Center for Independent Experts (CIE) Reviewer's Report on the SEDAR 58 Cobia Stock ID Review Workshop

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by

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1.0 Executive Summary:

The SEDAR 58 Cobia Stock Identification (ID) Review Workshop was held at the Crowne Plaza Hotel in North Charleston, South Carolina between June 5 and June 7, 2018. The purpose of the peer review was to review the conclusions and recommendations of the SEDAR 58 Stock ID Workshop on Cobia stock structure, unit stock definitions, boundaries, and to consider whether changes are required. The Review Workshop examined a broad spectrum of information on Cobia including data on genetic diversity, growth patterns, movement and migration, existing stock definitions, oceanographic and habitat characteristics. Approximately thirty people attended the three-day meeting.

The primary goal of the Stock ID Review Workshop was to determine, taking into consideration updated and available data, whether the stock structure and unit definition stock recommended by the SEDAR 58 Stock ID Workshop is reasonable and appropriate to use for the SEDAR 58 assessment unit stock. Currently, two Cobia stocks are recognized: (i) the Atlantic, and (ii) the Gulf of Mexico with the Florida/Georgia state line as the boundary for the allocation of catches for stock assessment purposes.

Stock structure recommendations/conclusions from the Stock ID Workshop were discussed under three main categories of data types: genetics, life history/biology, and spatial distribution/ movement. Specific recommendations were identified for each of these categories with an overall conclusion regarding the biological stock structure, boundary between the two stocks and zone of uncertainty as they related to the assessment of Atlantic Cobia in US waters.

The Review Panel agreed that the genetic data supports the SEDAR 58 Stock ID Workshop conclusion that there are two genetically distinct spawning stocks; one in the Atlantic (VA to Port Royal Sound, SC) and the other in the Gulf of Mexico (extending westward and north up to Fort Pierce, FL on the east coast of FL). The genetic data suggests a stock transition zone or zone of uncertainty between Savannah, GA and Brevard County, FL. The Review Panel also concurs with the conclusion that the available genetic data supports the current placement of the assessment unit stock boundary at the Georgia/Florida border.

The Stock ID workshop concluded that the life history data were generally insufficient to provide information on the stock structure of Cobia. Although most of the life history data examined provided no conclusive information (limited samples and spatial distribution) on Cobia stock structure, several Review Panel members felt that given the significant difference in size at age for some ages between the two areas, there was sufficient evidence to support different growth rates and the concept of two stocks.

Based on the available spatial distribution and movement information on Cobia, the Stock ID Workshop concluded that these data suggest at least two distinct biological stocks of Cobia; the Gulf of Mexico and the Atlantic biological stock. The location of the boundary between the two stocks is uncertain, but it likely occurs between the Brevard/Indian River, FL county line and the Glynn/Camden, GA county line. These data do not allow for further refinement of a regional scale biological stock boundary. The Review Panel agreed with the Stock ID Workshop conclusion that the data do not provide reason to move the current assessment or management boundary from the FL-GA border.

In summary, the Stock ID Workshop Review Panel concurs with the Stock ID Workshop's recommendations related to biological stock structure of Cobia (two distinct stocks), the assessment unit boundary and the management stock units recognizing that there is a zone of uncertainty or transition where the stock origin of fish is uncertain. Currently, there are insufficient data to justify adjusting the boundary between the two stocks given the uncertainty within the transition zone.

The Review Panel's report, which for all intents and purposes, is summarized in this report, represents the consensus view of the SEDAR Stock ID Review Workshop Panel. I fully concur with its content, recommendations, and conclusions. Overall, there were no major areas of disagreement between the Analytical team and the Workshop Review Panel, nor among members of the Panel.

2.0 Background:

Atlantic Cobia (*Rachycentron canadum*) is a pelagic species which occurs in warm waters throughout the world. Off the eastern USA, it is a valued recreational and commercial (by-catch) species that inhabits primary the inshore waters of the southern Atlantic and the Gulf of Mexico (GOM). However, recent information suggests that fish may overwinter in the offshore waters of the Carolinas. Spawning, which is temperature driven, is known to occur in both regions. Spawning begins in the Gulf of Mexico in March with peak spawning depending upon the area; May in Northern-central GOM and July in the eastern GOM. In the Atlantic, Cobia begin spawning in April, peaking in May in South Carolina through July in Virginia. Currently, two distinct biological stocks are recognized (the Atlantic and the Gulf of Mexico), but the fine scale geographical boundary between the two is unknown. There is also an area of uncertainty or transition along eastern Florida where fish from both stocks are commonly found. Movement between the two stocks appears to be limited. The last Cobia stock assessment was conducted under the South East Data, Assessment and Review (SEDAR) process, SEDAR 28, for the Gulf of Mexico in 2013 and the South Atlantic in 2012. Based on these assessments, both stocks are considered to be in relative good condition with no overfishing occurring and the stocks are not overfished. There remain, however, concerns about over-exploitation of a few local aggregations.

The SEDAR process provides a mechanism for an independent peer review of stock assessments and/or other technical issues prepared through SEDAR data, assessment and/or other procedural workshops. The main goal of these review workshops is to ensure that the assessment and/or other technical recommendations presented are scientifically sound and that they provide managers with adequate advice for the decision-making process. In this case, the focus was on an independent review of the Atlantic Cobia Stock ID workshop results, analyses, and conclusions/recommendations (SEDAR 58) held in North Charleston, South Carolina, in April of 2018. Under this process, an analytical team, composed of a subset of the Stock ID Workshop Panel, provided an overview of the data, analysis, and any feasible requests by the Review Panel for additional information/results at the review workshop. However, given the time allocated, there was limited scope for Review Panel requests for additional analyses, correction of existing analyses, or exploration of new datasets.

The Data Workshop (SEDAR 28) associated with the 2012/13 assessment, concluded that genetic and tagging data indicated the Gulf of Mexico and South Atlantic stocks of Cobia overlap in the waters to the east of Florida, with no distinct boundary separating the two stocks. However, for stock assessment purposes and the allocation of catches to one stock or the other, the workshop selected the Florida and Georgia state border as the line separating the two stocks. This decision was considered to be both convenient and consistent with genetic, tagging and life history data. There was also a change in 2015 in the Management boundary to be consistent with the stock assessment. The change in stock boundaries has led to concerns regarding the overall stock structure and eventually evolved into a requirement for a Stock ID Review Workshop prior to the next stock assessment scheduled for this year (2018) under SEDAR 58. The primary goal of the Stock ID Review Workshop was to review the conclusions/recommendations relating to Cobia stock structure and unit stock definitions resulting from the Stock ID Workshop, as well as to

consider whether changes are required as a result of updated and available data. Specific goals and objectives for both the Stock ID workshop and the Stock ID Review Workshop are identified in the terms of reference (Appendix IV).

