REPORT OF THE ALBACORE WORKING GROUP WORKSHOP

International Scientific Committee for Tuna and Tuna-like Species In the North Pacific Ocean

26-30 May 2016

National Research Institute of Far Seas Fisheries
Shimizu, Shizuoka, Japan

1.0 OPENING OF THE WORKSHOP

An intersessional workshop of the Albacore Working Group (ALBWG or WG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) was convened at the National Research Institute of Far Seas Fisheries (NRIFSF), Shimizu, Shizuoka, Japan, 26-30 May 2016. The ALBWG Chair briefly described the objectives of the meeting and the expected outcomes. The objectives of this workshop are to: (1) Review new research relevant to the stock assessment in 2017 (new methods, new estimates of important parameters, etc.); (2) Review progress on the management strategy evaluation (MSE) process; (3) Stock assessment planning (dates, data submission deadline, work assignments, model parameterization for growth (estimate or fixed), natural mortality, etc.); (4) Develop stock status and conservation advice recommendations for ISC16; (5) Identify ALBWG Vice-Chair; and (6) Elect a Chair for the ALBWG.

Scientists from Canada, Chinese Taipei, Japan, the United States of America (USA), and the Inter-American Tropical Tuna Commission participated in the workshop (Attachment 1). Members from Mexico, Korea, and the Secretariat of the Pacific Community sent their regrets.

This report is a record of discussions and planning decisions for the upcoming stock assessment in 2017 that were agreed to by the ALBWG. This report also captures the ALBWG proposals for performance indicators for management objectives proposed at a management/stakeholders workshop in Yokohama, 24-25 May 2016. This package of management objectives, performance indicators and notes is recommended by the ALBWG to the ISC16 Plenary in July 2016 and the 12th Regular Session of the Northern Committee in early September 2016.

2.0 REVIEW AND ADOPTION OF THE AGENDA

The draft agenda was reviewed and adopted at the workshop (Attachment 2). Rapporteuring duties were not assigned to specific WG members as discussions were not expected to be overly long nor complex. John Holmes had the overall responsibility for assembling the report and asked WG members to forward any notes they made to him.

One working paper describing the use of an age structured production model as a diagnostic tool (ISC/16/ALBWG-01/01) and a presentation by Japan describing work plans for the upcoming 2017 assessment were discussed (Attachment 3). The WP authors will make their paper publicly available on the ISC website; the presentation will not be publicly available.

3.0 MANAGEMENT STRATEGY EVALUATION PROCESS UPDATE

The ALBWG Chair briefly described progress on the MSE process since the last ALBWG workshop in April 2015. He noted that the report from that 2015 workshop (ALBWG 2015; WCPFC-NC11-WP-01) was forwarded to NC11 for discussion and with their endorsement a plan for developing management objectives was discussed and a template describing the inputs needed was provided (see WCPFC-NC11-IP-12). Progress on developing objectives included the submission of preliminary ideas at the WCPFC12 in Bali, Indonesia. The ALBWG Chair attended WCPFC12 on behalf of the WG to coordinate this input and provide feedback (see Attachment 4) in preparation for a second MSE workshop in 2016.

A 1.5 day workshop was convened in Yokohama, Japan, May 24-25, 2016, to develop management objectives and performance indicators for the north Pacific albacore management strategy evaluation through discussion with mangers and stakeholders. The proposed objectives developed at this workshop and recommended for initial MSE evaluations (Attachment 5) were reviewed by the ALBWG and endorsed as suitable for preliminary evaluations in the MSE, recognizing that revisions may be made in the future based on the MSE simulation results. The MSE workshop requested that the ALBWG propose performance indicators for the preliminary objectives and common language on acceptable risk.

ALBWG members proposed an additional management objective related to maintaining the stock at the target reference point (Objective 6 in Attachment 5). This objective was not proposed by managers and stakeholders, but was felt to be necessary to facilitate research on selecting a suitable target reference point for the north Pacific albacore stock using the MSE process.

The ALBWG proposals on performance indicators, example output, and acceptable risk language are included in Attachment 5. It should be noted that most of the proposed performance indicators are configured so that higher estimated values mean better performance and lower estimated values mean poorer performance, i.e., they have consistent directionality to reduce confusion in interpreting results. The first performance indicator for Objective 5 on management stability (%change due to harvest control rule between years) and the performance indicator for Objective 6 on target levels ($F_{target}/F_{current}$) are exceptions to this rule. The %change indicator has no directionality while the target level indicator is configured so that ratios > 1 in at least 50% of years are consistent with better performance while a ratio < 1 is indicative of overfishing.

The ALBWG recommends the proposed objectives, performance indicators and acceptable risk language shown in Attachment for the initial evaluations of the future MSE, but notes that this package is subject to future expert input from the MSE Scientist to be engaged in this process.

4.0 STOCK ASSESSMENT RESEARCH

The ALBWG is planning to conduct the next stock assessment in April 2017. Two items were discussed as part of this process.

4.1 Work Plan of Japan Prior to the Data Preparation Meeting

Summary **-** The majority of data on which the stock assessment is built are provided by Japan. Japanese scientists noted that simplified fishery definitions are needed for the 2017 assessment because the 2014 assessment fishery definitions based on fish size, season, area, gear criteria were too complicated. The intention is to develop a statistical basis for improved definitions, which are associated with length frequency data.

Five areas of work were identified, dependent on new fishery definitions:

1. Catch statistics (LL, PL and Others);
2. Length frequency data (LL and PL);
3. CPUE Standardization of longline fishery;
4. CPUE Standardization of pole and line fishery; and
5. Preliminary future projection software

Catch statistics (LL, PL and Others) – two catch statistic datasets will be compiled, a simple update using the 2014 fishery definitions, and a new dataset with the revised fishery definitions.

