pressure the Review Panel members addressed this issue after the conclusion of the workshop. A long list of research recommendations were given by both the Data and the Assessment Workshops. All of these seem sensible.

   Getting absolute stock estimates would be very useful for the assessment of the stock. It will help determine the shape of the selection curve, and the value of M, which again will improve the MSY estimation. Even though M is reasonable well known the assessment is still very uncertain due to M, because F is also low. Absolute stock estimates might be obtained from e.g. 1) underwater video surveys to count fish burrows; 2) deep water tagging like done for redfish in the Irminger Sea; or 3) depletion fishing experiments within a small area (e.g. 1 x 1 km) combined with NMFS survey type long line fishing to estimate survey catchability, like done in the REX project for cod and other species in the north-eastern North Sea. Especially method 3) seems a low hanging fruit as YEG is a very sedentary species, at least during most of the year.

10. *Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Develop a list of tasks to be completed following the workshop.*

A Summary Report was finalized by correspondence after the meeting.

MCMC runs, new projections where F is fixed to constant values, and an exploration of when the indices weighted run flipped away from the base and back again with increasing weight on the indices, were tasks to be finalized following the workshop.

Tilefish:

1. *Evaluate the adequacy, appropriateness, and application of data used in the assessment.*

The catch data were very carefully considered, but there are uncertainties in the early period of the time series.

Age data are only available for the more recent years. The age determinations were quite substantial in recent years, but low in previous years. They were verified to some extent. Previous validation methods were inconclusive in determining the timing of band depositions. Andrews (1999) determined good agreement between radiometric age and estimated age from growth zone counts for females and unknown age groups, but the oldest male age groups were not in agreement. The age determination must be considered uncertain and it is not possible to follow cohorts through time in the data.

Discards and recreational catches are minor and appropriately dealt with.

Natural mortality was well estimated although catch curves were sometimes negative and did not yield much support in the estimation process. However, the approach used by the DW and AW was appropriate and the Panel regarded the three central assumptions about M as equally valid.

Protogyny in Gulf of Mexico tilefish was judged less justified than for YEG. Transition from females to males seems a bit peculiar as the fraction females to males is quite constant over a large age range.

Overall, the basic data were very well treated and prepared for further analysis.

CPUE commercial – selection of data used for the tilefish CPUE, i.e. those trips where tilefish should be caught – a plot was requested to show the species composition in order to judge the appropriateness of the approach. It seemed that the trips on average consisted of about 50% of tilefish and YEG in all sub areas and all years.

GLM models were used for the CPUE using log normal distribution (plus binominal – delta distribution). Log normal models are generally not as robust for well designed surveys as simple mean by means of strata (area weighted if strata have largely different areas), see ANON. 1992. Report of the Workshop on the Analysis of Trawl Survey Data. ICES C. M. Doc., No. D:6: 1–96. This is probably due to the fact that areas with low CPUEs are probably more variable than areas with high CPUEs, but are getting equal weight in the GLM log normal analysis. Empty cells could be a problem however, and some decision on what to use for these will have to be made. This however is not in principle different from the GLM where the model makes the

"decisions". Some improvement in indices might be obtained by changing the approach to such a simple "mean by means by strata" approach.

Habitat could be important correcting factor for the CPUE. Temperature could also be considered as it seems that tilefish are only taking the bait at certain temperatures. This could be a future research recommendation.

Effort by area and year was presented on request from the Panel. It showed a trend over time towards shifting effort to the eastern areas.

There is a large black hole in the knowledge of tilefish. It is unknown where the juveniles are distributed. Maybe they already as young are occupying the same areas as the adults and thus are competing for the same space.

