REPORT OF THE 2013 MEETING ON BLUEFIN STOCK ASSESSMENT METHODS

(Gloucester, Massachusetts, United States – July 20 to 22, 2013)

1. Opening, adoption of the Agenda and meeting arrangements

The meeting was held at the Massachusetts Division of Marine Fisheries, in Gloucester, from July 20 to 22. Dr. Molly Lutcavage opened the meeting and welcomed participants.

Drs. Richard Hillary (CSIRO Australia) and Laurence Kell (ICCAT Population Dynamics expert) co-chaired the meeting. Drs. Hillary and Kell welcomed meeting participants ("the Group") and proceeded to review the Agenda, which was adopted with minor changes **(Appendix 1)**.

A List of Participants is attached as **Appendix 2** and 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, 7	Secretariat
2	G. Scott
3	L. Kell, P. de Bruyn
4	D. Butterworth
5	C. Porch
6	D. Butterworth

2. Review of General Information

2.1 BFT Work Planning.

A presentation was given that summarised work plans for the conduct of research and stock assessments by SCRS for bluefin tuna since the implementation of the GBYP. It was noted that demands from the Commission have often required modification of these plans, at the expense of progressing the work on Management Strategy Evaluation (MSE) and other components of the GBYP. It was also noted that the Commission expects updated stock assessment advice for both the eastern and western bluefin management units in 2015 and that advice be based upon assessment models that allow inclusion of updated knowledge on biology and ecology of bluefin tuna.

In view of this reality, acknowledging that progressing the MSE for Atlantic bluefin has been recommended by SCRS since the mid-1990s, and considering the added tasks the Commission requires of the SCRS in advance of the next assessment, the Group recommended that GBYP initiate a parallel effort on progressing the MSE (see section 4), which is less dependent upon direct efforts of the Secretariat and National Scientists responsible for addressing tasks required by the Commission. Nonetheless, such a parallel approach will require a focused and intensive level of effort by a small "core" group. Additionally, preparing for the 2015 assessment, which will incorporate our updated knowledge of biology and ecology of Bluefin coming from GBYP, and other activities requires substantially more effort (i.e., financial support) than applied for recent Bluefin assessments.

2.2 GBYP activities

A presentation was given of the activities taken under the GBYP to produce data usable for modelling purposes, including data mining and recovery, aerial surveys on spawning aggregations, tagging (conventional and electronic) and the biological sampling and associated analyses. For each activity, GBYP provided details of the activities, the total numbers of data available for analysis, and the main preliminary results. Furthermore. Initiatives undertaken by GBYP to develop new modeling approaches were also presented. According to the mid-term overview of the GBYP and the amount of funding already provided (that represents about 43% of the original figure by year), it is proposed to adjust the time frame for carrying out the programme, in order to reach the initial objectives and provide the necessary data required to improve the assessment.

The Group noted that in spite of the limitations imposed on GBYP by funding at a level less than half of that originally proposed, important information gains were being achieved. It is important that the information gained be incorporated into the next stock assessment, to the degree possible. It was also noted that a number of recent research activities have been undertaken under the GBYP umbrella, but without direct funding from the GBYP, especially related to western bluefin. To address this, the Group recommended that a summary be prepared in time for 2013 SCRS review, which identifies those projects funded under the GBYP umbrella and from which new or updated information should be applied in the 2015 assessment and in development of an operating model in support of MSE. Establishing the data base to apply to the 2015 assessment and in development of an operating model for MSE is a time-critical, initial step in defining the work plan leading to the 2015 assessment and MSE process.

2.3 Improving assessment models and the provision of scientific advice

The third objective of the GBYP is "To improve assessment models and provision of scientific advice on stock status through improved modeling of key biological processes (including growth and stock-recruitment), further developing stock assessment models including mixing between various areas, and developing and use of biologically realistic operating models for more rigorous management option testing".

In order to identify and quantify uncertainties and their consequences on assessment results and projections, focused effort is required. A main reason for this is to allow recommendations on stock status advice reflecting the Commission's decision framework (Rec. 11-13) and management to be supported by a full stock assessment exercise, based on the new model, additional information and statistical protocols.

There are therefore short-term and long-term objectives for the SCRS and the GBYP, i.e., to improve assessment methods for use in 2015 and to develop management strategies through a Management Strategy Evaluation (MSE). For these reasons a work plan for the GBYP and the SCRS needs to be developed that includes objectives, deliverables, milestones and responsibilities.

