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Greenpeace Recommendations for Reference Points

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Background to the development of reference points for WCPFC

Scientists from CSIRO, Australia, and the Oceanic Fisheries Programme of the Secretariat of the Pacific Community (SPC-OFP) have presented a comprehensive set of papers in 2011 and 2012 that explore the options available to the Western and Central Pacific Fisheries Commission (WCPFC) for choosing and setting limit reference points^{1, 2} (that correspond to the state of a stock that must be avoided), target reference points³ (that indicate the ideal state in which a stock should be maintained according to a set of biological, ecological, economic and social goals) and the harvest control rules⁴ that define what actions must be taken to ensure that there is a very low risk that the fishery will exceed the limit reference points.

As well as reviewing current best practice for fisheries management and the best option available for tuna fisheries, the papers highlight two key issues:

1. Setting strong fisheries reference points and harvest control rules is a key part of implementing the FAO Code of Conduct for Responsible Fisheries⁵ and the UN Fish Stocks Agreement.⁶
2. The current reference points used by the WCPFC for determining the 'relative health' of tuna fisheries – the maximum sustainable yield (MSY) and the corresponding biomass (B_{MSY}) and fishing rate (F_{MSY}) – should be, at best, treated as limit reference points (to be avoided) according to the FAO Code and UN Fish Stocks Agreement. The SPC-OFP notes that: "given the uncertainties in assessing stock status and natural stock variability, practical experience and scientific analysis has shown that treating F_{MSY} as a target often results in depletion of fish stocks, and that recovery from over-depletion is difficult. The use of MSY as a target is also often sub-optimal economically."⁷

Limit reference points

What has been agreed to date?

In 2011, the SC7 agreed to follow the recommendations⁸ to use a 3-level framework for choosing limit reference points based on the level of information available for the species and the fisheries (see Table 1). SC7 also agreed the nature of biomass limits for each level – B_{MSY} for level 1, and two possible depletion-based biomass limit reference points for levels 2 and 3:

- $20\%SB_0$ (unfished adult biomass based on historical average recruitment estimates); OR
- $20\%SB_{current, F=0}$ (unfished biomass based on recent average recruitment).

With regard to fishing mortality, F_{MSY} was agreed for level 1. For level 2, an F-limit known as $F_{X\%SPR_0}$ was agreed but choosing the value for X was postponed until SC8. This represents a fishing rate that would reduce the stock to a level that has X% of the spawning-potential-per-recruit of the unfished stock (calculated from the lifetime expectation of a single recruit's contribution to quantities such as yield, the spawning biomass, egg production or the number of spawning seasons an individual can expect to

participate in). It was agreed that no F-based limit should be set for level 3. The WCPFC endorsed this approach.

In 2012, the SC8 agreed which tuna species should be allocated to each level and that the biomass limit reference point $20\%SB_{\text{current}, F=0}$ should be used for levels 2 and 3, i.e. 20% of the adult biomass that could exist under recent current conditions. This is consistent with the ‘recent recruitment’ approach currently used by SPC-OFP for bigeye stock assessments that takes into account the impacts of changing ocean regimes on stock productivity. The SC8 asked the SPC-OFP to define the appropriate ‘current’ timeframe to use for estimating current unfished biomass for each species.

There was some debate about the value of X for selecting a $F_{X\%SPR_0}$ reference points and this decision has been postponed to SC9 following further clarification from SPC-OFP on appropriate values for each species.

Table 1. Hierarchical approach to choosing limit reference points (LRPs) for target species in the WCPFC.

