# Report on the SEDAR South Atlantic and Gulf of Mexico Yellowtail Snapper Assessment Review


By
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June 2012

## Executive Summary

To my knowledge, the science reviewed is the best scientific information available.

The data decisions made by the assessment panel are largely consistent with those made in the previous assessment (SEDAR 3). Without personal detailed knowledge of the data sources available versus those used and how they were used, it is difficult to be absolutely certain that the decisions are sound and robust. But knowing how the SEDAR process works with a data workshop and an assessment workshop, it is likely that the decisions in the current assessment are indeed sound and robust.

From the information available, I conclude that the uncertainties are larger than those in assessments of large volume commercial single species fisheries landing in a small number of landing sites well covered by sampling programs. However, the uncertainties are probably comparable with those expected in other assessments for this type of fishery where individual commercial and recreational catches are small, spread out in a large number of landing sites and sampling is therefore difficult. The uncertainties are acknowledged, reported and within the expected range.

There is clear indication that the assessment panel has understood the modeling approach that they chose to use and that the data are applied properly within the assessment model.

The relatively good fit with three of the four indices of stock size available suggest that the input data series are sufficiently reliable to support the assessment approach and findings. The lack of fit for the fourth index based on commercial logbook could be due to increased efficiency for this fleet that has not been accounted for.

The assessment uses the Age-Structured Assessment Program (Legault and Restrepo (1998), implemented as ASAP2, version 2.0.21 in the NOAA Fisheries Toolbox (http://nft.nefsc.noaa.gov/). ASAP is scientifically sound and robust. The assessment model is configured properly and used consistent with standard practices. A statistical catch-at-age approach such as that provided by ASAP is highly appropriate for the available data. Virtual Population Analyses type of modeling would not be appropriate because of its assumption that catch at age is known without error, which is certainly not the case for Florida yellowtail snapper.

Abundance, exploitation and biomass estimates are consistent with the input data, with population biological characteristics and they are useful to support status inferences.

Based on the updated assessment, the point estimate for F30%SPR (the overfishing limit for both fishery management councils) is estimated to be 0.295 per year (fully recruited age, age 5) corresponding to a SSB of 3 072 metric tons with the Minimum Spawning Stock Threshold (MSST= (1-M)*SSB30%SPR) equal to 583.6 metric tons.

The 2010 SSB estimate was 10 311 metric tons, considerably above the reference point, suggesting yellowtail snapper are not overfished. Overfishing is not occurring. F on age 5 in 2010 was estimated to be 0.0454 per year, considerably below the overfishing limit indicating that overfishing was not occurring in 2010. The quantitative estimates of status determination are considered reliable.

According to the current assessment, yellowtail snapper in 2010 were not overfished and overfishing was not occurring. Therefore a rebuilding plan is not needed. Projections of population structure (numbers), catch, discards, yield, and spawning stock biomass were made assuming status quo fishing mortality. The results are shown in figure 10.7.17 of the assessment report for illustrative purposes.

The methods used to evaluate uncertainty (MCMC, sensitivity analysis and retrospective analysis) do reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods given the choice of data and models. These do not reflect the real uncertainties, however, as a comparison with the previous assessment, using a different model and possibly slightly different data shows. In the 2003 assessment, the 2001 estimate of fishing mortality from the ICA model was F=0.21 while the current assessment suggests that the there is an almost 100% probability that the F2001 is less than F=0.10.

The importance of estimating discards should be demonstrated rather than assumed. Restricting the data to 1993 to the present may be one way of investigating the influence of the potential 1992 outlier in the MRFSS B2 estimate, but, generally, it is useful to include as many years as possible in the assessment and there are other ways of evaluating the influence of the 1992 outlier on the assessment results, e.g. by treating 1992 as a missing year in the ASAP formulation.

To substantially improve the stock assessment would probably require considerable investments in sampling the catch for size and age composition and obtaining additional fishery independent indices of stock sizes that would synoptically cover the entire distribution area of the assessment unit. It is not clear, however, that would be the most cost efficient, nor possibly the best way of improving the management of the fisheries harvesting yellowtail snapper. The assessment should continue to use the current ASAP modeling framework, which is completely appropriate for the type and amount of data available.

## Background

The yellowtail snapper assessment from the South Atlantic and Gulf of Mexico regions is a collaborative effort between the National Marine Fisheries Service (NMFS) and the Florida Fish and Wildlife Conservation Commission (FFWCC). This assessment was scheduled to be part of the SEDAR 27 review held in November 2011, but the assessment was not completed in time for consideration during the SEDAR 27 review. The last SEDAR review on the yellowtail snapper assessment by CIE reviewers was conducted in August 2003.

Three management bodies are involved in managing the fisheries harvesting the resource in this stock assessment: The Southeast Atlantic Fisheries Management Council (SAFMC), the Gulf of Mexico Fisheries Management Council (GMFMC) and the Florida Fish and Wildlife Conservation Commission (FWC). In the Southeast Atlantic Fisheries Management Council, yellowtail snapper was included in the Snapper Grouper fishery management plan (FMP), in the Gulf of Mexico Fisheries Management Council, it was included in the Reef Fish FMP, and in the Florida fish and Wildlife conservation Commission, fishery management measures affecting the species were included in the Florida Administrative Code. The minimum size and aggregate bag limit are consistent between the three management organizations but they have first been implemented in different years (table 2.7.1 of the assessment report).

