COMMISSION
SECOND SCIENCE-MANAGEMENT DIALOGUE (SMD-02)
10:00 – 15:00, Pohnpei Time, 10-12 September 2024 (Online)

Reporting Template for Stock Status and Management Advice to the Commission

WCPFC-SMD02-2024/BP-08

Secretariat

1. The WCPFC is pivotal in conserving and managing tuna and other highly migratory fish stocks in the WCPO. To improve the accuracy and consistency of stock status reporting and management advice, the Commission endorsed a study under Project 113b, titled "*Develop Stock Status and Management Advice Template for Consistent Reporting of Stock Assessment Outcomes, Uncertainties, and Risk*." This study aims to create a standardized reporting template, developed in consultation with assessment teams and fisheries managers, to ensure that stock assessments submitted to the WCPFC adhere to a consistent and accountable reporting framework.

2. The recent 20th Regular Session of the Scientific Committee (SC20) noted that the inconsistency in the current reporting of stock status and management advice, particularly regarding the communication of uncertainty, both in data inputs and assessment estimates, should be an important consideration for the Scientific Committee and its work. SC20 agreed on the need for a standardized approach to reporting stock status and management advice from stock assessments for the Commission's work and recommended it as a guideline.

3. SC20 reviewed the project report (SC20-SA-WP-10) through a series of informal small group (ISG) meetings and agreed that the proposed template should serve as a 'guideline' for providing such information to SC21. SC20 also noted that the decision to accept or request revisions to the report remains with the Scientific Committee and recommended that the Commission review the template and provide feedback if necessary.

4. The Informal Small Group (ISG) report from SC20 introduced two template tables: (i) a table identifying the main sources of uncertainty in assessments across all stocks, accompanied by a degree of confidence (Table 2), and (ii) a table presenting stock status in a consistent manner across all stocks, including a probability statement and likelihood category (Table 3). The 2024 silky shark assessment advice was presented using this new template for review. Examples of the stock assessment uncertainty and stock status for the 2024 silky shark assessment are in Tables 5 and 6 of SC20-SA-WP-10, respectively.

5. The ISG discussions on general guidelines for the template can be summarized as follows:

    1) **Reporting Structure:**

- Maintain separate sections to ensure clarity, particularly regarding uncertainty quantification.
- The reporting template should consist of three separate sections:
    1. Stock Assessment and Trends
    2. Stock Status
    3. Management Advice

2) **Content Guidelines:**
    - Keep objective information and management advice in separate sections for coherence.
    - Develop corresponding paragraphs to explain key points concisely for figures and tables.
    - Include a summary table of the assessment's main uncertainties and a separate summary table of stock status. Present a brief overview of these tables before the management advice section.

3) **Assessment and Review:**
    - Conduct an assessment, applying the discussed approach in describing the stock assessment results, and review the outcomes in the next SC21 meeting.

4) **Paragraph Content:**
    - **Stock Structure and Rationale:** Describe the stock structure and provide a rationale for the assessment approach.
    - **Key Uncertainties:** Address key uncertainties, including spatial assumptions, and explain how the assessment dealt with them.
    - **Confidence Levels:** Ensure that confidence levels in the tables accurately reflect whether uncertainties have been adequately addressed in the model.
    - **Trends and Comparisons:** Report annual catch estimates, trends, and diagnostic model trends. Highlight differences between current and previous assessments.
    - **Depletion and Biomass Trends:** Discuss depletion and biomass trends in detail.
    - **Model Diagnostics:** Present diagnostics of the model before discussing trends, with detailed explanations included in the main body of the stock assessment report.