Level	LRPs	Data requirements	Species
Level 1	B: B_{MSY} F: F_{MSY}	A reliable estimate of steepness is available (i.e. the relationship between adult biomass and corresponding recruitment at low levels of biomass, and the point at which recruitment overfishing would occur)	No species at present
Level 2	B: $20\%SB_{\text{current}, F=0}$ F: $F_{X\%SPR_0}$	Steepness is not well-known, if at all, but key biological (natural mortality, maturity) and fishery (selectivity) variables are reasonably well estimated.	Yellowfin Bigeye Albacore Striped marlin
Level 3	B: $20\%SB_{\text{current}, F=0}$ F: no F limit	The key biological and fishery variables are not well known.	Skipjack

Acceptable risk levels

Stock assessments result in a range of possible biomass and fishing rate values, any of which could be the correct values. Setting ‘acceptable risk’ levels is essentially a way to define whether a limit reference point has been breached when a part of a range is close to or overlapping the reference point. Although there was considerable support for the SC8 to also make recommendations on the ‘acceptable risk’ levels for failing to maintain the stock above these limits – 10% for yellowfin and bigeye, and 5% for albacore and skipjack – this did not reach consensus. The final recommendations were that:

- the probability of breaching a limit reference point should be very low;
- the allowable risk of breaching a limit reference point may be applied on a species-specific basis, e.g. higher risk for yellowfin and bigeye tunas but a more precautionary lower risk to skipjack and South Pacific albacore tuna;
- a range of risk levels of breaching the LRP were suggested with a majority recommending a 10% level and that a lower more precautionary value could be considered in some cases;
- the Management Objectives Workshop should review appropriate values for specifying the level of risk for individual species.

The SC also asked SPC-OFP to further explain and model the range of proposals for target references and harvest control rules and to present the results to the WCPFC Management Objectives Workshop.

Greenpeace position on limit reference points

Greenpeace supports the limit reference points (LRPs) agreed by the SC to date. These were based on recommendations provided by Preece et al⁹ which were supported by a thorough review of best practices around the world and detailed reasoning for why these reference points would be best for tuna species. The recommendations are based on data from other fisheries and on the relative resilience of tropical tunas to fishing (compared to other fish). The decision to base the biomass estimates on current potential unfished levels is consistent with how bigeye stocks are currently assessed and takes into account the fact that the oceanic conditions and productivity of the Pacific are constantly changing.

Recommendations for acceptable risk levels

Greenpeace supports the 'acceptable risk' levels for failing to maintain the stock above limit reference points be set at 10% for yellowfin and bigeye, and 5% for albacore and skipjack, as supported by the majority of the SC8. The 10% level is based on best practice, such as at by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR).

Recommendation for F-based limit reference points

Greenpeace supports the use of $F_{40\%SPR_0}$ as the limit for level 2 species, as recommended for relatively productive species where the relationship between adult biomass and corresponding recruitment at low levels of biomass (i.e. steepness) is unknown.

All reference points must be reviewed regularly as more data becomes available. Ultimately the assurance that limit reference points are not breached by fisheries depends on WCPFC choosing strong target reference points and harvest control rules, and on swift action to agree and implement the required conservation and management measures.

What do the new limit reference points say about current stock status?

Harley et al¹⁰ have reviewed the risks of breaching various reference points for each species.

Yellowfin stock indicators determined in 2011 are close to F_{MSY} and B_{MSY} (limit) reference points and there are significant uncertainties involved in the assessments.¹¹ For region 3 where most yellowfin is fished the stock may already be at, or may have breached, these MSY-based reference points. If we use the new $F_{40\%SPR}$ limit reference point, then the fishing mortality limit has been breached multiple times (undergoing overfishing) over the last 10 years. The new $20\%SB_{current, F=0}$ limit reference has not yet been breached and is unlikely to be in the next 10 years at recent catch rates.

Bigeye stock indicators from the 2011 assessment, show that F is well above F_{MSY} (with the possible range as high as double the F_{MSY}).¹² Based on the average recruitment in recent years, scientists concluded that the bigeye tuna stock is also likely to have dropped below B_{MSY} and the spawning biomass is as low as 23% of its potential spawning level.¹³ Using the new $20\%SB_{current, F=0}$ limit reference, the bigeye stock has likely fallen below the biomass limit since 2010. The weakest of the proposed F -limits, $F_{20\%SPR}$, has been overshoot since the mid-1990s and $F_{40\%SPR}$ since the mid-1980s.