The SEDAR 58 Stock ID Review Workshop Panel was composed of a Chair appointed by the Cooperator, two CIE (Center for Independent Experts) reviewers (an additional reviewer had a last-minute cancellation), and up to two additional SSC reviewers appointed by each SEDAR Cooperator who has jurisdiction over the stocks under review. A list of reviewers and participants is provided in Appendix III. Reviewers are selected to be independent and should not have contributed to the earlier stages of the Stock ID process under review, nor have a role in any management deliberations or actions that may stem from the Stock ID decisions/recommendations. All SEDAR workshops, including the Review Workshop, are open, transparent, and a public processes administered according to the rules and regulations governing Federal Fishery Management Council operations. The Stock ID Review Workshop Report will be distributed publicly along with the other SEDAR Workshop working papers and workshop reports upon completion of the workshop. The public may also submit written comments in accordance with Cooperator guidelines.

Prior to the Review workshop, panelists received the Stock ID Workshop Reports, supplemental analytical material (e.g., all working papers and reference documents from earlier workshops; as well as general information regarding the Review Workshop, which included the agenda, report outlines, terms of reference, and participant list. These documents were made available approximately two weeks in advance of the workshop. Review panelists were expected to have read and reviewed the material preceding their participation in the Workshop.

The tasks assigned to each SEDAR Workshop are defined in Terms of Reference approved by the SEDAR Cooperator(s) who have jurisdiction over the stocks under review. Upon completion of the Stock ID Workshop, the Review Panel has been preparing a Summary Report addressing each of the Terms of Reference (Appendix IV). Two reports have been prepared for this review. The Workshop Report, which is intended to reflect the views of the Review Panel as a whole and includes any dissenting views of individual panelists (whenever they occurred). Outlines and example documents for the report are provided by SEDAR staff. In addition, an independent Report is provided by each Center for Independent Experts (CIE) member that includes a section on background, description of the individual reviewers' roles in the review activities, Summary of findings under each TOR in which the weaknesses and strengths are described, and conclusions and recommendations in accordance with the TORs.

It is important to note that the following report to the CIE reflects my independent opinions and views on the issues and questions identified for the Stock ID Review Workshop in the terms of reference, the statement of work, and the above goals and objectives. The report is, however, generally consistent with the recommendations and conclusions of the other panel members and CIE reviewers expressed in the Workshop Report prepared by the Review Panel Chair. Overall, there was consensus on the interpretation and conclusions for each of the TORs among the panel members with no decision changing areas of disagreement.

3.0 Description of the individual reviewers' roles in the review activities

Center of Independent Experts (CIE) reviewers essentially serve two roles on the SEDAR 58 Cobia Stock ID Review Workshop Panel. First, to participate as a full panel member in the review of updated information, available data, procedures and methods/approaches used in the Stock ID workshop. And, second to provide an independent review of the recommendations and conclusions of the workshop related to Cobia stock structure.

To meet these requirements for the Stock ID Review Workshop a reviewer must have achieved recognition in several fisheries related fields. In this context, I am considered an expert in the assessment of small pelagic fish stocks, fisheries acoustics as applied to assessment of small and large pelagic fish, and their application to the management. Currently, I am a senior Research Scientist with the Canadian Department of Fisheries and Oceans responsible for the research and assessment of large and small pelagic fish species. In addition, I have spent more than 25 years as the lead for small pelagic stock assessment program. I have a B.Sc. M.Sc., and PhD in fisheries related fields and have served on several international stock assessment review groups. My PhD was on stock discrimination. 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. Currently, I am Chair of the ICCAT western Bluefin tuna assessment working group where the separation of the eastern and western stock is critical to the assessment.

Prior to the Review Workshop, the report of the Stock ID workshop, associated working papers and numerous background reports/documents provided by the SEDAR Coordinator, were reviewed. My primary role at the Cobia Stock ID Workshop Review as a CIE expert was to participate as an informed Review Panel member and to contribute to the discussions and recommendations on the available data on Cobia stock structure put forward by the analytical team. Once the meeting began, my main focus was on the material presented by the analytical team and the conclusions of the workshop related to stock structure. During the meeting, the Reviewers were expected to participate in the discussions, the conclusions, and to express their views on the various issues as they arise. The Reviewers were also expected to contribute to the Workshop Report as requested by the Chair. After the meeting, each Reviewer submitted (within a week) written individual comments on the TORs to the Workshop Chair, who in turn collated the material into a final Review Workshop report. As a CIE Reviewer, I also prepared this independent report on the Stock ID Workshop Review, the conclusion/recommendations regarding the Stock ID Workshop, and the SEDAR process.

4.0 Summary of findings for each TOR

In preparation for the SEDAR 58 Stock ID Review Workshop, documents SEDAR 58-SID-01 to SID-11 and reference documents SEDAR 58-RD01 to RD25 were provided by the SEDAR Coordinator. Two additional documents were provided during the Workshop to help clarify questions related to network analysis/diagrams used to describe acoustic telemetry data. A complete list of the documents provided by the SEDAR coordinator can be found in Appendix I. An interactive plot of the tagging data from Perkins et al. (SEDAR58-SID-05) was provided by Nikolai Klinansky to illustrate how the tagging data could be filtered for several aspects such as state and regions. Further information in the form of figures and graphs were also provided by the analytical team to supplement the information available in the genetic papers and acoustic telemetry analysis and presentation figures.

4.1 Review the recommendations of the SEDAR 58 Stock ID workshop.

The primary goal of the SEDAR 58 Stock ID Review Workshop was to review the conclusions and recommendations of the SEDAR 58 Stock ID Workshop on Cobia stock structure and unit stock definitions, and to consider whether changes are required. In this context the workshop examined a broad spectrum of information including data on genetic diversity, growth patterns, movement and migration, existing stock definitions, oceanographic and habitat characteristics. Specific details of the tasks assigned to the Stock ID Workshop can be found in the Terms of Reference (Appendix IV). The main outcomes from the Stock ID Workshop were to:

1) Make recommendations on the **biological** stock structure and the **assessment** unit stock or stocks.

2) Provide recommendations for future research on stock structure.

Recommendations from the Stock ID Workshop related to stock structure were discussed under three main categories of datatypes: genetics, life history/biology, and spatial distribution/ movement. Specific recommendations were identified for each of these categories with an overall conclusion regarding the biological stock structure, boundary between the two stocks and zone of uncertainty as they related to the assessment of Atlantic Cobia in US waters. Each category and their associated recommendations/conclusions are discussed below.