The yellowtail snapper fisheries are managed by the South Atlantic Fishery Management Council and the Gulf of Mexico Fishery Management Council as separate stock units with the boundary being U.S. Highway 1 in the Florida Keys west to the Dry Tortugas. This corresponds to the respective area of responsibility of the two Councils. Since SEDAR 3 (2003) yellowtail snapper in the SAFMC and GMFMC jurisdictions is treated as a single assessment unit. There is no specific information on the distribution and dispersion of yellowtail snapper larvae, but information from other snapper species with similar larval durations and from circulation studies are consistent with the single stock hypothesis. The yellowtail snapper in Mexican waters of the Gulf of Mexico do not appear to have been included in the assessment.

The previous assessment in SEDAR 3 concluded that the stock was not overfished and the overfishing was not occurring.

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

This was a desk review. I read and analyzed the five documents sent on June 1.

## Summary of Findings for each ToR in which the weaknesses and strengths are described

### 1. Evaluate the data used in the assessment, addressing the following:

### *a) Are data decisions made by the assessment panel sound and robust?*

The data decisions made by the assessment panel are largely consistent with those made in the previous assessment (SEDAR 3). The assessment uses landings and discards data from all the main gears in the fishery, it uses four stock size indices, three of which are fishery dependent and one is fishery independent. It uses age and length information to derive the age composition of the main gear categories.

The formulation in the assessment report does give the impression that data decisions made by the assessment panel are sound and robust. However, without personal detailed knowledge of the data sources available versus those used and how they were used, it is difficult to be absolutely certain that the decisions are sound and robust. Knowing how the SEDAR process works with a data workshop and an assessment workshop, it is likely that the decisions in the current assessment are indeed sound and robust. The last step in the SEDAR process is a review workshop, which the current desktop review by three external reviewers is replacing.

Section 5.3 of the assessment report reviews stock structure, population genetics, larval transport/connectivity and distribution. Based on the larval distribution of species with similar characteristics, the potential contribution of recruits from outside the assessment unit is considered negligible. In section 5.8, the statement "*The extent of linkage of the U.S. population with the Campeche Banks has not been studied, however*" suggests that yellowtail snapper in Mexican waters of the Gulf of Mexico belong to the same population but have not been taken into account. Other information in the report on distribution, migration and connectivity suggests that this is probably not a major issue as there seems to be relatively strong site fidelity once the larvae have settled, but the impact cannot be assessed until the linkages are studied.

Age composition information is available from various sources from 1980 to 2010. The number of fish aged per year varies from 10 to close to 1900 (table 5.10.5 of the assessment report) with particularly few ages determined in the mid 1980s to the early 1990s. More than about 1200 fish per year have been consistently aged since 2004. The report says in section 5.5.1, page 24, "*Ages determined from the otoliths and adjusted for collection date by year were used to develop an age-length key (Table 5.10.6) and were applied to the length samples of retained and estimated discards of yellowtail snapper for the separate fleets from each region to construct the proportions at age and estimate the numbers of fish in the catch by size (see section 5.5.5)*". Table 5.10.6 is not an age-length key, it shows the number of fish by age and year - there is no length information. The document contains a detailed description of how otolith ages were matched with corresponding field data (section 5.5.1).

Four stock size indices were examined in the assessment report:

1) The Reef Visual Census (RVC) index from NMFS and University of Miami's underwater surveys is a fishery independent index from a stratified random survey

design, and consists of both abundance and size estimates for yellowtail snapper in reef areas of the Florida Keys for 1998-2010.

2) The commercial landings index from the NMFS's Coastal Log Book Program (CFLP) is a fishery dependent index from mandatory log books submitted by vessel captains with federal permits from 1993-2010.

3) An index from total catches by anglers on boats (private/rental boats and charter vessels) from the NMFS's Marine Recreational Fishery Statistics Survey (MRFSS) constructed to represent total catch (fish harvested or released alive) on angler trips from 1981-2010.

4) An index of trip landings from the catch records of the NMFS's Southeast Head Boat Survey (HBS) based upon log book catch records for vessel trips for 1981-2010.

The three fishery dependent indices were constructed from delta-lognormal models used to examine both the probability of catching (MRFSS) or landing (CFLP and HBS) yellowtail snapper on trips and the amount of landings of yellowtail snapper from trips which caught yellowtail snapper.

Obtaining catch/landings, size/age and stock size information from a mix of commercial and recreational fisheries from at least three fishery management systems and a relatively large number of landing sites requires careful compilation. The conventions used in the current assessment have followed those used in SEDAR 3, with the exception of the relatively minor TL conversion from natural to "max" for the head boat measurements, which SEDAR 3 did not realize was necessary.

### b) Are data uncertainties acknowledged, reported, and within normal or expected levels?

The data collection and compilation procedures are well described and by themselves, they give a sense of the expected uncertainties in the data. Section 5.8 (Adequacy of data for assessment analyses) deals specifically with the uncertainties in the various sources of data. The tone of the section suggests that the data are sufficient to do the assessment, which is probably a correct statement, but it does not help in appreciating the magnitude of the uncertainties in the assessment. From the information available, I conclude that the uncertainties are larger than those in assessments of large volume commercial single species fisheries landing in a small number of landing sites well covered by sampling programs. However, the uncertainties are probably comparable with those expected in other assessments for this type of fishery where individual commercial and recreational catches are small, spread out in a large number of landing sites and sampling is therefore difficult. The uncertainties are acknowledged, reported and within the expected range.

As indicated above, the statement in section 5.8 "*The extent of linkage of the U.S. population with the Campeche Banks has not been studied, however*" suggests that yellowtail snapper in Mexican waters of the Gulf of Mexico belong to the same population but have not been taken into account. In the Gulf of Mexico, Mexican and USA waters broadly represent similar areas (see figure in section 2.1 of the assessment report), and probably one third of the yellowtail snapper area of distribution in the combined Atlantic and Gulf of Mexico area of distribution. Other information in the report on distribution, migration and connectivity suggests that this is probably not a major issue as there seems to be relatively strong site fidelity once the larvae have settled, but it is not possible to be definite until the linkages have been studied.