Southern albacore had a new, more robust assessment¹⁴ which was discussed at SC8. Current biomass and fishing rate are close to the MSY-based limits. Albacore has about a 10% risk of dropping down to the $20\%SB_{current, F=0}$ in the next few years, and there is a greater than 10% risk that all the $F_{30-50\%SPR}$ limits have been breached (and will be at current rates) since about 2009.

Skipjack indicators from the 2011 assessment¹⁵ show that the stock is significantly higher than the $20\%SB_{current, F=0}$ limit reference, which will be the only one set. Even if scientists did set an F limit for skipjack, the current fishing rate is well below all the F_{MSY} or any of the possible $F_{20-50\%SPR}$ limits recommended for other tuna stocks. Therefore skipjack is not overfished or experiencing overfishing based on any of these reference points.

Striped marlin in the south west Pacific was assessed in 2012¹⁶ and indicators show that current catch rates are approaching F_{MSY} , and current total and spawning biomass are close to the associated B_{MSY} levels and approaching an overfished state. There is a greater than 20% chance that the stock has been below $20\%SB_{current, F=0}$ since about 2000, but the likelihood of this has been dropping since 2010. For F , the current risk is >20% that $F_{30-50\%SPR}$ limits are being breached.

Target reference points

Greenpeace will review its position on target reference points following the presentation of further data and analysis at the SFP-OFP at the management meeting. However, there are some strong indicators

already available that show that the target reference points should be set much higher than the limit reference points.

The limit reference points agreed to date were based purely on single stock considerations – the emphasis was on avoiding recruitment overfishing and stock collapse. There was no precautionary element or ecosystem considerations built into these limit reference points. For this reason, the choice of target reference points must contain a strong precautionary element. The choice of target must ensure that the limit reference point is avoided with high probability. It must also consider the broader needs of the ecosystem, and the current and future socioeconomic objectives of the fishery under the range of environmental and productivity conditions that could be reasonably expected to occur.

Greenpeace is recommending simple biomass target references based on the proportion of stock remaining compared to the unfished levels expected under current conditions ($B_{\text{current}, F=0}$ and/or $SB_{\text{current}, F=0}$). These are easy to understand and simple to communicate – features that were also requested by at least one member state at SC8.

Albacore: Although this albacore stock is relatively healthy compared to many others, the catch per unit effort (CPUE) is an important socioeconomic consideration for the continuing commercial viability of albacore fisheries, particularly the domestic long-line fleets of Pacific Island nations. In addition, the stock is the least abundant of all four tuna species.¹⁷ The biomass available to longliners (targeting adults) is small compared to other fisheries and the declining adult biomass is already causing concern. The total stock is estimated to have been depleted to about 82% (62–93%) of the unfished level and the adult spawning stock is at 63% (35–80%). The target reference points set should ensure that the stock does not drop any lower in order to maintain the CPUE. Given the large range of possible depletion values, and the wide variation of impacts by various fleets, the **target reference points for albacore should ensure that total stock is maintained above 80% of the unfished size and adult stock above 60% of the unfished size.**

Skipjack: The total stock has declined to about 53% in the western equatorial region and 79% in the eastern region, to an overall 65% (based on 2006–2009 unfished levels) and has declined further in the past two years. While this poses little risk to the stock, concerns have already been raised regarding potential skipjack range contraction and the decline in catches for some nations – such as the Japanese pole-and-line fleet. In addition skipjack stock distribution is also influenced by changes in oceanographic conditions associated with El Nino and La Nina events. For these reasons, **target reference points for skipjack should ensure that the total stock is maintained above 60% of the unfished level.**