Length-frequency data – In order to establish new fishery definitions, work is needed to identify time and spatial changes in fisheries and the effects on size composition data, to evaluate sex differences in length frequency data and to capture large fish > 130 cm, which occur in areas close to the equator (+10°N), but were not used to define a separate fishery in the 2014 assessment. These large fish are important because in the two sex growth model they are predominately male, and work will focus on defining a fishery based on fish > 130 cm.

CPUE standardization of the longline fishery – longline fisheries may switch between targeting bigeye tuna and albacore tuna. CPUE standardization for the 2014 assessment did not include a targeting factor. Japanese scientists intend to explore how to account for targeting in two ways: the inclusion of a targeting factor directly in the standardization, and the use of a mixed effects model with a random effect for fleet or trip.

CPUE standardization for the pole and line fishery – there will be further work to determine how to treat the known targeting shift between SKJ and ALB that occurs inter-annually and may occur within a year as well. One idea is to include a random effect for fleet or trip in the GLMM model used for standardization.

Future projection software – The ALBWG switched to a two-sex model in the 2014 assessment and so had to develop projections on an ad hoc basis since the SSFUTURE projection software used in the 2011 assessment is based on a combined sex model. Japanese scientists intend to develop new software in R or ADMB to make two sex future projections. This software will only consider constant F simulations and preliminary results will be compared with SS3 output.

Lastly, as part of this work, the 2014 SS3 assessment model will be run using the updated datasets and the 2014 fishery definitions. The intent of this run is to evaluate the effect of the data update on model results. Results will be evaluated at the data preparation meeting.

Discussion - Standardization of longline CPUE was discussed, specifically the decline in 1960-1970s at the beginning of the time series. This steep decline was removed in the 2014 model, leaving a time series beginning in 1975. This decline is believed to be due to a targeting switch to bigeye tuna and also to a data quality issue in Japan. It was noted that data from earlier periods may be available that could be used to develop a much longer historical CPUE time series for longline. However, the quality of these data is believed to be lower and it is unknown whether they can be used to develop an index. An index prior to 1975 is of interest from a scale standpoint because at present the assessment model has little information on biomass scale and it is hoped that a pre-1975 index will provide that scale. Japanese and United States scientists indicated that they will explore the issue. It was noted that one approach to detecting changes in catchability and targeting is to evaluate the species composition of sets as developed and applied to the Taiwan LL data in 2014 (Chen and Change 2013a, b).

The ALBWG recommends that Japanese and US scientist work together on new fishery definitions and the development of a pre-1975 longline index and that they report on their results at the data preparation meeting in the fall of 2016.

4.2 Illustrating the use of the age-structured production model diagnostic tool in the Northern Albacore stock assessment. Carolina V. Minte-Vera and Mark N. Maunder.

Summary – The most recent assessment for the north Pacific albacore stock was performed using an age-structured statistical integrated model built on the Stock Synthesis 3 platform. Integrated models incorporate a suite of data and assumptions, and use likelihood methods to estimate the parameters. Recently, diagnostics such as the likelihood profile on the scale parameter and the age-structure production model (ASPM), have been developed. The use of the ASPM in the stock assessment model for the north Pacific albacore stock is illustrated and the insights gained from it are discussed. The ASPM diagnostics showed that the north Pacific albacore stock biomass, like other tuna stocks in the Pacific Ocean, is essentially driven by recruitment variability and that the length-composition data do not have a disproportionate effect on the stock assessment model results. However, the diagnostics also showed that in the middle of the time-series the abundance indices and the length-composition data may be in conflict. Model misspecification needs to be explored for the middle period of the stock assessment model. It is recommended that the ASPM diagnostic tool be used in the next assessment of the north Pacific albacore stock since it provides new insights into the assessment model and the dynamics of the stock.

Discussion – It was noted that the age-structured production model (ASPM) can only estimate reasonable biomass trends (compared to the 2014 base case) if recruitment is estimated. This finding is consistent with the hypothesis that the north Pacific albacore stock is recruitment driven. ALBWG members focused on the finding that uncertainty in ASPM biomass estimates was much lower than uncertainty around biomass trends estimated by the 2014 base case during the mid-1970s to mid-1990s. It was suggested that this difference may be due to conflicting signals from the CPUE and size composition data. This is a period when extra-large albacore (>130 cm) in tropical areas moved north. Catches were small overall, but significant to a specific fishery.

The ALBWG recommends using the ASPM as a diagnostic tool for the 2017 stock assessment.

5.0 STOCK ASSESSMENT PLANNING

The WG discussed the following components for the 2017 stock assessment:

1. Scheduling of the data preparation and stock assessment workshops and data submission
2. Information requirements for WPs to support CPUE index development (see Table 1);
3. Initial assumptions and parameterization of the 2017 assessment along with potential alternative approaches (see Table 2);
4. Sensitivity runs (see Table 3);
5. Diagnostic analyses (see Table 4); and
6. Work assignments for the assessment.

5.1 Scheduling

The ALBWG proposes the following schedule of meetings in support of the 2017 stock assessment:

	Dates	Location
Data Preparation Workshop	8-15 November 2016	Nanaimo, Canada
Stock Assessment Workshop	4-13 April 2017	Shimizu, Japan
Data Submission Deadline	31 January 2017	
Assessment Preparation Meeting	1-day, ISC17	

It is expected that fishery data (catch, size composition, CPUE) up to 2015 will be used in the 2017 assessment. Member scientists will also attempt to include 2016 catch data if possible. The final call on the availability of 2016 catch data will be made at the data preparation meeting.

Table 1. Information requirements in working papers to support the development of abundance indices. Taken from ALBWG (2013).

