REPORT OF THE 2014 MEETING OF
THE ICCAT WORKING GROUP ON STOCK ASSESSMENT METHODS (WGSAM)

(Miami, USA – 16-20 February 2015)

1. Opening, adoption of Agenda and meeting arrangements

The Meeting was held at the Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, USA from 16-20 February 2015. Local arrangements were made by Dr. David Die with financial support of NOAA through the Cooperative Institute of Marine and Atmospheric Studies (CIMAS). Dr. Paul de Bruyn, on behalf of the ICCAT Executive Secretary, thanked the University of Miami for hosting the meeting and providing all logistical arrangements.

Dr. Michael Schirripa, the Stock Assessment Methods Working Group Rapporteur, chaired the meeting. Dr. Schirripa welcomed meeting participants ("the Group") and proceeded to review the Agenda which was adopted without changes (**Appendix 1**).

The List of Participants is attached as **Appendix 2**.

The List of Documents presented at the meeting is attached as **Appendix 3**.

The following participants served as Rapporteurs for various sections of the report:

Section	*Rapporteurs*
1, 4, 8 -10	P. de Bruyn
2	G. Diaz
3, 6, 7	M. Karnauskas
6, 11	M. Lauretta
12	M. Schirripa

2. Limit Reference points and Management Strategy Evaluation (MSE)

Document SCRS/2015/030 (Building a MSE for NSWO: part 1) described how an initial management strategy evaluation (MSE) procedure was constructed to assess the potential outcomes of four different management procedures. The procedures consisted of a combination of two assessment models (the Shaefer and Fox production models, both implemented with ASPIC) and two different management targets (one less conservative, $B_{tazrget} = B_{MSY} * 1.0$ and $F_{target} = F_{MSY} * 1.0$, and one more conservative, $B_{target} = B_{MSY} * 1.20$ and $F_{target} = F_{MSY} * 0.80$). The performance measures used to measure the success of the four management procedures where: absolute and variation in landings, the average fishing mortality over F_{MSY} by year, the average spawning stock biomass over B_{MSY} each year, and the probability of the stock being overfished and experiencing overfishing each year. Based on the eight performance measures considered, the Shaefer production model coupled with the more conservative benchmark outperformed the other three management procedures. This combination of assessment model and management targets resulted in the lowest probability of overfishing while doing so with no sacrifice in landings. This work is intended to be continued to be built upon to broaden its usefulness and conclusions.

The Group agreed that presenting to the Commission MSE results using a 'web graph' and with the list of performance measures as shown in the document is a very good starting point. The Group discussed presenting this web graphs with a list of performance measure in the upcoming meeting of the SWGSM and ask for input to managers on the performance measures that managers consider useful in the evaluation of different management strategies. The Group discussed that the interpretation of this type of graph when several operating models (OM) are used might become difficult and options for summarizing or averaging results could be explored. The Group noted that under the GBYP, MSE is being considered for bluefin tuna and that the albacore working Group has already started to conduct an MSE and the work is ongoing. This ongoing work might be useful examples to present to the SWGSM. It was stressed the importance of using more than one Operating Model (OM) as the outputs from one model could be different from other (e.g., different MSY).

Document SCRS/2015/020 (Management Strategy Evaluation- Albacore Case Study) described a generic MSE framework based on an ALB study. The management procedure (MP) evaluated used a biomass dynamic models as 9 out of 12 Kobe II strategy matrices provided by the SCRS were based on ASPIC or BSP models. The Precautionary Approach (PA) requires that undesirable outcomes be anticipated and measures be taken to reduce the probability of them occurring. This requires determining how well management measures achieve their objectives given uncertainty, i.e. to manage risk. The presentation provided an example of how to do this using MSE, i.e. by determining under what conditions a simple stock assessment method can be used to achieve management objectives. Although production models have been criticized as being too simplistic to capture the actual population dynamics, the document showed that they can provide robust advice under some conditions. It was shown that if the correct function form of the production function (i.e. logistic or Fox production function) is not known, then the target F must be reduced. This means that there is an economic value for improving scientific knowledge. Development of priors for the reference points (i.e., those based on MSY) used to provide management advice was more important than developing those for population parameters, such as population growth rate.

The Group noted that for the albacore case study, the simulation results showed that the shape of the production model had a more significant effect than the priors on *r* and *k*. In light of this result, the Group recommended that when production models are used, attention should also be paid to the assumptions of the production function used. In the simulations, all hypotheses in the OM were equally weighted. The Group discussed if that always has to be the case and it was indicated that in the case of southern bluefin tuna, all hypothesis in the OM do not receive equal weighting. The issue of using several HCRs for redundancy was raised. It was discussed that different LRP and HCR can have different properties and, therefore, they can be combined or averaged to develop management advice or provide guidance on setting a TAC. For the purpose of the simulations, the presentation also included a list of five management objectives. While the Group fully agreed that management objectives are a must element of any MSE, there was a general agreement that the management strategy to achieve those objectives may depend on the status of the stock. In other words, it is not the same to manage a healthy stock in the 'green quadrant' of the Kobe plot, than a stock that it is deep in the 'red quadrant' (i.e., overfished and undergoing overfishing).

The Group held extensive discussions with regard to the upcoming meeting of the ICCAT Standing Working Group of Scientists and Managers (SWGWM) regarding on how to advance the concept of identifying management objectives, developing management strategies, LRP, HCR, and MSE within ICCAT. Most specifically, the Group thought that it was important to have specific questions/requests from SCRS to the managers that can help to advance SCRS work. For example, Rec. [11-13] requires that healthy stocks be maintained in that condition with a 'high probability'. But, what is 'high probability'? This concept is clearly related to the acceptable level of risks that managers are willing to take and it is not a question that scientist can, or should, answer. The Group noticed that although this question, among others, was posted during the first meeting of the SWGSM in 2014, managers were not ready to provide answers during that meeting. There was full agreement in the discussions of the Group that LRP and HCR cannot be developed and MSE process cannot be started without clear management objectives. However, the Group agreed that scientists still can help managers in this task. For the development of LRP, HCR, and MSE, management objectives have to achievable, specific, and have to be numerically evaluated. For example, management objectives like 'maximize employment' or 'measure will be taken when a threshold reference point is reached' provide no guidance for MSE; while a management objective like 'maintain the stock in the green zone with a probability higher than 80%' is achievable, specific enough, and have measurable results. To help in this process, the Group discussed that a list of examples of management objectives that can be numerically evaluated (e.g., 75% prob. of maintaining the stock in the green quadrant) could be presented to the Commission. In addition, the results of different LRP and HCR developed to achieve those management objectives should also be presented to the Commission. In this way, and in the absence of better direction from the Commission, the SCRS could continue to progress MSE. The Group agreed of the utmost importance of a fluent conversation between managers and scientists to set HCR and MSE.