Considering the time-frames required, initial focus needs to be on establishing the data base to be utilise in the 2015 stock assessment and used as a basis for operating model development. For operating model development as part of the MSE, it will be necessary to identify a small "core" group for developing and running the necessary computer code, which should be initiated in the near future. It will also be necessary to incorporate procedures that will inform the hypotheses to be considered. This should be based upon broad consultation and dialogue with experts having appropriate knowledge and/or experience in the bluefin fisheries.

3. Review of work packages

3.1 Operating models

The report from the Bluefin Meeting on Biological Parameters Review (BFT-BPR) was presented, focusing on the recommendations made. The meeting reiterated the importance of those recommendations for improving stock assessment and management. It was noted that the recommendations fell into two categories i.e., what is required for (i) the 2015 assessment, and (ii) the development of the operating model. It was agreed that a multi-annual plan for the work needs developing (see section 4 on operational matters).

The spatial structure was presented in Kerr et al (2013). Atlantic bluefin tuna are currently managed as separate eastern and western stocks. However, tagging and otolith chemistry patterns suggest that the two stocks mix seasonally and return to natal areas to spawn. Advances in spatially-explicit stock assessment models enable incorporation of tagging and otolith data to inform stock movement; however, modelling constraints can limit the manner in which movement rates are parameterized. The authors developed a simulation model to explore the consequences of leading hypotheses of bluefin tuna stock structure and mixing on stock productivity and the stock composition of catch. They also examined the impact that alternative movement rate parameterizations have on predicted distribution of biomass and the stock composition of the yields. The operating model includes two spawning populations based on western and eastern stocks, each with unique vital rates and independent recruitment. The analytical framework is a stochastic, age-structured, overlap model that is seasonally and spatially-explicit, with seven geographic zones. Spatial model structure was informed by expert consensus, and movement rates were derived from gravity and bulk transfer estimation methods. The western stock composed the entire mature biomass and yield in the Gulf of Mexico and Gulf of St. Lawrence, and the eastern stock composed the entire SSB and yield in the Mediterranean Sea and northeast Atlantic in all simulated scenarios.

Stock composition of mature biomass and yield in the western, central, and eastern Atlantic was mixed and the proportional contribution of stocks depended on the method used to parameterize movement. Different methods of estimating movement produced different estimates of overall productivity and yield, with a general tendency for higher estimates of productivity and yield for both stocks across zones using bulk transfer movement rates. The spatial distribution of eastern and western spawning stock biomass and stock composition of catch across geographic zones was sensitive to the interaction of movement and selectivity across geographic zones, and assumptions of age at maturity for each stock. The results demonstrate that spatially-explicit simulation models can be useful tools to examine the sensitivity of models to movement, as well as other assumptions. Simulation results can also help to inform the appropriate configurations for spatially-explicit stock assessments, and the model framework can be used to evaluate alternative management scenarios in the context of stock mixing.

This document and the BFT-BP report were agreed to be a good basis for developing the operating model (OM), which would then be refined based on current data and expert and biological knowledge. In addition to developing the OM there must be deadlines for providing data for conditioning and these data must be made available to the SCRS if they are to be used in this process to ensure transparency and collaboration.

The development of the OM will also allow the benefits of different sampling schemes to be evaluated, for example the aerial survey, tagging and biological sampling programmes.

It was recommended that the unspent budget from the modelling programme under GBYP Phase IV modelling be used to start some of work required for the 2015 assessment, e.g., conversion of size to age using ALKs and completing the analyses started by BFT-BRP on growth and maturity.

