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**Proposal for adopting interim acceptable levels of risk for breaching limit reference points
of four key tuna species in the WCPO**

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AUSTRALIA

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Abstract

In 2015, WCPFC12 adopted a work plan to develop harvest strategies for the management of key tuna species according to CMM 2014-06. Under this work plan, the Commission is tasked in 2016 with agreeing acceptable levels of risk for breaching the agreed limit reference points of the key tuna species. The Scientific Committee have provided substantial technical and scientific advice to inform a decision on risk levels. However, given the range of fishery objectives, as well as potential economic and social consequences, this has been identified as a management decision for the Commission. The following interim acceptable levels of risk for breaching limit reference points are proposed for four of the key tuna stocks in the WCPO—5% for South Pacific albacore, 5% for skipjack tuna, 10% for yellowfin tuna and 10% for bigeye tuna. A rationale for these proposed risk levels is provided which makes reference to: the requirement to adopt risk levels that are very low (CMM 2014-06; Annex II of the UN Fish Stocks Agreement); the social and economic consequences of depleted key tuna stocks; the biological consequences of depleted key tuna stocks; the need for separation of limits from agreed or potential target reference points. The risk levels are proposed as ‘interim’ because they may be revisited as more information becomes available through the management strategy evaluation process.

Introduction—why do we need acceptable levels of risk for breaching the limit?

The WCPFC has adopted a 20 per cent depletion biomass limit reference point for South Pacific albacore, skipjack tuna, yellowfin tuna and bigeye tuna (specifically 20 per cent of the estimated recent average spawning biomass in the absence of fishing or $SB_{F=0}$). WCPFC is adopting a harvest strategy approach for the management of these (and other) key tuna species in accordance with CMM 2014-06. In the context of a harvest strategy, the limit reference point represents a stock condition that should be avoided which is paired with a target reference point that represents a stock condition that is desirable.

When designing harvest strategies, it is important to consider the risk that the stock may fall below the limit reference point. Reaching agreement on these risk levels will help us to test and evaluate the performance of alternative harvest control rules later on. The risk of exceeding the LRP is not something that would form part of harvest control rules directly, rather, the agreed minimum acceptable level of risk would be to use it to exclude candidate harvest control rules (where the evaluated risk was greater than the minimum) from further consideration. For example, we may have two candidate harvest control rules, both of which give the same long-term catch levels but have different risks of breaching the limit reference point—say 4% and 13%. If the Commission has agreed that a 10% risk is the maximum that would be accepted, then on this basis, the harvest control rule that gave the 4% risk would be favoured.

The Commission has been considering the issue of acceptable risks for several years and it has also been discussed in the Management Objectives Workshops (2012, 2013 and 2014) and the Harvest Strategy Workshop (2015). The Scientific Committee has provided a range of technical and scientific advice and also responded to requests from the Commission. Given the diversity of fishery objectives, as well as potential economic and social consequences, this has been identified as a management decision for the Commission. Under the Harvest Strategy Workplan agreed at WCPFC12 (2015), a decision on acceptable levels of risk for key tuna species is scheduled for 2016.

CMM 2014-06 (Annex 1) contains the following guidance on determining acceptable levels of risk for breaching the limit reference point:

“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.”

CMM 2014-06

This text is consistent with Annex II of the UN Fish Stocks Agreement which states that “Fishery management strategies shall ensure that the risk of exceeding limit reference points is very low”.

In this paper, we propose interim acceptable levels of risk for breaching limit reference points for four of the key tuna stocks in the WCPO—South Pacific albacore, skipjack tuna, yellowfin tuna and bigeye tuna. A rationale for these interim risk levels is provided which makes reference to:

- requirement to adopt risk levels that are very low (CMM 2014-06; Annex II of the UN Fish Stocks Agreement)
- the social and economic consequences of depleted key tuna stocks (below the limit reference point)
- the potential biological consequences of depleted key tuna stocks, and
- the need for separation of limits from agreed or potential target reference points.

The proposed interim risk levels are consistent with previous proposals or recommendations by FFA members of WCPFC. Relevant technical supporting information is cited with updates based on recent assessment or analysis outcomes where relevant.

The risk levels are proposed as ‘interim’ because they may be revisited as more information becomes available from the management strategy evaluation process. It is noted that the risk of breaching the limit reference point will be one of the key indicators when assessing the performance of harvest control rules and, provided risks of breaching are very low, there may be a need to trade-off risk level with other management objectives.

Proposed interim acceptable levels of risk for breaching the limit

FFA members propose that WCPFC adopt the interim risk levels contained in Table 1.

Table 1: FFA proposed interim acceptable levels of risk for breaching limit reference points

Stock	Risk level
South Pacific albacore	5%
Skipjack	5%
Yellowfin	10%
Bigeye	10%

Rationale for the proposed acceptable levels of risk

Requirement to adopt risk levels that are “very low”

The harvest strategy CMM 2014-06 and Annex II of the UN Fish Stocks Agreement require that the risk of exceeding the limit reference point be “very low”. FFA members consider that the proposed risk levels of 5–10 per cent are very low, in accordance with this requirement. These levels are consistent with other international bodies such as the Commission for the Conservation of Antarctic Marine Living Resources who have adopted an acceptable risk of 10 per cent for krill, toothfish and other species (associated with the same 20 per cent biomass depletion reference point; Koch 2000). From a technical perspective, acceptable risk values in the range 5–10 per cent have commonly been used in simulation studies of limit reference points (WCPFC-SC8-2012).