The Group had a lengthy discussion of the different uses of MSE as they can be used to evaluate OM and assumptions, evaluate stock indicators to develop HCR and estimate associated costs, and to develop LRP and HCR that are robust to different sources of uncertainties. The discussion pointed out that the results of MSE can show that in some cases stock assessments could be made simpler by using simpler models, and that under certain circumstances the frequency by which stock assessment are conducted can be significantly reduced. For example, MSE showed that in southern bluefin tuna (SBFT), juvenile aerial surveys and CPUEs can be used to monitor population trends and provide guidance on management. In the case of SBFT, MSE showed that investing in data collection to improve estimation of CPUE and investing in aerial surveys can result in better management without the need of large investments in other fishery dependent or independent data collection programs.

Regardless of the objective of MSE, the Group agreed that MSE cannot be conducted without clear management objectives. The Group agreed that the expectation of the Commission seems to be that MSE will be used to develop LRP and HCR that are robust to important sources of uncertainty. However, it was argued that this does not preclude SCRS for using MSE for other purposes that it considers fit and that the results of those MSE can be presented to the Commission when it considers pertinent.

The Group also discussed if HCR and management objectives should be consistent for different stocks or fisheries. It was pointed out that in WCPFC the management objectives differ by species. The Group wondered if the management objectives for the different species were different or if the management strategies were different while the management objectives were the same. This discussion highlighted the need to have a common definition for terms like 'management objectives' or 'management strategies'. In any case, the Group discussed that generic LRP and HCR could be developed which then could be adapted to the characteristics of the different ICCAT managed stocks. Regardless if LRP and HCR are species specific or not, the Group agreed that they must be robust to achieve the management objectives in light of the uncertainties associated to the OM hypotheses.

An interesting question was posted during the discussion with regard to implementing HCR for species that are not target in all ICCAT fisheries. More specifically, The Group discussed that the adoption of LRP and HCR in fisheries were controlling F is more challenging will be greatly benefited from the implementation of MSE. This can be the case for multi-species fisheries like the tropical tuna purse seine fisheries in West Africa.

The Group held extensive discussion on what can be done to better explain the concept of LRP, HCR and MSE to managers so they can adopt these approaches for ICCAT fisheries. Particularly, there was an agreement of the need to better explain that LRP and HCR are not a synonym of long-term yield losses and that they can result in better and more stable yields compared to other management approaches. It was also discussed that the uncertainties that managers consider important should be incorporated in the MSE so to develop LRP and HCR that are robust to those uncertainties. History has shown that sources of uncertainties have been used as an excuse to defy stock assessment results and management advice that require reductions in catches. In summary, and without getting into the specific technical details of MSE, scientists should do a better job to show managers that LRP and HCR do not result in long-term loss of yield and that can be robust to different sources of uncertainty. The Group acknowledged that the web-graph discussed in SCRS/2015/030 could be an excellent tool to present that type of results.

The Group agreed that hypotheses in the operating models (e.g.; steepness or stock-recruitment functions) sometimes are too simplistic and by using simplistic assumptions the range of the management strategies evaluated can be limited. The Group indicated the need to move to more internally complex models and to be more creative in our thinking.

In the process of developing MSE to test management options that incorporate uncertainties, the Group felt that is was important for the species group to identify those key uncertainties. Even though species groups have been directed to identify sources of uncertainties that can affect stock assessment results, the Group discussed the possibility of developing a questionnaire with specific questions that can help to identify uncertainties that should be incorporated in the MSE process similar to the questionnaire developed by the Imperial College for bluefin tuna (Leach *et al.* 2014).

3. Incorporation of oceanographic and environmental changes into the assessment process

Simulation Study

The Group noted that the background for the simulation study comes from the 2014 WGSAM work plan. During that time, it was agreed that the simulation would be designed during 2015 meeting, with recommendations for 2016 meeting. One of the goals of the present meeting was to form three ad-hoc working groups to work on the following tasks: 1) create a set of environmental variables and gear information, 2) link the variables to the fish distributions, and run simulations, and 3) analyse the results via GLMs or other methods.

The goal of the simulation exercise is generally to understand how environmental variables are best introduced into the assessment process. For example, they could be introduced explicitly as linked to some process in the stock assessment model, or as a variable in the CPUE standardization process. The simulation exercise would produce a simulated longline data set, to which different analysis methods could be applied. It is expected that this theme would be cycled through the Methods Group repeatedly, as the concept evolves and new research questions surface. It was noted that a number of participants have built longline simulators which could potentially form the basis for the work to be carried out.

The timeline of the project was set as follows: the simulation design and methods would be set up during the present meeting, methods would be carried out during the year, and results would be presented during the 2016 meeting.

It was also noted that this study relates to a number of agenda items on the 2015 Sub Committee on Ecosystems meeting, including:

3. Develop a list of ecosystem objectives that are practical and measurable….

4. Review the progress that has been made in implementing EBFM and enhanced stock assessments.

Related studies and papers were then presented.

Preferred habitats of the juvenile and adult Atlantic bluefin tuna: from ecology to management

Presentation SCRS/P/2015/002 by Druon *et al.* described a multinational effort to study the preferred habitats of the juvenile and adult Atlantic bluefin tuna. The authors put together presence data from different sources (observers, scientific surveys, etc.), with relatively high coverage in both spawning grounds (G. Mexico and Mediterranean) as well as the Atlantic. Presence data were matched to oceanographic data from satellites and models, and a cluster analysis was used to characterize different habitat preferences of spawning and feeding bluefin tuna. The authors provided maps of potential habitat that realistically resembled some of the biological dynamics (e.g. spawning seasonality within the Mediterranean). The authors argued that the information could be useful for stock assessment and management purposes in different ways. On one hand, habitat anomalies could shed light to understand the probability of transatlantic migrations through time and interpret results obtained by different methodologies (such as otolith microchemistry) suggesting migration pulses from west to east (Fraile *et al.* 2014). On the other hand, habitat maps could be used to produce time series of relative abundance/availability in different areas, that could feed spatially explicit stock assessment models (i.e. Taylor *et al.* 2011) in similar way to how electronic data can be used (i.e. Galuardi *et al.* 2014). At a more local scale, expansion/contraction of suitable habitat could inform about changes in catchability for a given fleet and might be incorporated in the CPUE standardization process.

