Center for Independent Experts (CIE) Independent Peer Reviewer's Report on the South Atlantic Dolphinfish Management Strategy Evaluation (MSE) Review Workshop

July 28 - 31, 2026
Charleston, South Carolina

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Executive Summary

The South Atlantic Dolphinfish Management Strategy Evaluation (MSE) Review Workshop was conducted under the Southeast Data Assessment Review (SEDAR) process. The independent, in person, peer review meeting was held at the Hilton Garden Airport Hotel in Charleston, South Carolina between July 28th and 31st, 2026. The objectives of the workshop were to review the development of an MSE framework that uses an empirical (indicator-based) management procedure (MP) for South Dolphinfish in the US Atlantic that meets mandated requirements and regionally varying stakeholder management objectives to optimize yield. The review also evaluated the data inputs, analytical procedures, characterization of uncertainty, management procedures, and the overall progress to date.

Review panel discussions focused on the MSE progress relative to the terms of Reference (TOR) for the review workshop. A major issue considered by the Panel was the poor quality and/or the limited available data for most aspects of the MSE framework and the constraints these uncertainties imposed on MSE development. Additional concerns were expressed about the lack of a fishery independent index of abundance, the small proportion of the catch taken by the commercial fishery (<4%) and the uncertainty related to representativeness of this non-directed fishery. Currently, there is no directed commercial fishery for Dolphinfish and the reported catches are actually a by-catch in fisheries directed at other species.

The largest source of uncertainty for this stock originates from the near lack of scientific data upon which to characterize uncertainty associated with the life history/population dynamics, stock structure, migrations/movement, and fisheries. However, overall, the ranges/levels used for the reference set of Operating Model (OM) axes of uncertainty are well within the expected bounds for this and similar species, and they represent reasonable and plausible bounds. Robustness tests were identified for less plausible scenarios.

Evaluation of the strengths and weaknesses of the methods used to simulate the stock requires examination of the multiple attributes of the species and the resource. From an MSE perspective the methods to generate the operating models are generally scientific sound. They are based on standard model development practices and tools that have evolved over time from previously approved and implemented MSE programs for several fisheries (e.g., bluefin tuna, Bay of Fundy herring and Atlantic swordfish).

Given the consistency and relatively good fit of the evaluated parameters it was concluded that simulated data had reasonable statistical properties relative to what would be available to the management procedure. However, caution is warranted given the multiple layers of uncertainty associated with the models, the data, and the input parameters.

Performance measures for Dolphinfish were established based on a series of stakeholder workshops to identify specific management objectives and their priority. Several performance comparisons tools (e.g., projections, trade-off, quilt plots) were shown to demonstrate how the individual CMP might be related/ranked to each other. This implied that MSE can produce management objective criteria to evaluate the stock status relative to conservation issues are available within the MSE framework, but their meaning and interpretation could be different because of the simulation environment.

From the review perspective the projection assumptions are reasonable and appropriate for the stock given limited amount of data availability. The primary assumption is that the future variable distributions are consistent with the past. While this may be based on the best available scientific information (poor as it is) future efforts should explore mechanisms to improve all aspects of data collection.

In summary, the Dolphinfish MSE is limited/constrained by the lack of available data and strong dependence on the VAST model index. This can introduce a large amount of uncertainty into the evaluation process. Most inputs were essentially proxies, based on other fisheries or species. Furthermore, the majority of reported catches were from international waters and beyond US jurisdiction. Regardless, the MSE framework appears to encompass a large portion of the uncertainty associated with the resource and seems suitable to provide management advice once complete. The responsiveness of the model to MP options is minimal, except at extreme levels.

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Background

The National Marine Fisheries Service (NMFS) is mandated by the Magnuson Stevens Fishery Conservation and Management Act, the Endangered Species Act, and the Marine Mammal Protection Act to conserve, protect, and manage the nation's marine living resources based upon the best scientific information available (BSIA). Under this mandate, the NMFS (Office of Science and Technology) coordinates and manages a contract for providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. CIE reviewers are selected by the CIE Steering Committee and the CIE Coordination Team to conduct independent peer reviews of the NMFS science in compliance with the predetermined Terms of Reference (TORs) for the review. The terms of reference for the South Atlantic Dolphinfish MSE Review Workshop were provided through the SEDAR process (Appendix 2). The 6-member Review Panel consisted of three CIE reviewers and was chaired by Dr Matt Damiano of the North Carolina Division of Marine Fisheries. Other members of the Review Panel included Jeffrey Buckel (North Carolina State University) and Kelsey Roberts of the University of Massachusetts Dartmouth (Appendix 1). The meeting was hosted by the South Atlantic Fisheries Management Council and convened in Charleston, South Carolina from July 28th to 31st. The objective of the workshop was to review the development of an MSE framework that used an empirical (indicator-based) management procedure (MP) for South Atlantic Dolphinfish in the US Atlantic that meets mandated requirements and regionally varying stakeholder management objectives to optimize yield. (Appendix 2). In simple terms, the primary purpose of the review was to evaluate the scientific validity of the Dolphinfish MSE and to ensure it is consistent with best scientific information available.

The Statement of Work (SOW) described in Appendix 2 identifies the roles, responsibilities and reporting structure for the CIE reviewers. The reviewers are chosen based on their expertise and experience to provide an impartial, independent peer review, without conflicts of interest, to report on methods, outcomes and recommendations of the Management Strategy Evaluation (MSE) framework. Currently, the South Atlantic Dolphinfish resource/fishery is divided into two key components, a domestic component (approximately 46% of the total catch) which is further subdivided into 6 fleets over a broad spatial range (5 regions) from north to south, as well as an international component (54% of total catch) outside US waters (including reported and unreported catches and estimated discards). Fishing in the domestic component is subject to US and state regulations while fishing in the

international component is beyond US control and involves tens of independent countries, each with their own rules and regulations.

Currently, the entire US Atlantic Dolphinfish fishery (Maine to Florida), is managed by the South Atlantic Fishery Management Council (SAFMC) through agreements with other agencies. In the absence of a comprehensive analytical assessment for this stock a program was initiated for the development of an MSE framework (started around 2024). The following report is a summary of a workshop to review the overall MSE progress, assumptions, challenges, and recommendations to date as defined in the terms of reference. Consideration was also given to future developments in support of Dolphinfish assessment and management.