Fishery description	Describe fishery including catch, effort, size composition of catch, nominal CPUE by area, season, history of fishery development and changes
Analysis description	Describe data selection, CPUE standardization model, and CPUE estimates. Include any data filtering, outlier removal
Statistical Results	Provide model diagnostics and goodness-of-fit criteria relative to alternative model configurations; ANOVA tables, etc.
Nominal/Standardized	Comparison plot of nominal and standardized indices
Diagnostic plots	QQ, residuals, etc.
Point estimate & variability	Characterize uncertainty in estimates of standardized CPUE; SE or CV of standardized CPUE (generated or assumed)

Table 2. Preliminary parameterization of the base case model for the 2017 stock assessment of north Pacific albacore.

Parameter	Previous assessment	2017 Assessment	Notes
Model period	1966-2012	1966-2015	Will attempt to include 2016 catch in the model, so timeframe 1966-2016; PL index starts in 1972 and LL in 1975; Explore early JPN data for index development
Stock structure	Single, well-mixed stock	Single, well-mixed stock	
Natural mortality	0.3 yr^{-1} for all ages	0.3 yr^{-1} for all ages	The WG noted that there are several alternatives for estimating M (Lorenzen with 0.3 for adults, SPC M vector, use tagging data). S. Teo to develop WP investigating alternatives before the assessment
Growth	2-sex VBGF, estimated outside the model	2-sex VBGF, estimated outside the model	Attempt to include otolith data and estimate growth in model, consider tagging data also (C. Minte-Vera, H. Ijima to explore); C. Minte-Vera to consider Maunder growth model for tropical tunas informed by maturity (presented at SAC in 2015)
Stock-recruitment	Beverton-Holt, steepness = 0.9	Beverton-Holt, steepness = 0.9	Based on the midpoint value between two studies on albacore steepness (0.95 and 0.85); sensitivities based on SPC assumption
Maturity	50% at age-5, 100% at age-6	50% at age-5, 100% at age-6	Ijima to check if maturity at length data available; will reformulate if possible; Chen (2010) paper expresses relationship between gonad weight and length; C.-Y. Chen to retrieve raw data from Dr. Chen; worked up by Ijima and Chen;
Length-weight	Seasonal length weight relationships from Watanabe et al	Seasonal length weight relationships from Watanabe et al	
CV of indices	Avg CV of 0.2 on main LL indices; CV 0.3 on PL	Additive constant to CV to make average CV of an index to be 0.2	Consider iteratively reweighting indices and size comp data to improve fit once WG feels weighting between indices and size comps is approximately correct; attempts to improve estimates of uncertainty
Size composition effective sample size	Reweight by catch; Initial sample size based on number of trips for EPO Longline and troll, and other fleets are adjusted so that the average sample size is equivalent to US longline and troll. Further down-weighted by lambda of 0.01	Reweight by catch; Initial sample sizes for fleets should be scaled with a multiplier so that the average is equal to the US troll and longline fleets (number of trips). Use Francis reweighting scheme once model is close.	Initial sample sizes will depend on whether set or trip data is available from Japan (Ijima and Kiyofuji) and Taiwan (Chen). Provide during data prep meeting. Experiment with reweighting by area (consistent with weighting of indices).
Selectivity	Fixed size selectivity	Fixed size selectivity	Explore fixed size selectivity with time-varying age selectivity to try and capture movement

Table 3. List of sensitivity model configurations for 2017 stock assessment of North Pacific Albacore tuna.

Sensitivity Run	Alternative Assumption	Justification	Comments
Natural Mortality	Lorenzen	model performance	
Natural Mortality	Range between 0.3 and 0.4	range of uncertainty	
Steepness	Range 0.75-0.9	range of uncertainty	
Selectivity	Size selectivity	Model performance	Comparison with previous approach if time-varying age selectivity is used
Selectivity	All domed	model performance	Evaluate influence of selection assumption
Growth form	Two alternative growth forms (combined sex, Taiwan – Chen et al. (2012) and TBD based on results of planned research, led by C. Minte-Vera and H. Ijima	model performance	Evaluate importance of composition data on scale
Alternative CPUE	TBD	model performance	
Starting years	1952, 1975, 1993	model performance	JPN statistical datasets changed 1975 and 1993
Fit to equilibrium catch	Average pre1966	model performance	
Drop Juvenile CPUE	PL, Troll, Small longline	model performance	Minimize influence of missing movement process on estimated dynamics

Table 4. Proposed diagnostic analyses for the 2017 north Pacific albacore stock assessment.

Analysis	Rationale	Comments
Recruitment (R_0) profiling	Model performance	Identifies data providing scale to the model and potential conflicts between data types
Residuals	Model performance	Standard statistical test; model misspecification
Fit to indices, size comps	Model performance	Standard statistical test; model misspecification
Age structured Production Model	Model performance	Highlights conflicting trends in different data types; model misspecification;
Model convergence	Globally optimized	Jitter analysis
Retrospective	Model performance	Bias in terminal year estimates of biomass and recruitment needed for projections

It was noted that the ALBWG will, with the approval of the ISC16 Plenary, produce an extended Executive Summary of the stock assessment (see 2014 assessment report for format) describing the key results, stock status, and scientific advice as soon as possible after the assessment workshop for distribution and review at the May 2017 Scientific Advisory Committee meeting of the IATTC. The intent of this process, which follows the process used by the Pacific Bluefin Working Group after its Feb 2016 stock assessment workshop, is to ensure the timely delivery of stock assessment results and scientific advice from the ALBWG to the IATTC.

The ALBWG recommends using Stock Synthesis version 3.24s or u (to be determined) for 2017 assessment. SS 3.30 is expected to be released in summer 2016, but the stability of this version is unknown at present. S. Teo will develop a comparison of output from 3.24 and 3.30 for the data preparation meeting for evaluation by WG members.

The WG discussed inviting an outside stock assessment expert familiar with the life history of albacore to the stock assessment workshop. It was noted that Ian Stewart (IPHC) was invited to the 2014 assessment workshop and was helpful with the data weighting process, particularly with the iterative reweighting of the size composition data. Several potential expert scientists were identified.