2. *Evaluate the adequacy, appropriateness, and application of methods used to assess the stock.*

The B&H S-R model is normally the most appropriate model for marine fish stocks. I agree that there are very few convincing data rich examples of a Ricker curve for marine fish stocks, but maybe that is because those with rich data are those that have been heavily exploited. Here we have to deal with a new fishery and a lightly exploited stock, maybe here we have a Ricker curve. The territorial behavior could support that idea and the fact that the S-R points actually are on a downwards slope curve for high S values support it as well. Furthermore, the 1997 year class coincides with a peak in fishing 6-10 years earlier, maybe clearing some territories for new recruits. No run was done with a Ricker model as it turned up that for YEG the data did not fit well to a Ricker curve, probably because the SS3 model were driven more by the length and age data.

Likelihood values for the various runs by parameter were presented on request by the Panel and help clarify which parameters and observations were the drivers in the various models.

The year class of 1997 was estimated by SS3 to be large. A plot made for the Panel showed that it was not at all clear from the row age data that the 1997 year class was anything special.

The use of the SRA model seems appropriate in order to understand the dynamics of the stock and as a kind of quality assurance approach by applying another method to the same stock, especially when the SS3 is applied for the first time. The SS3 however, seems to be superior when applied properly as it uses more of data available (i.e. length and age data).

SS3 model:

A problem is that the CPUE indices are almost out-weighted. A more balanced run was produced on a request by the Panel. Red grouper SEDAR19 used the SS3 and that was looked into to get ideas about how to weight the CPUE indices vs. the age and length data. A new run with weighting indices in between the run12, strong weight on indices, and the base run, gave strange results which were far from in between the results of the two other runs in terms of estimated SSBs, and Fs. New runs were requested to check when and why the SS3 flipped when gradually going from the base run to the run 12.

The Panel was struggling to understand the large discrepancies in the various SS3 model outputs that in several cases were counter-intuitive.

3. *Recommend appropriate estimates of stock abundance, biomass, and exploitation.*

   Of all the sensitivity runs presented and some extra ones requested by the Panel a subset was selected to be representative for the estimates of stock abundance, biomass, and exploitation.

   For pragmatic reasons the SS3 central run is suggested as the run from which to use estimates of abundance, biomass and exploitation in order to visualize trends. However, other runs with different model configurations or model parameters can give stock trajectories that suggest different trends and may be equally valid.

4. *Evaluate the methods used to estimate population benchmarks and management parameters (e.g., MSY, OFL, Fmsy, Bmsy, MSST, MFMT, or their proxies); recommend appropriate management benchmarks and provide estimated values for management benchmarks, a range of ABC, and declarations of stock status.*

   It was observed by the Panel that tilefish is fully exploited from age 6-9 but matures already at age 2. That means that all fish have spawned several times before they enter into the fishery. That is probably a good safeguard against overexploitation. For many commercial fish stocks, some to most fish are caught before they reach maturity.

   I have reservations about accepting Fspr30% and Fspr40% as proxies for Fmsy, and think that Fspr10% and Fspr20% are better proxies for tilefish. For an elaborate explanation, see text above under YEG.

5. *Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition (e.g., exploitation, abundance, biomass).*

   Both the SRA and the SS3 models were properly applied in projection runs. These were obvious choices for the projections as they were the basis for the historical stock population dynamic parameters and values. As stated above these models are relatively well tested and commonly accepted in the science world. The SS3 model is regarded as the most appropriate method because it makes use of the age and length data available from the commercial fishery.

   Of the 15 sensitivity runs of SS presented to the Panel (run 15 - balancing the indices better with the age and length data - was produced during the meeting on request from the Panel) six were selected as more appropriate for prediction due to their degree of realism to the actual stock population dynamic. These were Runs, 1, 3, 4, 9, 13, and 15.

   Deterministic projections were done for these and because Runs 1, 3 and 9 covered the range of all six runs, only MCMC projections were performed for Run1, 3 and 9. The Panel judged that the resultant confidence intervals represented the total uncertainties in the projections and that the true values are to be found somewhere in the center of the overall distribution.