It is important to note that while this document represents a stand-alone review by a single CIE reviewer, the key outcomes, conclusions and recommendations in the report are in general agreement with the other Panel members. Just prior to the meeting closing, the Panel met to review and summarize their observations, conclusions and recommendations. Overall, there was common consensus regarding the Panel members' views of the MSE process and the responses to the terms of reference, although there were a few minor discrepancies among individual reviewers that were discussed and solutions proposed that would be addressed after the meeting. Unfortunately, a draft report was not prepared prior to the meeting's closure, so the CIE reviewers did not have an opportunity to appraise (or come to an actual consensus on) the SEDAR report before finalizing their individual reports. It is assumed that the discussions and agreed content will be contained in the Chair's report with a specific focus on the review objectives. That being said, individual reviewers may have focused on specific topics of interest in their personal review reports.

Introduction

A fundamental challenge for the assessment and management of Atlantic Dolphinfish and Wahoo, given the absence of an analytical assessment, was lack of a responsive and robust approach/methodology to deal with the diverse management objects for the South Atlantic Dolphinfish population and the fishery. The primary aim was to develop an approach to predict the annual amount of Dolphinfish and to maximize the usage of these fish across multiple fishery sectors and regions. Management considerations included, area specific management, accessibility, ecosystems concerns, fishery stability and the maximization of catches. These goals were further complicated by the species unique life history characteristics, its highly

migratory nature, and the near absence of species-specific data (data poor resource), as well as the current static management approach.

To address these challenges, the SEFSC in collaboration with SAFMC, SERO, Blue Matter Science, and a wide range of stakeholders embarked on the development of an MSE framework that could potentially address these concerns and objectives for Dolphinfish along the US Atlantic coast (FL - ME). The approach taken was to explore/evaluate the development of an empirical (indicator-based) management procedure (MP) under an MSE framework. A series of Terms of Reference (TORS-Appendix 4) were devised to evaluate the workshop review of the proposed framework. Detailed responses to each of the TORs are discussed is Section 3 below. However, before entering into a discussion of the individual TORs, there are several key factors, with data interpretation implications, that need to be identified and kept in mind throughout the review. These include the following:

- Dolphinfish are a short-lived, highly migratory (rapid) species and distributed over a broad geographical range in the South Atlantic.
- Dolphinfish mature young (1 to 2 years), are batch spawners, and spawn throughout the spawning season.
- There is no fishery independent index of abundance and other data on the population, from a major portion of the fishery (the recreational fishery), are extremely limited and variable from state to state. Most model input data for Dolphinfish are derived from proxies of other species or areas.
- The largest catches of Dolphinfish are harvested by the recreational fishery (96%) with limited available data. There is no directed commercial Dolphinfish fishery and the commercial fishery originates from a bycatch of Dolphinfish in other fisheries such as tuna and swordfish.
- Most Dolphinfish catches are reported as international, estimated unreported or discards. These catches are outside of US jurisdiction and regulations. Management directives/objectives may be restricted because of non-US activities.

The current SEDAR workshop/review was focused on the outcomes of the MSE framework as defined in the Terms of Reference and summarized in a number of reports provided to the Review Panel prior to the workshop meeting. Links to additional information were provided during the meeting. This reviewer would like to commend the level of effort exerted by the MSE team to develop the MSE framework and the high level of communications with major stakeholders to integrate their concerns and objectives as part of the process.

Description of the Individual Reviewer's Role

The CIE reviewers served two roles on the SEDAR Panel of the South Atlantic Dolphinfish MSE Workshop Review. First, was to participate as a full panel member in the review of the practices and procedures involved in the development of the MSE framework, current research and assessment for improvement of methods/approaches, and second to provide an independent review of the methodology and process to ensure the best available science is used when possible. To meet these requirements for the Atlantic Dolphinfish MSE workshop, a reviewer must have achieved recognition in several fisheries related fields including a familiarity/experience working with MSE. In this context, I am considered an expert in the assessment of small and large pelagic fish stocks, fisheries acoustics as applied to assessment of pelagic species, and their application to the management of the stocks. Prior to retiring, I was a senior Research Scientist with the Canadian Department of Fisheries and Oceans responsible for the research and assessment of large and small pelagic fishes. In addition, I was the scientist responsible for the acoustic program in my region of Canada for 20 years and have spent more than 25 years as the lead for small pelagic stock assessment programs. I have served on multiple international stock assessment review groups. Between 2010 and 2014, I was the Chair of the ICES North Sea Technical Review working group, which provided quality control for all North Sea fish stocks assessed by ICES. In 2016, I was appointed Chair of the ICCAT western Bluefin tuna assessment working group and later (2018) elected as chair of the ICCAT SCRS, which was actively involved in the development of MSE's for several mandated species (Bluefin tuna, Atlantic Swordfish, and several tropical tuna species).

My primary role in this SEDAR meeting was to review the MSE report and participate in the Review workshop as an informed expert, as well as to contribute to the discussions and recommendations put forward by the Project teams. Prior to the meeting, several report documents were provided to the Panel team by the SEDAR coordinator (Appendix 3). At the meeting, the primary objective was to conduct a thorough review of the MSE development and inputs to date in collaboration with the other Panel members and assist the Chair with the final report. Thereafter, it was the task of each CIE reviewer to prepare an independent expert review report based on the SOW (Appendix 2) and the terms of reference (Appendix 4).

Disclaimer

The following report to the CIE reflects my independent opinions and views on the issues and questions identified for the South Atlantic Dolphinfish MSE Review Workshop defined in the terms of reference, the statement of work, and the goals and objectives. The report is, however, generally consistent with the concerns/uncertainties, the recommendations and the conclusions of the other Panel members and CIE reviewers expressed in the Panel Report currently being prepared by the Panel Chair. Overall, there was consensus on the interpretation and conclusions for each of the TORs among the Panel members. No significant directional changers related to the MSE Review issues were identified among the Panel members.