The ALBWG Chair reminded members about the ISC rules on inviting outside experts:

> *Rule W4. Invited experts. Occasionally, a Working Group may have a need for special expertise to assist in assignments or may receive requests for participation from experts. On such occasions, the Working Group Chairperson is responsible for following Rule C6 and consulting with the Committee Chairperson.*
>
> *Rule C6: Invited experts. Scientific and fisheries experts, who are neither Members nor Non-voting Members of the Committee, may be invited to participate in the deliberations or work of the Committee. Decision on inviting experts, nominated by Members, shall be made by consensus of Members of the Committee. The Chairperson will be responsible for preparing the list of nominees, nominated by Members no later than 90 days before the event, and immediately distribute to Members for approval. If no objections are received by 45 days of the event, the Chairperson shall issue invitations to approved nominees. The manner of invited experts' participation shall be decided by the Members. Invited experts are not eligible to vote on ISC matters.*

The ALBWG recommends that an independent stock assessment scientist familiar with albacore life history be invited to the stock assessment workshop to assist in model development with respect to data weighting and the complicated movement and life history patterns of the north Pacific albacore stock.

5.2 Work Assignments

1. H. Ijima, H. Kiyofuji, and S. Teo work together on new fishery definitions and the development of a pre-1975 longline index;
2. H. Ijima, H. Kiyofuji, S. Teo, C.-Y. Chen to estimate standardized CPUE indices and report results in WPs containing the information identified in Table 1;
3. S. Teo to develop WP investigating alternatives for estimating M (Lorenzen with 0.3 for adults, SPC M vector, use tagging data) before the assessment;
4. S. Teo to investigate potential travel funding for independent scientific expert to attend stock assessment workshop;
5. H. Ijima to develop new code for future projections based on two sex, constant F;

6. C. Minte-Vera, H. Ijima to explore combining otolith and tagging data to estimate growth in model;
7. C. Minte-Vera to conduct ASPM model diagnostics for stock assessment workshop;
8. H. Ijima to check if maturity at length data available and reformulate maturity ogive if possible;
9. C. Minte-Vera to consider Maunder growth model for tropical tunas informed by maturity data, if available from #8 (presented at SAC in 2015);
10. Chen (2010) paper expresses relationship between gonad weight and length; C.-Y. Chen to retrieve raw data and collaborate with H. Ijima to work up data if possible;
11. Initial sample sizes for size composition based on set or trip data; Japan (H. Ijima and H. Kiyofuji), Taiwan (C.-Y. Chen), and USA (S. Teo);
12. C. Minte-Vera to contact Chinese scientist about catch data and J. Holmes to follow-up with invitation to participate in stock assessment process,
13. S. Teo to develop a comparison of output from SS 3.24 and 3.30 for the data preparation meeting; and
14. All members to provide catch, size composition, and CPUE (if available) data up to 2015. Investigate availability of 2016 catch data for assessment.

6.0 RECOMMENDATIONS FOR ISC16 PLENARY

The WG reviewed trends in catch, including a preliminary estimate of 2015 catches, which shows that total catch is moderately above the long-term mean (72,128 t) but almost the same as catch in 2014. There was a brief discussion about Chinese data and engaging Chinese scientists in the stock assessment process. Although this brief review did not include full catch data from China and non-ISC member countries, it did not raise any concerns and the ALBWG concluded that its view on stock status and conservation advice was unchanged from ISC15, which is reiterated below.

Stock Status

> *"Because the calculated Fs for 2010-2012 relative to most candidate reference points, except F_{MED} and $F_{50\%}$ (which the ALBWG considers to be poor choices as reference points for this stock), are below 1.0, NPALB is not experiencing overfishing. The 2014 assessment estimated that spawning biomass in 2012 (110,101 t) was more than two times greater than the 20%$SSB_{CURRENT\ F=0}$ limit reference point established by the WCPFC, which means that the stock is not in an overfished state. Thus, the ISC concludes that overfishing is not occurring and that the stock is not in an overfished state."*

Conservation Advice

> *"The ISC concludes that the North Pacific albacore stock is healthy (SSB2012 >>20%$SSB_{current\ F=0}$) and that current productivity (SSB_{2012}) is sufficient to sustain recent exploitation ($F_{2010\text{-}2012}$), assuming average historical recruitment (about 42.8 million fish annually) continues."*

7.0 ALBWG VICE-CHAIR

The ALBWG Chair briefly discussed the need to identify a Vice-Chair and the responsibilities of that position. He noted that he was looking for a volunteer and that the Vice Chair needed to be prepared to run a WG meeting if the Chair could not participate. The Vice Chair might also have to develop the agenda and meeting report on some occasions.

H. Kiyofuji from Japan volunteered and was unanimously supported by the ALBWG.

8.0 ELECTION OF THE CHAIR

The term of the current WG Chair, John Holmes, expires at ISC16 in July 2016. Since no WG meeting was scheduled in advance of the ISC16 plenary, an election was held for the position of Chair. John Holmes was unanimously re-elected as WG Chair for a term of one year. The newly re-elected WG Chair noted that he had served as Chair for two consecutive three year terms plus a one-year extension. This upcoming term will be his second one-year extension term and is the last term permitted under the ISC rules so a new Chair must be elected at a meeting in advance of ISC17.

9.0 ADMINISTRATIVE MATTERS

9.1 Clearing the Report

The WG reviewed a draft of the meeting report prepared by the Chair during the meeting. A revised report was prepared based on comments at the meeting and circulated via email for comment and approval by meeting participants. Subsequently, the Chair evaluated any suggested changes that were received, made final decisions on content and style. The goal of the WG Chair is to forward this workshop report to the Office of the ISC Chair no later than June 15 for approval at the ISC16 Plenary.