6. *Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty in estimated parameters. Provide measures of uncertainty for estimated parameters. Ensure that the implications of uncertainty in technical conclusions are clearly stated.*

   The use of the SRA model seems appropriate in order to understand the dynamics of the stock and as a kind of quality assurance approach by applying several methods to the same stock, especially when the SS3 was applied for the first time. The SS3 however, seems to be superior when applied properly as it uses more of the data available (i.e. length and age data).

   The SS3 model was run with 15 different set ups. This gave a very good feeling for the uncertainties in the data and in the population dynamic parameters and values estimated. The Panel requested an additional run (Run 15) where the CPUE indices got a higher weight and the age and length data a lower weight in order to balance the importance of these input data or observations in the model. Ideally the SS3 model should be able to do that but it was regarded as a realistic possibility that the vast amount of age and length data swamped the model and that autocorrelation in these input data might be underestimated by the SS3 model. This phenomenon has been observed in other cases where the SS3 has been applied. As it is difficult if not impossible to account for this autocorrelation in a stringent way it was accepted to apply expert judgment in the weighting.

   MCMC projections were only performed for Runs1, 3 and 9. The Panel judged the resulting confidence intervals to be representative of the total uncertainties in the projections.

7. *Ensure that stock assessment results are clearly and accurately presented in the Stock Assessment Report and that reported results are consistent with Review Panel recommendations.*

   The RP checked and are confident that the Stock Assessment Report clearly presents the assessment results and that it is consistent with the RP recommendations.

8. *Evaluate the SEDAR Process as applied to the reviewed assessments and identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops.*

   The ToRs were adequately addressed by both the Data and the Assessment Workshops, with the exception of the Assessment Workshop ToR 6. Here a range of ABC recommendations were not made. This was due to the judgment of the Assessment Workshop that the assessment was too unreliable to be the basis of a projection. This was a fair judgment, but the Review Panel decided that six runs (and three with MCMC) could be used to inform management about the stock status and projections with, however, large uncertainties– see above.

9. *Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted. Clearly denote research and monitoring needs that could improve the reliability of future assessments. Recommend an appropriate interval for the next assessment, and whether a benchmark or update assessment is warranted.*

   Due to time pressure this issue was dealt with inter-sessionally by the RP. A long list of research recommendations were given by both the Data and the Assessment Workshops. All of these seem sensible.

   Getting absolute stock estimates would be very useful for the assessment of the stock. It will help determine the shape of the selection curve, and the value of M, which again will improve the MSY estimation. Even though M is reasonable well known the assessment is still very uncertain due to M, because F is also low. Absolute stock estimates might be obtained from e.g. 1) underwater video surveys to count fish burrows; 2) deep water tagging as was done for redfish in the Irminger Sea; or 3) depletion fishing experiments within a small area (e.g. 1 x 1 km) combined with NMFS survey type long line fishing to estimate survey catchability, as was done in the REX project for cod and other species in the north-eastern North Sea. Especially method 3) seems to be a low hanging fruit as tilefish is a very sedentary species, at least during most of the year.

10. *Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Develop a list of tasks to be completed following the workshop.*

    A Summary Report was finalized by correspondence after the meeting.

    MCMC runs and runs gradually going from the base case run to run 12 in order to see where the SS3 flipped when putting various weighting on the CPUE indices, were tasks to be finalized following the workshop. The results of these were correctly provided by addenda to the assessment report.

Appendix 1: Bibliography of materials provided for review

The Data Workshop report and all of the working papers and reference documents that were made available during this process on the SEDAR website:

http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=22

Supplementary Documents:

SEDAR22-RD10 Comparison of Two Techniques for Estimating Tilefish, Yellowedge Grouper, and Other Deepwater Fish Populations

SEDAR22-RD11 Deep-water sinkholes and biotherms of South Florida and the Pourtales Terrace ? Habitat and Fauna

SEDAR22-RD12 Tilefishes of the genus Caulolatilus construct burrows in the sea floor

SEDAR22-RD13 Spawning Locations for Atlantic Reef Fishes off the Southeastern U.S.

