

Nuku'alofa, Tonga
13 – 21 August 2025

Stock Status and Management Advice Template - Update

WCPFC-SC21-2025/SA-IP-22

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SC20 recommended a template for *Consistent Reporting of Stock Assessment Outcomes, Uncertainties and Risk* (Attachment F, SC20 Summary Report), and the Commission endorsed the template as a guideline, providing the following advice (para 206, WCPFC21 Summary Report):

- Include MSY-based reference points in the template if calculable and useful.
- Correct overfished status reference to LRP ($20\%SB_{F=0}$).
- Revise the overfishing reference to F_{MSY} .

Dragonfly provided an updated template in consultation with the SPC-OFP (**Table 3 below**). Under the Agenda Item 4.2, SC21 will review the Commission's advice above and finalize the template for applying to the *Provision of scientific information to the Commission* section under each stock assessment agenda item.

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STOCK STATUS AND MANAGEMENT ADVICE TEMPLATE

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)
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. Stock status table (Example only). Please note that not all reference points can be calculated for all stocks, or some may not be available with sufficient precision to be referenced; the decision should be

Year: 2023	Biomass	Unlikely (<40%) to be above target		Stock is overfished
	Fishing mortality	Likely (>60%) to be below target		Overfishing is not occurring
	Projections	F likely (>66%) to decline further		Overfishing is unlikely (<66%) to occur at current catch levels
	Recommendation	Stock increasing towards target and F declining at current catch, no action required to reach target biomass.		
Reference points/MP		Estimate [5%--95%]		Comment
Biomass	B _{MSY}	2 400 000 t [low – high]		
Biomass	TRP (0.4 SB _{F=0})	3 000 000 t [low – high]		
Biomass	LRP (0.2 SB _{F=0})	1 500 000 t [low – high]		
Catch	MSY	500 000 t [low – high]		
Fishing Mortality	F _{MSY}	0.1 [0.08 – 0.014]		
Recent estimates				Recent trend / projection
Biomass	B _{recent}	3 000 000 t [low – high]		B _{recent} increasing
Depletion	B _{recent} /B _{F=0}	0.32 [0.18 – 0.43]		
Fishing mortality	F _{recent}	0.08 [0.06 – 0.09]		F _{recent} declining
Catch	C _{recent}	200 000		
Status			Likelihood ^{##}	
Biomass	B _{recent} /TRP	0.8 [0.65 – 1.07]	About as Likely as Not (40--60%) to be above target	
	B _{recent} /B _{MSY}	1 [0.9 – 1.65]	About as Likely as Not (40--60%) to be above B _{MSY}	
	B _{recent} /LRP	1.65 [0.9 – 2.65]	Unlikely (<40%) to be below limits	
Fishing mortality	F _{recent} /F _{MSY}	0.8 [0.6 – 1.1]	Likely (>60%) to be below F _{MSY}	
	F _{recent} /F _{limit}	0.6 [0.4 – 0.6]	Very likely (>90%) to be below limits	
Projections (basis[recent catch/effort/ alternative catch])				
Biomass	B _{proj} /B _{MSY}	0.42 [0.3 – 0.53]	About as Likely as Not (40--60%) to be below	B _{proj} increasing
Fishing mortality	F _{proj} /F _{MSY}	0.6 [0.5 – 0.7]	Likely (>60%) 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