10.0 ADJOURNMENT

The ALBWG meeting was adjourned at 10:30 on 30 May 2016. The WG Chair thanked the hosts (Drs. H. Ijima and H. Kiyofuji, NRIFSF) for their hospitality and overall meeting arrangements, which served as the foundation for a productive meeting. He also thanked the scientists participating in the workshop for their attendance and contributions.

11.0 LITERATURE CITED

Albacore Working Group (ALBWG). 2015. Report of the Albacore Working Group Workshop, 20-22 April 2015. ANNEX 8. Report of the Fifteenth Meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean, Plenary Session, 15-20 July 2015, Kona, Hawaii, United States of America.

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ATTACHMENT 1

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ATTACHMENT 2

ALBACORE WORKING GROUP (ALBWG)
INTERNATIONAL SCIENTIFIC COMMITTEE FOR TUNA AND TUNA-LIKE SPECIES IN THE NORTH PACIFIC OCEAN

INTERSESSIONAL WORKSHOP

26-30 May 2016

NRIFSF, Shimizu, Shizuoka, Japan

Revised Agenda

1. Opening of Albacore Working Group (ALBWG) workshop
2. Adoption of Agenda and Assignment of Rapporteurs for Workshop Report
3. Management Strategy Evaluation Progress
    i. Analyst hired by US?
    ii. Preliminary list of management objectives and performance metrics
    iii. Next steps
4. Stock Assessment Research - Review and consider adoption for upcoming assessment
5. Stock Assessment Planning
    i. Workplan – data preparation (Fall 2016) and stock assessment (Spring 2017) workshops
    ii. Data submission deadline
    iii. Work assignments for assessment
    iv. Assessment plan;
        - Model fitting principles
        - Catchability assumption (fixed, time-varying)
        - Base case scenario: Assumptions and rationale
            - Model period
            - Structural assumptions (one-stock, etc.)
            - Biological parameter estimates (steepness, M, growth, maturity)
            - Fishery selectivity
            - Primary abundance index/indices for fitting
            - Initial conditions
    v. Sensitivity analyses (steepness, maturing, CPUE series, data weighting scheme, Inclusion of secondary CPUEs, size of equilibrium catches relative to base case, effective sample size, etc.)
6. Recommendations for ISC16 Plenary
    - Stock status and conservation advice in 2016
7. Identification of ALBWG Vice-Chair
8. Election of the Chair
9. Administrative Matters
    i. Clearing of the Report
    ii. Other matters
10. Adjournment

ATTACHMENT 3

List of Working Papers and Presentations

Number	Title and Authors	Availability
ISC/16/ALBWG-01/01	Illustration the use of the age-structured production model diagnostic tool in the Northern Albacore stock assessment. Carolina V. Minte-Vera and Mark N. Maunder	Available from the ISC website
Presentation	Work plan of Japan: until the data preparation meeting. Hirotaka Ijima	Contact the author

ATTACHMENT 4

Potential management objectives for north Pacific albacore proposed by Northern Committee member countries at WCPFC12, Kuta, Bali, December 1, 2015. Clarifications were drawn up by the ALBWG Chair, John Holmes, and represent questions that may be discussed at the upcoming workshop in April 2016.

Proposed NC Member Objective	Some Clarifications Needed at April 2016 Workshop
Maintain spawning biomass above the Limit Reference Point (20%$SSB_{current\ F=0}$)	1. What is the acceptable level of risk of spawning biomass dropping below the LRP? Should it be minimal (e.g., only a 5% chance) or are you willing to accept more risk (e.g., 10, 15, 20%, etc.)? 2. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?
Maintain total biomass around its current level	1. How is current level defined? Do you mean the estimated biomass in 2012 (last year of the current assessment) or the average of estimated biomass from a specific period such as 2008-2012 or some other measure? 2. What is the acceptable level of risk associated with achieving the current biomass level? 3. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?
Maintain the biomass, with reasonable variability, around its current level. Variability around the current level should take into account biomass changes related to regime shifts in the North Pacific Ocean as well as the effects of target switching in some fleets accessing north Pacific albacore.	1. What biomass is of interest? Total, spawning, or some other component biomass? 2. How is current biomass level defined? 3. How is variability in biomass measured (e.g., coefficient of variation, CV = sd/mean, standard deviation (sd), RMSE, etc.)? 4. Variability in biomass related to decadal scale events such as regime shifts might be extreme relative to average conditions between regime shifts. Do you wish to consider different measures for regime shifts and conditions between regime shifts? 5. What is the acceptable level of risk associated with achieving the current biomass level? 6. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?
Prevent overfishing and recover rapidly from an overfished condition, should it occur	1. This objective seems to be a policy statement and needs to be broken down into components that can be evaluated in the MSE process. 2. What are the overfishing and overfished thresholds? 3. How is rapid recovery defined?

Maintain catch at average levels	1. What length of time should be used to calculate average catch (5, 10, years, long-term 30 years)? 2. How will the average catch be calculated (using a specific range of years, e.g., 2008-2012, 1981-2010, or a specified number of years, e.g., average catches in the most recent 5 years in the current stock assessment)? The latter approach may mean that the average catch level changes between assessments. 3. What is the acceptable level of risk associated with maintaining the catch at an average level? 4. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?
Limit average annual variability (AAV) in catch	1. How is variability in catch measured (e.g., coefficient of variation, CV = sd/mean, standard deviation (sd), RMSE, etc.)? 2. What is the proposed limit in annual variability (i.e., how much change in catch is permitted between years)? 3. What period of time is needed to estimate variability (e.g., 5 years, 10 years, other, etc.)? 4. What is the acceptable level of risk associated with achieving the AAV in catch? 5. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?
Limit average annual variability (AAV) in effort	1. How is effort estimated (e.g., gear specific such as vessel-days, pole-days, 1000s of hooks, etc., or some common measure among fleets such as number of vessels, etc.)? 2. How is variability in effort measured (e.g., coefficient of variation, CV = sd/mean, standard deviation (sd), RMSE, etc.)? 3. What is the proposed limit in annual variability (i.e., how much change in catch is permitted between years)? 4. What period of time is needed to estimate variability (e.g., 5 years, 10 years, other, etc.)? 5. What is the acceptable level of risk associated with achieving the AAV in effort? 6. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?