Social and economic consequences of depleted key tuna stocks

FFA members have noted a number of social and economic consequences associated with the depletion of key target stocks below the limit reference point. FFA members also note that a breach of the limit reference point would signal a serious failure to achieve many of their objectives for a species or for its associated fishery (the “Strawman” document WCPFC10-2013-15b contains the full range of CCMs objectives). Relevant objectives include maximising economic yield, maintaining acceptable CPUE, securing food sources and provision of employment (among others). Depletion of key target stocks below the limit reference point may lead to a prolonged rebuilding program involving significant cuts to catch or effort with associated impacts. The severity of the social and economic consequences differs across the four species in question and, for this reason, the tolerance for risk also differs among the species. FFA members regard the consequences of serious stock depletion to be most dire for skipjack and South Pacific albacore because of the high reliance of some member CCMs on these species for economic and social prosperity—hence the proposal for a lower 5 per cent risk for these species.

Potential biological consequences.

There are a range of potential biological consequences for depleted key tuna stocks. The level of depletion at which these biological consequences will occur is often unknown until the stock is actually depleted and the consequences observed. It is probably the case that some of these consequences gradually manifest and become more extreme with increasing depletion, while others may manifest suddenly. Noting this, a spawning biomass depletion below 20% (the adopted limit reference point) has been considered a threshold for recruitment overfishing for productive stocks (Myers 1994), and recruitment declines might be observable below this level (Beddington and Cooke 1983). Other potential biological consequences for a stock that is below the LRP may include higher variability in productivity, genetic modifications, reduced age structure with consequences to the quality of spawning, and changes to the ecological role of the species in the food web (Sainsbury 2008).

These biological consequences are a substantial concern in their own right and also feed into sustainability threats for the dependant fisheries. The biological consequences are an important factor in the FFA proposal for acceptable levels of risk levels for breaching the limit reference point.

Buffer between limits and agreed or potential targets

The harvest strategy CMM 2014-06 (Annex 1) states the following:

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.”

CMM 2014-06

When designing harvest strategies, it is important that there is enough “buffer” between the limit reference point (20% biomass depletion) and the target reference point (e.g. for skipjack 50% biomass depletion). If these reference points are too close together, it is likely that the biomass may unintentionally fall below the limit just by trying to reach the target—the risk of breaching the limit is too high.

The Scientific Committee has provided advice (MOW3-WP-02, further summarised in HSW-WP-02) on how large this buffer needs to be. The advice is that it depends on the level of risk managers are prepared to accept for breaching the limit—the lower the acceptable risk, the larger the required buffer between the limit and target. The level of uncertainty around stock status was also found to be important—more uncertainty in stock status requires a larger buffer between the limit and target reference points for a given level of risk.

Table 2 shows the median spawning biomass depletion ($SB/SB_{F=0}$) for each species associated with each of four levels of risk of exceeding the limit (note that the estimates for South Pacific albacore have been updated following the 2015 stock assessment of that species). It can be seen that the lower the acceptable risk, the larger the biomass required in order to avoid the limit. These biomass depletion levels may be thought of as “minimum” biomass levels that would ensure that the different acceptable risks are not exceeded. For example, if WCPFC were to adopt an acceptable risk of 5%, given the level of uncertainty included within the analysis, the spawning biomass would at a minimum need to be maintained above 37% for south Pacific albacore, above 28% for bigeye tuna, above 29% for skipjack tuna and 31% for yellowfin tuna¹.

Noting the assumptions and methodology (MOW3-WP-02), FFA members considered these estimates to be a reasonable basis for determining whether there is a sufficient buffer between the agreed limit and actual or potential targets. Target reference points under consideration have generally been in the range of 40–60 per cent spawning biomass depletion (0.4 to $0.6 SB/SB_{F=0}$) and these are above the “minimum” spawning biomass associated with all acceptable risk levels for all species (Figure 1). The FFA proposed interim acceptable risk levels in Table 1 are, therefore, compatible with both the existing target reference point for skipjack and target reference points under consideration for the other species (Figure 1 and Table 2).

For reference, the most recent estimate of spawning biomass is also provided in Figure 1 and can be compared to the median spawning biomass depletion ($SB/SB_{F=0}$) associated with each of four levels of risk of exceeding the limit. In the case of South Pacific albacore, skipjack and yellowfin tuna, the most recent estimate of spawning biomass is above the “minimum” target level for all four acceptable risk levels. However, the current estimate of spawning biomass depletion for bigeye tuna is below the limit and also below the four “minimum” target levels.

Table 2: Median levels of spawning biomass depletion ($SB/SB_{F=0}$) associated with a given risk of exceeding the limit reference point of $0.2SB_{F=0}$ for the four main tuna stocks. (Source: MOW3 WP-02, except for south Pacific albacore which were derived from HSW-WP-05). The FFA proposed interim acceptable risk levels are shaded.

