

International Seafood Sustainability Foundation

STATUS OF THE WORLD FISHERIES FOR TUNA

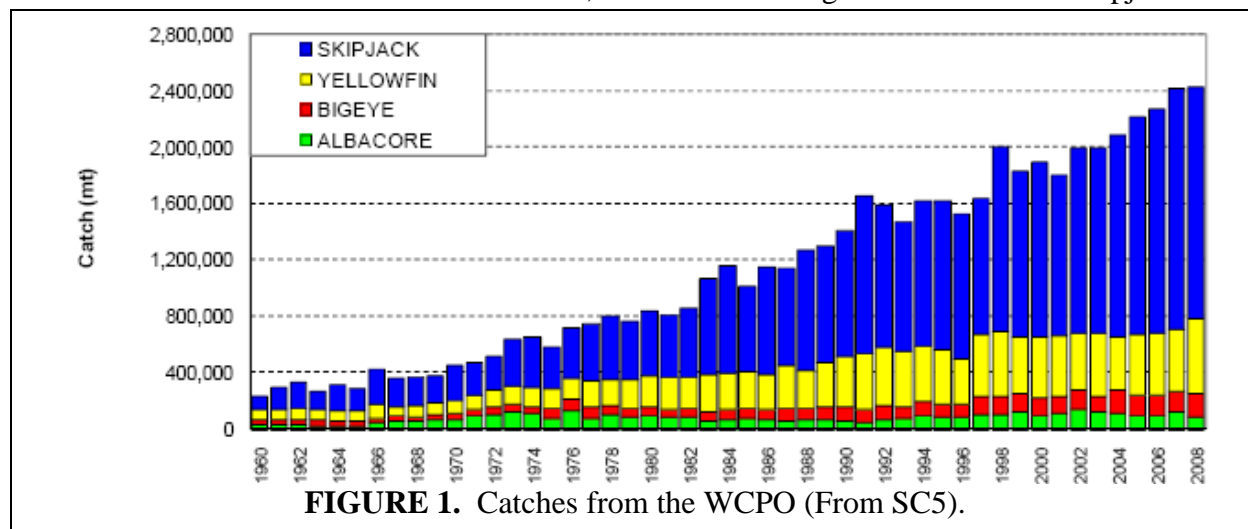
**UPDATE ON THE STATUS OF THE TUNA STOCKS IN THE
WESTERN AND CENTRAL PACIFIC OCEAN
DECEMBER 2009**

This document updates the assessment of the status of the tuna stocks in the western and central Pacific Ocean (WCPO) in the ISSF report on the status of the world's tuna stocks published in August 2009, which was based on data available as of 15 April 2009. The Scientific Committee of the Western and Central Pacific Fisheries Commission (WCPFC), which is responsible for tuna in the WCPO, met in August 2009, while the Annual Session of the Commission was held in December 2009. This report takes into account the relevant information presented at those meetings, and the conclusions and decisions that were reached.

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1. CATCHES

Preliminary catch figures for the Western and Central Pacific Ocean (WCPO) show that about 2,426 thousand tons of tuna were caught from the region during 2008. This represents the highest annual catch recorded, but by only about 26 thousand tons (Figure 1). The 2008 WCPO catch forms about 81% of the Pacific catch, and 56% of the global catch. The skipjack catch



from the region was about 1,635 thousand tons, or 67% of the total, yellowfin about 539 thousand, or 22% (the highest on record), bigeye about 157 thousand tons, or 6%. Albacore catches in both the north and south Pacific declined during 2008. Purse-seine vessels accounted for about 73% of the total catch, longliners about 10% percent, pole-and-line about 7%, and a variety of other gears the remainder.

Setting on unassociated schools is the predominant form of fishing by purse seiners. This type of fishing accounted for 63% of all sets, while sets on floating objects accounted for most of the remainder. All purse-seine fleets, with the exception of U.S. vessels, showed increases in sets on fish-aggregating devices (FADs) during 2008.