The Group noted that the habitat modeling work could be informative for a wide range of purposes. For example, one could use the habitat model to create a habitat suitability index that varies by year, and this could be used to understand when CPUE changes may be due to how concentrated the fish are based on area of suitable habitat. It was noted that bluefin tuna and albacore are two species where this approach could be particularly useful. The work could also be used for calibrating fishery-independent surveys, or for guiding aerial surveys. Also, rather than mechanistically incorporating the habitat information in a stock assessment, the information could be used to frame hypotheses about how productivity is expected to change over time. The Group noted that there was much potential for this work beyond just standardization of CPUE.

The presenter clarified that while the presentation reported climatologies, the annual habitat information for the last 10 years is available at the EU Joint Research Centre website. A question was posed as to how the “feeding habitat” and “spawning habitat” could be derived without data confirming specifically the activities of the fish at that location. It was clarified that the designations were made not necessarily to differentiate different behaviours but that they were meant to serve as broad designations of different seasonal and spatial distributions. Another question was raised in regard to how far back in time the analysis could be taken. As the model is based on information derived from satellites, the analysis is basically restricted to the mid-90s when this information became available. However, proxies from other data sources would be another possibility to take the analysis further back historically, particularly if lower spatial resolution was sufficient.

It was noted that the present study was very comprehensive, but that perhaps other data sources could be incorporated. As the study was based largely on fishery-dependent data sets, it was expressed that it would be useful to ground truth the model with more fishery-independent data or electronic tagging data. Electronic tags, on the down side, are very different in nature because of the limited release and recapture points. Combining such data sources may prove challenging due to differences in spatial scales and spatial autocorrelation.

A discussion revolved around the issue of using only sea surface variables, which are the only variables available when using satellite data. In temperate areas where surface waters are well-mixed and the thermocline is relatively deep, subsurface conditions probably relate well to surface conditions. In other areas, this could be more of a concern. There is no immediate solution to this issue, but other variables derived from alternate data sources could be considered.

A method for estimating stock mixing rates based on length or age composition data

Document SCRS/2015/027 described a method to use age or length composition to estimate stock mixing rates. The general idea behind the paper was that if two populations that contribute to a mixing zone have distinct age compositions, and representative samples of age structure could be obtained from both populations and the mixing zone, then the percent contribution of stocks to the mixing zone could be estimated by comparing the age compositions. A preliminary simulation was set up with two age-structured populations with variable recruitment, and an environmentally-forced migration to a mixed zone, which varied by year and by age. A model implemented in a Bayesian framework was used to estimate the environmental forcing effect, and the percent contribution of each stock to the mixed zone. With only stochastic process error around the environmental function, the model was able to well-estimate these quantities. Preliminary analyses were done to consider the effect of some ageing error on the robustness of the results.

The Group noted a number of ways that the simulation could be altered to represent more realistic situations. Firstly, ageing error is often a function of age and so it was suggested that the error be implemented in this manner. If the method were to be attempted with bluefin tuna, there would be a number of other issues related to age slicing. It was noted that it may be possible to actually model the process of age slicing and test different hypotheses about ageing biases. Secondly, information on abundances of the two stocks, along with variance around estimates of abundance, could be easily incorporated into the framework which would allow estimates of the probability of migration from each area. Thirdly, it was noted that there may be issues with obtaining samples from purely “mixed” or purely “independent” populations, since different sectors of the population may migrate at different times. This could be particularly problematic for this simulation in instances where fishes of different sizes or ages are migrating at different times. Finally, it was recommended that the simulation include a sensitivity analysis related to sample size, i.e., whether the method still performed well with various degrees of unrepresentative sampling. The presenter agreed that these sensitivity analyses would be useful before attempting to apply the method to real data. The next step would be to incorporate in the simulation various forms of observational error related to the data collection of a specific species, to understand the performance of the method under realistic constraints.

Evolution of spatial distribution of fishing ground for the Spanish albacore (Thunnus alalunga) troll fleet in the North eastern Atlantic, years: 2000 to 2013

Document SCRS/2015/025 described how the annual geographical distribution of Spanish troll fleet activity is estimated by means of sampling scheme based on a number of interviews to skippers carried out at landings in main fishing ports of the Spanish Atlantic and Bay of Biscay coast. The compiled geographical position by trip on latitude and longitude (1x1 degrees) is mapped on monthly bases for each year. Troll fleet targets albacore (*Thunnus alalunga*) from June to November operating in offshore waters of the northeast Atlantic and Bay of Biscay. Based on the compiled interviews information, it is presented the spatial evolution of the troll fleet fishing ground for the fishing seasons from 2000 to 2013.

It was noted by several participants that the Bay of Biscay works as a separate area of oceanography as compared to the rest of the Atlantic, and that some patterns observed offshore may not be observed for the Bay of Biscay.

Proposed study design for best practices when including environmental information into ICCAT indices of abundance

It is now a generally accepted fact that variation in the planet’s climate and its effects on the worlds ocean is increasing. Given this increased variation, the relatively narrow tolerance levels for temperature and highly migratory nature of the tuna and tuna like species under the management of ICCAT, methods of accounting for responses of tuna to their changing environment are timely and necessary. Most important is how these factors manifest themselves in indices of abundance; in the case of ICCAT, indices of catch-per-unit effort (CPUE). The study design proposed in document SCRS/2015/031 will use a longline simulator as an operating model to generate data sets in which the true stock abundance and environmental are known with certainty. These data sets will then be analysed with two comparative methods: (1) using the environmental data as a covariate in the standardization of CPUE via a generalized linear model, and (2) use of the data within the stock assessment model explicitly to modulate catchability. The criteria used to evaluate each method will include goodness of fit, degree of uncertainty, and model parsimony.

An extensive discussion ensued on the topic of how such a simulation would be set up to answer relevant questions for ICCAT, and how and when to go about defining the relevant questions. It was noted that defining the research question before building the simulation would be desirable in order not to unnecessarily overcomplicate the simulation. On the other hand, it would not be desirable to make the simulation so prescribed such that it would not have any utility for further research questions that might surface. It was agreed that having a general focus on the types of research questions would be useful, before embarking on the details of the simulation. Generally, the group expressed interest on a simulation to inform how to best capture environmental effects on a given species with the available data. Basically, to answer this question it would be necessary to simulate an environmental effect on a fish, sample from the simulated distributions with an idealized fishing fleet, and then test whether the environmental effect could be retrieved via analysis of the data. It was noted that broadly, the environment can have two types of effects on a population: an effect on the distribution, or an effect on the productivity of the stock. Likely these two effects are not mutually exclusive, but in practice may be difficult to differentiate. This issue would also be the focus of questions to be answered with the simulation exercise.

