Annex 11

REPORT OF THE SEMINAR ON THE USE OF THE BEST AVAILABLE SCIENTIFIC INFORMATION

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

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Introduction

Annex 11 describes the ISC 11 Seminar on the Use of the Best Available Scientific Information. The seminar was presented to the Plenary by Jon Brodziak. The seminar was convened by Jon Brodziak and Michele Dreyfus. The seminar provided information on four topics regarding the use of the best available scientific information.

Section 1. Information Needs for Stock Assessments

The first seminar topic was the information needs for conducing stock assessments. It was emphasized that the science requirements for policy research and analysis included the following five elements (e.g., Morgan and Herion 1990): (i) Empirical Testing; (2) Open Debate; (iii) Documentation and Reproducibility; (iv) Reporting Uncertainty; and (v) Peer Review. The role of stock assessment science was identified to include two primary elements. The first element was to provide scientific advice to resource managers on the current status and future trends in abundance and productivity of exploited marine resources. The second element was to provide the technical basis for setting annual fishery catch quotas and other fishery management measures that will achieve optimum yield from the fishery while avoiding overfishing and ecosystem harm.

The group discussed the timeliness of data and its subsequent effects on stock assessment and resulting management uncertainty. It was noted that most stock assessments have a gap between the year an assessment is completed and the last year of the data represented in the model. The smallest gap possible is ideal, but some participants offered a 1 year gap is probably good enough for most ISC stocks. It was also pointed out that uncertainty also increases because of the time duration between assessments. Development of future projections, updated assessments and stock indicators (e.g. key CPUE series) can be used to reduce uncertainty of stock status in the interim years. The group also noted that historical data often can be more uncertain than current data (data quality). Because stock assessments use what happened in the past to predict the future, historical data quality will affect the uncertainty of the future projections. This may be as important to future uncertainty as the timeliness of data. In addition, the timeliness of acceptance of assessment results also affects uncertainty.

Participants generally agreed that areas where we can improve scientific advice and reduce uncertainty (e.g. timeliness of data) and members should strive to do so. However, there are certainly areas unlikely to be improved (biases in fishery data) and the ISC may need to find ways of dealing with these situations.

Section 2. Best Available Scientific Information

The second seminar topic was the development of the best available scientific information for stock assessments conducted by the ISC. It was noted that a lack of complete and current data had a negative impact on the timeliness and relevance of the stock assessment for use in fishery management. The Plenary was presented with recommendations on the development of best available scientific information for the catch data, the catch-per-unit effort standardization, and the stock assessment model. The Plenary discussed this issue and the presenter formulated a set of recommendations for guidelines to develop the best available scientific information for catch data (Table 1), CPUE standardization (Table 2, and the assessment model (Table 3). It was also noted that stock assessment models could be categorized into four different tiers

- Tier 4: Size, Stage, or Age-Structured Model
- Tier 3: Production or Biomass Dynamics Model
- Tier 2: Equilibrium Model Applied to Life History Data, e.g., Yield Per Recruit Analysis
- Tier 1: Relative Abundance Index or Single Estimate of Absolute Abundance

These four tiers provided a way to identify the increasing information requirements of stock assessment models from the simplest models (Tier 1) to the most complex models (Tier 4).

The participants discussed what constitutes “best available” and how to verify and report it. Participants noted that this is especially crucial to the development of CPUE series used in the stock assessments. CPUE series provide the primary tuning information used to derive stock trends. However it was noted that the fisheries from where the catch and effort data are collected are both complex and changing. It was suggested that ISC CPUE papers presented during the working groups need to better document the data, standardization process and model performance. These paper would also benefit from a description of the fishery that may help the working group understand changes in fishery characteristics (e.g. economic and management actions) that affect CPUE but are difficult to standardize. In some cases these issues will not be identified until diagnostics from the stock assessment model cause a re-evaluation of the CPUE data.

Participants also discussed what constitutes the “best available” assessment model and approach. It was identified that the available data often determine the type of stock assessment model used, however complex models offer a more realistic estimation of population dynamics at the cost of more complex data needs. It was suggested that assessments should use different models with different levels of complexity, as comparing models using different assumptions often help identify issues that would be difficult to find in isolation. Although most participants agreed that alternative models are informative, focusing efforts on developing a main model should be considered. Participants agreed that whatever modeling platform is chosen, some method of model validation would be beneficial.

The group noted that incorporation of both ecosystem and socioeconomic information into the stock assessment process was still a work in progress. Partnering with organization such as PICES may provide the expertise to improve that progress.