Summary of Findings for each Term of Reference

The tasks for the South Atlantic Dolphinfish MSE workshop review are identified in the terms of Reference (Appendix 2). The TORs are divided into 8 broad Categories, each of which is further subdivided into 1 - 4 focused topics and questions, associated with the MSE review, its assumptions, its outputs and its application. The primary objective of the meeting was to evaluate and address each of these questions under TOR categories; (1) the types and ranges of uncertainty used in the MSE; (2) strengths and weaknesses of methods used to simulate the stock; (3) operating model conditioning; (4) MSE projections; (5) the performance metrics; and (6) the candidate management procedures. The remaining two categories were related to recommendations to improve the MSE and the report preparation. Each of these categories, including subcategory questions identified by the steering committee (Development) team, are discussed in detail and addressed below.

1. The types and ranges of uncertainty used in the MSE

a. *Were selected axes of uncertainty relevant to the stock and fishery and appropriately characterized? If relevant, were uncertainties highlighted by managers and stakeholders included?*

b. *Did levels of uncertainty for each axis meaningfully and reasonably encompass plausible uncertainty?*

c. *Were uncertainties appropriately classified into reference (primary) or robustness (secondary) set and sufficiently explained?*

The MSE framework is characterized by 8 fleets (Commercial, recreational, and international), representing 5 regions (north to South), and 4 seasonal steps (offset quarter intervals). All are plagued by data limitations. While the US catch records are likely reliable, the international reporting may be uncertain and variable. Biological information is poor, and movement data is very limited although the species is known for its rapid and extensive movements. Furthermore, because of the lack of an analytical assessment the range of model inputs are often borrowed from other sources. The reference set of OMs is based on 5 axes of uncertainty: Natural mortality, Resilience, Catch levels, Recruitment level and Viscosity. Although viscosity was retained there was some discussion on the need for its inclusion. The proposed Reference Case operating model was defined as having low M, low steepness, full historical catches, continuation of historical mean recruitment and high stock mixing. Although reasonable, these characterizations might be a little conservative given the limited general knowledge on Dolphinfish.

In terms of the first TOR, which was primarily related to the range of model inputs necessary to describe/account for the broad spectrum of uncertainties, the Review Panel's response to whether or not the axes of uncertainty are relevant to the stock and the fishery is "Yes", but within the constraints imposed by the available data. The South Atlantic Dolphinfish has a very unique and dynamic life history characterized by rapid growth (K), early maturity (second quarter), high fecundity (Batch) and protracted spawning season, high natural mortality (M), and environmentally influenced productivity, as well as a broad geographical distribution in the western Atlantic. Biological sampling of the catch is spatially and temporally limited as illustrated by the number of fish measured for size and the small number otoliths sampled for ageing. All of these factors can lead to uncertainty in estimating a stock's trajectory and projections. In addition, the fishery is predominately a recreational operation (96% US Catches) with a small commercial bycatch of Dolphinfish in other fisheries (4% US total catch). This is further complicated by the fact that more than 50% of the total Dolphinfish catch is taken Internationally by multi-national fleets (Catches, discards and Unreported) and beyond US jurisdiction. Catches outside the US waters could be, and likely are, a major source of uncertainty depending on the efficiency of the countries' reporting systems. It seems a bit unusual that the estimate of discards has remained constant while the international catches have been increasing in recent years.

Factors such as alternative movement and changing availability patterns and catchability throughout the north-south US distribution, possibly due to environmental variability, could also have a significant impact on the model

outcomes and introduce additional uncertainty. However, the data is so poor that it would be hard to evaluate these changes.

The lack of a fisheries independent index of abundance and the dependency upon a non-directed (by-catch) fishery associated with such a small portion of the total catch to develop an index of abundance leads to uncertainty associated with representation of the stock's trajectory. Slight changes to any of the multiple components could have an impact on the OM conditioning and the projections. In this development, far too much dependency is based on the VAST model (no alternative) to estimate seasonal distribution and abundance as the foundation for the MSE framework, given the small proportion of Dolphinfish catches it represents. Alternatives indices need to be explored, developed and implemented for future consideration.

Overall, the largest source of uncertainty is the near lack of scientific data upon which to characterize uncertainty associated with the life history/population dynamics, stock structure, migrations/movement, and fisheries. In almost every case, the selected inputs represent proxies from other data sources or species. That being said, the ranges/levels used for the OM axis of uncertainty are well within the expected bounds for this and similar species, and they represent reasonable and plausible characterizations. Furthermore, the technical team's selection of a reference set is representative of the plausible uncertainty, although there was discussion on whether or not the 5th axis (Viscosity) was necessary. A series of 16 robustness tests related to catches, recruitment, spatial distribution, productivity and changes in the fishery were identified for testing to evaluate the less plausible scenarios prior to the review. Several additional robustness tests were added to the list during the review meeting.

2. Evaluate the strengths and weaknesses of methods used to simulate the stock

a. *Are methods to generate operating models scientifically sound?*
b. *Did methods meet the needs of stakeholders and/or research questions (i.e., appropriate spatial resolution, time-step, ability to measure key performance statistics)?*
c. *If data were unavailable to parameterize the model, were the assumptions used to overcome this limitation reasonable and/or multiple assumptions included as an axis of uncertainty?*

d. Was plausibility weighting of reference operating models appropriate and sufficiently justified?

e. Does the robustness of the operating model grid allow the management procedure to fail?

Evaluation of the strengths and weaknesses of the methods used to simulate the stock requires examination of the multiple attributes of the species and the resource. From an MSE perspective, the methods to generate the operating models are generally scientifically sound. They are based on standard model development practices and tools that have evolved over time from previously approved and implemented MSE programs for several fisheries (e.g., bluefin tuna, Bay of Fundy herring and Atlantic swordfish). The Dolphinfish MSE was developed from strong scientific and stakeholder communication and collaboration to meet the questions and concerns of the interested parties. Factors such as spatial resolution, fisheries, biological parameterization, and appropriate time steps were implemented based on the available (likely the best), although limited data. These approximate the characteristics for a short lived, rapid growing widely distributed species. The quarter-long time steps allowed for the detection of changes in a realistic timeframe, rather than the smoothing that could occur for annual intervals. A weakness of the model was the limited data on spatial resolution (poor tagging data) and the reliance of the VAST model to define fish density and biomass from the commercial fishery data only. No spatial distribution information was resolved from the main recreational fisheries that account for 96% of the US catches. Outputs from the model when complete should allow the measure of key performance indicators as identified by the MSE team and stakeholders. However, based on what was presented to date, the model's responsiveness to changes is minimal except at the extremes. This could limit management options.