Section 6.4.2 of the assessment report suggests that discards in the commercial fishery are highly uncertain. It begins by stating "*There was so little information available on commercial discards it should be considered unknown until it is properly studied*" and further on in the middle of the paragraph states: "*Unfortunately, this meant stretching what little data existed to cover the wide gaps in information about discards for this fleet. The extent to which the effort succeeded rests on a lot of tenuous assumptions about the annual sizes of fish harvested, discarded, and released and the reliability of the release mortality estimate. The discard calculations and assumptions used should be viewed as very rough approximations to the reality existing over the 30 years covered by this assessment*". Discards, however, represent a very small fraction of the catch in weight compared with landings (table 6.8.14 of the assessment report) and unless those are grossly underestimated this is unlikely to be a major problem for the assessment.

The second paragraph in section 6.6.2 Ageing using Age-Length Keys states: "*Relative catches of yellowtail snapper estimated to be older than age 6 showed a vertical stacking in the bubble plot indicating that year-to-year changes across ages 7-12+ were more important than cohort-specific changes (Fig. 6.9.10)*". This could indicate that year class sizes variation is small but also suggests that sample size were small, resulting in considerable year to year variability unrelated to year class size.

Paragraph 2 in section 8.1.1 discusses upfront weaknesses of the indices of abundance. The uncertainties are not quantified, but the message is clear that there are problems with the stock size indices used in the assessment and the uncertainties are acknowledged.

### c) *Are data applied properly within the assessment model?*

There is clear indication that the assessment panel has understood the modeling approach that they chose to use and that the data are applied properly within the assessment model.

This assessment converts all fork length measurements and Head Boat TL measurements (when a FL was not measured) to “maximum” TL (i.e., TLmax measured with the tail compressed) using new length-length and length-weight equations developed for this assessment using more recent length and weight data available for this species. The parameters for the FL-TL conversion equations used in this assessment were functionally similar to those used in SEDAR 3. The two TL measurement methods (“natural” and “maximum”) can differ from 10-25 mm over the range of legal sizes typically encountered by anglers.

Lengths-at-age predicted using a von Bertalanffy growth model vary considerably depending on whether all the data or a subset of the data is used (section 5.5.4 of the assessment report). The parameters resulting from the “no more than 30 length samples per age" were used in estimating the age-specific mortality values. I have no basis to disagree with this choice of the assessment panel.

Section 5.5.5 of the assessment report describes how the age composition was derived from estimated length composition of the landings and released fish (discards) using age-length keys. It states that there were insufficient length-age samples to develop separate age-length keys (ALK) for each year, region, and length class. The cells were region (2; South Atlantic and gulf), year (30; 1981-2010), and total length inch classes (20 classes,<=5",6"-23",>=24" inches) for a total of 1,200 cells. Pooling within region across 5-year periods accounted for data for 336 cells, pooling across all years within region accounted for data in 310 cells, and finally pooling across all years and regions provided age composition information for 90 cells. Pooling was therefore necessary for more than 60% of the cells, i.e. 736 of the 1200 cells. This represents considerable pooling which could explain, at least partly, the lack of strong signal about year class size variability.

### d) *Are input data series reliable and sufficient to support the assessment approach and findings?*

As indicated above, the uncertainties are probably relatively large and typical of assessments based on fisheries with small commercial/recreational landings in a large number of landing sites, which poses a considerable sampling challenge. The catch at age does not seem to show strong year class consistency, but this may be because recruitment is relatively stable without strong year class being produced, but it is also likely a by-product of the difficulties in obtaining reliable catch at age for this type of fishery and the considerable pooling that has been necessary to cover all gear and area combinations. The stock size indices are reasonably consistent with one another and the fit with the modeling results are relatively good except in recent years for the commercial logbook index (index 2 CFLP, in section 1a above), where the observed index is higher than the predicted index (see figure 10.7.4 of the assessment report). The relatively good fit with three of the four indices of stock size available suggests that the input data series are sufficiently reliable to support the assessment approach and findings. The lack of fit for the fourth index based on commercial logbook could be due to increased efficiency for this fleet that has not been accounted for.

## 2. Evaluate the methods used to assess the stock, taking into account the available data.

### a) *Are methods scientifically sound and robust?*

The assessment uses the Age-Structured Assessment Program (Legault and Restrepo (1998), implemented as ASAP2, version 2.0.21 in the NOAA Fisheries Toolbox (http://nft.nefsc.noaa.gov/). ASAP is scientifically sound and robust, it is widely available and used including at the NMFS Northeast Fisheries Science Center. It is a forward-projecting, statistical catch-at-age model that allows for:

1. Age- and year-specific M, weights (spawning, catch and January 1) and maturity
2. Multiple fleets with one or more selectivity blocks within the fleets,

3. Incomplete age-composition and
4. Indices of abundance in either numbers or biomass, by age or age aggregated whose timing is taken into account
5. Discards by fleet can be linked to their fishery as can fishery-dependent indices.

ASAP estimates population numbers, fishing mortality rates, stock-recruit parameters, and management benchmarks. The precision of parameters can be evaluated by their standard deviations from the variance-covariance matrix or through Markov Chain Monte Carlo (MCMC) simulations.