A presentation on a preliminary Stock Synthesis model for western Atlantic bluefin tuna was given. The initial configuration of the model mimics the western Atlantic bluefin tuna VPA in fleet configuration, indices and in the use of the catch at age developed from age-slicing the catch at size. The model runs from 1950 to 2010 and assumes that the catches reported from 1950 represent an equilibrium level of fishing mortality rather than virgin conditions. Selectivities for most fleets were modelled with a double normal functional form that allows for either dome-shaped or asymptotic selectivities except for the United States pelagic longline, the U.S. pelagic longline indices for fish greater than 195 cm and the Japanese pelagic longline in the Gulf of Mexico which were modelled with a logistic form, and the Gulf of Mexico larval index which was accorded a selectivity equal to the maturity schedule, assuming 100% maturity at age 9. Multiple time blocks for estimating selectivity were chosen on the basis of limited *a priori* knowledge and some clear breaks in the catch at age patterns, but these should be re-evaluated in consultation with national scientists. The initial model performance was poor with several bounded selectivity parameters and substantial lack of fit to the age composition. Given the bimodal patterns in some fleet age compositions and the potential that the age compositions represent carry-overs or substitutions, there will be a need to re-evaluate the input age composition and the fleet definitions to improve future catch at age modelling. Futhermore, the residual patterns in the age-composition fits indicate that there is substantial targeting of cohorts which may need to be considered with more flexible and time-varying selectivity patterns. Lastly the effects of regulations on the observed age composition will need to be considered. Nonetheless the results largely reflect the VPA results and highlight some of the complexities necessary to develop an operating model that reflects the realities of the data used for western Atlantic bluefin tuna.

It was agreed that this model was not ready for use as the main assessment approach, but recognised it to be a useful tool for exploring the data used in the assessment and for developing hypotheses for use in OM scenarios. It was also agreed that a work plan for developing those hypotheses should be formulated to ensure consistency this should be done jointly for the East and West.

SCRS/2013/136 provided initial statistical catch-at-age and catch-at-length assessments of western Atlantic bluefin tuna stock, making assumptions comparable to those of the VPA continuity run from the 2012 ICCAT assessment meeting. The approach was similar to that taken for the eastern Atlantic and Mediterranean stock in Butterworth and Rademeyer (2013). Both analyses pointed to the important role played by assumptions related to possibly domed selectivity (or alternatively increasing natural mortality at age) in determining the overall scale for the abundance of the population assessed. For the western stock, assumptions about the form of the stock-recruitment relationship were also influential. The paper pointed to the need to clarify aspects of the length-at-age data for some components of the western fishery and for models such as SS, iSCAM, SCAA and SCAL (see recommendations).

Work is being conducted under the GBYP iSCAM modelling contract to develop a statistical catch-at-age model as an alternative to the VPA. iSCAM can be implemented as a MP (see below) to be simulation tested, i.e., to

compare the benefits of using a statistical catch-at-age model with the current assessment method VPA or with empirical MPs (see section 3.2). It could also be used to help condition an OM.

3.2 Management procedures

A presentation was given summarising the elements of a Management Procedure (MP). This provided a basic definition of what is meant by a management procedure, i.e. the combination of data, a stock assessment method and management regulation. The data available to ICCAT for use by an MP was listed briefly. Assessment models that are available for use as part of an MP were noted as having been classified by the World Conference on Stock Assessment Methods (WCSAM). The benefits of the WCSAM were acknowledged and it was noted that this conference had provided an ideal forum for identifying potential modelling approaches for stock assessment. Assessment models incorporated a range of complexities and data requirements from catch only models (e.g., Depletion Corrected Average Catch-DCAC) to fully integrated assessments (e.g., Multifan-CL and Stock Synthesis). The current models used in the ICCAT assessment process were summarised.

The benefits of developing new methods were recognised, e.g., stage based models that could use the juvenile and adult aerial surveys directly without the need of age or size data. The presentation then provided a synthesis of potential examples of Harvest Control Rules (HCR) as they are applied in other fora (CCSBT, IWC) as well as the work that has already been conducted within ICCAT (such as for northern albacore) and between tuna RFMOs (ISSF meetings). Lastly, the need to identify objectives and quantify associated performance statistics for testing HCRs was stressed.

Several papers on HCRs and the Management Strategy Evaluation (MSE) process in general were provided by attending scientists.

The Group noted, that an MSE may range from relatively simple, unconditioned simulations, to highly data conditioned simulation evaluations and model-based HCRs that require considerable technical expertise and resources, and may take several years to complete. Considering the time-frames involved it was recommended that the work should initially focus on the relatively simple operating models (which at least include mixing and other demonstrable major sensitivities) and building additional complexity (e.g., ecosystem effects) as needed. The need for additional complexity should be based upon (jargon-free) dialogue with stakeholders and fishery managers, which should be initiated in the near future.