Acceptable risk	SP albacore	Bigeye tuna	Skipjack tuna	Yellowfin tuna
5%	0.37	0.28	0.29	0.31
10%	0.34	0.26	0.27	0.28
15%	0.33	0.25	0.26	0.27
20%	0.32	0.24	0.25	0.25

¹ Note that this represents the minimum level of a target reference point based only on management objectives relating to the risk of falling below the limit. Targets may be set at higher biomass levels to achieve other objectives such as relative stability in catches, economic objectives, food security, etc.

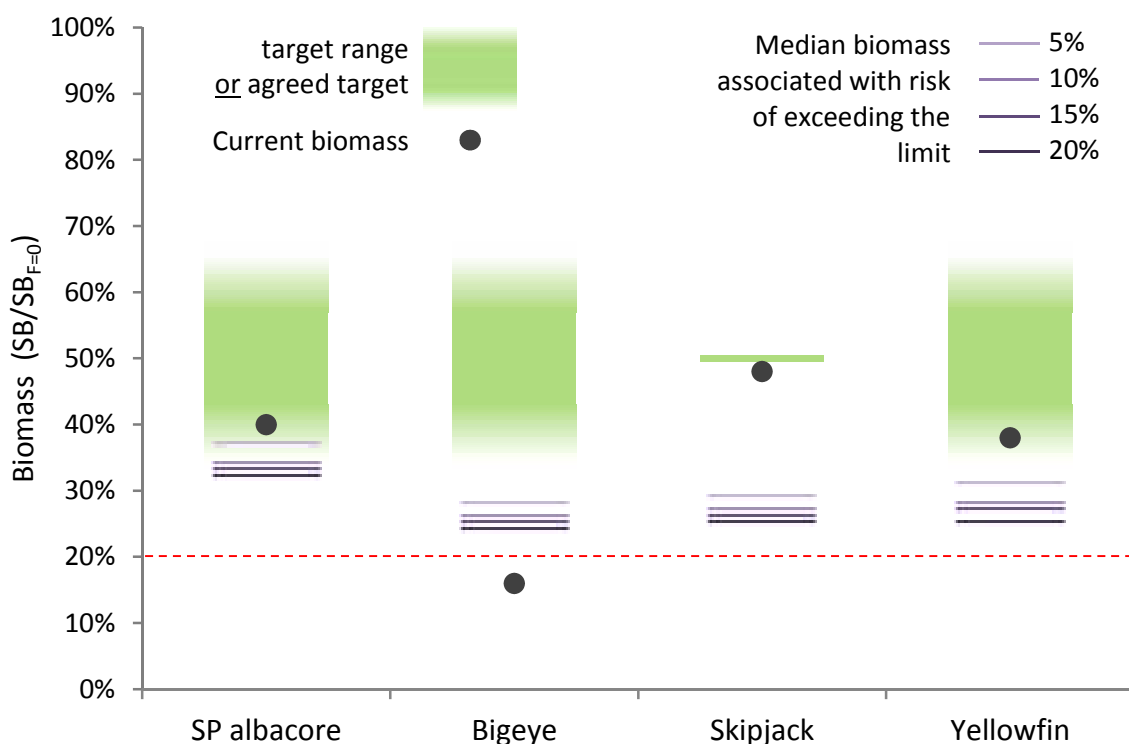


Figure 1: Relationship between the limit reference point (red dashed line), median levels of spawning biomass depletion at different risks of exceeding the limit reference point (purple lines, as per Table 2), the current biomass (black dot) and the target reference point range under consideration (green band) (Sources: MOW3 WP-02, except for south Pacific albacore which were derived from HSW-WP-05; most recent stock assessments as at August 2015; skipjack will require updating following the 2016 assessment)

Conclusion and an Invitation

FFA members put forward this proposal for the consideration of WCPFC CCMs, for technical and scientific consideration by the Scientific Committee, and for relevant consideration at the Technical and Compliance Committee with a view to formal adoption by WCPFC13 at the end of 2016. In the spirit of improving the collective understanding, we welcome questions from interested CCMs on the purpose and role of agreed risk levels for limit reference points in harvest strategies as well as questions and comments on the proposed interim risk levels. Further, we invite CCMs to put forward alternative proposals for the risk levels for the key tuna species under CMM 2014-06 and we would encourage that alternative proposals be accompanied by a rationale.

Sources

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SC9-MI-IP-01 “Report of the 2013 ISSF Stock Assessment Workshop: Harvest Control Rules and Reference Points for Tuna RFMOs”

SC10-MI-WP-01 “Evaluation of risks of exceeding limit reference points for south Pacific albacore, bigeye, yellowfin and skipjack tunas with implications for target reference points: a case study using south Pacific albacore”

SC11-MI-WP-04 “Compatibility and consequences of alternative potential Target Reference Points for the south Pacific Albacore stock”

SC11-MI-WP-10 “Estimating potential tropical purse seine fleet sizes given existing effort limits and candidate target stock levels”