The MSE was severely constrained by the lack of scientific data available to parameterize the model. To address these data gaps, reasonable assumptions were made to overcome the deficiency in actual data including expert judgement, general information, best guess estimates, available data from other areas or species, and plausible ranges for each of the axes of uncertainty. Natural mortality parameters were set between M =1 and M =2 to capture the probable range of mortality for a short- lived species. Yet, given the Dolphinfish's characteristic short life span, an M value of 1 is unlikely, although still plausible. A similar approach was used for parameterization of steepness, with values ranging from 0.65 to 0.95. Again, based on the species' biology, the actual steepness value (although virtually impossible to calculate in this case) is likely closer to the upper end of the defined range, although the lower value of uncertainty is not unrealistic.

Technical aspects of using a CV or standard deviation to describe/compare parameter distribution for M and steepness were discussed. Although, the difference is unlikely to have a significant impact on the model outcome, one or the other should be chosen and used throughout for consistency. Some concern was also expressed about the relationship between M and K that should be investigated further.

Catch levels of international discards and unreported catches were set at 50% and 100% of the reported values. While the range is fully plausible, there is an assumption that the reported values are correct and that these values cannot be exceeded. Consideration should be given to increasing the upper limit, although this is partly addressed in the robustness tests. Recruit level is based on historical estimates. It is assumed that the upper level is a maximum observed and the lower limit 75% of the maximum value. Given the observed changes in the stock, this is not an unrealistic range of plausible values for this highly productive, rapidly growing species. Finally, there is viscosity, or the tendency to stay put in a location, with a minimum level of 0.4 and a maximum level of 0.6 as used in the Reference case OMs. Alternative percentages outside the axes of uncertainty levels were explored and included in the robustness tests. It was also suggested during discussions that fish in the model should only move if required to balance the distribution. Again, the levels selected were realistic and plausible, but the influence of this within the VAST model could have significant implications on the outcomes for this highly mobile fish.

Overall, the axes of uncertainty accounted for a reasonable representation of the assigned/selected uncertainty and the range of levels within each axis were all plausible given the constraints imposed by the dearth of actual/direct data necessary to define a plausible range of levels within the axes of uncertainty.

Regarding OM plausibility weighting of the reference set, all OMs were weighted equally given the uncertainty of Dolphinfish characterization. Future development may want to include weighting, assuming the weighting resulted in an improvement in CMP tuning and performance outcomes.

The question was raised as to whether the “robustness of the operating model grid allowed the management procedure to fail”. This was not tested or presented at the review meeting.

3. Operating Model Conditioning

a. Did conditioning the operating model on available data result in simulated data with reasonable statistical properties relative to what would be available to the management procedure?

Conditioning of the operating models was undertaken in a series of sequential steps and an iterative process to accommodate the available data using the Rapid Conditioning Model (RCM). The model was aggregated and conditioned on an annual basis for a multi-fleet, spatially-aggregated, and the seasonal model summed for annual catches, the total VAST abundance index (all areas summed) and the fleet length composition data. These annual values were used to estimate the unfished recruitment (stock-wide productivity, scale), recruitments (per year and season), apical fishing mortality rate at age, and selectivity of the fleets. Spatial aggregation was explored for equilibrium yield, fits to the fleets and compared with the VAST with some limitations (failed to meet the extremes in some cases), but tracked the perceived recent declines. For the selected OMs, the catch - length composition data by fleet were reported to fit reasonably well. However, this is debatable based on the data presented, likely owing to the inconsistent and sparce input data (i.e., few length comps).

Another important aspect of the model conditioning was the characterization of movement and mixing. A mixing matrix (gravity and viscosity) was based on the VAST spatial model and the area retention of Dolphinfish. Here, again, there is uncertainty with the model outputs, and it is limited by the absence of reliable data upon which to validate the assumptions. Differences in the mixing model parameters could impact the OM conditioning although the fitting of the model and the VAST were nearly identical.

Given the consistency and relatively good fit of the evaluated parameters, it was concluded that the simulated data had reasonable statistical properties relative to what would be available to the management procedure. However, caution is warranted given the multiple layers of uncertainty associated with the models, the data, and the input parameters.

4. Evaluate MSE projections

a. Did the operating models project data that would be available to the management procedure?
b. Were projection assumptions reasonable and appropriate for the stock

(e.g., decisions about future parameter estimates and uncertainty; resampling approaches to generate future data; future nonstationary, productivity, etc.)?

A critical component of MSE projections is the continuous availability of the data used in the projection simulations in the future. Without these data, the annual projections cannot be considered complete and available for management, especially for a fishery such as Dolphinfish where the data are so sparce and there are no alternatives. Here, a single index of abundance (Standardized U.S. pelagic longline CPUE in area 1 (winter; Caribbean and S. Florida)) is used to represent change and assumed proportional to vulnerable biomass of the US commercial fleet. Without this index, evaluation of stock status would not be possible and management advice limited. Historical indices were fixed at the observed values. Other data sets (e.g., the MRIP, Puerto Rico Tournament, the blue Blob and ENSO) were explored as indices, but deemed unsuitable for a variety of reasons and are not recommended as a replacement or proxy for the primary index. Unless there is a change in the longline fishery, the necessary data will be available for MSE at least until the next review period.

Unfortunately, utilization of the standardized US pelagic longline CPUE index has several issues of its own. The index is based on the bycatches of Dolphinfish from a single area during the winter and is assumed to reflect proportional changes of the US commercial fleet used in the OM conditioning. Contained within this assumption are several levels of uncertainty. Yet, comparison of the observed and expected (simulated values) historical values show a reasonable level of consistency, with the latter tracking the former and minimal residual patterns over the years. Catches are not simulated but based on historical observations. There is also a lag in years related to management advice. Currently, there is a 1-year lag in management advice, but an interest in extending this timeframe to 3 years has been noted. In this case, catches would be held constant during the management interval for the simulations. Given the short life span (2-4 years) of Dolphinfish the shorter the interval the better. The management interval can have an influence on MP performance by preventing the fleet from taking advantage of changes in productivity. In-season management for this resource was determined to be unfeasible at the moment.