Bigeye: The adult stock size that supports the MSY is estimated to be reached at around 24–33% of the unfished adult stock level. The adult spawning stock is as low as 23% based on unfished levels estimated for 2010. In equatorial regions (3 and 4), which account for 88% of the total bigeye tuna catch (based on 2001–2010 unfished levels) the adult stock is as low as 17% of the unfished level. Given the wide variation of exploitation levels between regions, and its importance as a large predatory fish, **target reference points for bigeye should aim to recover the total stock above 50% of the unfished level.**

Yellowfin: The adult stock size that supports the MSY is estimated to be reached at around 25–34% of the unfished adult stock level and at 35–40% of the total biomass. The stock has declined to about 50–55% of unexploited total biomass (based on 2006–2009 unfished levels). Depletion is considerably higher in the equatorial region 3 where the total biomass is at 30% of the unfished level. Given the wide variation of exploitation levels between regions, and its importance as a large predatory fish, **target reference points for yellowfin should ensure that the total stock is maintained above 50% of the unfished level.**

Striped marlin: The adult stock size that supports the MSY is estimated to be reached at around 22–32% of the unfished adult stock level. The stock has declined to between 32–44% of unexploited adult biomass (based on 2007–2010 unfished levels). Given the high level of uncertainty in the recent assessment, and its importance as a large predatory fish, **target reference points for striped marlin should aim to recover the total stock above 50% of the unfished level.**

Summary: Greenpeace recommendations

The Commission must:

- Adopt the limit reference points for tuna species agreed by the SC to date.
- Direct the SC to agree final F-based limit reference points
- Set interim target biomass reference points as follows:
 - Albacore: 80% of the unfished stock biomass and 60% of the unfished adult stock
 - Skipjack: 60% of the unfished total stock biomass
 - Bigeye: 50% of the unfished total stock biomass
 - Yellowfin: 50% of the unfished total stock biomass
 - Striped marlin: 50% of the unfished total stock biomass
- Agree urgent measures to ensure limit reference points are not exceeded and to begin the process of recovering stocks to target levels.
- Agree urgent measures to reduce fishing capacity in the region to levels that ensure the fisheries cannot exceed reference limit points.