There was discussion on the specific species of focus for an initial simulation exercise. Swordfish is a relatively data-rich species, and the fleets are well-defined, and recent work suggests that the environment is highly influential in shaping its distributions. Bigeye tuna was mentioned as another data-rich candidate species. For species interactions, it was thought that swordfish and blue shark would be a noteworthy species set to simulate.

Much discussion pertained to the specific setup of the simulation exercise. It was emphasized that exactly mimicking the real world was not as important as simply knowing the "true" simulation world and understanding whether or not it could be predicted. At the same time, however, there is a desire to make the simulation similar enough to a real-world scenario such that the results could be thought to be applicable. It was recommended that generally, complexities should not be included unless they were directly relevant to the question at hand. The most challenging step in building the scenario was thought to be in modeling the environment-fish relationship. It was noted that some existing work, including work done by members of the Group, could be informative for defining these relationships. For example, habitat models already exist and are readily available for five species: albacore, bluefin tuna, yellowfin tuna, skipjack, and southern bluefin. Quantitative relationships from these sources could be used to define the links between environmental variables and fish distributions for the simulations.

There was additional discussion on the level of complexity that would be necessary to include in the simulation. The Group's opinions were widely variable with respect to this issue. It was mentioned that not only fish distributions, but also feeding patterns could be important to simulate, but that this might also arise as an emergent property due to simulated bait competition. Schooling was thought to be potentially critical, depending on how it was applied to the model. Also, it would be difficult to capture realistic fishing behaviour, as fishers don't fish randomly in a given cell; they fish specific fine-scale features. Discussion also revolved around the level of spatial and temporal resolution necessary, and whether the simulation would be set up in three dimensions, or as a two-dimensional grid with equations to describe the relevant depth-related processes. Finally, the pros and cons of a single species versus a multi-species model were discussed.

The Group discussed the types of analyses that would be carried out once the simulation had been run. It was suggested that initial analyses should be very simple, with further complexities added on later. A first goal could be on single index, which when standardized properly, would correctly reflect the abundance signal. A second step would be to include environmental effects explicitly within the stock assessment model. This would require an actual stock assessment on the simulated population. If the simulator were to have multiple fleets, decisions would have to be made as to how standardization would be completed among fleets.

The following ad-hoc Working Groups were formed:

Group 1: Overall study design and simulator configuration: Michael Schirripa, Phil Goodyear, Patrick Lynch

Group 2: Collect and assimilate oceanographic and gear data,; form decisions on how fish should be distributed: Guillermo Diaz, Barb Muhling, Miguel Santos, Andres Domingo, Mandy Karnauskas, Jiangang Luo, Patrick Lynch

Group 3: Analysis of simulated data; will create analysis (GLMs or internal to stock assessment model) to reproduce stock abundance Matt Lauretta, John Walter, Rui Coelho, Michael Schirripa, Toshihide Kitakado, Haritz Arrizabalaga

These three ad-hoc working groups met separately and reported back to the larger Working Group as follows:

Summary of group 1: Overall study design and simulator configuration

Michael Schirripa was named as the leader of the group to oversee the various components of the simulation study. The first decision that was made was that the simulation author would attempt to incorporate a GUI, or move the simulation framework to a more user-friendly form, such that the users would not be completely dependent on the author for the running of the simulation. The second task was to define the specific research question to be addressed explicitly. It was decided that the focus of the initial simulation exercise would be to answer the question: "Assuming that swordfish distributions are driven by changes in temperature, is the abundance of the stock best estimated by: 1) ignoring an environmental effect, 2) incorporating an environmental variable into the abundance index standardization process, 3) by linking the environmental variable to a process within the assessment model, or 4) both (2) and (3)?" The configuration of the simulation was also discussed. It was decided that initially, only one gear with a single configuration throughout North Atlantic would be used, and for a single species. Fishing effort would be distributed according to known longline effort. To obtain this information, this ad-hoc working group called upon the U.S., Canada, Spain, Portugal and Japan to provide the number of sets, by latitude and longitude, month, and year. It was noted that there may be challenges with confidentiality agreements, and in such cases the readily-available 5x5 degree resolution data could be sufficient. The preferred time frame of the simulation is 1950-2010.

Simulation set up: 1 gear, 1 species, 1 gear configuration, number of sets by lat long, month and year

Fish distributed at depth by PSAT data on time that fish spent at temperature and in space by temperature at lat, long and depth. Fleet effort distributed by historical distribution of effort by 5x5 or finer resolution, if possible. Several abundance trends will be modeled.

Summary of group 2: oceanographic Collect and assimilate oceanographic and gear data.

Guillermo Diaz was chosen as the leader of this ad-hoc working group. The task given to the data working group was to find temperature data, by depth layer, for 1950-2010, in a format that would easily be fed into the simulation model. Data availability issues were discussed. Oceanographic models such as HYCOM can provide estimates of temperature by depth globally, but these models only go back to the mid-1990s at the earliest. Also, high-resolution sea surface temperature data is only available back to the early 1980s, when satellite coverage began. Thus, obtaining temperature data back to the 1950s at the resolution desired may be challenging. It was emphasized by the simulation leaders that data quality was more important than time span, and thus the years to be included in the simulation may have to be modified.

The Group was also to be responsible for obtaining PSAT tagging data from swordfish, which would be used to understand the time that the fish spends at various temperatures. This, in turn, would be used to parameterize the environment-fish distribution relationship in the simulation. There was a brief discussion on how exactly the satellite data would be used to create this relationship, including whether or not additional depth and/or temperature-depth profiles would be required

Summary of group 3: Analyses of simulated data

John Walter was assigned as the leader of the analysis group. Briefly, the working group is tasked with analysing data that is handed to them by the simulation group, to determine whether they can extract a more correct abundance signal and potentially identify relevant environmental driver. The group stated that their performance metric of the CPUE standardization exercise would be the level of correlation of their derived CPUE index with the known abundance index (which would remain unknown to the analysts during the analysis stage). The group will produce a suite of indices of various treatments, to see which match most closely.

The group discussed the pros and cons of including various levels of noise in the data set that was to be handed to the analysis group. To carry out a true blind test of analysis skill in recreating known values, ideally the analysis group would be provided several environmental variables: a true value, a true value with added noise, and a purely random variable. This would allow for a more realistic scenario, where numerous environmental variables are available, only some of which may be explanatory. There was discussion on whether or not other extraneous variables needed to be included in the data set; for example, number of hooks between floats. On one hand, this would make the data set more realistic, but on the other hand, to separate out the sources of error in determining environmental effects, it may be advantageous to start with a simplified data set.

The suggestion was made to meet at SCRS meeting to discuss progress with the simulation exercise, and to consider intermediate milestones. For example, for the SCRS plenary meeting a paper could be submitted on how the simulated data set was constructed. A study plan will be developed and will include a suggested schedule of meetings and milestones.