As part of the GBYP modelling programme, an application of a single stock, single area statistical catch-at-age model (iSCAM) is to be developed to account for observation error in catch data for comparison with the 2012 VPA stock assessment. iSCAM can be incorporated in the MSE as a stock assessment method that operates on data simulated from the operating model. iSCAM model (Martell 2013) has been peer-reviewed and applied in the assessment of herring populations. An alternative package is Stock Synthesis 3. However, in the scope of this contract implementing SS3 is problematic: to have confidence about a correct application requires training outside the scope of this contract. Instead, iSCAM offers an open-source alternative that is easier to modify and apply. The Group agreed that the method looked promising although its complexity may make it difficult to use as an MP, and considered that primarily empirical HCRs such as those used by CCSBT may be more appropriate.

A presentation was given on evaluating the effectiveness of harvest control rules and biological reference points for bigeye tuna and yellowfin tuna fisheries in the Indian Ocean (Zhang et al. 2013). It emphasised that a Biological Reference Point (BRP) is one of the essential components in the management strategy evaluation (MSE). However, as BRPs were usually derived externally from stock assessment models, their efficacy should be evaluated before being applied to fisheries management. On the other hand, the consistency among different types of BRPs should also be evaluated. In this study, an age-structured operating model was used to systematically evaluate 1500 combinations of alternative BRPs in managing the bigeye tuna (*Thunnus obesus*) and yellowfin tuna (*Thunnus albacares*) fisheries in the Indian Ocean. The efficacy of these BRPs was evaluated using four performance measures related to fisheries performance and conservation. Monte Carlo simulation was used to evaluate the uncertainties quantified by implementation and process errors, and uncertainties in key fisheries parameters were considered as sources of uncertainty in the study. The results suggest that the current maximum sustainable yield (MSY)-based BRP combinations are effective target BRPs to manage the bigeye and yellowfin tuna fisheries if used in conjunction with the "linear" harvest control rule (HCR). However, using a "knife-edge" HCR, better BRP combinations could be found for both the bigeye and yellowfin tuna fisheries management with improved fisheries and conservation performance. The framework developed in the study can be used to identify suitable BRPs based on a set of defined performance measures.

3.3 Data and supporting analyses

It was noted that not all of the budget under the GBYP had been allocated in 2013, and it was suggested that this money be used to complete the analyses needed for the 2014 assessment and conditioning of the operating model.

3.4 Risk Assessment

On-going work under the Risk Analysis contract was described, i.e., how to quantify the "unquantified uncertainties" and selection of hypotheses for use in the OM.

4. Elaboration of a detailed work plan for conducting the Management Strategy Evaluation

This section outlines, in tabular form, a schedule for the work required to conduct the 2014 and 2015 assessments and then to evaluate a management procedure using an operating model for Atlantic bluefin. A detailed work plan, based on this schedule, will be developed for presentation at the SCRS plenary. Following endorsement by the SCRS, a budget will be proposed for presentation to the Commission. To implement the operating model, it is essential that contracts for providing external support for a number of years are awarded. It is also essential to establish a core steering group to oversee the work.

2013

- Discussion of alternative mixing structures in broad terms
  - SCRS paper with key contributors
- Clarification of standard inputs to standard separate west/east assessments (**Appendix 4**)
  - Use ICCAT meeting to facilitate with those most familiar with data (Terms of Reference document)
  - Table of information available
- Clarification on data availability for mixing and stock structure related data for more complex stock assessments.
  - Genetic, microconstituents, tags (archival, conventional, other)
- Identification of major sensitivities for both separate and mixed stock assessments (e.g., M, fecundity schedule, SRR and alternative mechanism of population regulation)
- Use Risk assessment paper on qualitative identification of uncertainty (written under GBYP modelling contract) to inform OM scenarios, i.e., SCRS paper with key contributors.
- Identification of those who will be taking both assessment approaches further forward
  - Consistent, core group over a multi-year timeline
- Support capacity development for conduct, understanding and use of MSE in adoption of Harvest Control Rules for the Atlantic bluefin fisheries through:
  - ICES/ICCAT MSE training in (Dec. 2013) to facilitate capacity building for CPC scientific delegations;
  - Take advantage of GEF/FAO Areas Beyond National Jurisdiction Tuna Program funds intended to accelerate the joint tuna RFMO working group for MSE development and management /stakeholder / science (jargon-free) dialogue.
  - Conduct a 'side event'(SCRS Chairman to co-ordinate) at the 2013 Commission meeting open to CPCs and stakeholder groups, drawing upon the experience at CCSBT to initiate the management / science/ stakeholder dialogue.