Overall, the projection assumptions are reasonable and generally appropriate for the stock given limited data availability. The primary assumption is that the future variability in distributions are consistent with the past. And, while this may be based on the best available scientific information (poor as it is) there are a lot of weaknesses associated with the limited available data. Future efforts should explore

mechanisms to improve all aspects of data collection (e.g., life history studies, biological sampling, tagging, catch reporting, etc.) and the potential development of a new index or indices of abundance for south Atlantic Dolphinfish.

5. Evaluate Performance Metrics

a. Do performance metrics include all legally mandated management objectives as outlined in the Magnuson-Stevens Fishery Conservation and Management Act (i.e., to include status determination criteria with suitable risk tolerance to measure probability of overfishing and overfished status; and rebuild overfished stock in accordance with rebuilding requirements)?

b. Did performance metrics sufficiently capture additional manager and/or stakeholder objectives to achieve optimum yield, if relevant (i.e., to include desired management objectives such as: total catch, catch rate, catch size, fishing opportunity/season length, etc.)?

Performance measures for Dolphinfish were established based on a series of stakeholder workshops to identify specific management objectives and their priority. These measures fell under 6 broad categories (Status, Yield, Stability, Catch Rate, Opportunity, and Fish Size) with their priority based on stakeholder input of sustainability, quality (fish size), catch rate and Yield (fish landed). Performance measures for these indicators were available within the mahiMSE package and available as output, but there remain a number of decisions to be made on the harvest strategy upon which to measure the performance under each category.

The report provided clear examples of how the performance indicator for each of the management objectives could be examined/evaluated within the MSE framework and that generally following standard protocols. Status was based on the probability of the stock being overfished (SSB/SSBmsy) or that overfishing (F/Fmsy) was occurring. Yield was evaluated using the average annual landings by fleet and area, allowing for spatial difference in stated management objectives, with stability measured as the absolute percent change in annual landings for each management update. Future catch rate was evaluated as a percentage the predicted catch rate relative to the 2022 rate, while opportunity was based on the proportion of years the landings met the ACL, while the size indicator was reflected by the average size caught by fleet and area. All of the above provided a mechanism to measure the mandated management objectives.

Performance comparisons were reported for each of the 6 proposed candidate management procedures (still in development) within the report. As is common, a

constant catch (status quo) scenario to illustrate following the current management approach was presented. This was followed by results for each CMP. One informative omission commonly provided for most MPs, that will be included in future reports, is the performance of a "0-catch" scenario to illustrate the maximum achievable results. The 0-catch scenario can be used to compare the impact of other management strategies to achieve the defined objectives. Several performance comparison tools (e.g., projections, trade-off, quilt plots) were shown to demonstrate how the individual CMP might be related/ranked to each other. In other words, how to quantitatively determine which MP wins. All of these approaches have been used in other MSE frameworks for qualitative and quantitative applications.

The Slick App, briefly presented at the meeting, provides a transparent, convenient and flexible tool for exploring and presenting MSE results to all, managers and stakeholders included. Links specific to the Dolphinfish MSE were provided to the Review Panel so they could explore and compare the multiple outputs.

Reference points and performance indicators were estimated following standard procedures used by other MSE frameworks. The question of whether or not the performance metrics include the legally mandated management objectives depends on how the criteria are defined. In most cases, the mandated objectives are based on traditional stock assessment analytical approaches that function on scale and output. MSY values for SSB, F and other critical measures are used to evaluate a stock in the real world. However, in the MSE context, the same outputs are obtainable, but estimated in the simulation space and do not have the same relevance. For example, an MP would produce multiple SSBmsy estimates, for each of the fleets and the reference set OMs. How they should be used, interpreted, or how the entire set is combined (e.g., mean or weighted) is up for debate and likely undefined under the management directives. Consequently, the MSE can produce management objective criteria to evaluate the stock status relative to conservation issues that are available within the MSE framework, but their meaning and interpretation could be different.

6. Evaluate candidate management procedures

a. Did the candidate management procedures only utilize data available for the stock in practice?

b. Did the management procedure explore management tools and controls that are applicable to the stock (e.g., appropriate management procedure archetype)?

c. *Were top-performing management procedures tuned to minimally achieve all satisficing criteria?*
d. *If empirical management procedure, does the MSE include a mechanism to periodically update stock status?*

Note that this MSE is not complete and is still in progress with the final analysis/report scheduled for later. However, six empirical CMPs were presented for illustrative purposes with management control options for catch limits, minimum size, slot limits and bag/trip limits. While the primary functionality of the mahiMP is to investigate options for setting TAC advice, the MP is flexible and has the ability to prescribe only fishing effort and effort and TAC combined. Other MP options include the following: longer management update intervals, additional indices, control rules specific to regions, MPs that use regional catches in addition to indices (availability), and alternative smoothing (polynomial smoothness or means) techniques.

Although the MSE is not finalized, the CMP candidate management procedures presented utilized mostly data available for the stock and explored management tools and controls that are applicable to the stock based on the stakeholder input. Top-performing management procedures tuned to minimally achieving all satisfying criteria were not evaluated but once determined they could be. No mechanism to periodically update stock status was identified but given the short life of Dolphinfish the updates it should be relatively short, likely on the order of 1-2 years.

In the end, there are far more analyses and decisions to be made before the process can be finalized and fully evaluated. An interesting outcome of the analyses to date is that an aggressive approach is required to impact the overall stock status for this apparently stable stock. However, a major contributor to this result is the large international fishery, the assumption of constant catches over time in the projections and the general biology of the Dolphinfish.

7. Comments on recommendations to improve the MSE

Throughout the Review meeting, recommendations were identified by the Panel to potentially improve the MSE on a topic-by-topic basis. These recommendations were tracked by the Panel Chair and will be documented in the SEDAR Review report currently in preparation. Unfortunately, the reviewers have not seen a draft of this report and thus cannot comment on the specific

recommendations. However, this reviewer would like to add or ensure that the following recommendations are identified for consideration.