The configuration for the Florida yellowtail snapper assessment used the data for fleet catch-at-age and fleet discards-at-age from age-length keys for each region to represent the age compositions in the catches and discards for 1981-2010. Three fleets (commercial, general recreational (MRFSS), and head boat) and four indices of abundance (three fishery dependent indices and one fishery-independent index) were used. The MRFSS and Head Boat Survey Indices covered the entire landings series period of 1981 through 2010, the commercial hook-and-line index developed from the reef fish log books spanned the 1993-2010 period, and the NMFS-UM RVC index covered 1998-2010. The fishery dependent indices for yellowtail snapper were linked to their respective fleets, and the fishery independent index was linked to the population estimates. Selectivity blocks were set to correspond to years when changes in management (e.g. minimum size) were expected to result in changes in selectivity.

In the previous assessment, natural mortality (M) was estimated based on maximum age (Hoenig 1983, known maximum age = 23 years). In the current assessment, M was assumed to be inversely related to fish length (Lorenzen 2005) scaled such that the cumulative rate over age 3 - 20 was the same as that used in the previous assessment. The assessment document includes a sensible discussion of why episodic types of natural mortality (red tides, cold kills, etc.) were not included. Cold kills are known to have occurred in the past and may occur once or twice per decade.

In the previous assessment, 30% release mortality, based upon the MRFSS B1 fish, was assumed. In the current assessment, a 10% release mortality was chosen as an approximation for the lower bound on release mortality for yellowtail snapper, and sensitivity runs using release mortality rates of 20% and 30% were considered to account for any delayed mortality after encounter with hook and line fishing gears. This is considered an improvement over the previous assessment as these estimates are based on field observations rather than best guesses.

### *b) Are assessment models configured properly and used consistent with standard practices?*

Yes, the assessment model is configured properly and used consistent with standard practices. There is catch composition for each of the main fleets, the stock size indices are related to the appropriate fleet and the fishery independent index is related to the population estimates. Goodness of fits and residual patterns were taken into account and iterative reweighting of the Effective Sample Size for age composition and weights for the indices were applied.

The assessment panel has investigated the sensitivity of the stock size indices to the inclusion of various subsets of the data (figures 8.8.2 to 8.8.11 of the assessment report). Section 8.4.2 of the assessment report notes that "*The modeled catch rates were generally above the observed catch rates for the early portion of the time period, but were more similar after 1995*" but does not offer an explanation for the lack of fit, nor does it indicate that recent values are also systematically above the observed (e.g. figure 8.8.11 of the assessment report). A similar problem is observed with the MRFSS data (e.g. figure 8.8.14) but the lack of fit is in the other direction. The lack of fit suggests that the standardization could be further improved. The justification for the indices chosen is provided in section 8.5 of the assessment report.

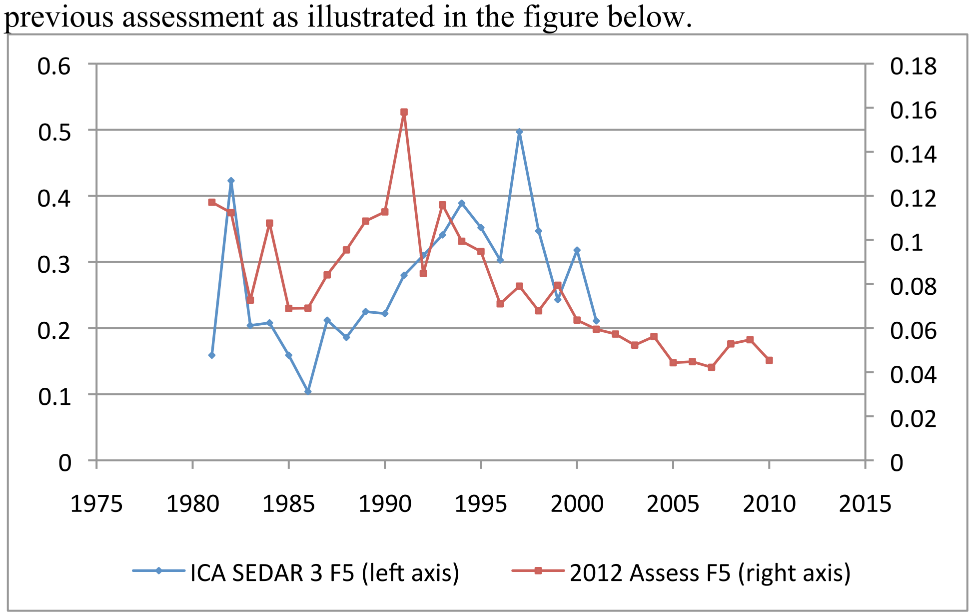
### *c) Are the methods appropriate for the available data?*

A statistical catch-at-age approach such as that provided by ASAP is highly appropriate for the available data. Virtual Population Analyses type of modeling would not be appropriate because of its assumption that catch at age is known without error, which is certainly not the case for Florida yellowtail snapper.

## 3. Evaluate the assessment findings with respect to the following:

### *a) Are abundance, exploitation, and biomass estimates reliable, consistent with input data and population biological characteristics, and useful to support status inferences?*

Abundance, exploitation and biomass estimates are consistent with the input data, with population biological characteristics and they are useful to support status inferences. However, the reliability of the estimates cannot be evaluated from the documentation supplied and would require considerable additional analyses. The results from this assessment differ markedly from those obtained using the ICA approach in the previous assessment as illustrated in the figure below.



While fishing mortality trends in the two assessments could be interpreted as being broadly similar, their absolute values are very different with F estimates in the current assessment being considerably smaller than in the previous assessment.