2. 2009 ASSESSMENTS:

2.1. Yellowfin

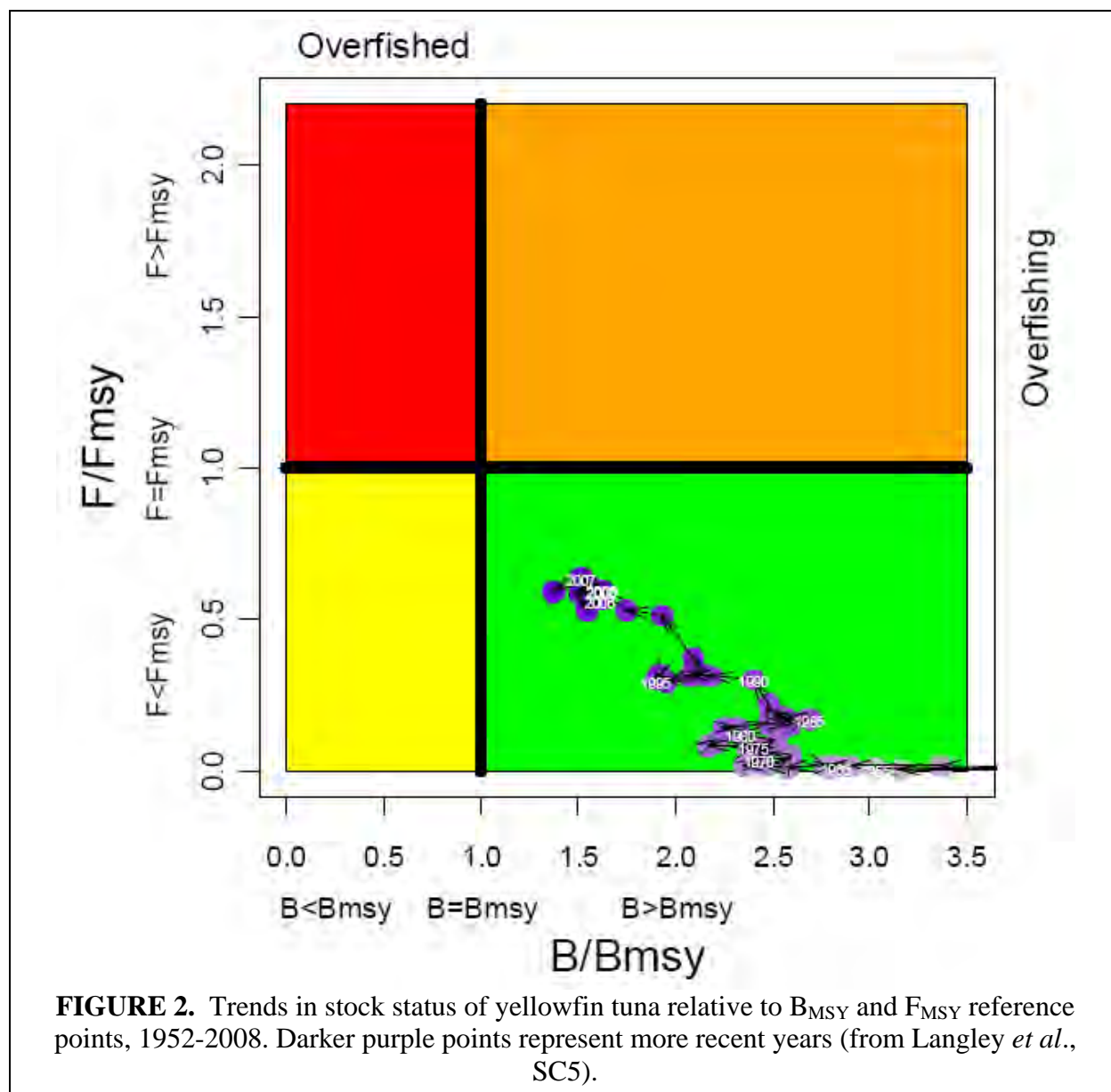
The most recent yellowfin stock assessment, using the MULTIFAN-CL model, was in 2009. The assessment was reported on at the WCPFC's Science Committee 5 (SC5) meeting held in August in Vanuatu. The model analysis used a spatial and fishery structure equivalent to that used in the previous assessment, but a number of refinements concerning catch histories of the important fisheries were made for the 2009 analysis, particularly higher levels of catch from purse-seine sets on floating objects (including FADs) and levels of catch from the Philippine fishery. Also, consideration was given to a range of assumptions concerning weighting of longline catch-per-unit-of-effort (CPUE) indices, size frequency data, and changing catchability.