2014

For bluefin session

- Eastern assessment update

Post-bluefin; ideally follows bluefin session

- Review of updated separate assessment approaches
- Review of initial mixed stock models and refinement of alternative mixing structure scenarios
- Tool for visualizing movement
- Meeting including stakeholders (finalise at 2013 Commission meeting)

2015

For bluefin session

- Data guillotine – finalisation of data to be considered for operating model development for MP testing (back reference); includes data update for assessments for that year.
- Updated catch limit advice for both East and West based on revised separate assessments, and possibly also mixed stock models

2016

For separate meeting (Jan-Feb 2016)

- Agreement on operating model specifications (conditioning)
- Agreement on data for use in MPs
  - Subset of OM data
- Initial agreement on objectives and performance statistics (other stakeholders need to be included in these discussions)
- Specifications and schedule for coding

Early in year

- Circulation of code to allow alternative MP developers to plug-in and test their candidate MPs

Bluefin session

- Refinement of MP testing procedures
- Interaction with stakeholders for feedback based on initial results from developers

2017

Bluefin session

- Review of further results from developers
- Development of final recommendations to Commission on MP to adopt, together with its associated data inputs.

5. Recommendations

- Draft a detailed multi-annual work plan that includes objectives, deliverables and responsibilities, for presentation at the SCRS for agreement and finalisation (based on the outline in section 4).
- Develop an associated budget for the work plan for presentation to the Commission.
- Because external support is essential for conducting the work plan, particularly for implementing the operating model, this support must be guaranteed for a number of years.
- Establish a core modelling steering group to oversee the work.

- Reallocate the unspent 2013 GBYP modelling budget to modelling size–at-age, growth and fecundity (started under BFT-BPR).
- All relevant data, especially electronic tagging data to be used in developing the OM must be made openly available to the group involved. In addition deadlines for providing these data must be established.

6. Other matters

No other matters were discussed.

7. Adoption of the report and closure

The report was adopted.

The Chairman thanked the participants for their hard work.

The meeting was adjourned.

Literature cited

Butterworth, D.S. and Rademeyer, R.A. 2013, A comparison of initial statistical catch-at-age and catch-at-length assessments of eastern Atlantic bluefin tuna. Collect. Vol. Sci. Pap. 69(2): 710-741.

Kerr, L.A., Cadrin, S.X., Secor, D.H. and Taylor, N. 2013, A simulation tool to evaluate effects of mixing between Atlantic bluefin tuna stocks. Collect. Vol. Sci. Pap. 69(2): 742-759.

Kimoto, A., Itoh, T. and Miyake, M. Overview of the Japanese longline fishery for bluefin tuna in the Atlantic Ocean, up to 2009. Collect. Vol. Sci. Pap. ICCAT, 66(3): 1116-1135.

Legault, C.M., Restrepo, V.R. 1999. A flexible forward age-structured assessment program. Collect. Vol. Sci. Pap. ICCAT, 49(2): 246-253.

Martell, S. 2013. ISCAM project https://sites.google.com/site/iscamproject/

Porch, C.E., Turner, S.C., Methot, R.D. 1994, Estimates of the abundance and mortality of West Atlantic bluefin tuna using the stock synthesis model. Collect. Vol. Sci. Pap. ICCAT, 42(1): 229-239.

Zhang, Y., Chen, Y., Zhu, J., Tian, S. and Chen, X. 2013, Evaluating harvest control rules for bigeye tuna *Thunnus obesus*) and yellowfin tuna (*Thunnus albacares*) fisheries in the Indian Ocean. *Fish Res.* 137. 1- 8.

Appendix 1

AGENDA

1. Opening, adoption of the Agenda and meeting arrangements
2. Review of General Information
3. Review of Work Packages
   - 3.1 Operating Model
   - 3.2 Assessment frameworks
   - 3.3 Data and supporting analyses
   - 3.4 Risk Analysis
4. Elaboration of a detailed work plan for conducting the Management Strategy Evaluation
5. Recommendations
6. Other matters
7. Adoption of the report and closure

Appendix 2

LIST OF PARTICIPANTS

SCRS CHAIRMAN

Santiago Burrutxaga, Josu
Head of Tuna Research Area, AZTI-Tecnalia, Txatxarramendi z/g, 48395 Sukarrieta (Bizkaia), Spain
Tel: +34 94 6574000 (Ext. 497); 664303631, Fax: +34 94 6572555, E-Mail: jsantiago@azti.es; flarrauri@azti.es