Question 1: If SWO abundance varies due to some environmental factor can we get the correct abundance signal by CPUE alone, include environment in GLM, include environment in assessment model.

Performance metric: correlation of CPUE index with known abundance signal

Expectations of needs from Simulation group: CPUE, lat, long, year, month and environmental factors with varying degrees of information content, but unknown to analysts; for instance SST(true SST), SST2 (SST1+random normal (0,σ^2)), SST3 (random normal variate N(μ, σ^2)) where is the μ and σ^2 are the mean and variance of the temperature in the series.

Preliminary time frame (expected completion date; specific schedule TBD)

June 2015	Obtain simulated CPUE
September 2015	Evaluate/Model separate CPUEs according to SOP CPUE~year+area+gear+season+Environment+*year*area* + …and other interactions as RE DLN, NegBinomial, Tweedie distributions as needed
December 2015	Evaluate/Model separate CPUEs according to alternative procedures
January 2016	Evaluate performance of CPUEs by calculating correlation with known abundance signal. Test indices in SPM- can we reconcile the abundance trend
February 2016	Two papers for 2016 Methods meeting

Deliverables

2/3 Papers for 2016 ICCAT methods meeting

1. Simulations setup
2. CPUE estimation and performance within SPM model

Analysis workgroup terms of reference:

1. Estimate standardized CPUEs according to standard operating procedures
2. Estimate standardized CPUEs with environment

4. Review of new ICCAT method for estimating EFFDIS

The Group was informed of the current status of the proposed EFFDIS contract requested by the SCRS. The secretariat explained that the initial call for tenders had not resulted in a single proposal being submitted and thus the deadline had been extended. It was noted that this extension had resulted in a proposal being submitted and that in the near future the proposal would be evaluated and if found to be suitable, could be awarded with the contract. This would, however, result in delays in the initial deadlines for presentation of the EFFDIS results. It is still planned that the tentative results of the EFFDIS contract would be made available during the Sub Committee on Ecosystems meeting and it was recommended that members from the WGSAM be present at that meeting to evaluate the technical aspects of the exercise.

6. Review the CPUE protocol for current inclusion criteria

The Group reviewed the protocol and review criteria table for CPUE series. It was discussed that the general scoring method of metrics was intended to provide a measure of each criterion for individual indices, but not to create an overall score for ranking of indices. The main intention of the criteria table is to facilitate the review of the appropriateness of CPUE series for inclusion in the stock assessment models. During the albacore assessment, the Group discussed if the table could present possible ways to generate weights for indices within the assessment model, and recommended further evaluation by the WGSAM. It was noted that further development would be required to make the criteria useful for quantitative weighting of CPUEs.

Inclusion of the CPUE series is dependent on the assessment model, and consideration of model structure is recommended. The exercise is time consuming; however, once the initial evaluation is conducted, the subsequent evaluations of the same index during future assessments should be less time consuming. Some of the criteria were difficult to evaluate during the species group meetings. For example, an evaluation of the biologically plausible criteria could be better facilitated if improved tools were developed to allow for a more objective evaluation of this criterion. Some of the metrics could potentially be combined to simplify the table and expedite the CPUE review process. For example, the Group discussed removing catch fraction from the table. The table has stimulated discussion on numerous occasions and for multiple assessments. The Group agreed that a revised version of the table be reviewed at the next meeting of the WGSAM. The Chair will form an ad-hoc working group to create a revised table.

7. Development of a template for unifying the North Atlantic swordfish CPUE data

In the introductory remarks, it was highlighted that the focus of the day was to discuss a method for combining CPUE indices. An ad-hoc working group would be formed to discuss the issue of obtaining high-resolution data while maintaining security and confidentiality. The Group was reminded that such an activity was important for improving the ability to track stock abundance trends when stock distribution/availability is changing (e.g., due to environmental influences) and this cannot be reflected by indices developed by individual CPCs.

Considerations for the estimation of the variance of two-stage standardization models were presented (SCRS/2015/029). It was recommended that the Goodman exact estimator be used for the two - stage models and that the negative binomial or Poisson be used for discrete catch data, which simplifies the model estimation of mean and variance subject to meeting distributional assumptions. General rules of thumb were provided along with statistical codes for model selection, goodness-of-fit and CPUE standardization. It was noted that cases where the data contain a high number of zero catches poses a problem, and the zero-inflated or two-stage models are recommended for exactly these cases.

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A method for combining indices of abundance across fleets that allow for precision in the assignment of environmental covariates while maintaining confidentiality of spatial and temporal information provided by CPCs

In paper SCRS/2015/032, a method was presented and statistical codes were provided for combining catch and effort information that allows scientists from individual CPCs to assign key environmental (or other) covariates to each observation, and then assign the observations to a coarser resolution spatial (e.g. 5 by 5 degree cell, or larger areas) and temporal (e.g. month) categories that maintain requisite levels of confidentiality. The resulting datasets preserve the links between testable factors and catch rates, as well as the observational level variability required for statistical hypothesis testing, while meeting confidentiality requirements, and can then be combined to develop a single standardized index that is more robust to changes in individual fleet catchability over time.

Discussion revolved around two main areas of focus of the paper: 1) confidentiality issues, and the general application of the method, and 2) the issue of incorporating environmental variables. The issue of spatial resolution of data sets and definition of statistical or other areas was first discussed. One participant asked about the utility of maintaining the use of the ICCAT statistical areas in such an analysis. It was clarified that the ICCAT areas were used just to showcase the concept, but that any areas could be specified. Having spatial information at as fine a resolution possible would be the ideal scenario. This would allow for further spatial analyses, for example, applying cluster analyses or other multivariate analyses to such a data set to classify areas of similarity. A mention was made of the work by Longhurst (2006) which discussed different habitat areas within the larger ocean, however a note was made that these areas while useful may still be too large for CPUE standardization. Another possibility would be to use habitat usage information based on the life history of the species to define areas.

It was noted that the accepted practice in ICCAT is to provide aggregated data at a spatial resolution of 5x5 degrees. However, this resolution may not address all of the confidentiality issues of all countries. To take care of this issue, a filter could be applied, to drop bins where samples within were confidential. It was noted that this practice could potentially lead to the loss of important information along the fringe of the fishery. A discussion ensued on the issue of inclusion of environmental variables, and scaling issues with the available data. It was noted that with coarse scale variables obtained from satellite data, the resolution of the data may not be the same as the scales of actual habitat usage by the fish. Also, given the nature of the longline, and the extensive geographical area that can be covered in a single set, it is unrealistic to match exactly environmental parameters to the precise locations of capture. Despite this difficulty, broad scale sea surface temperature should be a measure of the overall heat content of the ocean in that place and time, and thus should be useful in linking to stock dynamics. Additional environmental variables can also be incorporated into the framework, and these can be tailored to the species in question. It was stressed that the paper was intended as a concept to be developed further, rather than a final tool.