During the Stock ID Review Workshop, the analytical team provided summaries/presentations of the results, recommendations and conclusions for each of the categories identified above. This lead to a general discussion and detailed questions from the Review Panel related to the data quality, analysis, points of clarification and the conclusions/recommendations made by the Stock ID Workshop. Limited information was presented on oceanographic and habitat characteristics at the Review Workshop; consequently no recommendations were made related to how these factors may impact stock structure, other than spawning appears to be a function of water temperature.

4.1.1 Genetics

Several overviews were presented at the Cobia Stock ID Workshop Review on past and present genetic studies. In one study (SEDAR58-SID-03) microsatellite markers from 427 DNA samples

from the southern Atlantic, eastern Florida and the Gulf of Mexico were examined for differences; unfortunately, the majority of samples originated from Virginia and North Carolina. The data indicated statistically significant differences between samples from the Atlantic and the Gulf of Mexico were observed, but the results were considered non-conclusive for individual samples. The analyses also showed a great deal of overlap in the microsatellite constituents from the different areas. Due to spatially constrained data (a weakness of the data), additional sampling along eastern Florida and in the Gulf of Mexico was recommended.

By far the most extensive genetic study of Cobia, SEDAR58-SID-04, contained samples (2954 successfully genotyped) collected from throughout the species' range (a strength of the data). However, the samples were limited around the stock boundary area (Jacksonville, Florida to Brunswick, Georgia) and to some extent in the Gulf of Mexico (a weakness of the data). In addition to identifying two distinct stocks in the Southern Atlantic and the Gulf of Mexico, genotypic distributions and pairwise hierarchical RST statistics indicated that the offshore groups were genetically homogenous, while the inshore between South Carolina and Virginia showed some heterogeneity. The detection/suggestion of the two genetically distinct inshore aggregations (SC and VA) is new information, but is considered tenuous given the limited data. The authors discuss how these findings are related to known mixing offshore and how genetics may be used to identify overwintering areas for Cobia. These results are generally consistent with the popup satellite archival (PSAT) observations. The Review Panel agreed with the general conclusion of two distinct stocks and a transition zone, but could not agree with the potentially four distinct stocks the genetics data suggested. A number of sources of uncertainty or error were identified related to differences in the sub-regional distinct units. The Panel was informed that a restocking program has been ongoing for several years and that the releases have contributed up to 4.7% (ranged from <1% to 4.7% depending upon the year) of the total South Carolina population. Furthermore, genetics cannot identify offspring of hatchery fish (no genetic marker is carried forward to the next generation), so the released fish may have an undetected impact on genetic observations. Considering the distinctiveness of the SC grouping, the question as to whether or not stock enhancement can create genetically distinct groups was raised. While the technical group did not feel this was a major issue, the Review Panel felt there was insufficient information available for such a conclusion. Another concern was why should there be so much heterogeneity in the Atlantic and homogeneity in the Gulf of Mexico given the geographical separation of samples. The analytical team suggested that there was a hint of genetic differences in the Gulf of Mexico, but it was not well defined given the limited samples.

SEDAR58-SID-04 also showed strong support for estuarine fidelity based on genetic markers/tags. The report suggested a 2-tiered strategy, in which Cobia are managed regionally as a single population for the offshore fishery activities, but might also be managed at the local level (state management) for aggregation-specific to inshore fishing activities. The Review Panel did not address this suggestion, but this reviewer would recommend additional information be obtained and examined before this type of management approach is adopted.

Based on the genetic papers/studies and updated information since the Stock ID workshop, the Review Panel agreed that the genetic data supports the SEDAR 28 and the SEDAR 58 Stock ID

Workshop conclusion that there are two genetically distinct spawning stocks that occur in the Atlantic (VA to Port Royal Sound, SC) and Gulf of Mexico (extending westward and north up to Fort Pierce, FL on the east coast of FL) with spatial separation occurring within Cobia's geographic distribution. The recent genetic data also suggests a stock transition zone or zone of uncertainty along the east coast of the USA from Savannah, GA through Brevard County, FL. Unfortunately, there was a lack of data from this area, or when available, the data were limited.

Regarding current stock units and their boundary, the Stock ID Workshop concluded that the available genetic data supports the current placement of the **assessment unit** stock boundary at the Georgia/Florida border; however, acknowledges that the boundary may be south of the Georgia/Florida state line, but north of the Brevard/Indian River FL county border. The Review Panel agreed.

4.1.2 Life History

The Stock ID Workshop examined a number of life history characteristics to determine if there was evidence to support distinct stocks units. Specifically, the workshop explored three data types for differences among samples and regions; weight-length information, age and growth, and reproductive biology. The only new data presented at the Review Workshop since SEDAR 28 were length weight samples from fishery-dependent dockside sampling programs and fishery-independent surveys (very limited). No new data were available for age, growth or reproductive biology. This represents a weakness in biological sampling as there is very little data upon which to base the stock age structure or reproductive status. Furthermore, because the majority of samples were collected from the recreational fishery, the fish were mature when retained due to the minimum size restriction for retention. The fact that no new data are available for age and reproductive characteristics since 2011, and even when available sample size is small, is a concern and a weakness in the overall sampling program(s) approach.

Based on the available life history data, the Stock ID workshop concluded for length/weight that, although fish >1300mm FL were heaviest at larger lengths in the NJ-SC area, intermediate in AL-TX, and the lightest in eastern and western Florida, there were no biologically important differences throughout the range of Cobia in the U.S. Atlantic and Gulf of Mexico. A similar conclusion was reached for the reproductive biology of Cobia, in that these characteristics could not be used to define or support a distinct stock structure. In addition, there was a lack of data from the east coast of Florida and an absence of comprehensive information on spawning locations upon which to draw a conclusion.

Information on age and length was also limited for Cobia in both the Gulf of Mexico and the southern Atlantic (a weakness). The difference in observed maximum age by state/area of the Cobia showed a general decrease from north to south, but the Stock ID workshop felt these differences were likely more related to sample size than geographical difference. The Stock ID workshop report points to a significant relationship between sample size and maximum age. The Review Panel, however, suggested that this may not be a valid comparison/regression as even

small samples would be expected to have older ages if enough small samples were collected. In the end, the Review Panel agreed with workshop's conclusion that maximum age was not conclusive in identifying possible stock structure.

Comparison of size at age from the Atlantic and Gulf of Mexico samples indicated differences, significant at some ages, between the sexes and between the stocks. The stock ID workshop concluded that although there were differences in the size at age, there was not enough data to definitively define Cobia stock structure or support two separate stocks. The primary reason was the limited data specifically from the GOM and east coast of Florida. The Review Panel disagreed with the Stock ID Workshop's conclusion. Review Panel members felt that given the significant difference in size at age for some ages between the two areas, there was sufficient evidence to support different growth rates and the concept of separate stocks.