- There is a real need to improve all aspects of data availability and collection for Dolphinfish to better inform the model and parameter estimates of the MSE.
- The MSE is hindered/restricted by the lack of indices of abundance (both fishery dependent and fishery independent) to track the stock's trajectory. Several suggested alternatives were proposed during the workshop review meeting, but all were basically dismissed. The recommendation is to develop or implement alternative indices of abundance that could be used in future updates.
- Explore options to improve estimates of International and unreported catches, as well as discards, to reduce the uncertainty associated with a large portion of the total Dolphinfish catch.
- Improve the biological sampling of Dolphinfish catches by fleet, region and season to better characterize the spatial and temporal variability of the US fisheries. Also, explore options to obtain data from the many foreign fleets actively pursuing this resource.
- Explore length-based models for evaluating the stock.
- Explore options to integrate environmental indicators into the assessment/MSE modeling, including the blue blob.

8. Review Workshop Summary Report describing the Panel's evaluation of the MSE and addressing each TOR

The Panel Chair has taken on the task of preparing the Review Panel's report with contributions from the individual reviewers and assistance with finalization of the report. The SEDAR review report was unfortunately unavailable prior to the completion of this CIE report.

In summary, the Dolphinfish MSE is limited/constrained by the lack of available data and strong dependence on the VAST model index. This can introduce a large amount of uncertainty into the evaluation process and procedure. Most inputs were essentially proxies, based on other fisheries or species. Furthermore, the majority of reported catches were from international waters and beyond US jurisdiction. Regardless, the MSE framework appears to encompass a large portion of the uncertainty associated with the resource and seems suitable to provide

management advice. The responsiveness of the model to MP options is, however, minimal except at extreme levels.

Appendix 1: Material provided before the review

Material previewed prior to the Atlantic Dolphinfish MSE workshop review are listed below. Additional material and links to other data/reports were provided for background during the meeting.

- SEDAR 104 Assessment Process Report: https://sedarweb.org/documents/sedar-104-atlantic-dolphinfish-management-strategy-evaluation-assessment-process-report/
- https://sedarweb.org/assessments/sedar-104-dolphin-management-strategy-evaluation/
- SEDAR 104 South Atlantic Dolphin MSE Review Workshop Terms of Reference.
- SEDAR 104 Atlantic Dolphinfish Management Strategy Evaluation SECTION I: Introduction. SEDAR 104 Atlantic Dolphinfish Management Strategy Evaluation SECTION II: Assessment Process Report – July 8, 2026.
- Project overview and supporting information: https://blue-matter.github.io/mahiMSE/
- Trial specifications document: https://blue-matter.github.io/mahiMSE/tsd/TSD.html
- Github repositories:
- Dolphin MSE repository (private data processing, OM generation, etc.): https://github.com/Blue-Matter/DolphinMSE
- mahiMSE repository (public-facing R package for dolphin MSE): https://github.com/Blue-Matter/mahiMSE | User manual: https://blue-matter.github.io/mahiMSE/tsd/docs/mahiMSE.html
- Reference and robustness set of OMs: https://github.com/Blue-Matter/mahiRefSet | https://github.com/Blue-Matter/mahiRobSet
- Shiny app: https://shiny.bluematterscience.com/app/slick | results object: https://blue-matter.github.io/mahiMSE/tsd/data/Slick/mahiSlick.rda

Appendix 2: Statement of Work (SOW)

Performance Work Statement (PWS)
National Oceanic and Atmospheric Administration (NOAA)
NOAA Fisheries
Center for Independent Experts (CIE) Program
External Independent Peer Review

SEDAR 104 Atlantic Dolphinfish Management Strategy Evaluation Review

July 28-31, 2026

Background

The NOAA Fisheries is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available (BSIA). NOAA Fisheries science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external scientific peer reviews have been and continue to be essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These expert(s) must conduct their peer review impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards[1].

Scope

The Southeast Fisheries Science Center (SEFSC), in collaboration with the South Atlantic Fishery Management Council (SAFMC), the Southeast Regional Office (SERO), Blue Matter Science, and others, have developed a full-stakeholder management strategy evaluation (MSE) for dolphin (e.g., dolphinfish, mahi, dorado) in the US Atlantic. The objective of the MSE is to develop empirical (indicator-based) candidate management procedures (MPs) for dolphin in the US Atlantic that meet legally mandated (e.g., Magnuson-Stevens Fishery Conservation and

[1] https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/memoranda/2005/m05-03.pdf

Management Act) and regionally-varying stakeholder-defined management objectives, such that they may achieve optimum yield. Dolphin in the US Atlantic are managed by SAFMC. The MSE is intended to be used to inform dolphin management, such that top performing candidate MPs will be proposed for use as Amendment alternatives to the Dolphin Wahoo Fishery Management Plan and be voted on for implementation by the SAFMC.
Before an MP may be enacted, the MSE used to derive candidate MPs must be deemed best scientific information available. The review panel is requested to review the scientific validity of the dolphin MSE. Unlike stock assessments (designed to provide a best estimate of stock status and for which diagnostics are of increased importance), MSE operating models are discrete hypotheses designed to encompass plausible uncertainty and are conditioned to ensure projected data are simulated with realistic uncertainty and variability.

The specified format and contents of the individual peer review reports are found in **Annex 1**. The Terms of Reference (ToR) of the peer review are listed in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3.**

Requirements

NOAA Fisheries requires 3 reviewers to conduct an impartial and independent peer review in accordance with the Performance Work Statement (PWS), OMB guidelines, and the ToRs below. The reviewers shall have expertise in management strategy evaluation, quantitative population dynamics, and fisheries simulation analyses.

The chair, who is in addition to the three reviewers, will not be provided by the CIE. Although the chair will be participating in this review, the chair's participation (e.g., labor and travel) is not covered by this contract.

Each reviewer will write an individual review report in accordance with the PWS, OMB Guidelines, and the TORs below. Modifications to the PWS and TORs cannot be made during the peer review, and any PWS or TORs modifications prior to the peer review shall be approved by the Contracting Officer's Representative (COR) and the CIE contractor. All TORs must be addressed in each reviewer's report.