CONTRACTING PARTIES

CANADA

Hanke, Alex
Scientific, St. Andrews Biological Station/ Biological Station, Fisheries and Oceans Canada531 Brandy Cove Road, St. Andrews New Brunswick E5B 2L9
Tel: +1 506 529 4665, Fax: +1 506 529 5862, E-Mail: alex.hanke@dfo-mpo.gc.ca

EUROPEAN UNION

de Cárdenas González, Enrique
Consejero de Pesquerías, Ministerio de Medio Ambiente, Medio Rural y Marino, Secretaría General del Mar, C/Velázquez, 144, 28006 Madrid, Spain
Tel: +34 91 347 6110, Fax: +34 91 347 6037, E-Mail: edecarde@magrama.es

Scott, Gerald P.
AZTI Tecnalia, AZTI Tecnalia, Txatxarramendi Ugartea z/g, Sukarrieta, Bizkaia , Spain
Tel: +1 954 465 5589, E-Mail: gpscott_fish@hotmail.com

JAPAN

Itoh, Tomoyuki
Chief Scientist, National Research Institute of Far Seas Fisheries, 5-7-1 Orido Shimizu, Shizuoka 424-8633, Japan
Tel: +81 543 36 6036, Fax: +81 543 35 9642, E-Mail: itou@fra.affrc.go.jp

Iwata, Shigehide
Assisstant Professor, Faculty of Marine Science, Tokyo University of Marine Science and Technology, Department of Marine Biosciences5-7, Konan 4, Minato-ku, Tokyo, Japan 108-8477, Japan
Tel: +81 3 5463 0469, Fax: +81 3 5463 0469, E-Mail: siwata0@kaiyodai.ac.jp

Kimoto, Ai
Scientist, National Research Institute of Far Seas Fisheries, 5-7-1 Orido Shimizu, Shizuoka 424-8633, Japan
Tel: +81 543 36 6036, Fax: +81 543 35 9642, E-Mail: aikimoto@affrc.go.jp

Kitakado, Toshihide
Associate Professor, Faculty of Marine Science, Tokyo University of Marine Science and Technology, Department of Marine Biosciences5-7, Konan 4, Minato-ku, Tokyo, Japan 108-8477, Japan
Tel: +81 3 5463 0568, Fax: +81 3 5463 0568, E-Mail: kitakado@kaiyodai.ac.jp

Sakai, Osamu
Researcher, Temperate Tuna Group, Bluefin Tuna Resources Division, National Research Institute of Far Seas Fisheries, 5-7-1 Orido Shimizu-ku, Shizuoka-City, Shizuoka 424-8633, Japan
Tel: +81 543 36 6037, Fax: +81 543 36 6036, E-Mail: sakaios@affrc.go.jp

Takahashi, Norio
Senior Researcher, Temperate Tuna Group, Bluefin Tuna Resources Division, National Research Institute of Far Seas Fisheries, Fisheries Research Agency, 2-12-4 Fukuura Kanazawa, Yokohama, Kanagawa, Japan 236-8648
Tel: +81 45 788 7509, Fax: +81 45 788 5004, E-Mail: norio@affrc.go.jp

Uozumi, Yuji
National Research Institute of Far Seas Fisheries, 5-7-1 Chome Orido, Shimizu, Shizuoka 424-8633, Japan
Tel: +81 543 36 6037, Fax: +81 543 35 9642, E-Mail: uozumi@fra.affrc.go.jp

UNITED STATES

Butterworth, Douglas S.
Professor, Department of Mathematics and Applied Mathematics, University of Cape Town, Rondebosch 7701, South Africa
Tel: +27 21 650 2343, Fax: +27 21 650 2334, E-Mail: doug.butterworth@uct.ac.za

Cadrin, Steven Xavier
Associate Professor, SMAST-University of Massachusetts, Department of Fisheries Oceanography, 200 Mill Road, Suite 325, Fairhaven, Massachusetts 02719
Tel: +1 508 910 6358, E-Mail: scadrin@umassd.edu

Galuardi, Benjamin
Large Pelagics Research Center, University of Massachusetts, Amherst, 932 Washington St., Gloucester, Massachusetts 01931
Tel: +1 978 283 0368, Fax: +1 978 283 0297, E-Mail: galuardi@eco.umass.edu