4.1.3 Spatial Distribution/Movement:

To investigate the distribution and movement of Cobia, the Stock ID Workshop considered and analyzed a combination of data from conventional tagging, acoustic tagging, satellite tagging, commercial catch data, and fishery-independent collections (e.g., larval surveys). The conventional tagging data represents by far the largest dataset available to date with just under 26,000 fished tagged and 2,000 returns between 1986 and 2017 (a strength). In general, fish tagged within the geographical boundaries of the Atlantic Stock were returned from the stock and fish tagged in the Gulf of Mexico (GOM) were returned from the GOM, with only a few exceptions (a strength). These results support the concept of two distinct **biological** stocks. Conventional tagging also identified a zone of uncertainty or transition zone where stock origin was unknown and specific boundaries could not be determined due to limited tagging in the vicinity of the current stock boundary. Fish tagged off eastern Florida were recovered in both the Gulf of Mexico and the Atlantic stocks.

Acoustic telemetry and popup satellite archival (PSAT) tagging programs for Cobia are only in the early stages of deployment with few tags having been released. As well, research effort which began in 2017 has primary focused on fish in Virginia and North Carolina. No telemetry or PSAT tags are known to have been applied to Cobia in the Gulf of Mexico (a weakness). Concerns and limitations of the data for telemetry are primarily related to the distribution of detection arrays, and for PSAT the time delay associated with the release/transition of the data and in some cases the need to recover the tag. Most acoustic arrays (i.e., listening receivers) are located in the near shore waters along the coast and there are very few receivers in the vicinity of the current stock boundary (i.e., Florida/Georgia state border). Although the telemetry/PSAT data are only available for a short period of time, they are consistent with the conventional tagging information and the information supports distinct **biological** stocks. In addition, the data to date indicate the possible occurrence of an overwintering area in the offshore of NC/SC that other data sources had not detected, as well as some potential sub-structure in the inshore waters. Future research and continuing acoustic data collections will hopefully provide better spatial resolution on the location of a regional **biological stock** boundary between the Gulf of Mexico and Atlantic.

By-catch of Cobia from the commercial fishery represents about 10% of the overall catch. Logbook data illustrate where the fish are being caught and the season, but provide no useful information on the stock structure. Fish are caught commercially in both stock areas and the transition zone. In fact, the largest catches of Cobia are taken throughout the year along east Florida. As with most of the other datasets, there is limited data around the current stock boundary (a weakness). The Stock ID workshop also examined larval survey data to determine if information could be extracted regarding stock structure. Unfortunately, larval surveys with information on Cobia larvae were restricted to the Gulf of Mexico, confirming spawning in several areas of the Gulf, but virtually nothing in the Atlantic (a weakness). This was considered primarily due to the timing of available surveys not matching the Cobia spawning season in the Atlantic.

Based on the available Cobia spatial distribution and movement data, the Stock ID Workshop concluded, mostly based on the tagging information (conventional, telemetry and PSAT), that the data suggests at least two distinct biological stocks of Cobia; the Gulf of Mexico and the Atlantic biological stock. However, where the stocks' boundary is actually located is uncertain, but it likely occurs between the Brevard/Indian River FL county line and the Glynn/Camden GA county line. The current resolution of the conventional and acoustic tagging datasets does not allow for further refinement of a regional scale biological stock boundary. The Workshop recommended additional tagging resources in the zone of uncertainty to better refine a regional scale biological stock boundary. The workshop also noted for the Atlantic stock that there may be potential site fidelity and limited exchange between areas.

As with the other data types, the distribution and movement data suggested a zone of uncertainty were the true boundary was likely to occur, but the interchange between groups is not well characterized and little if any data are available. Based on this, the Stock ID workshop concluded that the data do not provide reason to move the current **management** boundary from the FL-GA border. Future research may help to address this issue.

4.2. Determine whether the stock structure recommended by the SEDAR 58 Stock ID Workshop is reasonable and appropriate to use for the SEDAR 58 assessment unit stock.

4.2.1 Inclusion of data

Based on the Stock ID Workshop report and the Review workshop, a comprehensive and broad spectrum of data types from multiple datasets were examined for information on Cobia stock structure. When asked the analytical team reported that all available and relevant data on Cobia stock structure were considered in the most recent information presented to the Review Panel. However, due to limited samples or sampling (temporal and/or spatial) some datasets were excluded from the analyses. The Review Panel felt the report should be more explicit on how the decision was made to include or exclude data in the analysis. The analytical team explained that several datasets were examined in detail but provided little or no useable information on Cobia to support stock structure (e.g. Bottom trawl surveys from several sources), so they were excluded

from the analyses. The Review Panel continued to inquire about the data types and sources and was informed that the Stock ID workshop did not just rehash data used in SEDAR 28, but included a significant amount of new information. While the Review Panel considered the analytical team to have undertaken an extensive search for data which could contribute to the question of stock structure and potential boundaries, two datasets were identified as not having been included/considered (likely due to availability at the time of the workshop) that may contain information on stock structure and distribution of Cobia: Vessel Trip Reports (VTR) and the commercial Observer databases. The extent of information in these datasets related to Cobia was unknown but the Review Panel suggested that they be examined in the future to ensure valuable information was not being missed. Overall, the Review Panel felt that the data covered the three key areas of life history, genetics, and spatial (distribution and movement) and represent the most up to date and available data for investigating Cobia stock structure, with the above exceptions.

4.2.2 Data analysis

The analyses employed in the Stock ID Workshop generally followed standard analytical procedures associated with the data being examined. Details of the specific analyses were provided in the support documents available to the review Panel (Appendix I). Furthermore, the technical group stressed and acknowledged the limitations of the data given the sometimes small sample size and/or the limited geographical distribution of sampling. There were a number of new (to some Review Panel members) visualization tools (network plots and Population ancestry plots) used to present the acoustic telemetry and genetic data which were challenging for some to understand. A fair amount of the discussions centred on the interpretation of these figures and how they related to the results/conclusions. This was in part due to the fact that the CIE Reviewer with genetic expertise could not attend due to a last minute medical issue. Explanations on the network analysis and plots were provided by the technical team with some outside assistance. This vastly improved the Review Panel's understanding of the figures and how specific conclusions were reached. The genetic explanation was a little less clear and although some members of the Panel felt comfortable, certain aspects of the summaries remained unclear to those unfamiliar with genetic analysis. Part of the problem was the decision on how the number of populations (2 vs 4) were determined, and that the figures showed a somewhat subjective interpretation of separation while the statistics (AMOVA) indicated a statistical difference, but with little of the variance being explained by the genetic data. The end result was the Review Panel agreed with the conclusions regarding stock structure involving the Gulf of Mexico (GOM) and the Atlantic stock, but was less convinced about the sub-regional populations. There was some evidence of a sub-regional break between SC and offshore, as well as a hint of possible sub structure in the GOM, but the sample sizes were small and could be misleading.