Notes and References

- ¹ Preece A, Hillary R, Davies C (2011). Identification of candidate limit reference points for the key target species in the WCPFC. Seventh Regular Session of the Science Committee, WCPFC, 9-17 August 2011, Pohnpei, Federated States of Micronesia WCPFC-SC7-2011/MI-WP-03. <http://www.wcpfc.int/node/3522>
- ² Harley SJ, Berger AM, Pilling GM, Davies N, Hampton J (2012). Evaluation of stock status of south Pacific albacore, bigeye, skipjack, and yellowfin tunas and southwest Pacific striped marlin against potential limit reference points. Eighth Regular Session of the Science Committee, WCPFC. 7–15 August 2012, Busan, Republic of Korea. WCPFC-SC8-2012/MI-WP-01_rev1. <http://www.wcpfc.int/node/5390>
- ³ Pilling GM, Harley SJ, Berger AM, Hampton J (2012). Consideration of target reference points for WCPO stocks with an emphasis on skipjack tuna. Eighth Regular Session of the Science Committee, WCPFC. 7–15 August 2012, Busan, Republic of Korea. WCPFC-SC8-2012/ MI-WP-02. <http://www.wcpfc.int/node/5391>
- ⁴ Berger AM, Harley SJ, Pilling GM, Davies N, Hampton J (2012). Introduction to harvest control rules for WCPO tuna. Eighth Regular Session of the Science Committee, WCPFC. 7–15 August 2012, Busan, Republic of Korea. WCPFC-SC8-2012/MI-WP-03. <http://www.wcpfc.int/node/5392>
- ⁵ See Article 7.5.3 of FAO (1995). *Code of conduct for responsible fisheries*. Rome, Italy: Food and Agriculture Organisation of the United Nations. www.fao.org/fi/agreem/codecond/codecon.asp
- ⁶ Anon. (1995). Agreement for the implementation of the provisions of The United Nations Convention on the Law of the Sea of 10 December 1982 relating to the conservation and management of straddling fish stocks and highly migratory fish stocks.
- ⁷ Pilling GM, Harley SJ, Berger AM, Hampton J (2012). Consideration of target reference points for WCPO stocks with an emphasis on skipjack tuna. Eighth Regular Session of the Science Committee, WCPFC. 7–15 August 2012, Busan, Republic of Korea. WCPFC-SC8-2012/ MI-WP-02. <http://www.wcpfc.int/node/5391>
- ⁸ Preece A, Hillary R, Davies C (2011). Identification of candidate limit reference points for the key target species in the WCPFC. Seventh Regular Session of the Science Committee, WCPFC, 9-17 August 2011, Pohnpei, Federated States of Micronesia WCPFC-SC7-2011/MI-WP-03. <http://www.wcpfc.int/node/3522>
- ⁹ Preece A, Hillary R, Davies C (2011). Identification of candidate limit reference points for the key target species in the WCPFC. Seventh Regular Session of the Science Committee, WCPFC, 9-17 August 2011, Pohnpei, Federated States of Micronesia WCPFC-SC7-2011/MI-WP-03. <http://www.wcpfc.int/node/3522>
- ¹⁰ See page 11. Harley SJ, Berger AM, Pilling GM, Davies N, Hampton J (2012). Evaluation of stock status of south Pacific albacore, bigeye, skipjack, and yellowfin tunas and southwest Pacific striped marlin against potential limit reference points. Eighth Regular Session of the Science Committee, WCPFC. 7–15 August 2012, Busan, Republic of Korea. WCPFC-SC8-2012/MI-WP-01_rev1. <http://www.wcpfc.int/node/5390>
- ¹¹ Paragraphs 27 & 31 of Executive Summary: SC (2011). Summary Report. Seventh Regular Session of the Science Committee, WCPFC. 9–17 August 2011, Pohnpei, Federated States of Micronesia. <http://www.wcpfc.int/node/3961>
- ¹² Paragraphs 10 & 18 of Executive Summary, & paragraph 141: SC (2011). Summary Report. Seventh Regular Session of the Science Committee, WCPFC. 9–17 August 2011, Pohnpei, Federated States of Micronesia. <http://www.wcpfc.int/node/3961>
- ¹³ See paragraph 141. SC (2011). Summary Report. Seventh Regular Session of the Science Committee, WCPFC. 9–17 August 2011, Pohnpei, Federated States of Micronesia. <http://www.wcpfc.int/node/3961>
- ¹⁴ Harley SJ, Berger AM, Pilling GM, Davies N, Hampton J (2012). Evaluation of stock status of south Pacific albacore, bigeye, skipjack, and yellowfin tunas and southwest Pacific striped marlin against potential limit reference points. Eighth Regular Session of the Science Committee, WCPFC. 7–15 August 2012, Busan, Republic of Korea.
- ¹⁵ SC (2011). Summary Report. Seventh Regular Session of the Science Committee, WCPFC. 9–17 August 2011, Pohnpei, Federated States of Micronesia. <http://www.wcpfc.int/node/3961>
- ¹⁶ Davies N, Hoyle S, Hampton J (2012). Stock assessment of striped marlin (*Kajikia audax*) in the southwest Pacific Ocean. Eighth Regular Session of the Science Committee, WCPFC. 7-15 August 2012, Busan, Republic of Korea. WCPFC-SC8-2012/SA-WP-05. <http://www.wcpfc.int/node/5461>
- ¹⁷ Compare, for example, the recent assessment estimates of unfished adult stock biomass for each species: albacore 440,000 t; bigeye 740,000 t; yellowfin 2,000,000 t; skipjack 5,800,000 t.