Golet, Walter
American Bluefin Tuna Association-ABTA, University of Maine, 350 Commercial Street, Portland, Maine 04101
Tel: +1 207 228 1628, E-Mail: walter.golet@maine.edu

Kerr, Lisa
Gulf of Maine Research Institute, 350 Commercial Street, Portland, Maine 04101
E-Mail: lkerr@gmri.org

Lutcavage, Molly
Director, Large Pelagics Research Center, University of Massachusetts, 108 East Main Street, Gloucester, Massachusetts 01930
Tel: +1978 283 0368, Fax: +1 978 283 0297, E-Mail: mlutcavage@eco.umass.edu

Porch, Clarence E.
Chief, Sustainable Fisheries Division, Southeast Fisheries Science Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami Florida 33149
Tel: +1 305 361 4232, Fax: +1 305 361 4219, E-Mail: clay.porch@noaa.gov

Walter, John
NOAA Fisheries, Southeast Fisheries Center, Sustainable Fisheries Division, 75 Virginia Beach Drive, Miami Florida 33149, USA
Tel: +305 365 4114, Fax: +1 305 361 4562, E-Mail: john.f.walter@noaa.gov

Zhang, Yuying
Florida International University, 3000 NE 151 St. MSB 358 N Miami, Florida 33181
Tel: +1 305 9194105, Fax: +1 305 9194030, E-Mail: yzhang13@fiu.edu

External Experts

Hillary, Richard
CSIRO Marine and Atmospheric Research and Wealth from Oceans National Research Flagship, Castray Esplanade, Hobart, Tasmania 7000, Australia
Tel: +61 3 9545 2176, Fax: +61 3 9545 2175, E-Mail: Rich.Hillary@csiro.au

Davies, Campbell
CSIRO Marine and Atmospheric Research and Wealth from Oceans National Research Flagship, Castray Esplanade, Hobart, Tasmania 7000, Australia
Tel: +61 3 9545 2176, Fax: +61 3 9545 2175, E-Mail: Campbell.Davies@csiro.au

****

ICCAT SECRETARIAT
C/ Corazón de María, 8 - 6 Planta, 28002 Madrid, Spain
Tel: + 34 91 416 5600, Fax: +34 91 415 2612, E-Mail: info@iccat.int

Pallarés, Pilar
Kell, Laurence
Di Natale, Antonio
De Bruyn, Paul

Appendix 3

LIST OF DOCUMENTS

SCRS/2013/136 A comparison of initial statistical catch-at-age and catch-at-length assessments of western Atlantic bluefin tuna. Butterworth, D.S. and Rademeyer, R.A.

Appendix 4

TERMS OF REFERENCE FOR THE WORKING GROUP ON BFT FLEET STRUCTURE, CAA, CAS AND LENGTH COMPOSITION

Need: Given the desire to move to a statistical catch at age model there is a need to evaluate the fleet definitions and the available basic age and length composition data. Decisions regarding fleet definitions and time breaks for modeling selectivity will facilitate development of future assessment models for BFT.

I. Evaluate fleet definitions for East and West BFT.
   a. Spatial and operational homogeneity.
   b. Magnitude of catches or importance to model/management considerations (i.e. do we need to model them separately or can they be condensed).

II. Classify age composition data according to tiers of inclusion (Carlos has done for the most part, it just needs to conform to fleets defined in (I) above.
   a. Tiers may be: (1) Original age comp with sample size; (2) raised age comp; (3) carried over age comp or substitutions.
   b. Obtain actual sample sizes (when/if possible).
   c. Identify possibility of obtaining raw data.

III. Evaluate CAS data according to similar tiers of inclusion

IV. Recommend time breaks where selectivity may have changed.
   a. Obtain objective *a priori* information from expert opinion.
   b. Visually inspect age and length comp for East and West for breaks.
   c. Evaluate decisions made in Porch et al (1994), Legault and Restrepo (1999) model or other models and papers describing fleet history (Kimoto et al, 2011).

V. Compile table of regulatory changes that may have affected selectivity and catchability.

VI. Potential volunteers: John Walter (US), Sylvain Bonhommeau (EU), Rebecca Rademeyer, others?

It was noted that during the SCRS meeting it will be desirable to follow up on the bullet point listed for 2013. It was also agreed that a small core group of experts will be required to help lead discussions; the group composition will be finalised following the SCRS.