The retrospective analysis (figure 10.7.16 of the assessment report) suggests a tendency to underestimate F and overestimate SSB but this is not critical if the estimated F and SSB are reliable - F estimated to be considerably smaller than management benchmarks and SSB is estimated to be considerably higher.

### b) Is the stock overfished? What information helps you reach this conclusion?

Based on the updated assessment, the point estimate for F30%SPR (the overfishing limit for both fishery management councils) is estimated to be 0.295 per year (fully recruited age, age 5) corresponding to a SSB of 3 072 metric tons with the Minimum Spawning Stock Threshold (MSST= (1-M)*SSB30%SPR) equal to 583.6 metric tons.

The 2010 SSB estimate was 10 311 metric tons, considerably above the reference point, suggesting yellowtail snapper are not overfished.

### c) Is the stock undergoing overfishing? What information helps you reach this conclusion?

Overfishing is not occurring. F on age 5 in 2010 was estimated to be 0.0454 per year, considerably below the overfishing limit, indicating that overfishing was not occurring in 2010.

### *d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?*

**Figure 10.7.13** The estimated Beverton-Holt stock-recruit relationship for yellowtail snapper. The point estimate for steepness was 0.696 and 14,316 metric tons for the female spawning biomass at F=0.

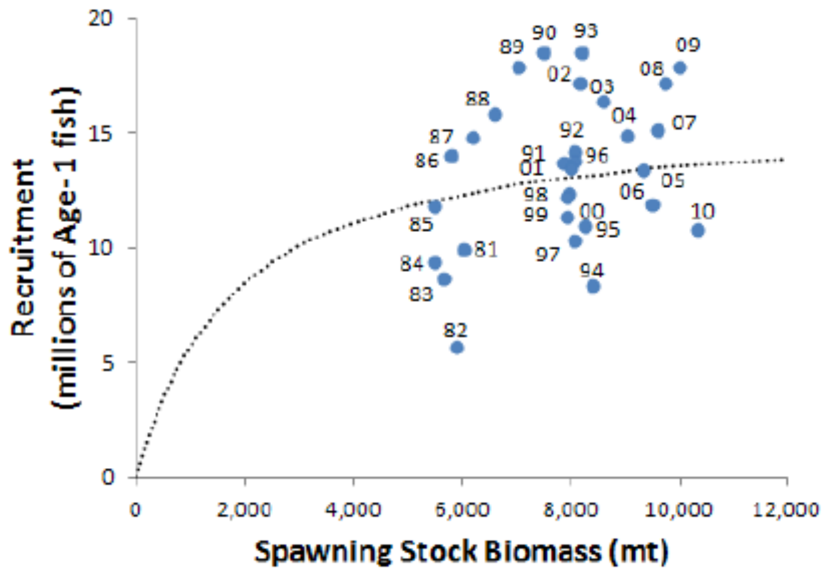



Figure 10.7.13 of the assessment report, reproduced above, shows the usual scatterplot for marine species. While there is an indication that higher SSBs (female SSB only) are associated with higher recruitment, the relationship is not strong. There is also a relatively strong temporal trend in recruitment.

### *e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?*

The quantitative estimates of status determination are considered reliable. There is no need to seek other indicators of stock status.

### 4. Evaluate the stock projections, rebuilding timeframes, and generation times, addressing the following:

According to the current assessment, yellowtail snapper in 2010 were not overfished and overfishing was not occurring. Therefore a rebuilding plan is not needed. Projections of population structure (numbers), catch, discards, yield, and spawning stock biomass were made assuming status quo fishing mortality. The results are shown in figure 10.7.17 of the assessment report for illustrative purposes.

### *a) Are the methods consistent with accepted practices and available data?*

The methods used to make projections are consistent with accepted practices and available data and are integral part of the ASAP2 assessment software.

### *b) Are the methods appropriate for the assessment model and outputs?*

The projections methods are entirely appropriate for the assessment model and output. ASAP2 has the ability to do projections in the same framework in which the assessment is done. There is therefore complete compatibility between the assessment results and the projection inputs.

### *c) Are the results informative and robust, and useful to support inferences of probable future conditions?*

The projections are illustrative of what might happen under status quo fishing mortality.