The analytical team also went to great efforts to explain the figures and how to interpret the outputs. In fact, an external authority was contacted, at the request of the Review Panel, to provide a more detailed explanation of the network plots and the analysis. Regarding requests for additional information, the assessment team met all requests but one. In this case, a request was made by a Panel member to obtain the numbers at age from the last Gulf of Mexico stock assessment (available in the South Atlantic assessment report, but not in the GOM report) to

compare if strong or weak year-classes could be tracked and/or co-occurred through-out the time series. The implication being that if they were different, it would indicate independent stocks. The request was not completed as it was felt it was outside the TORs for the Review workshop.

4.2.3. Appropriateness of conclusion regarding recommended stock units and associated spatial structure.

Overall, the Stock ID Review Workshop agreed with the SEDAR 58 Cobia Stock ID Workshop Panel's recommendation "that Cobia be considered two distinct **biological** stocks at the regional scale: the Gulf of Mexico stock (south of Brevard/Indian River FL county line) and the Atlantic stock (from north of Glynn/Camden county GA line)" with "the stock separation occurring within a transition zone, ranging from the southern boundary of Brevard County, FL to Brunswick, GA (a range of ≈370km)". The location of the boundary separating the two stocks is unknown, primarily due to the limitations of the available data. Furthermore, given that the Workshop included most available data (see above), this situation is unlikely to change until such time as new and additional data become available.

Regarding the assessment stock units, the Review Panel agreed with the Stock ID workshop recommendation that "Cobia be considered two **assessment** unit stocks: The Gulf of Mexico stock and the Atlantic stock and that the data supports a separation within a transition zone between Brevard County, FL to Glynn/Camden County, GA". However, the data were insufficient "to identify a specific boundary within this transition zone to separate the two biological stocks". The Review Panel also agreed with the Stock ID Workshop's recommendation that the current management boundary at the FL/GA line, which lies within the transition zone, be used as a boundary between the Gulf of Mexico and the Atlantic **assessment** unit stocks.

Although there was general agreement with the Stock ID Workshop recommendations and conclusions, there were a number of statements where the Review Panel disagreed and/or had a different interpretation of the data. For the life history data, the Review Panel considered the conclusion that the life history information provided no insight or support for the recognition of two biological distinct stocks (populations) as inappropriate. Based on the information provided, the Review Panel felt that there were sufficient differences in growth rates (size at age) between the samples collected in the Gulf of Mexico and the Atlantic to suggest separate stocks. In general, the maximum age, from limited samples, decreased from north to south, however, the Stock ID Workshop suggested that these differences were not attributed to stock biological attributes, and speculated them to be a function of sample size. The regression of maximum age against sample size showed a difference between stocks that was assumed by the Stock ID Workshop to be more related to sample size than a biological characteristic. Although, the analysis of maximum age and sample size produced a significant relationship, it was considered inappropriate by the Review Panel. The Panel noted that small samples (i.e., samples with few fish) could also contain older fish if enough samples were examined. Other life history features, such as reproductive characteristics, were felt to have contributed no conclusive information related to stock structure,

due to the small sample size, and stock delineation. For maturity, the issue was related to the source of the samples and the minimum size regulations. Most samples were obtained from the recreational fishery and the onset of maturity is known to occur at lengths less than the legal minimum size for retention.

The Stock ID workshop expressed a major concern about the amount of available data (samples and size) upon which to develop life history characteristics. For almost every life history characteristic examined the observed differences were attributed more to small sample sizes and limited spatial coverage than stock features. This reviewer feels that an important recommendation would be to improve the biological sampling and coverage of Cobia throughout its range in the Southern US, especially in the zone of uncertainty between the two stocks.

The Review Panel agreed with the Stock ID workshop's conclusion that the life history data did not provide any criteria, due to the small sample size and limited spatial coverage, to suggest changes to the existing stock structure identified in SEDAR 28; nor to address the placement or refining of the boundary between two stocks.

The Review Panel agreed with the recommendations on **biological** stock structure and zone of uncertainty between the two stocks based on the genetic evidence. However, it was noted that the evidence, although significantly different, was weak for some of the analyses that identified distinct groups. There was a fair amount of overlap in the genetic diversity between regions. STRUCTURE, F_{ST}, and AMOVA analyses supported genetically distinct Atlantic (South Carolina and northward) and Gulf of Mexico (Texas to Ft. Pierce, Florida) groupings as representing separate biological populations with a zone of uncertainty along eastern Florida from Cape Canaveral north into Georgia. Determination of the break points in the structure plots were clear in some cases/locations, but subjective for others. The Panel did not concur that the evidence supported potentially four different genetic groups including inshore/offshore genetic groups off the Carolinas. Concern was also expressed about the impact the SC hatchery reared Cobia release program had on the genetic diversity and the determination of structural break points.

The Review Panel also agreed with the recommendation that "Nothing in the genetic analyses refutes the current placement of the **assessment** unit stock boundary at the Georgia/Florida border; however, the actual boundary could not be refined based on the genetic data due to sampling limitations". The boundary may be south of the Georgia/Florida border, but north of the Brevard/Indian River FL county border).

The Review Panel agreed with the Stock ID Workshop's recommendations based on spatial distribution and movement evidence. The tagging data (conventional, telemetry, and PSAT) supports at least two distinct **biological** stocks of Cobia at the regional scale, the Gulf of Mexico stock and the Atlantic stock. Where the separation between the two stocks occurs is uncertain, but likely occurs between the Brevard County line, Florida, and Brunswick, Georgia. Unfortunately, the current resolution of the conventional and acoustic tagging datasets did not allow for further refinement of a regional scale biological stock boundary. Furthermore, there is evidence of multiple sub-regional biological stocks within the Atlantic, based on site fidelity and

limited exchange between areas. New information in the coming years from the telemetry and PSAT will hopefully shed some insight on this matter.

In summary, the Stock ID Workshop Review Panel concurs with the Stock ID Workshop's recommendations related to biological stock structure (two distinct stocks), assessment boundaries, and management stock units, recognizing that there is a zone of uncertainty or transition where the stock origin of fish is uncertain.