Tasks for Reviewers

1) Pre-review Background Documents: Review the following background materials and reports prior to the review:

   Two weeks before the peer review, the NOAA Fisheries Project Contact will send by electronic mail or make available at an FTP site to the CIE reviewer all necessary background information and reports for the peer review. The CIE reviewer shall read all documents in preparation for the peer review, to include:

   - Trial specifications document
   - Github repository: https://github.com/Blue-Matter/DolphinMSE (note currently set to private, will be made public or shared with reviewers prior to review.)

- Shiny app: (html to be developed)

2) Attend and participate in an in-person review meeting. The meeting will consist of presentations by NOAA and other scientists, stock assessment authors and others to facilitate the review, to answer any questions from the reviewers, and to provide any additional information required by the reviewers.

3) After the review meeting, reviewers shall conduct an independent peer review report in accordance with the requirements specified in this PWS, OMB guidelines, and ToRs, in adherence with the required formatting and content guidelines. Reviewers are not required to reach a consensus.

4) Each reviewer shall assist the Chair of the meeting with contributions to the summary report.

5) Deliver their reports to the Government according to the specified milestones dates.

Foreign National Security Clearance

When reviewers participate during a panel review meeting at a government facility, the NOAA Fisheries Project Contact is responsible for obtaining the Foreign National Security Clearance approval for reviewers who are non-US citizens. For this reason, the reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days in advance. For additional information, please see the following link: https://www.commerce.gov/osy/programs/foreign-access-management. The contractor is required to use all appropriate methods to safeguard Personally Identifiable Information (PII).

Place of Performance
The place of performance shall be in Charleston, SC.

Period of Performance
Each reviewer's duties shall not exceed **14** days to complete all required tasks.

Schedule of Milestones and Deliverables: The contractor shall complete the tasks and deliverables in accordance with the following schedule.

Schedule	**Milestones and Deliverables**
Within 2 weeks of award	Contractor selects and confirms reviewers
Approximately 2 weeks prior to the review	Contractor provides the pre-review documents to the reviewers

July 28-31, 2026	Panel review meeting
Approximately 2 weeks later	Contractor receives draft reports
Within 3 weeks of receiving draft reports	Contractor submits final reports to the Government

* The Peer Review Summary Report will not be submitted to, reviewed, or approved by the Contractor.

Applicable Performance Standards

The acceptance of the contract deliverables shall be based on three performance standards: (1) The reports shall be completed in accordance with the required formatting and content (2) The reports shall address each ToR as specified (3) The reports shall be delivered as specified in the schedule of milestones and deliverables.

Confidentiality and Data Privacy

This contract may require that services contractors have access to Privacy Information. Services contractors are responsible for maintaining the confidentiality of all subjects and materials and may be required to sign and adhere to a Non-disclosure Agreement (NDA).

Travel

All travel expenses shall be reimbursable in accordance with Federal Travel Regulations (Travel resources | GSA), and all contractor travel must be approved by the COR prior to the actual travel. Any travel conducted prior to the receipt of proper written authorization from the COR will be done at the Contractor's own risk and expense. International travel is authorized for this contract. Travel is not to exceed $14,000.

NOAA Fisheries Project Contact

Cassidy Peterson
Management Strategy Evaluation Specialist
Southeast Fisheries Science Center
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Annex 1: Peer Review Report Requirements

1. The independent Peer Reviewer report shall be prefaced with an Executive Summary providing a concise summary of whether they accept or reject the work that they reviewed, with an explanation of their decision (strengths, weaknesses of the analyses, etc.).

2. The report must contain a background section, description of the individual reviewers' roles 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 must describe in their own words the review activities completed during the panel review meeting, including 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, but especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the summary report that they believe might require further clarification.

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

   e. The 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 report shall represent the peer review of each ToR, and shall not simply repeat the contents of the summary report.

3. The report shall include the following appendices:

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

Annex 2: Terms of Reference for the Peer Review

SEDAR 104 Atlantic Dolphinfish Management Strategy Evaluation Review

July 28-31, 2026

CIE reviewers are contracted to complete their independent peer review based on the ToRs. Therefore, the CIE-NOAA Fisheries review and approval process is based on whether the CIE independent reports addressed each ToRs.

1. Evaluate the types and ranges of uncertainty used in the MSE. Explicitly consider uncertainty in data, life history, process error, nonstationarity (i.e., environmental variability and oceanographic changes), and if appropriate, fishery dynamics.
    a. Were selected axes of uncertainty relevant to the stock and fishery and appropriately characterized? If relevant, were uncertainties highlighted by managers and stakeholders included?
    b. Did levels of uncertainty for each axis meaningfully and reasonably encompass plausible uncertainty?
    c. Were uncertainties appropriately classified into reference (primary) or robustness (secondary) set and sufficiently explained?
2. Evaluate the strengths and weaknesses of methods used to simulate the stock.
    a. Are methods to generate operating models scientifically sound?
    b. Did methods meet the needs of stakeholders and/or research questions (i.e., appropriate spatial resolution, time-step, ability to measure key performance statistics)?
    c. If data were unavailable to parameterize the model, were the assumptions used to overcome this limitation reasonable and/or multiple assumptions included as an axis of uncertainty?
    d. Was plausibility weighting of reference operating models appropriate and sufficiently justified?
    e. Does the robustness of the operating model grid allow the management procedure to fail?
3. Evaluate operating model conditioning.
    a. Did conditioning the operating model on available data result in simulated data with reasonable statistical properties relative to what would be available to the management procedure?
4. Evaluate MSE projections.
    a. Did the operating models project data that would be available to the management procedure?
    b. Were projection assumptions reasonable and appropriate for the stock (e.g., decisions about future parameter estimates and uncertainty; resampling

approaches to generate future data; future nonstationarity, productivity, etc.)?