### *d) Are key uncertainties acknowledged, discussed, and reflected in the projection results?*

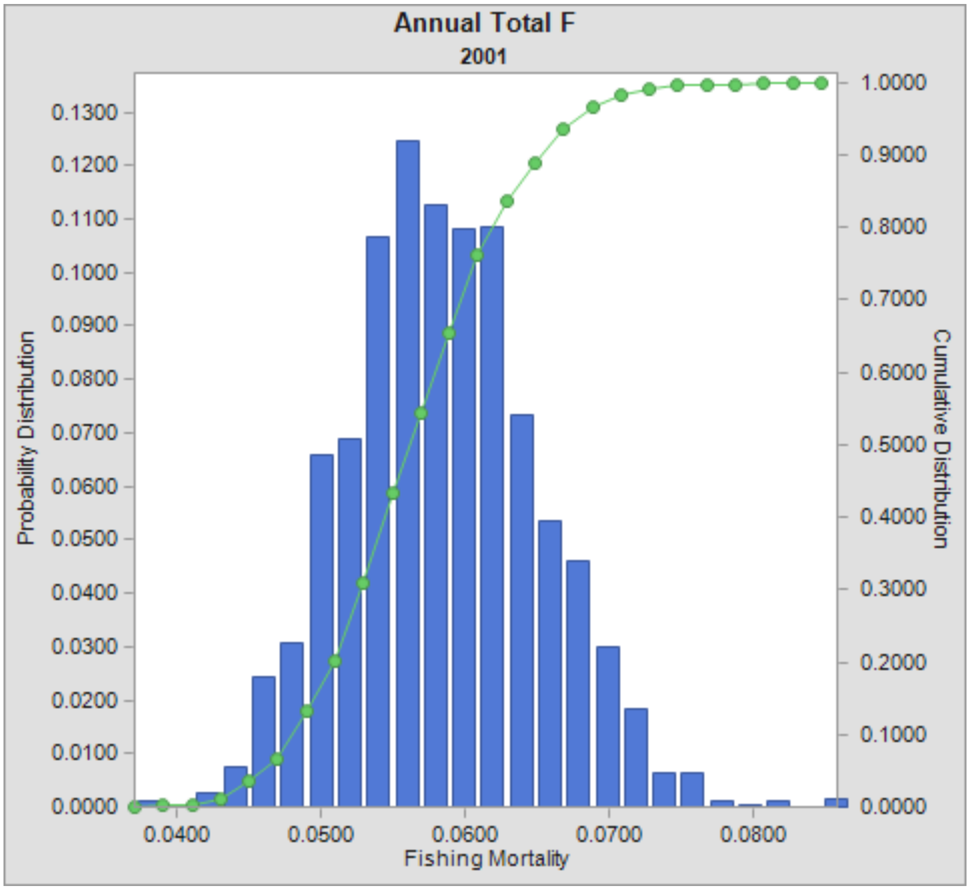
As a rebuilding plan is not necessary, the projections are illustrative only and not extensively discussed in the assessment report.

## 5. Consider how uncertainties in the assessment, and their potential consequences, are addressed.

The assessment report shows the fit to the various data series used in the assessment and residual patterns versus time (e.g. figures 10.7.2, 10.7.3 and 10.7.4) as well as the distribution of Markov Chain Monte Carlo (MCMC) simulation results for important parameters such as the cumulative proportion, and the point estimate for the fishing mortality per year for age 5 and for the spawning biomass in 2010 (e.g., figure 10.7.14 of the assessment report).

The description of the results of the retrospective analysis (section 10.3.9 of the assessment report) does not correspond with figure 10.7.16 of the assessment report and is internally inconsistent. The text says that both F and SSB consistently declined with the addition of new years of data from 2005 to 2010, which is rarely possible. In fact, figure 10.7.16 shows that **F consistently increased** and the SSB consistently decreased with the addition of new data. The scale used to plot the F trends makes it difficult to see the difference between successive retrospective runs, but the graph for SSB is easier to interpret. The direction of the retrospective bias (underestimating F and overestimating SSB) would normally be a concern for the conservation of the resource, but given that F appears to be considerably below the overfishing limit and that SSB is considerably larger than the reference point, this may not be a concern in this specific case. In other words, if the absolute of F and SSB are correct, the implications for the technical conclusions are probably minimal.

The methods used to evaluate uncertainty (MCMC, sensitivity analysis and retrospective analysis) do reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods given the choice of data and models. These do not reflect the real uncertainties, however, as a comparison with the previous assessment, using a different model and possibly slightly different data shows. In the 2003 assessment, the 2001 estimate of fishing mortality from the ICA model was F=0.21, while the current assessment suggests that the there is an almost 100% probability that the F2001 is less than F=0.10 as indicated in the figure below:




## 6. Consider the research recommendations provided and make any additional recommendations or prioritizations warranted.

The assessment document contains several suggestions on further analyses in various sections of the document but these cannot be interpreted as research recommendations from the assessment panel. Section 10.4 is where the assessment panel formulates its recommendations and there are, surprisingly, only two:

i. The gathering of data on released fish (size, quantities, disposition at release) is important for all assessments and should be encouraged.
ii. Future assessments could restrict the data to 1993 to the present, for example, to investigate the impact this restricted data set would have on population parameter estimates. This is to account for a possible outlier in the 1992 MRFSS B2 estimate.

The importance of estimating discards should be demonstrated rather than assumed, to avoid spending time and energy on collecting data that may have little influence on the results of the assessment. Table 6.8.14 of the assessment document suggests that in weight discards are small compared with landings. This collection of data on released fish, presumably, could be achieved by a relatively large scale coordinated one-time sampling experiment.

Restricting the data to 1993 to the present may be one way of investigating the influence of the potential 1992 outlier in the MRFSS B2 estimate, but, generally, it is useful to include as many years as possible in the assessment in order to avoid the shifting baseline problem. Restricting the data to 1993 to the present would not be a problem here if the assessment results are correct, but nevertheless as many years of data should continue to be included in the assessment and there are other ways of evaluating the influence of the 1992 outlier on the assessment results, e.g. by treating 1992 as a missing year in the ASAP formulation.

## 7. Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.

To substantially improve the stock assessment would probably require considerable investments in sampling the catch for size and age composition and obtaining additional fishery independent indices of stock sizes that would synoptically cover the entire distribution area of the assessment unit. It is not clear, however, that would be the most cost efficient, nor possibly the best way of improving the management of the fisheries harvesting yellowtail snapper.

Unless a real breakthrough in fisheries modeling occurs between now and the next scheduled assessment, it would be preferable to continue to use the current ASAP modeling framework, which is completely appropriate for the type and amount of data available. The documentation available did not systematically compare the results of this assessment with the previous one, nor did it identify if the reason(s) for the new perception was the addition of new data or the use of a different modeling approach. However, the observation in section 5 above that the estimate of the 2001 F in the previous assessment is twice the highest MCMC estimate for that year in the current assessment suggests that the changed perception is likely due to the change in assessment models. It should be standard practice to systematically compare the results of the assessment with those of the previous assessment and try to identify the main causes of changes in estimates, if there are any.