6. SC20 provided the following recommendations:

91. ***SC20 thanked the consultants for their work on Project 113b and agreed on the need for a standardized approach to reporting stock status and management advice from stock assessments for the work of the Commission and recommended it as a guideline.***

92. *SC20 noted that the inconsistency in the current reporting of stock status and management advice, particularly regarding the communication of uncertainty, should be a significant concern for the Scientific Committee and its work.*

93. *SC20 generally supported the recommendations for reporting stock status and management advice described in the SC20-SA-WP-10 as outlined below.*

- *Rename sections of the Stock Status and Management Advice report to better reflect the content, ensuring consistency in section structures. This includes clearly defining elements such as assessment methodology, uncertainties, catch estimates, and management quantities.*

- *Use consistent language to describe uncertainties, including a summary of the main sources of uncertainty in the assessment and the associated degree of confidence*
- *Use IPCC likelihood categories with corresponding probability statements.*
- *Tabulate main sources of uncertainty in the assessment, including rationale, impact, and confidence level in a consistent manner across all stocks.*
- *Provide a consistent and user-friendly interface for accessing stock assessment reports such as a web-based reporting app.*

94. *The report from the Informal Small Group (ISG-06) (Project 113b: Develop Stock Status and Management Advice Template for Consistent Reporting of Stock Assessment Outcomes, Uncertainties and Risk) is included in* ***Attachment 2*** *(of the SC20 Outcomes Document). Based on the results of ISG-06,* ***SC20 agreed that the proposed template be used as a guideline for providing such information to the SC21, noting that the decision to accept or request revisions to the report rests with the SC. A worked example using WCPO silky shark was provided to and approved by SC20. SC20 recommended the Commission review the template and advise, if necessary.***

7. Refer to the proposed template below for reporting stock status and management advice.

Stock assessment and trends

Paragraphs (link to Figures)

1. Describe the assessment structure and rationale (Fig 1, Table 1)
2. Describe the main uncertainties considered (Table 2, see examples below)
3. Describe annual catch estimates and trends (Figure 2)
4. Describe CPUE trends and other indicators of biomass trends (Figure 3)
5. Describe trends in a diagnostic model, including recruitment, spawning potential, and fishing mortality, as well as performance against diagnostics (Figures 4-6)
6. Describe the depletion of spawning stock biomass and associated uncertainty (Figure 7)
7. Describe stock assessment results compared to the previous assessment

Table 1. Assessment structure, including key fisheries and catch proportions. No defined format to accommodate alternative assessment methods.

Table 2. Summary of main sources of uncertainty in the assessment, with a degree of confidence assigned to each aspect of the assessment and potential source of uncertainty.

Figure 1. Spatial structure used in the 20XX stock assessment model

Figure 2. Time series of total annual catch (1000's mt) by fishing gear over the full assessment period

Figure 3. Time series of CPUE and/or other main abundance indices

Figure 4. Estimated annual average recruitment by model region for the diagnostic case model, including estimation uncertainty.

Figure 5. Estimated annual average spawning potential by model region for diagnostic case model, including estimation uncertainty.

Figure 6. Estimated annual average juvenile and adult fishing mortality for the diagnostic case model, including estimation uncertainty.

Figure 7. Plot showing the trajectories of spawning biomass and spawning biomass depletion (of spawning potential) by region, including uncertainty arising from estimation, structural, and intrinsic uncertainties (variability and process error).

Table 2 Example: Assessment configuration and sources of uncertainty.

Source	Type	Rationale	Uncertainty	Impact	Confidence**
Data	CPUE	Best available spatio-temporally standardised Index	Low availability of gear configuration impacting catchability	Potential hyperstability, leading to over-estimating current biomass	Medium
	Catch	Best available information	Reporting, early catch	Early catch probably less impactful now; total magnitude will impact productivity estimates	High
Model	Multifan CL	Standard tuna model in WCPFC	Low, benchmark tested	Single model used for inference	High
Spatial assumptions	9 Regions	Most parsimonious given available tags, alternative spatial configurations difficult to test	Not considered	Potentially important, not quantified, impact unknown	Low
Key parameter uncertainty	M	Estimable given trend	Estimated	Impacts estimation uncertainty	Medium
	steepness	Not estimable in present model	Grid (VALUES)	Impacts overall structural uncertainty	High
Structural uncertainties (model configurations)	Process error	Recruitment variability, time-varying selectivity	Estimated	Potential to over-fit selectivities, bias other parameter estimates	Medium
	Movement	Best estimates from tag data	Estimated, grid over assumed tag-mixing rates	Estimates driven by assumptions may not fully represent the true movement process	Low
	Time-varying selectivity	Evident in LFs	Estimated	Impacts estimation uncertainty	Medium
Estimation uncertainty	MCMC	Full Bayesian estimation integrating over key uncertainties (M)	Estimated	Estimation uncertainty replaces structural uncertainty for M	High
Other sources of uncertainty	Climate impacts	Recent recruitment may have been impacted by above-normal temperatures	Not considered	Projected biomass may be optimistic	Low