5. Evaluate performance metrics.
    a. Do performance metrics include all legally mandated management objectives as outlined in the Magnuson-Stevens Fishery Conservation and Management Act (i.e., to include status determination criteria with suitable risk tolerance to measure probability of overfishing and overfished status; and rebuild overfished stock in accordance with rebuilding requirements)?
    b. Did performance metrics sufficiently capture additional manager and/or stakeholder objectives to achieve optimum yield, if relevant (i.e., to include desired management objectives such as: total catch, catch rate, catch size, fishing opportunity/season length, etc.)?
6. Evaluate candidate management procedures.
    a. Did the candidate management procedures only utilize data available for the stock in practice?
    b. Did the management procedure explore management tools and controls that are applicable to the stock (e.g., appropriate management procedure archetype)?
    c. Were top-performing management procedures tuned to minimally achieve all satisficing criteria?
    d. If empirical management procedure, does the MSE include a mechanism to periodically update stock status?
7. Provide or comment on recommendations to improve the MSE.
8. Prepare a Review Workshop Summary Report describing the Panel's evaluation of the MSE and addressing each TOR.

Annex 3: Tentative Agenda

SEDAR 104 Atlantic Dolphinfish Management Strategy Evaluation Review Workshop

July 28-31, 2026
Charleston, SC

Tuesday

8:30 am – 12:00 pm	**Introductions and Opening Remarks**	**Coordinator**
	- Agenda Review, TOR, Task Assignments	
	Project Presentations	**MSE Team**
	- *Clarifying questions*	
12:00 pm – 1:30 pm	**Lunch Break**	
1:30 pm – 5:00 pm	**Project Presentations (continued)**	**MSE Team**
	- *Clarifying questions*	
5:00 pm – 5:30 pm	**Public Comment**	**Chair**

Tuesday Goals: Part of initial presentations completed, requests for additional analysis identified.

Wednesday

8:30 am – 12:00 pm	**Project Presentations**	**MSE Team**
	- *Clarifying questions*	
12:00 pm – 1:30 pm	**Lunch Break**	
1:30 pm – 5:00 pm	**Panel Discussions**	**Chair**
	- MSE Team and Review Panel	
5:00 pm – 5:30 pm	**Public Comment**	**Chair**

***Wednesday Goals*:** Initial presentations completed. Summary report drafts begun.

Thursday

8:30 am – 12:00 pm	**Project Presentations**	**MSE Team**
	- *Clarifying questions*	
12:00 pm – 1:30 pm	**Lunch Break**	
1:30 pm – 5:00 pm	**Panel Discussions**	**Chair**
	- MSE Team and Review Panel	
5:00 pm – 5:30 pm	**Public Comment**	**Chair**

***Thursday Goals*:** Presentations completed, Summary report drafts continued.

Friday

8:30 am – 12:00 pm	**Panel Deliberations or Work Session**	**Chair**
	- *Recommendations and comments.*	
	- *Report writing*	

***Friday Goals*:** Finalize discussions, draft summary report reviewed.

Annex 4: Terms of Reference

SEDAR 104 South Atlantic Dolphin MSE
Review Workshop
Terms of Reference
FINAL: 3/6/2026

1. Evaluate the types and ranges of uncertainty used in the MSE. Explicitly consider uncertainty in data, life history, process error, nonstationarity (i.e., environmental variability and oceanographic changes), and if appropriate, fishery dynamics.
    a. Were selected axes of uncertainty relevant to the stock and fishery and appropriately characterized? If relevant, were uncertainties highlighted by managers and stakeholders included?
    b. Did levels of uncertainty for each axis meaningfully and reasonably encompass plausible uncertainty?
    c. Were uncertainties appropriately classified into reference (primary) or robustness (secondary) set and sufficiently explained?
2. Evaluate the strengths and weaknesses of methods used to simulate the stock.
    a. Are methods to generate operating models scientifically sound?
    b. Did methods meet the needs of stakeholders and/or research questions (i.e., appropriate spatial resolution, time-step, ability to measure key performance statistics)?
    c. If data were unavailable to parameterize the model, were the assumptions used to overcome this limitation reasonable and/or multiple assumptions included as an axis of uncertainty?
    d. Was plausibility weighting of reference operating models appropriate and sufficiently justified?
    e. Does the robustness of the operating model grid allow the management procedure to fail?
3. Evaluate operating model conditioning.
    a. Did conditioning the operating model on available data result in simulated data with reasonable statistical properties relative to what would be available to the management procedure?
4. Evaluate MSE projections.
    a. Did the operating models project data that would be available to the management procedure?

b. Were projection assumptions reasonable and appropriate for the stock (e.g., decisions about future parameter estimates and uncertainty; resampling approaches to generate future data; future nonstationarity, productivity, etc.)?

5. Evaluate performance metrics.
    a. Do performance metrics include all legally mandated management objectives as outlined in the Magnuson-Stevens Fishery Conservation and Management Act (i.e., to include status determination criteria with suitable risk tolerance to measure probability of overfishing and overfished status; and rebuild overfished stock in accordance with rebuilding requirements)?
    b. Did performance metrics sufficiently capture additional manager and/or stakeholder objectives to achieve optimum yield, if relevant (i.e., to include desired management objectives such as: total catch, catch rate, catch size, fishing opportunity/season length, etc.)?
6. Evaluate candidate management procedures.
    a. Did the candidate management procedures only utilize data available for the stock in practice?
    b. Did the management procedure explore management tools and controls that are applicable to the stock (e.g., appropriate management procedure archetype)?
    c. Were top-performing management procedures tuned to minimally achieve all satisficing criteria?
    d. If empirical management procedure, does the MSE include a mechanism to periodically update stock status?
7. Provide or comment on recommendations to improve the MSE.
8. Prepare a Review Workshop Summary Report describing the Panel's evaluation of the MSE and addressing each TOR.

Appendix 3: List of Review Panel Members

SEDAR 104 Review Panel Membership		
Name	Email	Affiliation
Daniel Howell	daniel.howell@hi.no	Institute of Marine Research, CIE
Ernesto Jardim	ernesto.jardim@gmail.com	Independent Consultant, CIE
Gary Melvin	gary.d.melvin@gmail.com	Independent Consultant, CIE
Jeffrey Buckel	jabuckel@ncsu.edu	North Carolina State University
Kelsey Roberts	kroberts6@umassd.edu	University of Massachusetts Dartmouth
Matt Damiano (Chair)	matt.damiano@deq.nc.gov	North Carolina Division of Marine Fisheries