5.0 Conclusions and Recommendations in accordance with the TORs.

5.1 Comments on the NMFS/SEDAR Review Process:

The last stock assessment for Cobia was conducted in 2012 (SEDAR 28) and concluded that neither the Atlantic nor the Gulf of Mexico stock was overfished, and that overfishing was not occurring. At this stock assessment, the state line between Florida and Georgia border was selected as the boundary for separating the two stocks and for the allocation of catches to one stock or the other. The workshop pointed out that this decision was both convenient and consistent with genetic, tagging, and life history data. It did, however, acknowledge the uncertainty associated with Cobia stock structure and recommended a review of the available data on genetics, life history, spatial distribution, and movement patterns, thus leading to the SEDAR 58 Stock ID Workshop prior to and in preparation for the 2018 Cobia benchmark stock assessment.

Currently, catches of Cobia in the recreational fishery represent about ten times those taken in the commercial fishery, where it is primarily a by-catch. Total annual catch limits (ACLs) are 305mt for the Atlantic stock, 422mt for the east coast of Florida and 753mt for the Gulf of Mexico. Regulations associated with take, minimum size, and ACL vary from state to state. The mid-Atlantic recreational landings have increased substantially in recent years. Some have attributed the increased landings to an increase in abundance while others have observed an increase in the number of small fish in specific areas. Another possible explanation is that the fish are moving further north in response to environmental changes making them more accessible to recreational fisheries. Unfortunately, there was no new data available to support any of these contentions. In essence, there is no notable reason for the increases in 2015 and 2016 catches. The biggest increase came from Virginia where it is becoming a popular fishery.

Regardless of the cause, over the past several years the estimated recreational catches have exceeded the allowable catch limits in some areas. This has resulted in the closure of several recreational fisheries along the US eastern seaboard, especially in federal waters. Furthermore, there was limited distributional information on recreational catches except on a very broad scale (e.g., East/west Florida). No information on the monthly/seasonal recreational landings were available, especially in the zone of uncertainty. During the discussion of landings, concern was expressed about potential over exploitation of spawning components within the overall Atlantic

stock (South Carolina in particular and also possibly in Chesapeake Bay). Again, no data were presented to support this contention.

SEDAR 58 is the 2018 benchmark assessment process for Atlantic Cobia. Under the SEDAR process, a benchmark assessment is required for the first application of a new assessment approach or methodology for a stock. Overall the NMFS/SEDAR process provides a mechanism for a robust and rigorous evaluation of the data and methods, and generally includes an independent peer review. Whether or not the Cobia Stock ID Workshop and the Stock ID Review Workshop were both required is subject to debate. Several of the Review Panel members considered the Review somewhat redundant with the Stock ID Workshop given the similar conclusions/ recommendations. In the case of the Stock ID Review Workshop it may be true as the Review Panel was generally in agreement with the workshop outputs. Yet, consider the situation where there are major differences in opinion on the outcomes of a particular workshop.

The SEDAR process is flexible enough to allow for an independent review of the available data, the analyses and the conclusions, presumably by an unbiased Review Panel which produces a consensus report on the stock issues. Dissenting opinions are also documented in the report. The SEDAR process also serves an important function in the stock assessment process in that it is open and transparent. While improvements in the overall SEDAR approach are always possible, the changes for improvement will likely be more species dependent than global. I have no recommendations for improvements at this point in time as I feel the process has achieved its primary goals and objectives.

The Review Panel asked if something specific triggered the SEDAR review of the Stock ID workshop. In essence the response was that there were constituent concerns over the stock boundary decision, recent closures, and the 2015 management boundary change. Some questioned whether or not the division was appropriate or even in the correct place based on the available data. Combining the recommendations from the SEDAR 28 stock assessment, the changing recreational catch patterns and closures, with uncertainty of stock structure and the amended stock definitions, a strong need was identified for a review of the available and up to date data on Cobia stock structure. In addition, given the uncertainty about stock structure, the concerns related to the fishery and sampling, and the need for these issues to be resolved prior to the assessment workshop, SEDAR 58 included a Cobia Stock ID Workshop in April of 2018 and a formal review of the workshop (SEDAR 58 Cobia Stock ID Review) in June of 2018.

5.2 Recommendations and Conclusions.

Overall, the analytical/technical team provided excellent summary of the workshop data, results, and conclusion/recommendations. Each of the conclusions/recommendations resulting from the Stock ID workshop is discussed in detail in Section 4. While there were a few slight differences of opinion between the Review Panel and the Workshop on the interpretation of some results, there was nothing that would affect the overall conclusions reached by the Stock ID workshop. There is sufficient evidence to identify two distinct biological stocks of Cobia; the Atlantic and the Gulf of Mexico with zone of uncertainty along the east coast of Florida. Furthermore, based on the

available data there is insufficient information and inconclusive data to recommend a change in stock boundaries or catch assignment for the upcoming assessment. The current boundary lies within the zone of uncertainty and the available information is not precise enough to recommend an alternative at this point in time.

Throughout the Review, the technical team stressed the lack of information related to discerning stock structure, especially in northern Florida and Georgia. Most research programs were geographically constrained and biological sampling limited and mostly opportunistic, with little consideration for the structure or the data issues. A major recommendation resulting from the Workshop is the need for increased sampling that covers the geographical range of the species in the USA. Future PSAT and acoustic tagging programs and genetic research may help to delineate the stock boundaries and movement within and between stocks, but at the moment they do not. It is this Reviewer's opinion that increased deployment of new acoustics arrays in the offshore waters may not be the best approach and would be expensive to maintain. An alternative may be to consider tagging in the offshore and expand the array system in the inshore waters where they are easier and cheaper to maintain.

DISCLAIMER

Appendix 1: Bibliography of materials provided for review

SEDAR 58
Atlantic Cobia
Workshop Document List

Document #	Title	Authors
SEDAR58-SID-01	Predicting the distribution of cobia, Rachycentron canadum, seasonally, for mid-century, and for the end-of-century.	Crear et al. 2018
SEDAR58-SID-02	Use of Pop-Up Satellite Archival Tags (PSATs) to Investigate the Movements, Habitat Utilization, and Post-Release Survival of Cobia (Rachycentron canadum) that Summer in Virginia Waters	Jensen & Graves, 2018
SEDAR58-SID-03	Summary results of a genetic-based investigation of cobia (Rachycentron canadum).	McDowell et al., 2018
SEDAR58-SID-04	Population Genetic Analysis of Cobia within U.S. Coastal Waters.	Darden et al., 2018.
SEDAR58-SID-05	Evaluation of cobia movements using tag recapture data from the Gulf of Mexico and South Atlantic coast of the United States.	Perkinson et al., 2018.
SEDAR58-SID-06	Summary Report of the North Carolina Division of Marine Fisheries Cobia (Rachycentron canadum) Acoustic Tagging.	Poland, 2018.
SEDAR58-SID-07	A brief summary of scientifically collected distribution data for cobia (Rachycentron canadum) in US waters of the Atlantic and Gulf of Mexico.	Klibansky, 2018.
SEDAR58-SID-08	Cobia Telemetry Working Paper	Young et al., 2018.