Estimates of yellowfin biomass derived from the model show relatively high levels in the early years of the fishery, and a declining trend as the fishery expanded. It was estimated that the unfished biomass of yellowfin was reduced by about 40% as a result of fishing; this is considered to be a modest level of depletion overall. In the equatorial region, where most of the yellowfin fishery occurs, reductions from the unexploited level were about twice as great, while in other areas they were minimal. The Philippines and Indonesian domestic fisheries are responsible for the highest impact on the yellowfin stock in the equatorial region, while the longline fishery has a small impact in all areas.

Although a number of changes in model assumptions were made in the 2009 analysis, assumptions about the steepness of the relationship between spawners and recruits had the greatest impact on the results. A series of model runs were made in which steepness was varied between 0.55 and 0.95. Assuming a moderate steepness value of 0.75 resulted in a stock status that was an improvement over the previous assessment, and for this 0.75 value, $F_{\text{current}}/F_{\text{MSY}}$ was estimated to be between 0.54 and 0.68, indicating that the fishing mortality (F) was much less than that required to take the maximum sustainable yield (MSY); $B_{\text{current}}/B_{\text{MSY}}$ was estimated to be 1.41-1.67 while $SB_{\text{current}}/SB_{\text{MSY}}$ was 1.50-1.79, both indicating biomass well above the MSY level. For steepness values between 0.55 and 0.65, biomass ratios were above 1.0 in all cases, and fishing mortality ratios were less than 1.0, except for model options that incorporated the lowest value of steepness (0.55).

The estimates of MSY varied between 552,000 and 637,000 tons, values significantly greater than current levels of catch.