SEDAR22-RD14 Trends in tilefish distribution and relative abundance off South Carolina and Georgia

SEDAR22-RD15 Age, growth, and reproductive biology of blueline tilefish along the Southeastern coast of the United States, 1982-1999

SEDAR22-RD16 Temporal and spatial variation in habitat characteristics of tilefish (Lopholatilus chamaeleonticeps) off the east coast of Florida

SEDAR22-RD17 The Complex Life History of Tilefish Lopholatilus chamaeleonticeps and Vulnerability to Exploitation

SEDAR22-RD18 The fishery for tilefish, Lopholatilus chamaeleonticeps, off South Carolina and Georgia

SEDAR22-RD19 Tilefish off South Carolina and Georgia

SEDAR22-RD20 Spawner-recruit relationships of demersal marine fishes: Prior distribution of steepness for possible use in SEDAR stock assessments

The Assessment Workshop Reports were available from the SEDAR website:

http://www.sefsc.noaa.gov/sedar/Sedar_Documents.jsp?WorkshopNum=22&FolderType=Assessment

Working Papers
SEDAR22-AW-01 United States Commercial Longline Vessel Standardized Catch Rates of Golden and Blueline Tilefish in the Gulf of Mexico, 1992-2009: Revised

SEDAR22-AW-02 United States Commercial Longline Vessel Standardized Catch Rates of Yellowedge Grouper (Epinephelus flavolimbatus) for Three Regions in the Gulf of Mexico, 1991-2009

SEDAR22-AW-03 Pre-review draft of the tilefish assessment report (23 Nov 2010)

SEDAR22-AW-04 Pre-review draft of the yellowedge grouper assessment report (23 Nov 2010)

An FTP site was also available to the RP with the same documents and was used as a common working space for the RP, before, during and after the meeting.

Appendix 2: A copy of the CIE Statement of Work

Attachment A: Statement of Work for Dr. Henrik Sparholt

External Independent Peer Review by the Center for Independent Experts

SEDAR 22 Gulf of Mexico Yellowedge Grouper and Tilefish Review Workshop

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

Project Description: SEDAR 22 will be a compilation of data, a benchmark assessment of the stock, and an assessment review conducted for Gulf of Mexico Yellowedge Grouper and Tilefish. The review workshop provides an independent peer review of SEDAR stock assessments. The review panel is ultimately responsible for ensuring that the best possible assessment is provided through the SEDAR process. The stocks assessed through SEDAR 22 are within the jurisdiction of the Gulf of Mexico Fishery Management Council and the states of Texas, Louisiana, Mississippi, Alabama, and Florida. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the review meeting is in **Annex 3**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers shall have expertise, working knowledge, and recent experience in stock assessment, statistics, fisheries science, and marine biology sufficient to complete the primary task of reviewing the technical details of the methods used for the assessment. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in Tampa, Florida during 14-17 February 2011.

Statement of Tasks: Each CIE reviewers shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title,

affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also responsible for providing the Chair a copy of the SoW in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Other Tasks – Contribution to Summary Report: Each CIE reviewer may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review. Each CIE reviewer is not required to reach a consensus, and should provide a brief summary of the reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting in Tampa, Florida during 14-17 February 2011.
3) During 14-17 February 2011 in Tampa, Florida as specified herein, conduct an independent peer review in accordance with the ToRs (**Annex 2**).
4) No later than 3 March 2011, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and CIE Regional Coordinator, via email to David Sampson david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

11 January 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
1 February 2011	NMFS Project Contact sends the CIE Reviewers the pre-review documents
14-17 February 2011	Each reviewer participates and conducts an independent peer review during the panel review meeting
3 March 2011	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
17 March 2011	CIE submits CIE independent peer review reports to the COTR
24 March 2011	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) each CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) each CIE report shall address each ToR as specified in **Annex 2**,
(3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