The main thrust of the paper was on the issue of finding a mechanism for maintaining high-resolution data while dealing with confidentiality issues. The Group viewed the paper as a strong step forward in this regard, and thought that the proposed methodology would be a useful framework. Regardless of whether or not environmental variables were included in the process, the framework is still highly valuable for simply making available set level data sets to analysts. The Group suggested moving forward with such an approach, and testing it with a small group of CPCs that were willing to participate. Swordfish and Bluefin tuna were mentioned as potential test species, given the existing work and/or discussions on combining abundance indices for these species. The Group agreed that the approach was useful, and suggested that the report and conclusions should be looked over by each CPC to confirm that the methods are consistent with confidentiality requirements. It is also expected that as the method is pilot-tested among the individual CPCs, further issues would come to light which would then need to be addressed. It was thought that the best way to advance the method may be via a smaller group at a data preparatory meeting, because the particular variables to be included will vary from species to species. In general, the paper should be viewed as an initial attempt at a standard methodology for retaining high-resolution data, which should be improved through an iterative process.

The Group noted that the method presented could address the ICCAT Working Group of Fisheries Managers and Scientists in support of WBFT stock assessment request to find ways to combine data for the creation of CPUE indices. As the bluefin tuna Group is already making progress in this direction, this Working Group proposes that a parallel effort be initiated and applied to swordfish, in an effort to include environmental data and estimate the combined CPUE.

The following ad-hoc Working Group was formed to explore the methodology and its application to swordfish, initially including: Matt Lauretta, Alex Hanke and Rui Coelho.

The method outlined in SCRS/2015/032 is intended to maintain data confidentiality, while preserving set-level detail and allowing the assignment of precise environmental factors. The method retains the key variables used in most CPUE statistical standardizations (**Tables 1** and **2**).

The Methods Group reviewed paper SCRS/2015/032 that addresses the need to combine CPC data in creating CPUE indices. While it would be ideal for scientists to have access to complete data sets, the methodology outlined represents an intermediate step that would preserve set-level details. The Group agreed that the method presented in the paper provides a good template for unifying swordfish and bluefin tuna data, and has the flexibility to be tailored to the needs of each species group. Scientists from individual CPCs should confirm that the proposed methods in the paper meet individual CPCs' confidentiality requirements. The Methods Working Group recommends this approach to be considered by the species groups.

Table 1. Raw datasets visible only to CPCs. Shaded columns represent columns that make the data confidential, but are not generally included in CPUE standardizations and so not necessary for the combined dataset.

Set	*Vessel*	*Lat*	*Long*	*Date*	*Catch*	*Species*	*Effort*	*Month*	*FLAG*	*Area*	*SST*	*Depth*	*Gear*
1	Snoopy	45	22.45	3/2/2011	2	BFT	1000	3	1	1	24	1000	deep
1	Snoopy	47	25.56	3/2/2011	2	SWO	1000	3	1	1	24	1000	deep
2	PeterPan	35	22	3/2/2011	1	SWO	800	4	2	7	26	1000	deep
2	PeterPan	34.33	22	3/2/2011	4	BET	800	4	2	7	26	1000	deep
3	PeterPan	23.5	21	3/2/2011	4	BET	1200	5	3	6	25	1000	deep
4	Loco	26.32	22.2	3/2/2011	56	YFT	1300	5	3	6	25	1000	deep
5	Unlucky	38.42	23.3	3/2/2011	4	BET	1000	5	3	6	25	1000	deep
…	…	…	…	…	...	...	...	...	...	...	...	...	…

Table 2. Dataset that can then be shared, after being run through cleaning.

Set	*Catch*	*Species*	*Effort*	*Month*	*FLAG*	*Area*	*SST*	*Depth*	*Gear*
1	2	BFT	1000	3	1	1	24	1000	deep
1	2	SWO	1000	3	1	1	24	1000	deep
2	1	SWO	800	4	2	7	26	1000	deep
2	4	BET	800	4	2	7	26	1000	deep
3	4	BET	1200	5	3	6	25	1000	deep
4	56	YFT	1300	5	3	6	25	1000	deep
5	4	BET	1000	5	3	6	25	1000	deep
…	…	…	…	…	…	…	…	…	…

The afternoon session was devoted to separate working group sessions to design the simulation study.

8. ICCAT glossary: review of the WGSAM role in its development

There is a need to update the current ICCAT glossary, a need that was reaffirmed by the ICCAT WGSAM in previous meetings. The update should consider other glossaries developed by other tuna RFMOs and especially glossaries related to management strategy evaluation, given that this area of research is one where many terms need to be considered for addition to the ICCAT glossary. A proposal of how the update of the ICCAT glossary may be undertaken was proposed to the WG for comments. The authors of such proposal will be presenting a draft of the updated glossary to the 2015 plenary meeting of the SCRS.

9. ICCAT software catalogue: review of the process to incorporate new methods in both the stock assessment and the software catalogue

The Secretariat mentioned a new initiative on how to reinvigorate the ICCAT Software Catalogue in a way that encourages software development and innovation and is flexible to the needs of the SCRS; while ensuring reliability, stability, auditability, accountability and supportability of software. It was noted that procedures should also be consistent with best practice elsewhere, *i.e.* that of other RFMOs and bodies responsible for developing advice based on software.

The procedure is to

1. Contact chairs of species Working Group with a summary of the old requirements and additional issues that have arisen since the establishment of the Software Catalogue, e.g. related to the Strategic Plan, Kobe advice framework, SISAM/WCSAM, recent assessment and the use of stock assessment methods as part of a Management Procedures (MP) when conducting MSE.
2. Ask chairs to review if the old requirements are still adequate or need updating and to propose a set of revised requirements.
3. Ask chairs to use these new requirements to "certify" the new version of ASPIC (as an example).
4. Canvass views of software developers since if the process becomes too burdensome then no software will be developed.
5. Canvass views of other RFMOs and bodies that use stock assessment methods.
6. Present results of the exercise to the SCRS which would approve a new protocol.