From the perspective of conserving the yellowtail snapper resource, current fishery management measures seem to be achieving the conservation objective. From an optimum yield perspective, however, the resource seems to be underexploited and if the assessment is correct, fishing effort, fishing mortality, and catches could be increased substantially. Given the changes in the perception of the trends in the assessment unit between the previous assessment and the current assessment, bearing in mind that some modeling approach might still suggest that the previous perception was the correct one, if increases in effort, fishing mortality and catches (or changes in other management measures that would have the same effect) are considered, these should be very gradual, with regular monitoring of the effects in an experimental fishery management context. As yellowtail snapper is only one of the species in the multispecies management plans for the Southeast Atlantic and Gulf of Mexico Fisheries Management Councils, changes in management measures would need to consider the status of the other species in the managements plans and the possible effects of changes on them.

I was surprised that there was no reference to the Deep Water Horizon oil spill, even if only to say that it was expected to have no effect on yellowtail snapper.

The structure of the report is somewhat confusing with the same, or similar, topics being covered in several chapters/sections from a slightly different angle. For example, catch, effort and cpue are covered in 6.2.1, the review of working papers, 6.5, commercial effort, and also in several sections of chapter 8. I assumed that the last treatment is the most relevant one for the assessment.

## Conclusions and Recommendations in accordance with the ToRs.

The data decisions made by the assessment panel are largely consistent with those made in the previous assessment (SEDAR 3). Without personal detailed knowledge of the data sources available versus those used and how they were used, it is difficult to be absolutely certain that the decisions are sound and robust. But knowing how the SEDAR process works with a data workshop and an assessment workshop, it is likely that the decisions in the current assessment are indeed sound and robust.

From the information available, I conclude that the uncertainties are larger than those in assessments of large volume commercial single species fisheries landing in a small number of landing sites well covered by sampling programs. However, the uncertainties are probably comparable with those expected in other assessments for this type of fishery where individual commercial and recreational catches are small, spread out in a large number of landing sites and sampling is therefore difficult. The uncertainties are acknowledged, reported and within the expected range.

There is clear indication that the assessment panel has understood the modeling approach that they chose to use and that the data are applied properly within the assessment model.

The relatively good fit with three of the four indices of stock size available suggests that the input data series are sufficiently reliable to support the assessment approach and findings. The lack of fit for the fourth index based on commercial logbook could be due to increased efficiency for this fleet that has not been accounted for.

The assessment uses the Age-Structured Assessment Program (Legault and Restrepo (1998), implemented as ASAP2, version 2.0.21 in the NOAA Fisheries Toolbox (http://nft.nefsc.noaa.gov/). ASAP is scientifically sound and robust. The assessment model is configured properly and used consistent with standard practices. A statistical catch-at-age approach such as that provided by ASAP is highly appropriate for the available data. Virtual Population Analyses type of modeling would not be appropriate because of its assumption that catch at age is known without error, which is certainly not the case for Florida yellowtail snapper.

Abundance, exploitation and biomass estimates are consistent with the input data, with population biological characteristics and they are useful to support status inferences.

Based on the updated assessment, the point estimate for F30%SPR (the overfishing limit for both fishery management councils) is estimated to be 0.295 per year (fully recruited age, age 5) corresponding to a SSB of 3 072 metric tons with the Minimum Spawning Stock Threshold (MSST= (1-M)*SSB30%SPR) equal to 583.6 metric tons.

The 2010 SSB estimate was 10 311 metric tons, considerably above the reference point, suggesting yellowtail snapper are not overfished. Overfishing is not occurring. F on age 5 in 2010 was estimated to be 0.0454 per year, considerably below the overfishing limit, indicating that overfishing was not occurring in 2010. The quantitative estimates of status determination are considered reliable.

According to the current assessment, yellowtail snapper in 2010 were not overfished and overfishing was not occurring. Therefore a rebuilding plan is not needed. Projections of population structure (numbers), catch, discards, yield, and spawning stock biomass were made assuming status quo fishing mortality. The results are shown in figure 10.7.17 of the assessment report for illustrative purposes.

The methods used to evaluate uncertainty (MCMC, sensitivity analysis and retrospective analysis) do reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods given the choice of data and models. These do not reflect the real uncertainties, however, as a comparison with the previous assessment, using a different model and possibly slightly different data shows. In the 2003 assessment, the 2001 estimate of fishing mortality from the ICA model was F=0.21 while the current assessment suggest that the there is an almost 100% probability that the F2001 is less than F=0.10.

The importance of estimating discards should be demonstrated rather than assumed. Restricting the data to 1993 to the present may be one way of investigating the influence of the potential 1992 outlier in the MRFSS B2 estimate, but, generally, it is useful to include as many years as possible in the assessment and there are other ways of evaluating the influence of the 1992 on the assessment results, e.g., by treating 1992 as a missing year in the ASAP formulation.

To substantially improve the stock assessment would probably require considerable investments in sampling the catch for size and age composition and obtaining additional fishery independent indices of stock sizes that would synoptically cover the entire distribution area of the assessment unit. It is not clear, however, that would be the most cost efficient, nor possibly the best way of improving the management of the fisheries harvesting yellowtail snapper. The assessment should continue to use the current ASAP modeling framework which is completely appropriate for the type and amount of data available.

## References


Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. Fishery Bull. 82:898-903.

Legault, C. M. and V. R. Restrepo. 1998. A flexible forward age-structured ssessment program. ICCAT Working Document SCRS/98/58. 15 pp.