William Michaels, Contracting Officer's Technical Representative (COTR)
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov Phone: 301-713-2363 ext 136

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Northern Taiga Ventures, Inc.
10600 SW 131st Court, Miami, FL 33186
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Roger W. Peretti, Executive Vice President
Northern Taiga Ventures, Inc. (NTVI)
22375 Broderick Drive, Suite 215, Sterling, VA 20166
RPerretti@ntvifederal.com Phone: 571-223-7717

Key Personnel:

NMFS Project Contact:

Julie A Neer, SEDAR Coordinator

4055 Faber Place Drive, Suite 201, North Charleston, SC 29405

Julie.neer@safmc.net Phone: 843-571-4366

Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Tentative Terms of Reference for the Peer Review

SEDAR 22 Gulf of Mexico Yellowedge Grouper and Tilefish Review Workshop

Yellowedge Grouper:

11. Evaluate the adequacy, appropriateness, and application of data used in the assessment.
12. Evaluate the adequacy, appropriateness, and application of methods used to assess the stock.
13. Recommend appropriate estimates of stock abundance, biomass, and exploitation.
14. Evaluate the methods used to estimate population benchmarks and management parameters (*e.g., MSY, OFL, Fmsy, Bmsy, MSST, MFMT, or their proxies*); recommend appropriate management benchmarks and provide estimated values for management benchmarks, a range of ABC, and declarations of stock status.
15. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition (e.g., exploitation, abundance, biomass).
16. Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty in estimated parameters. Provide measures of uncertainty for estimated parameters. Ensure that the implications of uncertainty in technical conclusions are clearly stated.
17. Ensure that stock assessment results are clearly and accurately presented in the Stock Assessment Report and that reported results are consistent with Review Panel recommendations.
18. Evaluate the SEDAR Process as applied to the reviewed assessments and identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops.
19. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted. Clearly denote research and monitoring needs that could improve the reliability of future assessments. Recommend an appropriate interval for the next assessment, and whether a benchmark or update assessment is warranted.
20. Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Develop a list of tasks to be completed following the workshop.

The review panel may request additional sensitivity analyses, evaluation of alternative assumptions, and correction of errors identified in the assessments provided by the assessment workshop panel; the review panel may not request a new assessment. Additional details regarding the latitude given the review panel to deviate from assessments provided by the assessment workshop panel are provided in the *SEDAR Guidelines* and the *SEDAR Review Panel Overview and Instructions*.

** The panel shall ensure that corrected estimates are provided by addenda to the assessment report in the event corrections are made in the assessment, alternative model configurations

are recommended, or additional analyses are prepared as a result of review panel findings regarding the TORs above.**

Tilefish:

1. Evaluate the adequacy, appropriateness, and application of data used in the assessment.
2. Evaluate the adequacy, appropriateness, and application of methods used to assess the stock.
3. Recommend appropriate estimates of stock abundance, biomass, and exploitation.
4. Evaluate the methods used to estimate population benchmarks and management parameters (*e.g., MSY, OFL, Fmsy, Bmsy, MSST, MFMT, or their proxies*); recommend appropriate management benchmarks and provide estimated values for management benchmarks, a range of ABC, and declarations of stock status.
5. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition (e.g., exploitation, abundance, biomass).
6. Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty in estimated parameters. Provide measures of uncertainty for estimated parameters. Ensure that the implications of uncertainty in technical conclusions are clearly stated.
7. Ensure that stock assessment results are clearly and accurately presented in the Stock Assessment Report and that reported results are consistent with Review Panel recommendations.
8. Evaluate the SEDAR Process as applied to the reviewed assessments and identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops.
9. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted. Clearly denote research and monitoring needs that could improve the reliability of future assessments. Recommend an appropriate interval for the next assessment, and whether a benchmark or update assessment is warranted.
10. Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Develop a list of tasks to be completed following the workshop.