Move biomass towards a target reference point	1. Depending on the choice of target reference point, the stock may be above, below or at the target reference point at present. 2. What biomass is of interest (spawning, total, some other component)? 3. What is the target reference point (note that in many applications a target reference point is specified in terms of fishing mortality rather than biomass)? 4. What period of time (in years) should be considered to move from current biomass to the target reference point biomass? 5. What is the acceptable level of risk associated with moving biomass to the target reference point? 6. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?
Ensure long-term conservation and sustainable catch of North Pacific albacore by achieving an optimum level of average yield taking into account economic, social, and ecological factors (including long-term economic and social benefits to the various North Pacific albacore fishery participants)	1. This objective seems to be a policy statement and needs to be broken down into components that can be evaluated in the MSE process. 2. Economic, social, and ecological factors need to be specified 3. Economic and social benefits desired for fishery participants would need to be specified. 4. Optimum level of annual yield is a judgement that must be made by managers. It cannot be evaluated with an MSE process unless the criteria defining optimum are specified in advance. 5. What does long-term mean (i.e., 10 years, 20 years, 30 years, etc.)?
Ensure a stable supply of high-quality North Pacific albacore	1. This objective also seems to be a policy statement and needs to be broken down into components that can be evaluated in the MSE process. 2. What does stable mean (some of the objectives listed above related to AAV and catch may address this point)? 3. How is fish quality assessed (e.g., high condition factor, high weight, fat content, etc.)? 4. What period of time (in years) should be considered to move from current biomass to the target reference point biomass? 5. What is the acceptable level of risk associated with achieving a stable supply of high-quality fish? 6. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?

Maintain current fishing effort in targeting and non-targeting fisheries. Consider the implications of shift in effort from SPALB if those fisheries are uneconomical.	1. How is effort estimated (e.g., gear specific such as vessel-days, pole-days, 1000s of hooks, etc., or some common measure among fleets such as number of vessels, etc.)? 2. How is current effort measured (e.g., 2012 effort – last year in current stock assessment, average of last five years in the current assessment, average of 2002-2004, etc.)? 3. How would this objective apply to a fleet that does not target albacore but captures albacore as a valued non-target species? 4. What is the acceptable level of risk associated with achieving this objective? 5. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?
Maintain current catches in targeting and non-targeting fisheries	1. How is current catch measured (e.g., 2012 catch – last year in current stock assessment, average of last five years in the current assessment, average of 2002-2004, etc.)? 2. How would this objective apply to a fleet that does not target albacore but captures albacore as a valued non-target species? 3. What is the acceptable level of risk associated with achieving this objective? 4. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?
Maintain current fishing effort in targeting fisheries	1. How is current effort measured (e.g., 2012 effort – last year in current stock assessment, average of last five years in the current assessment, average of 2002-2004, etc.)? 2. What is the acceptable level of risk associated with achieving this objective? 3. Over what simulated period of time (in years) should we collect data in order to evaluate whether this objective is being achieved or not?
Equitably distribute the "conservation burden" among members. (Conservation burden may be assessed in terms of revenue foregone and costs incurred because of management restrictions and requirements.)	1. This objective seems to be a policy statement and needs to be broken down into components that can be evaluated in the MSE process. 2. Equitable distribution of costs and benefits is a judgement that must be made by managers. It cannot be evaluated with an MSE process unless the criteria defining equitable and the distribution of costs and benefits are specified in advance. 3. Implementation of this statement as an objective will require the development of a bio-economic model for north Pacific albacore fisheries.

ATTACHMENT 5

2nd ISC Management Strategy Evaluation Workshop

May 24-25, 2016

ALBWG Chairman's Report on Outcomes for North Pacific Albacore

To ensure adoption of effective fishery management measures, Tuna RFMOs have been working towards developing and implementing a management strategy evaluation (MSE) process. This process provides decision makers with information to assess consequences of a range of management strategies given stated fishery objectives, exposing the underlying trade-offs between the various management objectives.

At the 15th Meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), members endorsed a plan developed by the Albacore Working Group (ALBWG) to implement MSE. As a first step in implementing this plan, and with endorsement from the Western Central Pacific Fisheries Commission-Northern Committee, the ALBWG was tasked with leading the development of management objectives, performance indicators, harvest control rules, and management procedures. An MSE Workshop was convened in May 2016 to develop management objectives and performance indicators for those objectives based on input from managers, stakeholders and scientists. The purpose of this report is to document proposed objectives and performance criteria that can be used in initial MSE evaluations by the ALBWG. This report also documents several concerns raised by participants that will require further engagement (meetings) between managers, stakeholders, and scientists. It is anticipated that this is the first of many such meetings and reports. The agenda for this meeting is shown in Table 1.

Approximately 24 people (Table 2) participated in the 2nd MSE workshop. John Holmes, the ALBWG Chair, led the process and reviewed the purpose, process and roles of participants in the MSE process as well as the objectives of the workshop. He emphasized that management objectives for a stock are statements about things that matter to managers and stakeholders such as conservation and harvesting. He also noted that the objectives developed at this workshop represent an initial set for use by the ALBWG in the MSE process; the NC and stakeholders are not committed to these objectives because it is expected that there will be modifications to the set based on information from the initial evaluations.