10. Collaboration with other Stock Assessment Methods WGs (ICES, RFMOs, etc.)

The secretariat informed the group of the ongoing developments to improve collaboration between ICCAT and ICES regarding issues of common interest. There has been contact between the secretariats of the two organisations to identify key areas of collaboration. In the past ICCAT and ICES have had joint stock assessment meetings (e.g. sharks) and held joint training courses. While members of the SCRS and ICCAT Secretariat have conducted peer reviews of ICES stock assessments. It was suggested by the secretariat that it would be appropriate and desirable to improve collaboration between ICCAT SCRS – ICES. Collaboration on the development of stock assessment methods, e.g. through the Strategic Initiative on Stock Assessment Methods (SISAM) would be advantageous. It is envisioned that joint meetings may be held between the ICCAT Working Group on Stock Assessment Methods (WGSAM) and the ICES Working Group on Methods of Fish Stock Assessment (WGMG). In addition, close contact should be maintained by identified experts in both organisations to improve and develop new assessment methods. In addition collaboration in the areas of by-catch and sharks, through the ICCAT Shark Species Group and the SCECO would be convenient. It would be convenient to increase participation of ICES scientific experts in ICCAT shark stock assessments and vice versa. Qualified experts should be identified and invited to these meetings as appropriate.

There was an expression of interest from the US NOAA fisheries assessment methods working group to collaborate in the initiative. The group generally agreed that this collaboration could be useful and a joint meeting could be productive.

11. Other matters

The results of the catch-based assessment model for Skipjack were presented in the 2014 species group and the aim of this presentation is to discuss the potentiality of catch based methods such as Martell and Froese's (2012) to be used in ICCAT stock assessments. This is a simple method which uses catch data series, ideally from stocks that start from unexploited to overexploited populations. The outputs of the model are estimates of stocks MSY, r and K as probabilistic distributions. The R code is publicly available and the method has been validated against analytical fish stock assessment estimates of MSY in a wide range of fisheries, including tuna species'.

The group discussed the utility of this method for future assessments, and particularly, data poor stocks. It was noted that the method is most useful when there has been an observed contrast in catch, specifically, a period where MSY has been exceeded and catch levels declined. It was noted that the assumption of constant catchability could be problematic for some fisheries, for example, tropical tunas where a shift in fishing practice toward FAD targeted fishing is likely to cause a change in catchability which could result in the increased catches over time, regardless of abundance trends. Effort was also thought to be a factor in catch levels. The group commented on the utility for sharks where relatively good information on life history is available but catches are unknown, and it was noted that using a prior on the intrinsic growth rate, r, would improve the ability to estimate the carrying capacity and MSY.

A simulation study that explored using maximum size based metrics in respect to various levels of fishing mortality was presented (SCRS/2015/028). The method is based on the principle that the size distribution of the catch is an important characteristic of a population considered in stock assessments. The mean and maximum sizes are readily understood indicators of population health. The mean is clearly defined and easily understood, but properties of the maximum make it a less suitable reference parameter to be included in stock assessments. NZ50 is the smallest number of observations which will include fish ≥ a defined large threshold half the time. The concept is extended to define LNZ50,N, the smallest maximum length (L)expected in half of sets of N observations each.

Comments were provided on the potential effects of density dependent growth, mortality, fecundity, and cohort strength. Cohort strength was not thought to be as big a factor since most of the variation of size is due to individual variation in growth and not greatly influenced by cohort strength at larger sizes. A comparison of the method against data rich stock assessments would be useful to evaluate the utility. The definition of sample unit might be an important consideration, for example, trophy fisheries, where the total number of fish caught to achieve the threshold can be measured. The method provides a good indicator of changes in fishing mortality, as it is more sensitive than the mean length estimator. The performance in relation to targeting, and specifically selectivity changes over time, deserve further analysis. The maximum length estimator is expected to be sensitive to changes in selectivity, and one potential solution is to monitor a part of the fishery that targets large fish and is therefore less likely to observe a change in selectivity, or in any case where selectivity is constant when the largest fish are consistently targeted. Changes in selectivity concerns could be addressed by further simulation. The time lag for changes in maximum size is greater than the mean length-based estimators, which are likely to be more sensitive to variability in recruitment. For selection of the threshold value, a target of the 90th percentile of the cumulative probability distribution may be a good rule of thumb. The programs and source code for the estimators were provided to the Group.

The document SCRS/2015/033 presented a preliminary analysis of the number of longline sets needed for sampling the species richness (including target and bycatch species) of species intercepted by a longline fleet operating in the southwest Atlantic. For the purpose of this study, the observed on board data taken on the Uruguayan pelagic longline fleet (2005-2007) were analysed at two different scales (5x5° and 10x10° cells) commonly used by ICCAT parties to report Task II data. For both cases, we selected cells with more than 100 000 hooks observed. Sample (longline sets) – based rarefaction curves and extrapolations were conducted for each cells. Considering all 5x5°cells, none of the curves reached an asymptote. Based on their reference samples, it was estimated that in average their asymptotes would be reached at ~370 longline sets (range = 75 – 1000 sets). In average, 95% of the estimated species richness would be reached at ~200 longline sets (range= 51 – 472 sets). Similar results were found at 10x10° cells. Species richness would reach their asymptotes at ~410 longline sets (range =567 – 844). At this spatial level, 95% of the estimate species richness would be sampled at 275 longline sets (range= 40 – 724 sets). Areas of high species richness as those found on the shelf-break require a higher sampling effort (longline sets) to reach the 95% of the estimated species richness. Such values for our study region were about 470 and 720 sets at 5x5° and 10x10° cells, respectively. On high seas, these respective values were 51-62 and 40-124 sets. Although our analysis should be considered preliminary, we expect to encourage discussion on the minimum observer coverage needed to obtain reliable information from all species that are intercepted by the pelagic longline fishery.

The Group commented that the results would be highly informative to the SC-Eco which is exploring exactly these types of metrics, and recommended the paper be reviewed during the upcoming Ecosystems meeting.

The document SCRS/2015/034 presented information about the Uruguayan tagging program. A total of 1,364 specimens were double tagged in the period 2012 – 2013, with blue shark (*Prionace glauca*) being the most represented (92.6%). During 2012 – 2014 recaptures of 14 blue sharks and 1 shortfin makos (*Isurus oxyrinchus*) that were double tagged were recorded. Out of the total recaptures recorded, 11 had two tags and 4 had only one. Eight sharks were at liberty for over 3 months, 4 were recaptured with both tags and 4 with only one (3 Stainless steel head dart tags (SSD) and 1 Plastic head intra-muscular tag-small (PIMS)). Although there are only few data available, it appears that PIMS and SSD would work better than Plastic tipped dart tags (PDAT) at least in shark species. The estimates of tag retention from double-tagging indicated tag type selection preference by species.

It was commented that accounting for tag type is an important consideration in tag loss estimates used in capture-recapture models.