Lorenzen K. 2005. Population dynamics and potential of fisheries stock enhancement: practical theory for assessment and policy analysis. Philos. Trans. R. Soc. London B Biol. Sci., 360:171-189.

## Appendix 1: Bibliography of materials provided for review


Anon. Undated a. Standardised catch rates of yellowtail snapper (*Ocyurus chrysurus*) from the headboat fishery in southeast Florida and the Florida Keys. YTS-RD03, 16 pages.

Anon. Undated b. Standardized catch rates of yellowtail snapper (Ocyurus chrysurus) from the Marine Recreational Fisheries Statistics Survey in south Florida, 1981-2010. YTS-RD04, 17 pages.

McCarthy, K. Undated a. Commercial Vertical Line Vessel Standardized Catch Rates of Yellowtail Snapper in southern Florida, 1993 -2010. YTS - RD01, 11 pages.

McCarthy, K. Undated b. Calculated discards of yellowtail snapper from commercial vertical line fishing vessels in southern Florida. YTS - RD02, 11 pages.

O'Hop, J., Murphy, M., and Chagaris, D. 2012. The 2012 Stock Assessment Report for Yellowtail Snapper in the South Atlantic and Gulf of Mexico. FWC Yellowtail Snapper SA, 341 pages.

## Appendix 2: A copy of the CIE Statement of Work

# Attachment A

# Statement of Work for Dr. Jean-Jacques Maguire

### External Independent Peer Review by the Center for Independent Experts

### SEDAR South Atlantic and Gulf of Mexico Yellowtail Snapper Assessment Review

**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:**

The yellowtail snapper assessment from the South Atlantic and Gulf of Mexico regions is a collaborative effort between the National Marine Fisheries Service (NMFS) and the Florida Fish and Wildlife Conservation Commission (FFWCC). This assessment was previously scheduled as part of the SEDAR 27 review held in November 2011, but the assessment model was not completed in time for consideration during the SEDAR 27 review. The last SEDAR review on the yellowtail snapper assessment by CIE reviewers was conducted in August 2003; therefore, a CIE review is requested of the yellowtail snapper assessment.

The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**.

**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 working knowledge and recent experience in the application of 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 10 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 as a desk review, therefore no travel is required.

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

<u>Prior to the Peer Review</u>: 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, and other pertinent information. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

<u>Pre-review Background Documents</u>: 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.

<u>Desk Review</u>: 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.** The CIE Lead Coordinator can contact the Project Contact to confirm any peer review 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.

**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) Conduct an independent peer review in accordance with the ToRs (**Annex 2**).
3) No later than 19 June 2012, 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 Dr. 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.

| | |
|---|---|
| 21 May 2012 | CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact. |
| 4 June 2012 | NMFS Project Contact sends the stock assessment report and background documents to the CIE reviewers. Background documents may be sent to the CIE reviewers one week earlier. |
| 4-15 June 2012 | Each reviewer conducts an independent peer review as a desk review. |
| 19 June 2012 | CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator. |
| 3 July 2012 | CIE submits the CIE independent peer review reports to the COTR. |
| 10 July 2012 | The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director. |

**Modifications to the Statement of Work:** This 'Time and Materials' task order may require an update or modification due to possible changes to the terms of reference or schedule of milestones resulting from the fishery management decision process of the NOAA Leadership, Fishery Management Council, and Council's SSC advisory committee. A request to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent changes. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on changes. 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).

**Modifications to the Statement of Work:** This 'Time and Materials' task order may require an update or modification due to possible changes to the terms of reference or schedule of milestones resulting from the fishery management decision process of the NOAA Leadership, Fishery Management Council, and Council's SSC advisory committee. A request to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent changes. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on changes. 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).

**Support Personnel:**

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**Key Personnel:**

NMFS Project Contact:

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## 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.

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

**Annex 2: Tentative Terms of Reference for the Peer Review**

**SEDAR South Atlantic and Gulf of Mexico Yellowtail Snapper Assessment Review**

1. Evaluate the data used in the assessment, addressing the following:
   a) Are data decisions made by the assessment panel sound and robust?
   b) Are data uncertainties acknowledged, reported, and within normal or expected levels?
   c) Are data applied properly within the assessment model?
   d) Are input data series reliable and sufficient to support the assessment approach and findings?
2. Evaluate the methods used to assess the stock, taking into account the available data.
   a) Are methods scientifically sound and robust?
   b) Are assessment models configured properly and used consistent with standard practices?
   c) Are the methods appropriate for the available data?
3. Evaluate the assessment findings with respect to the following:
   a) Are abundance, exploitation, and biomass estimates reliable, consistent with input data and population biological characteristics, and useful to support status inferences?
   b) Is the stock overfished? What information helps you reach this conclusion?
   c) Is the stock undergoing overfishing? What information helps you reach this conclusion?
   d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?
   e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?
4. Evaluate the stock projections, rebuilding timeframes, and generation times, addressing the following:
   a) Are the methods consistent with accepted practices and available data?
   b) Are the methods appropriate for the assessment model and outputs?
   c) Are the results informative and robust, and useful to support inferences of probable future conditions?

d) Are key uncertainties acknowledged, discussed, and reflected in the projection results?

5. Consider how uncertainties in the assessment, and their potential consequences, are addressed.
   - Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods
   - Ensure that the implications of uncertainty in technical conclusions are clearly stated.
6. Consider the research recommendations provided and make any additional recommendations or prioritizations warranted.
   - Clearly denote research and monitoring that could improve the reliability of, and information provided by, future assessments.
7. Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.
8. Prepare a Peer Review Report summarizing the Reviewer's evaluation of the stock assessment and addressing each Term of Reference.