Management Objectives

Management strategy evaluation is a structured process of exploring the performance of management strategies (a set of rules that use pre-specified data and analysis to provide recommendations for management actions) relative to defined management objectives and sources of uncertainty (in monitoring, assessment, decision-making, and management action). The overall goal of MSE is to provide decision-makers and stakeholders with the information on which to base rational management decisions, given their objectives, preferences, and attitudes to risk. This information addresses two fundamental questions:

1. Do our management decisions perform the way we expect?
2. How can we develop management strategies that are robust to uncertainty?

MSE is not an optimisation procedure: it uses multiple candidate models (states of nature) to evaluate consequences of alternate management strategies across the models using simulation rather than finding the best available strategy for a given model.

Management objectives are a key component of the MSE process. Management objectives are statements describing things that are important to decision-makers and stakeholders (e.g., ecological, socio-economic, cultural aspects) and expected achievements for a stock/fishery. Objectives are important because they guide the development of specific benchmarks used to evaluate the performance of management strategies. The objectives need to be translated into measurable quantities (performance indicators) that can be computed. A set of management objectives for MSE typically consists of 5-10 statements (objectives) that capture important aspects of the stock/fisheries, that are understandable and concise, and that are sensitive in distinguishing among alternative management strategies.

Five objectives were proposed for the initial MSE by workshop participants (Table 3) after reviewing preliminary input received from NC member countries in at WCPFC12 in December 2015. The ALBWG proposed the sixth objective in Table 3 to facilitate evaluations of target reference points as requested by the NC.

Several objectives relate to maintaining catches or harvest ratios by fishery. Fishery in this context means country-gear combinations rather than the fisheries defined for the stock assessment model, which are based on country, gear, fish size composition in catches, and other criteria. Workshop participants also requested definitions of small-scale, artisanal, and subsistence fisheries. The FAO notes that "… Small-scale fisheries, often also referred to as artisanal fisheries, are difficult to define unambiguously, as the term tends to apply to different circumstances in different countries. In general, they are traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amounts of capital and energy, relatively small fishing vessels (if any), making short fishing trips close to shore, mainly for local consumption ". The ALBWG noted that subsistence fisheries usually fish for consumption purposes whereas artisanal fisheries are commercial operations. This usage is consistent with the Wikipedia definition (from Wikipedia, accessed 26 May 2016:

> *Artisanal fishing (or traditional fishing) are various small-scale, low-technology, low-capital, fishing practices undertaken by individual fishing households (as opposed to commercial companies). Many of these households are of coastal or island ethnic groups. These households make short (rarely overnight) fishing trips close to the shore. Their produce is usually not processed and is mainly for local consumption. Artisan fishing uses traditional fishing techniques such as rod and tackle, fishing arrows and harpoons, cast nets, and small (if any) traditional fishing boats.*

Operational Objectives

Converting the management objective statements in Table 3 into measurable quantities, i.e., operational objectives, requires three pieces of information:

1. target or threshold value or benchmark for a variable of interest (e.g., abundance, inter-annual variation in catch, etc.);
2. a time horizon for measurement (e.g., 2-3 generations for abundance, 5-10 years for catch or catch variability); and
3. an acceptable probability of either achieving the target or avoiding a threshold (e.g., 50% chance of being above a target, 5% chance below a threshold).

MSE Workshop participants were asked to provide information to operationalize the objectives, specifically the target or threshold level of interest, acceptable risk, and the period of measurement to be used to evaluate performance. While the quantities of interest as well as the related benchmarks (thresholds or targets) were readily apparent, there was difficulty with the concept of risk and how it would be operationalized as acceptable risk in an MSE process. Further work will be needed to communicate these ideas in an appropriate way to managers and stakeholders. The workshop participants requested that the ALBWG develop a list of common language and levels for acceptable risk, which is shown in Table 4.

WCPFC CMM 2014-06 (Annex 1) contains the following additional information on acceptable levels of risk:

> *"The Commission shall define acceptable levels of risk associated with breaching limit reference points, and if appropriate, with deviating from target reference points, taking into account advice from the Scientific Committee and , where appropriate, other subsidiary bodies. In accordance with Article 6(1)(a) of the Convention, the Commission shall ensure that the risk of exceeding limit reference points is very low. Unless the Commission decides otherwise, target reference points shall be conservative and separated from limit reference points with an appropriate buffer, with a view to ensuring that the target reference points are not so close to the limit reference points that the chance that the limits are exceeded is greater than the agreed level of risk."*

Debate on the period of measurement ranged from 5 to 30 or more years. A 30-year period was suggested because it corresponds to approximately two generations of north Pacific albacore. A long time frame is required to test the robustness of candidate harvest control rule to uncertainty. A longer time frame is more likely to capture rare events and is particularly important if robustness to events such as regime shifts is of interest in management strategies. Shorter time frames risk not fully characterizing system uncertainty. Note that these time frames do not represent predictions of future behavior of the stock. These simulations are not projections of the future as is done in a stock assessment, they are used to characterize the variability of the system on average while subject to a management strategy every year; consequently a longer simulation period is better.

Performance Indicators

MSE Workshop participants requested that the ALBWG propose performance indicators for each proposed objective in Table 3. The ALBWG proposals on performance indicators and examples of the output that would be provided to evaluate performance are shown in Table 3. It should be noted that most of the proposed performance indicators are configured so that higher estimated values mean better performance and lower estimated values are interpreted as poorer performance, i.e., they have consistent directionality to reduce confusion in interpreting results. Exceptions to this rule are the first performance indicator for Objective 5 on management stability (%change due to harvest control rule between years) and the performance indicator for Objective 6 on target levels (Ftarget/Fcurrent). The %change indicator has no directionality while the target level indicator is configured so that ratios > 1 in at least 50% of years are consistent with better performance while ratios < 1 are indicative of overfishing.

Conclusion

MSE workshop participants recommend these objectives for initial MSE evaluations, noting their expectation that the results will be communicated to them at a future date and revisions to this set of objectives are likely as the process proceeds.