The review panel may request additional sensitivity analyses, evaluation of alternative assumptions, and correction of errors identified in the assessments provided by the assessment workshop panel; the review panel may not request a new assessment. Additional details regarding the latitude given the review panel to deviate from assessments provided by the assessment workshop panel are provided in the *SEDAR Guidelines* and the *SEDAR Review Panel Overview and Instructions*.

** The panel shall ensure that corrected estimates are provided by addenda to the assessment report in the event corrections are made in the assessment, alternative model configurations are recommended, or additional analyses are prepared as a result of review panel findings regarding the TORs above.**

Annex 3: Final Agenda

SEDAR 22 Gulf of Mexico yellowedge grouper and tilefish Review Workshop

Tampa, Florida
14-17 February 2011

Monday

1:00 p.m.	**Convene**	
1:00 – 1:30 p.m.	**Introductions and Opening Remarks** *- Agenda Review, TOR, Task Assignments*	**Coordinator**
1:30 – 3:30	**Assessment Presentation**	**Linton/Walters/Lombardi**
3:30 – 4:00	**Break**	
4:00 – 6:00	**Continue Presentation/Discussion**	**Chair**

Tuesday

8:30 a.m.–11:30 a.m.	**Assessment Presentation**	**Linton/Walters/Lombardi**
11:30 a.m. – 1:30 p.m.	**Lunch Break**	
1:30 p.m. – 3:30 p.m.	**Panel Discussion** *- Assessment Data & Methods* *- Identify additional analyses, sensitivities, corrections*	**TBD**
3:30 p.m. – 4:00 p.m.	**Break**	
4:00 p.m. – 6:00 p.m.	**Panel Discussion** *- Continue deliberations* *- Review additional analyses*	**Chair**

***Tuesday Goals*:** Initial presentations completed, sensitivities and modifications identified.

Wednesday

8:30 a.m. – 11:30 a.m.	**Panel Discussion** *- Review additional analyses, sensitivities* *- recommendations and comments*	**Chair**
11:30 a.m. – 1:30 p.m.	**Lunch Break**	
1:30 p.m. – 3:30 p.m.	**Panel Discussion**	**TBD**
3:30 p.m. – 4:00 p.m.	**Break**	
4:00 p.m. – 6:00 p.m.	**Panel Discussion**	**Chair**

Wednesday Goals: Final sensitivities identified, preferred models selected, Projection approaches approved, Report drafts begun

Thursday

8:30 a.m. – 12:00 p.m.	**Panel Discussion/ Work Session** *- Final sensitivities reviewed.* *- Projections reviewed.* *- Review Reports*	**Chair**

Thursday Goals: Complete assessment work and discussions. Final results available. Draft Reports reviewed.

Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

SEDAR 22 REVIEW PANEL LIST OF PARTICIPANTS

Workshop Panel

Doug Gregory, Chair ..... GMFMC SSC
Henrik Sparholt ..... CIE Reviewer
Paul Medley ..... CIE Reviewer
Robin Cook ..... CIE Reviewer
Stephen Szedlmayer ..... GMFMC SSC

Analytic Representation

Brian Linton ..... NMFS SEFSC Miami
Linda Lombardi ..... NMFS SEFSC Panama City
John Walter ..... NMFS SEFSC Miami

Council Representation

John Greene ..... GMFMC

Official Observers

Martin Fisher ..... GMFMC AP

Other Observers

Michael Larkin ..... SERO
Nick Framer ..... SERO
Todd Gedamke ..... NMFS Miami

Staff

Carrie Simmons ..... GMFMC Staff
Charlotte Schiaffo ..... GMFMC Staff
John Froeschke ..... GMFMC Staff
Julie Neer ..... SEDAR
Ryan Rindone ..... SEDAR
Tyree Davis ..... NMFS Miami