**For Table 2, use the following criteria to assign confidence in model inputs and decisions (last column in Table 1). Note that inputs

Confidence levels (diagonal across IPCC confidence table)	Description
High	Data are representative, parameters or processes well known or highly likely to be contained within prior/grid range considered
Medium	Some uncertainty about data representativeness, parameters/processes or unsure if fully captured in data/parameter scenarios/priors (e.g., single M may be used for technical reasons even though length-based M has been shown in literature)
Low	Considerable uncertainty about data/parameters/process or unlikely to be well represented in data/parameter scenarios/priors (e.g., Climate impacts, past catch unknown)

Stock status

8. Describe management quantities for recent and latest years related to LRP, TRP, and/or other agreed objectives with CMMs (Table 3, Figures 7 & 8)
9. Describe projections (where relevant; Figure 9)

Table 3. Stock status summary table (see examples below).

Figure 7. Majuro plot summarising the results for each of the models, including uncertainty arising from estimation, structural, and intrinsic uncertainties (variability and process error).

Figure 8. Kobe plot summarising the results for each of the models, including uncertainty arising from estimation, structural, and intrinsic uncertainties (variability and process error).

Figure 9. Plot showing projected stock status under recent fishing levels, including uncertainty arising from estimation, structural and intrinsic uncertainties (variability and process error)

Management advice

Describe agreed recommendations based on the results of the stock assessment (possibly more than 1 paragraph; include in Table 3 summary*)*

Table 3. Example of a stock status table. Note, all numbers are for illustration only.

Summary				
Year of assessment: 2023 **Final year of assessment data: 2021**	**Biomass**	Unlikely (<33% to be above target		Stock is overfished
	Fishing mortality	Likely (>66%) to be below target		Overfishing is not occurring
	Projection	F likely (>66%) decline further		Overfishing is unlikely (<66%) to occur under current catch levels
	Recommendation	**Stock increasing towards target and F declining at current catch, no action required to reach target biomass.**		
Reference points		**Estimate [Lower–Upper]**		
Biomass	TRP ($0.4B_{F=0}$)	3,000,000 t [low – up]		
Biomass	LRP ($0.2B_{F=0}$)	1,500,000 t [low – up]		
Catch	*MSY*	250,000 t [low – up]		
Fishing Mortality	F_{MSY}	0.1 [0.08; 0.014]		
Recent estimates				**Recent trend/projection**
Biomass	*B*	1,800,000 t [low – up]		Biomass increasing
Depletion	$B_{recent}/B_{F=0}$	0.32 [0.18 – 0.43]		
Fishing Mortality	*F*	0.08 [0.06 – 0.09]		F declining
Catch	*C*	200,000		Catch stable
Status			**Likelihood**	
Biomass	B_{recent}/TRP	0.8 [0.65 – 1.07]	Unlikely (<33%) to be above target	
	B_{recent}/LRP	1.65 [0.9 – 2.65]	Unlikely (<33%) to be below limit	
Fishing mortality	F_{recent}/F_{target}	0.8 [0.6 – 1.1]	Likely (>66%) to be below target	
	F_{recent}/F_{limit}	0.8 [0.6 – 1.1]	Very likely (>99%) to be below limits	
Projections (basis[recent catch/effort/ alternative catch])				
Biomass	$B_{proj-year}^{proj-basis}/B_{MSY}$	0.42 [0.3 – 0.53]	About as Likely as Not (33 – 66%) to be below	B_{proj} increasing
Fishing mortality	$F_{proj-year}^{proj-basis}/F_{MSY}$	0.6 [0.5 – 0.7]	Likely (>66%) to be below target	F_{proj} declining

For table 3, use IPCC likelihood categories with numerical probability statements

Probability	Description
> 99%	Virtually Certain
> 90%	Very Likely
> 60%	Likely
40-60 %	About as Likely as Not
< 40%	Unlikely
< 10%	Very Unlikely
< 1%	Exceptionally Unlikely