Section 3. Minimal Components for a Structured Stock Assessment Document

The third seminar topic was the development of guidelines for the minimal components for a structured stock assessment document conducted by the ISC. The guidelines noted that the stock assessment document should include an Executive Summary that provides a concise description of the minimal information needed to use the stock assessment for the provision of management advice. A detailed outline of the minimal components for a structured (i.e., Tier 4) stock assessment document was provided (Table 4) and discussed by the Plenary.

Participants discussed if ISC stock assessment could be improved by standardizing the format of the assessment results and documentation. Participants noted that future projections of 3 years may be appropriate for stocks that are assessed every three years. Participants also discussed what sorts of model diagnostics should be included every stock assessment report, noting that each assessment may be quite different.

Section 4. Best Practices for Management Advice

The fourth topic was the development of guidelines for the best practices for the provision of management advice for stock assessments conducted by the ISC. A detailed outline of the guidelines for the Executive Summary of a stock assessment was provided and discussed by the Plenary (Table 5).

Participants noted that executive summaries are used in many other RFMO's and have been helpful in presenting results. It was also noted that Kobe plots are typically done using MSY based reference points. However proxies may be necessary in Kobe plots if MSY base reference points are thought to be unreliable.

References

Morgan, M., and Henrion, M. 1990. Uncertainty: A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis. Cambridge University Press, Cambridge, U.K.

Table 1. Guidelines for the development of the best available scientific information on fishery catch for stock assessments conducted by the ISC.

1. Need Accurate Species Identification
2. Need Complete Estimates of Fishery Catch
    1. By Area and Time Period
    2. By Fishing Fleet and Gear*
    3. With Fish Size and Age Composition*
3. Need to Characterize Uncertainty in Catch Reporting Including Bycatch and Discards

*depends upon stock assessment model tier

Table 2. Guidelines for the development of the best available scientific information on fishery CPUE standardizations conducted by the ISC.

1. Need to Describe Fishery Including History of Fishery Development and Changes
2. Need to Describe Data Selection, CPUE Standardization Model, and CPUE Estimates
3. Need to Provide Model Diagnostics and Goodness of Model Fit Criteria Relative to Alternative Model Configurations
4. Need to Compare Nominal and Standardized CPUE
5. Need to Characterize Uncertainty in Estimates of Standardized CPUE

Table 3. Guidelines for the development of the best available scientific information on fishery stock assessment models used in stock assessments conducted by the ISC.

1. Describe Model Structure and Assumptions
2. Document Statistical Formulation
3. Provide Diagnostics of Model Fit to Data
4. Describe Model Results Including Stock Status Relative to Biological Reference Points
5. Characterize Uncertainty in Model Results Including Sensitivity Analyses for Key Parameters
6. Provide Projections of Management Actions

Table 4. Guidelines for the minimal components of a structured stock assessment document for a stock assessment conducted by the ISC.

1. Introduction
2. Background on Biology, Fisheries, and Previous Assessment
3. Data Used for Assessment
    1. Spatial Stratification
    2. Temporal Stratification
    3. Catch Data
    4. Abundance Data, e.g. CPUE
    5. Tagging Data
4. Assessment Model
    1. Population Dynamics
        1. Cohort Dynamics
        2. Recruitment
        3. Initial Population Size
        4. Growth
        5. Sexual Maturity and Fecundity
        6. Natural Mortality
        7. Stock-Recruitment Resilience
        8. Movement, If Applicable
    2. Fishery Dynamics
        1. Fishery Selectivity
        2. Catchability for Abundance Indices
        3. Tagging Dynamics
    3. Likelihood Components
        1. Observation Error Model
        2. Process Error Model
    4. Prior Distributions or Parameter Constraints
        1. Model Parameters
        2. Process Dynamics
    5. Model Results
        1. Model Convergence Diagnostics
        2. Fit of Model Predictions to Observed Data
        3. Model Parameter Estimates
        4. Biomass and Fishing Mortality Estimates
        5. Biological Reference Points
        6. Stock Status Determination
5. Projections and Harvest Policy Analysis
    1. Kobe Status Plot

2. Retrospective Analysis
3. Harvest Projections
    1. Assumptions
    2. Fishery Performance Indicators
        1. Average Yield and Variability
        2. Probability of Overfishing and Overfished Status
        3. Probability of Exceeding Threshold and Target Biomass
4. Kobe II Strategy Matrix

Table 5. Guidelines for the Executive Summary of a stock assessment conducted by the ISC.

1. Status of Stock
2. Management Advice
3. Three-Year Forecast Table
4. Landings and Status Table
    1. Landings by Fleet
    2. Spawning Biomass
    3. Recruitment
    4. Fishing Mortality
    5. Exploitation Rate
5. Stock Identification and Distribution
6. Catches
7. Data and Assessment
8. Biological Reference Points
9. Special Comments