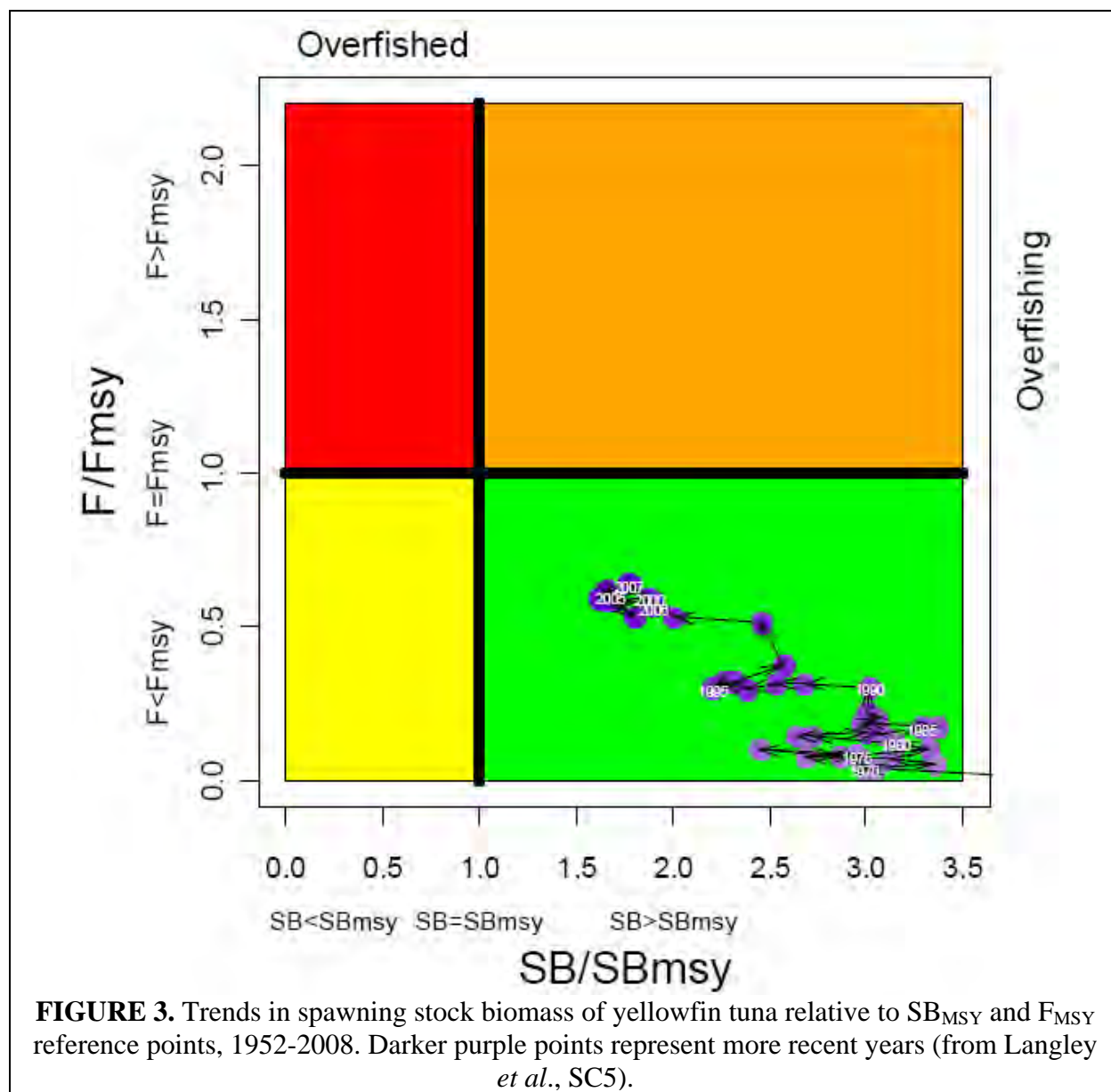
Based on the 2009 assessment, the population of yellowfin in the WCPO is estimated **to not be in an overfished state**, and current fishing mortality is estimated to be less than that needed to harvest the MSY, indicating the **overfishing is not occurring**. However, in the equatorial region



(Area 3), where about 90% of the yellowfin catch is taken, the stock may be fully exploited; this conclusion results from the fact that, when the data from all areas are combined, the three areas that provide the remaining 10% of the catch, and for which fishing mortality is low and biomass is high relative to MSY reference levels, tend to “buffer” the area-wide estimate of fishing mortality and biomass. Therefore, the interpretation that there is additional exploitation potential for yellowfin tuna from tropical region should be avoided.

The probability distributions resulting from the analysis reveal that there is zero probability that biomass is below the MSY level, or that fishing mortality is above the MSY level. Even though the key source of uncertainty in the analysis is attributable to assumptions regarding the steepness of the stock-recruitment relationship, sensitivity analyses indicated changes in the steepness did not significantly alter the conclusions.

The plots in Figures 2 and 3 provide a graphical representation of the status of the stock relative



to certain MSY reference points.

Some caution was expressed regarding the results of the analysis, since the estimates of MSY are based on a long-term series of data, and recent levels of estimated recruitment are well below the long-term average used to calculate the MSY. If recruitment remains low, yield from the fishery would be lower than the MSY estimates.

Because fishing mortality in Area 3 is near the MSY level, and because it would be prudent to maintain biomass approximately 5% above the MSY level, it was recommended during the SC5 meeting that fishing mortality in Area 3 not be increased over current levels.