The ALBWG recommends the proposed performance indicators (Table 3) and acceptable risk language (Table 4) for the initial evaluations of the future MSE, but notes that this package is subject to future expert input from the MSE Scientist to be engaged in this process.

Literature Cited

Conrow, E. H. (2003) Effective Risk Management: Some Keys to Success. 2nd edition. American Institute of Aeronautics and Astronautics, Reston VA, USA.

Table 1. Agenda for 2nd ISC Management Strategy Evaluation meeting.

ISC Management Strategy Evaluation Workshop

Queens Forum, Queens Tower B 7th Floor (in Queen's Square)

Yokohama, Japan

May 24-25, 2016

May 24, 2016（9:45 am – 5:00 pm）

Registration (9:45-10:15) – Coffee Service

1. Welcome-Japan
2. Opening Remarks – DiNardo/Holmes
3. Workshop Goals & Objectives – Holmes
4. MSE Review
    a. MSE – Structure, process; The importance of objectives (60 Minutes)

Lunch 12:00-1:30

    b. North Pacific Albacore objectives – review NC management framework, member country input from Dec 2015
    c. Identify preliminary set of working management objectives and performance metrics - discussion

Break 3:15-3:30 coffee service

5. Preliminary set of working objectives – discussion continued
6. Develop list of objectives and performance metrics for overnight consideration

Adjourn for the Day

May 25, 2015（9:00 am – 12:00 pm）

7. Review Agenda and Status from Day 1
8. Discussion & Resolution of Issues with Objectives
9. Develop Consensus on Preliminary Objectives and Performance Metrics
    - Key conclusions
    - Uncertainties
    - Advice to Inform MSE process
10. Closing Remarks

Adjourn Workshop

Table 2. List of Participants at the 2nd MSE Workshop, 24-25 May 2016, Queens Forum, Yokohama, Japan.

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Table 3. Proposed Management Objectives for the North Pacific Albacore stock, May 2016.

Objective[A]	Quantity	Proposed Performance Indicators[B, C]	Example Output[B]
1. Maintain spawning biomass above the limit reference point	• $20\%SSB_{0\ F=0}$ • 14%SSB0 F=0 (calculated as (1-M)*SSB20%) • $SSB_{0.5R0}$, where h = 0.75 (IATTC SAC)	• SSBcurrent/LRP	• % of runs in which ratio ≥1 for 29/30, 27/30, 24/30; • each run = 30 yrs in length with n replicate runs;
2. Maintain the total biomass, with reasonable variability (x%), around the average depletion level in the recent 10 years of the latest stock assessment	• Total biomass is estimated as average depletion level for final 10 years (2006-2015) in the 2017 stock assessment • Variability in depletion is estimated from the historical period (1966-2015)	• Median depletion current year /Depletion(10 yr avg) • Historical CV (1966-2014)/Current depletion CV (over 30 years)	• % of median and CV ratios ≥1 for x runs; Each run = 30 year length
3. Maintain harvest ratios by fishery (fraction of the SSB harvested) at current average	• Current average ratio last 10 years (2006-2015) in 2017 stock assessment • Reasonable variability is CV estimated from fishing intensity plot (late 1990s-present)	• Median current harvest ratio (1-SPR)i/Average 1-SPR (10 years)i, where i = fishery • Historical CV/current CV (over 30 years)	• % of median and CV ratios ≥1 for x runs; Each run = 30 year length
4. Maintain catches by fishery above average historical catch	• Average catch by fishery, 1981-2010 (30 year average corresponding to the current normal period).	• Current total catch/average historical catch • Current median catch/historical median (by fishery) • Historical CV of catch/Current CV of catch (by fishery)	• % of runs in which ratio ≥1 for 29/30, 27/30, 22/30, 15/30; each run = 30 yrs in length with n replicate runs;
5. Limit the magnitude of change to effort or catch to < 15% at any one time due to management actions by fishery		• % change due to HCR between years • % years change due to HCR < 15% within a run	• Median ± 5 and 95% percentiles of maximum % change due to HCR for all years over all runs

			• Median ± 5, 25, 50, 75 and 95% percentiles of % years change due to HCR < 15% over all runs
6. Maintain F at the target value with reasonable variability*** **Proposed by the ALBWG to facilitate performance evaluation of target reference points in the MSE as requested by NC12.	• Various potential target values previously suggested by NC • Will include variability around the target value, estimated from historical data.	• Ftarget/Fcurrent	• % of runs in which ratio ≥1 for 15/30 years or more; each run = 30 yrs in length with n replicate runs; • precautionary bias to prevent overfishing; need a range of variability around the target to be more accurate.
The objectives shown below were suggested as ideas requiring further work to implement. They are shown here as an indication of future direction.			
I. Maintain economic returns of existing fisheries II. Maintain interests of artisanal, subsistence and small-scale fishers, including limiting the regulatory impact on these fisheries			
NOTES A - Objectives 1-5 are proposed by the 2nd MSE Workshop participants, May24-25, 2016. Objective 6 is proposed by the Albacore WG for operational reasons. B - Performance indicators and example output proposed by the Albacore Working Group C - Performance indicators are configured so that higher estimated values mean better performance and lower estimated values means poorer performance, i.e., they have consistent directionality to reduce confusion in interpreting results. The exception to this practice is the first indicator (% change due to HCR between years) for objective 5 for which there is no directionality.			

Table 4. Common language and values for acceptable risk categories in a management strategy evaluation proposed by the Albacore Working Group. Terms and values are modifications of a scheme proposed by Conrow (2003).

Term	Median	Quantiles
Almost Certain	95	90-<100
Highly Likely	85	80-90
Likely	75	70-80
Better than Even	65	60-70
Even	50	40-60
Less than Even	35	30-40
Unlikely	25	20-30
Highly Unlikely	15	10-20
Almost Never	5	>0-10