	(revised 4/10/2018)	
SEDAR58-SID-09	Distribution and abundance of cobia (Rachycentron canadum) larvae captured in ichthyoplankton samples during National Marine Fisheries Service and Southeast Area Monitoring and Assessment Program fishery-independent resource surveys.	Hanisko et al., 2018.
SEDAR58-SID-10	Spatial and Temporal Distribution of Cobia, Southeast US and Gulf of Mexico'	Wrege, 2018.
SEDAR58-SID-11	VIMS Cobia Tagging Program.	Weng et al., 2018
SEDAR58-SAR1	Assessment of Atlantic Cobia.	
SEDAR58-RD01	SEDAR 28 South Atlantic Cobia Stock Assessment Report	SEDAR 28
SEDAR58-RD02	SEDAR 28 Gulf of Mexico Cobia Stock Assessment Report	SEDAR 28
SEDAR58-RD03	List of documents and working papers for SEDAR 28 (South Atlantic Cobia and Spanish Mackeral) –all documents available on the SEDAR website.	SEDAR 28
SEDAR58-RD04	Managing A Marine Stock Portfolio: Stock Identification, Structure, and Management of 25 Fishery Species along the Atlantic Coast of the United States.	McBride, 2014.
SEDAR58-RD05	Chapter 22: Interdisciplinary Evaluation of Spatial Population Structure for Definition of Fishery Management Units (excerpt from Stock Identification Methods – Second Edition).	Cadrin et al., 2014.
SEDAR58-RD06	Mitochondrial DNA Analysis of Cobia Rachycentron canadum Population Structure Using Restriction Fragment Length Polymorphisms and Cytochrome B Sequence Variation.	Hrincevich, 1993.

SEDAR58-RD07	Population Genetic Comparisons among Cobia from the Northern Gulf of Mexico, U.S. Western.	Gold et al., 2013.
SEDAR58-RD08	Population genetics of Cobia (Rachycentron canadum): implications for fishery management along the coast of the southeastern United States.	Darden et al., 2014.
SEDAR58-RD09	Growth, mortality, and movement of cobia (Rachycentron canadum).	Dippold et al., 2017.
SEDAR58-RD10	Assessment of cobia, Rachycentron canadum, in the waters of the U.S. Gulf of Mexico.	Williams, 2001.
SEDAR58-RD11	Life history of Cobia, Rachycentron canadum (Osteichthyes: Rachycentridae), in North Carolina Waters.	Smith, 1995.
SEDAR58-RD12	A review of age, growth, and reproduction of cobia Rachycentron canadum, from US water of the Gulf of Mexico and Atlantic ocean.	Franks and Brown Peterson, 2002.
SEDAR58-RD13	An assessment of cobia in Southeast US waters.	Thompson, 1995.
SEDAR58-RD14	Reproductive biology of cobia, Rachycentron canadum, from coastal waters of the southern United States.	Brown-Peterson et al., 2001.
SEDAR58-RD15	Age and growth of cobia, Rachycentron canadum, from the northeastern Gulf of Mexico.	Franks et al., 1999.
SEDAR58-RD16	Synopsis of biological data on the cobia Rachycentron canadum (Pisces: Rachycentridae).	Shaffer and Nakamura, 1989.
SEDAR58-RD17	Age, growth, and reproductive biology of greater amberjack and cobia from Louisiana waters.	Thompson et al., 1991.

SEDAR58-RD18	Cobia (Rachycentron canadum) stock assessment study in the Gulf of Mexico and in the South Atlantic.	Burns et al., 1998.
SEDAR58-RD19	Gonadal maturation in the cobia, Rachycentron canadum, from the northcentral Gulf of Mexico.	Lotz et al., 1996.
SEDAR58-RD20	Length-weight relationships, location and depth distributions for select Gulf of Mexico reef fish species.	Pulver & Whatley, 2016.
SEDAR58-RD21	Inshore spawning of cobia (Rachycentron canadum) in South Carolina.	Lefebvre & Denson, 2012.
SEDAR58-RD22	Determining the stock boundary between South Atlantic and Gulf of Mexico managed stocks of Cobia, Rachycentron canadum, through the use of telemetry and population genetics.	Perkinson et al., 2018.
SEDAR58-RD23	SAFMC Mackerel Cobia Advisory Panel and Cobia Sub-Panel Cobia Fishery Performance Report April 2017 SAFMC Mackerel Cobia AP & Cobia.	Sub-Panel, 2017.
SEDAR58-RD24	Spawning of the Cobia, Rachycentron canadum, in Joseph et al. 1964 the Chesapeake Bay Area, with Observations of Juvenile Specimens.	
SEDAR58-RD25	SEDAR28-DW02: South Carolina experimental stocking of Cobia Rachycentrom canadum	Denson, 2012.
SEDAR58-RD26	Applying network methods to acoustic telemetry data: Modeling the movements of tropical marine fishes.	Finn et al., 2014.
SEDAR58-RD27	Developing a deeper understanding of animal movements and spatial dynamics through novel application of network analyses.	

Appendix II: Statement of Work:

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

SEDAR 58 Cobia Stock ID Review

Background

The National Marine Fisheries Service (NMFS) 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). NMFS 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. Further information on the Center for Independent Experts (CIE) program may be obtained from www.ciereviews.org.

Scope

The South East Data, Assessment, and Review (SEDAR) is the cooperative process by which stock assessment projects are conducted in NMFS' Southeast Region. SEDAR was initiated to improve planning and coordination of stock assessment activities and to improve the quality and reliability of assessments. The SEDAR 58 Cobia Stock ID Workshop will review and evaluate all available and relevant information on Cobia stock structure to develop recommendations for

the biological and assessment unit stock structure in advance of the Atlantic and Gulf of Mexico Cobia stock assessments. The review workshop will provide an independent peer review and determine whether the stock structure recommendations from the Stock ID Workshop are reasonable and appropriate to use for the SEDAR 58 Cobia assessment. In making this determination, the reviewers would be asked to consider whether available scientific data have been taken into account and analyzed properly by the Stock ID Workshop, and whether conclusions based on those data are reasonable given the current fisheries data – considering inclusion of data, data analysis, and appropriateness of conclusions regarding recommended stock unit(s) and associated spatial structure. The Stock IDProcess will include the jurisdictions of the South Atlantic Fishery Management Council, Mid-Atlantic Fishery Management Council, Gulf of Mexico Fishery Management Council, Atlantic States Marine Fisheries Commission, and the states of Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Virginia, Pennsylvania, New York, New Jersey, Maryland, Delaware, and New York. . The specified format and contents of the individual peer review reports are found in Annex 1. The Terms of Reference (TORs) of the peer review are listed in Annex 2. Lastly, the tentative agenda of the panel review meeting is attached in Annex 3.