2.2. Bigeye

Rather than a full assessment, which was conducted in 2008, a streamlined assessment was done for 2009 and presented during the SC5 meeting. The streamlined assessment reports on less of

the background and supporting material, but the analysis is nonetheless comparable to the earlier analyses. The analysis for 2009, which focused on several changes in data and model structure to the previous analyses, was done primarily to facilitate an evaluation of the potential benefits of the 2008 conservation resolution for bigeye and yellowfin approved by the WCPFC.

An updated version of MULTIFAN-CL was used for the assessment. More than 130 runs of the model were made using a number of alternative assumptions. The assumptions regarding steepness of the spawner-recruit relationship, and the level of catches in the fishery for small fish

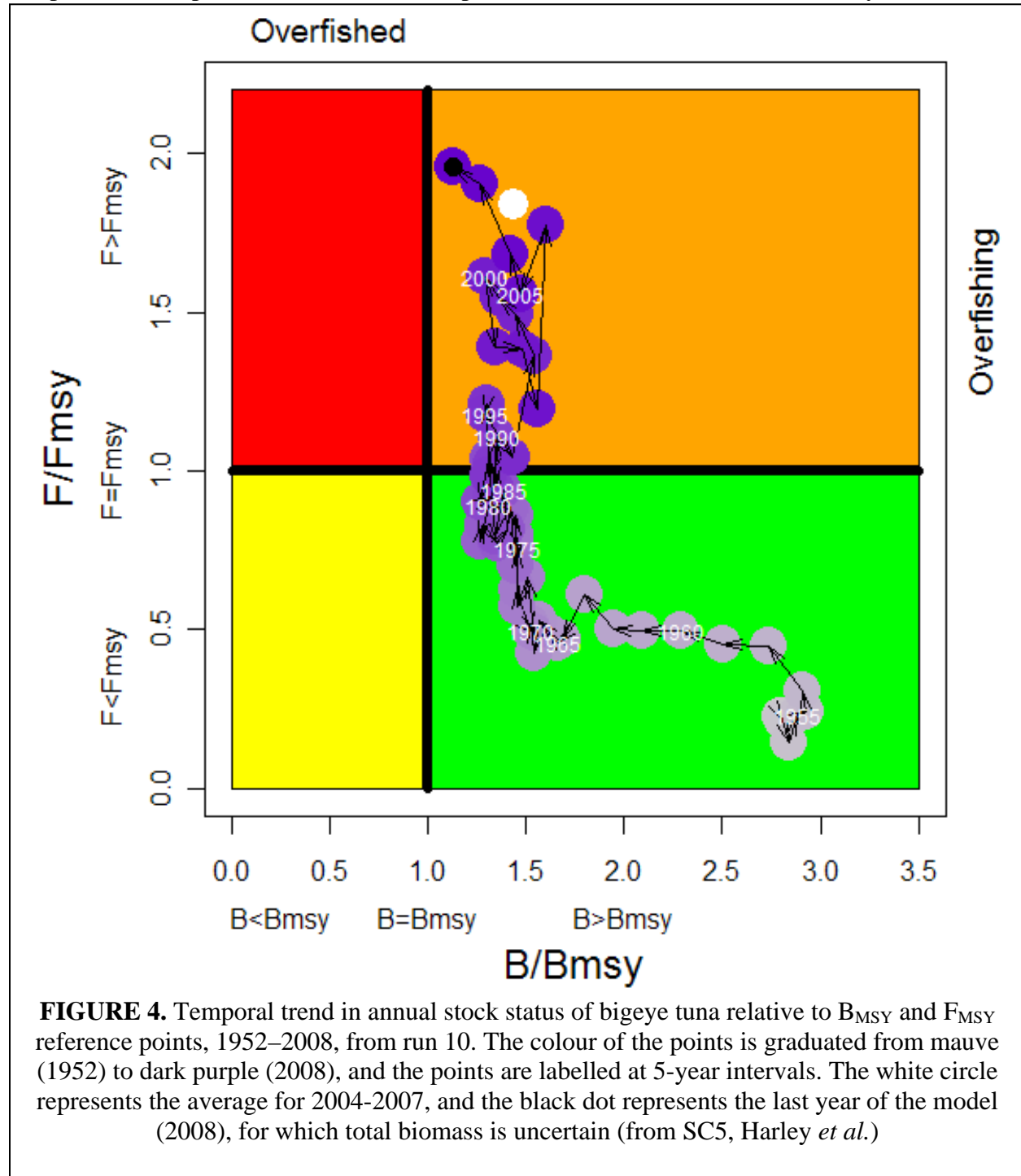
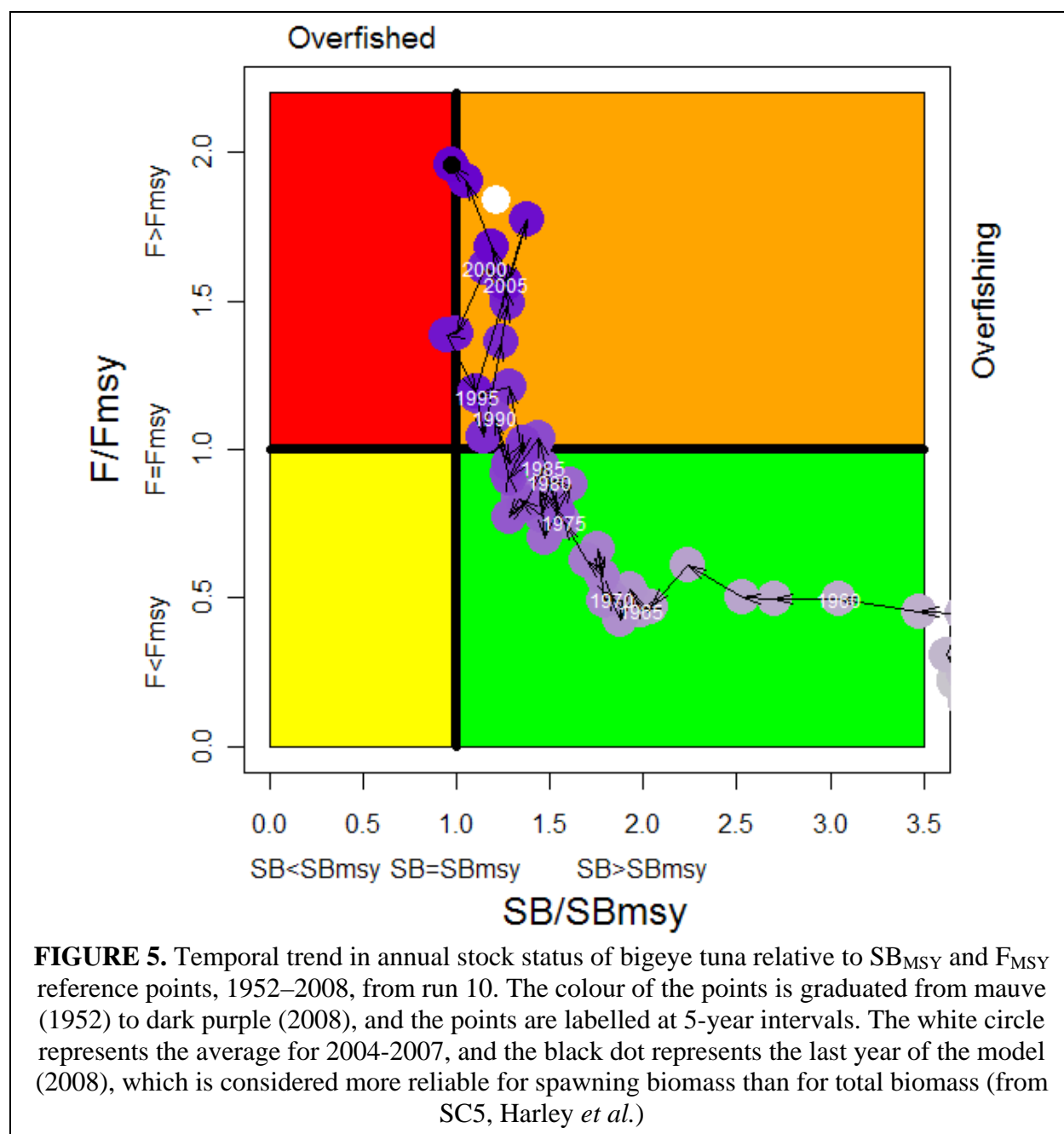