The group reiterated the previous recommendation made by the WGSAM in 2010 and approved by SCRS on the minimum elements that will be included in the Executive Summary tables.

SCRS-P-15-003 demonstrated that there are a variety of approaches for testing stock assessment methods e.g. Self Testing, Cross Testing, Cross-validation, Monte Carlo Simulation and Management Strategy Evaluation. The World Conference on Stock Assessment Methods (WCSAM, Deroba *et al.*, 2014) used self and cross tests with 14 stock dataset and 30 stock assessment methods i.e. Delay Difference (1), Virtual Population Analysis (4), Statistical Catch at age (21) and Surplus Production (4). Self and Cross-Testing were shown to be useful in helping to establish the robustness of methods. However cross-validation was thought too complicated to do on an extensive scale. In cross-validation a model is fitted to the first part of a time series, the dynamics are then projected forward and compared with fits made to the entire time series.

A main objective of stock assessment is to provide advice on the effect of management actions, i.e. to provide a description of the characteristics of a stock and to allow the biological reaction to being exploited to be rationally predicted and those predictions tested. WCSAM thought cross-validation was too complicated to perform for 14 stocks and 30 methods but it should be feasible for 1 stock and 1 method. Cross-validation is therefore an important tool for evaluating the predictive power of models used for management advice (e.g. Tidd, 2012).

Work from a preliminary cross-validation using the last East Atlantic Bluefin VPA assessment was presented. A variety of stock assessment methods are on the table for bluefin, e.g. VPA, SS, iSCAM, SCAL, SAM, and ssss. Different results from within and across stock assessment methods are the norm. A formal method for testing is therefore needed in order to provide robust advice and decide what scenarios to include in a Kobe II Strategy Matrix and to develop OMs for use in MSE.

Hopefully if other stock assessment model developers and working groups think it useful we will comparative studies will be conducted, e.g. in collaboration with ICES and SISAM.

In cross-validation the candidate assessment method is fitted using tail-cutting, i.e. successively deleting data from year n, n-1 to n; then projecting to year n based on the assessment fits, i.e. retrospective cross-validation. We have used two approaches i.e.

Model-Based and Model-Free Validation.

In Model-Based Validation Benchmarks based on a model are compared e.g. the quantities used for management such as B/B_{MSY} and F/F_{MSY}. In Model-Free Validation the procedure is run and the best performing model is identified by comparing the observed and predicted data values. If the CPUE series are regarded as being representative of the dynamics of the stock they can be used as a model-free validation measure.

The cross-validation example is available at http://rscloud.iccat.int/Tutorials/MSE/programme.html in the form of a tutorial.

12. Recommendations

1. The Group recommended that participants of the WGSAM and National Scientists with technical expertise with regard to the estimation of EFFDIS should attend the SC-ECO meeting to participate in the evaluation of the technical aspects of the new EFFDIS methodology to be developed by a contractor.

2. The Group recommended that the cross validation work should be extended to more stocks and more stock assessment methods.

3. The Group recommended that, to facilitate the adoption of LRP, HCR, and various management strategies by ICCAT, examples of the utility and benefits of these management approaches be presented to the SWGSM. This should facilitate the conversation with managers and help in the discussions on defining management objectives and other necessary elements required to advance this work by the SCRS.

4. The Group recommended that following the request of SWGSM, social and economic factors be discussed for potential inclusion in future MSE and invites examples to be presented in the next meeting of the WGSAM.

5. The Group recommended that examples of management objectives and performance measures such as been illustrated with the web-graph should be presented at the upcoming meeting of the SWGSM.

6. The Group reiterates that species groups should follow the format for the Executive Summary tables recommended by the WGSAM and adopted by SCRS in 2010.

7. The Group again encourages CPCs to provide limited access to CPUE set by set data according to the needs and priorities identified by the different species groups and Sub-committees. The method described in SCRS/2015/032 offers one possible approach to accomplish this task.

13. Adoption of the report and closure

The report was adopted during the meeting. The Convener of WGSAM thanked the local organizers for the excellent meeting arrangements and the participants for their efficiency and hard work. The Secretariat reiterated its thanks to the University of Miami RSMAS for the exceptional organization of the meeting and for the warm support provided to participants. The meeting was adjourned.

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Appendix 1

AGENDA

1. Opening, adoption of agenda and meeting arrangements

2. Limit Reference points and Management Strategy Evaluation (MSE)

   - Current situation
   - Identify next species to address
   - Definition of a generalized framework from which to conduct future MSEs

3. Incorporation of oceanographic and environmental changes into the assessment process

   - Work plan for a simulation study

4. Review of new ICCAT method for estimating EFFDIS

5. Review the CPUE protocol for current inclusion criteria

6. Development of a template for unifying the North Atlantic swordfish CPUE data

7. ICCAT glossary: review of the WGSAM role in its development

8. ICCAT software catalogue: review of the process to incorporate new methods in both the stock assessment and the software catalogue.

9. Collaboration with other Stock Assessment Methods WGs (ICES, RFMOs, etc.)

10. Other matters

11. Recommendations

12. Adoption of the report and closure

Appendix 2

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Appendix 3

LIST OF DOCUMENTS

Documents

SCRS/2015/020	Kell L., Ortiz de Urbina J., Merino G., De Bruyn P., Arrizabalaga H. and Tserpes G.
SCRS/2015/025	Ortiz de ZárateV. and PerezB.
SCRS/2015/027	Karnauskas M., Lauretta M.V., Walter III J.F. and Maunder M.N.
SCRS/2015/028	Goodyear C.P.
SCRS/2015/029	Lauretta M.V., Walter J.F. and Christman M.C.
SCRS/2015/030	Schirripa M.J.
SCRS/2015/031	Schirripa M.J. and Goodyear C.P.
SCRS/2015/032	Lauretta M., Walter J.F., Hanke A., Brown C., Andrushchenko I. and Kimoto A.
SCRS/2015/033	Domingo A., Forselledo R., Jiménez S. and Mas F.
SCRS/2015/034	Domingo A., Forselledo R., Jiménez S., Mas F. and Miller P.

Presentations

SCRS/P/2015/001	Goodyear C.P.
SCRS/P/2015/002	Druon, J-N., Hanke, A., MacKenzie, B. R., Damalas, D., Tserpes, G., Arrizabalaga, H., Arregi, I., Oray, I., Fromentin, J-M., Lamkin, J., Ramirez, K., Grubisic, L., Deflorio, M., Reglero, P., Afonso, P., Megalofonou, P., Addis, P., Ceyhan, T., Karakulak, S. and Ticina, V.
SCRS/P/2015/003	Kimoto, A., Kell, L. and Kitakado, T.