Requirements

NMFS requires three (3) reviewers to conduct an impartial and independent peer review in accordance with the PWS, OMB guidelines, and the TORs below. The reviewers shall have a working knowledge in the application of fisheries stock identification and stock structure, fisheries stock assessment processes and results, fisheries science, and marine biology sufficient to complete the primary task of providing peer-review advice in compliance with the workshop Terms of Reference. Additionally, it will be helpful if the reviewers have a working knowledge of genetics and tagging (tag/recapture, acoustic telemetry, satellite tagging, etc.) data and analyses.

Tasks for Reviewers

1) Review the following background materials and reports prior to the review meeting:
SEDAR 58 Stock ID Workshop Report, Working Papers, and Reference Documents

- The SEDAR 58 Cobia Stock ID Workshop Report, working papers and reference documents will be available on the SEDAR website at the link below http://sedarweb.org/sedar-58-stock-id-process

2) Attend and participate in the panel review meeting. The meeting will consist of presentations by representatives from the Stock ID Workshop (to include NOAA, state agency, and university scientists) 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 should 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 NMFS 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 NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/ and http://deemedexports.noaa.gov/compliance_access_control_procedures/noaa-foreign-national-registration- system.html. The contractor is required to use all appropriate methods to safeguard Personally Identifiable Information (PII).

Place of Performance

The place of performance shall be at the contractor's facilities, and in Charleston, SC.

Period of Performance

The period of performance shall be from the time of award through August 2018. The CIE reviewers' 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.

Within two weeks of award	Contractor selects and confirms reviewers
Approximately 2 weeks later	Contractor provides the pre-review documents to the reviewers
June 5-7, 2018	Panel review meeting
Approximately 3 weeks later	Contractor receives draft reports
Within 2 of receiving draft reports	Contractor submits final reports to the Government

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; and (3) The reports shall be delivered as specified in the schedule of milestones and deliverables.

Travel

All travel expenses shall be reimbursable in accordance with Federal Travel Regulations (http://www.gsa.gov/portal/content/104790). International travel is authorized for this contract. Travel is not to exceed $9,700.

Restricted or Limited Use of Data

The contractors may be required to sign and adhere to a non-disclosure agreement.

Project Contacts:

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Appendix III: SEDAR 58 Cobia Stock ID Review Workshop Attendees

Appointee	Function	Affiliation
REVIEW PANEL		
Luiz Barbieri	Review Panel Chair	GMFMC/SAFMC SSCs
Mary Christman	Reviewer	GMFMC SSC
Churchill Grimes	Reviewer	SAFMC SSC
David Kazyak	Reviewer	USGS
Dave Secor	Reviewer	University of MD
David Stewart	Reviewer	USFWS
Robin Cook	CIE Reviewer	CIE
~~Stefano Mariana~~**	CIE Reviewer	CIE
Gary Melvin	CIE Reviewer	CIE
STOCK ID WORKSHOP REPRESENTATIVES		
Nikoali Klibansky	Stock ID Workshop Chair	SEFSC Beaufort
Tanya Darden	Genetics WG rep	SCDNR
Jennifer Potts*	LH/Bio WG rep	SEFSC Beaufort
Matt Perkinson	Spatial Dist/Mvmt WG rep	SCDNR
Kevin Craig	Assessment Team	SEFSC Beaufort
Dan Goethel*	Assessment Team	SEFSC Miami
Jeff Isely*	Assessment Team	SEFSC Miami
APPOINTED OBSERVERS		
Wes Blow	Fisherman	VA
Bill Gorham	Fishermen	NC
Ira Laks	Fisherman	FL
COUNCIL REPRESENTATIVES		
Anna Beckwith	Council member	SAFMC
COUNCIL AND AGENCY STAFF		
Julia Byrd	SEDAR Coordinator	SEDAR
Kimberly Cole	Admin	SEDAR/SAFMC
John Carmichael	SAFMC/SEDAR	SAFMC/SEDAR

Mike Errigo	SAFMC	SAFMC
Mike Larkin	SERO	SERO
Juli Neer	SEDAR	SEDAR
Ryan Rindone	GMFMC	GMFMC
Mike Schmidtke	ASFMC	ASMFC
Christina Weigand	SAFMC	MAFMC
Mel Bell	SAFMC	SAFMC/SCDNR

Appointees marked with a * are appointed to the workshop but may not be able to attend the meeting. They will provide
data, review materials, and/or will be available via internet or phone for questions as needed.
** Absent due to illness.

Appendix IV: Terms of Reference for the Stock ID workshop and the Stock Workshop Review.

TOR - Stock ID Workshop

Workshop Goal: Review cobia stock structure and unit stock definitions and consider whether changes are required.

1. Review information including genetic studies, growth patterns, movement and migration, existing stock definitions, otolith chemistry, oceanographic and habitat characteristics, prior SEDAR stock ID recommendations and any other relevant information on stock structure.

2. Make recommendations on biological stock structure and the assessment unit stock or stocks to be addressed through SEDAR 58 and document the rationale behind the recommendations.

3. Discuss the strength of evidence in support of stock ID recommendations with particular attention on those that result in a mismatch of biological stock structure, assessment unit stock recommendations, and existing management unit boundaries.

4. If biological stock structure recommendations, assessment stock unit recommendations, and existing management units (state and federal) do not align, provide guidance to address the relative risks (biological and management) and consequences of managing based on existing Council or prior assessment boundaries.

5. Provide recommendations for future research on stock structure.

6. Prepare a report providing complete documentation of workshop recommendations and decisions.

TOR - Stock ID Review Workshop

1) Review the recommendations of the SEDAR 58 Stock ID workshop.

2) Determine whether the stock structure recommended by the SEDAR 58 Stock ID Workshop is reasonable and appropriate to use for the SEDAR 58 assessment unit stock. In making this determination consider whether available scientific data have been taken into account and analyzed properly by the Stock ID Workshop, and whether conclusions based on those data are reasonable given the current fisheries data. The Review Panel should consider the following in making its conclusions: 1) inclusion of data, 2) data analysis, and 3) appropriateness of conclusions regarding recommended stock unit(s) and associated spatial structure.

3) Prepare a report documenting the Review Panel's findings and recommendations regarding the SEDAR 58 assessment unit stock.