FIGURE 4. Temporal trend in annual stock status of bigeye tuna relative to B_{MSY} and F_{MSY} reference points, 1952–2008, from run 10. The colour of the points is graduated from mauve (1952) to dark purple (2008), and the points are labelled at 5-year intervals. The white circle represents the average for 2004–2007, and the black dot represents the last year of the model (2008), for which total biomass is uncertain (from SC5, Harley *et al.*)

in Indonesia and the Philippines, resulted in some of the most dramatic effects on the outcome of the various model runs. The model 10 run was considered to provide the most comparable results to the 2008 assessment.

Several important results of the analysis for the model 10 run were:

- 1) Recruitment estimates showed a decreasing trend until about 1970 and increasing thereafter, with highs during 1995-2005, since when estimates have declined to the long-term average.
- 2) By 1970, biomass had declined to about half of its initial (1952-1956) level, and remained relatively constant at that level until about 2007; however, spawning biomass, which declined precipitously from its initial level until about 1965, has continued to decline, and is now at



about 30% of its initial level.

- 3) Using the long-term series of estimates of recruitment, MSY was calculated to be about 57,000 tons, and recent catches have been well above that level; MSY estimated for current high levels of recruitment was also shown to be significantly less than current catch levels. Based on these findings, and recognizing that these recent high catches are the result of recent high levels of recruitment, it was stated in the assessment that: “...**we conclude that current levels of catch are not sustainable...**” even if the high levels of recruitment continue.
- 4) Fishing mortality has increased steadily since the introduction of commercial fishing. In all cases examined, $F_{\text{current}}/F_{\text{MSY}}$ is considerably greater than 1.0, and it was estimated that a 34%-50% reduction from the level of fishing mortality in 2004-2007 would be needed to keep the biomass above the level corresponding to MSY. For comparative purposes, in 2006 a 25% reduction from 2001-2004 average levels was recommended, and in 2008 a 30% reduction from the 2003-2006 average level. **Based on the results of the analysis, overfishing is occurring in the bigeye tuna stock.**
- 5) The current situation in the fishery respecting biomass is that $B_{\text{current}}/B_{\text{MSY}}$, where B_{current} is for the 2004-2007 period, is equal to 1.44; however, there is a 70% probability that the latest estimate of spawning biomass, which is for 2008, is less than the spawning biomass at MSY (0.89). It was predicted that, if fishing mortality continues at current levels, the biomass would be reduced to about half the MSY level. Based on the analysis results, it was concluded that “**it is likely that bigeye tuna is in, at least, a slightly overfished state, or will be in the near future.**” It was also concluded that yields could be increased if fishing mortality of small fish was decreased.

These results are depicted graphically in Figures 4 and 5, which were taken from the report by Harley *et al.* presented at the SC5 meeting.

Because the stock of bigeye may just be entering an overfished state, and fishing mortality is well in excess of the MSY level, the Scientific Committee recommended that fishing mortality of bigeye in the WCPO be reduced by 43% from the 2007 level.

2.3. Skipjack

The last assessment for skipjack in the WCPO was in 2008 and it concluded that the stock **was not in an overfished state nor was overfishing occurring**. Nothing has been observed in the fishery that indicates that this conclusion should be changed, although some mild concern over possible shifts in distribution of skipjack in the northern regions of the WCPO has been expressed.

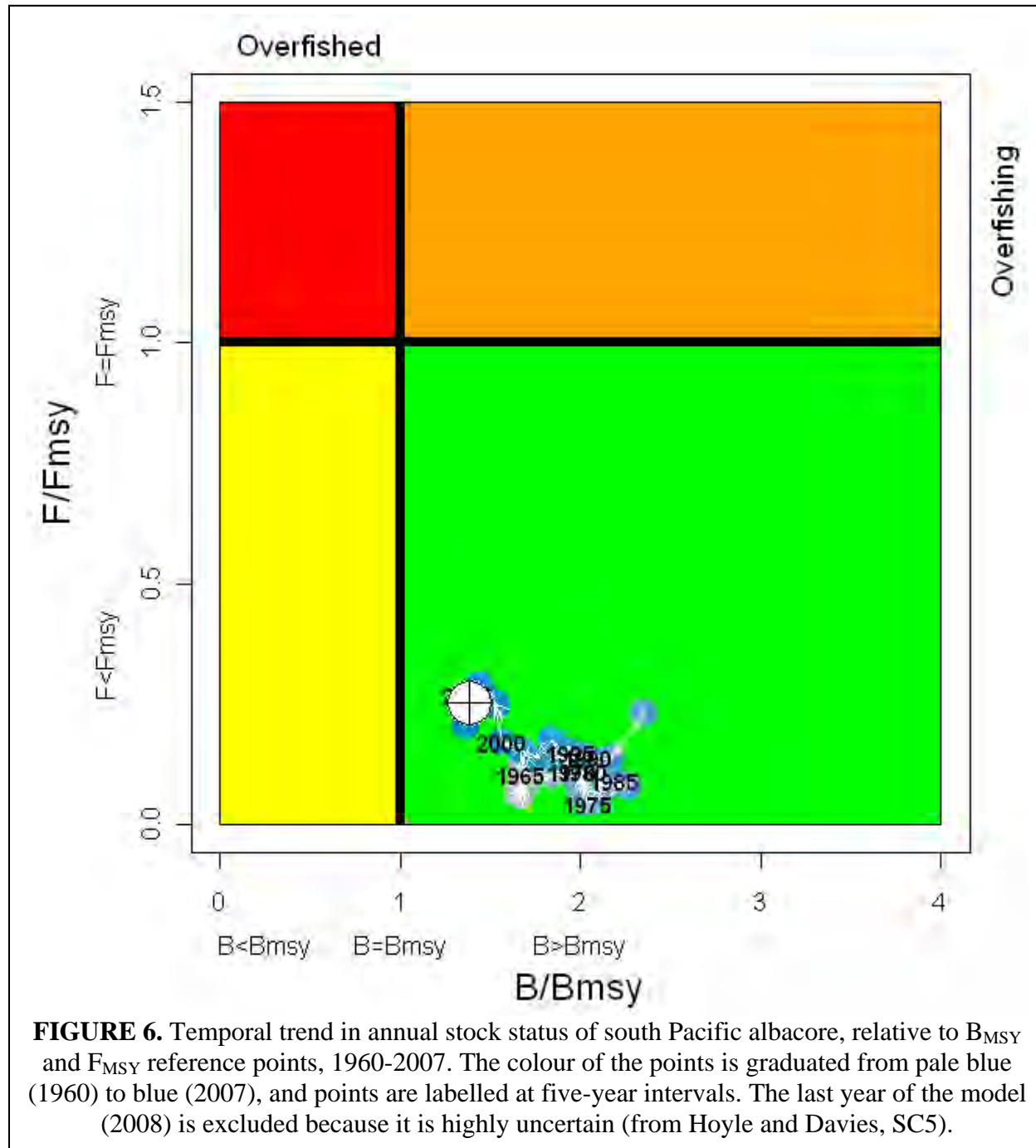
2.4. South Pacific albacore

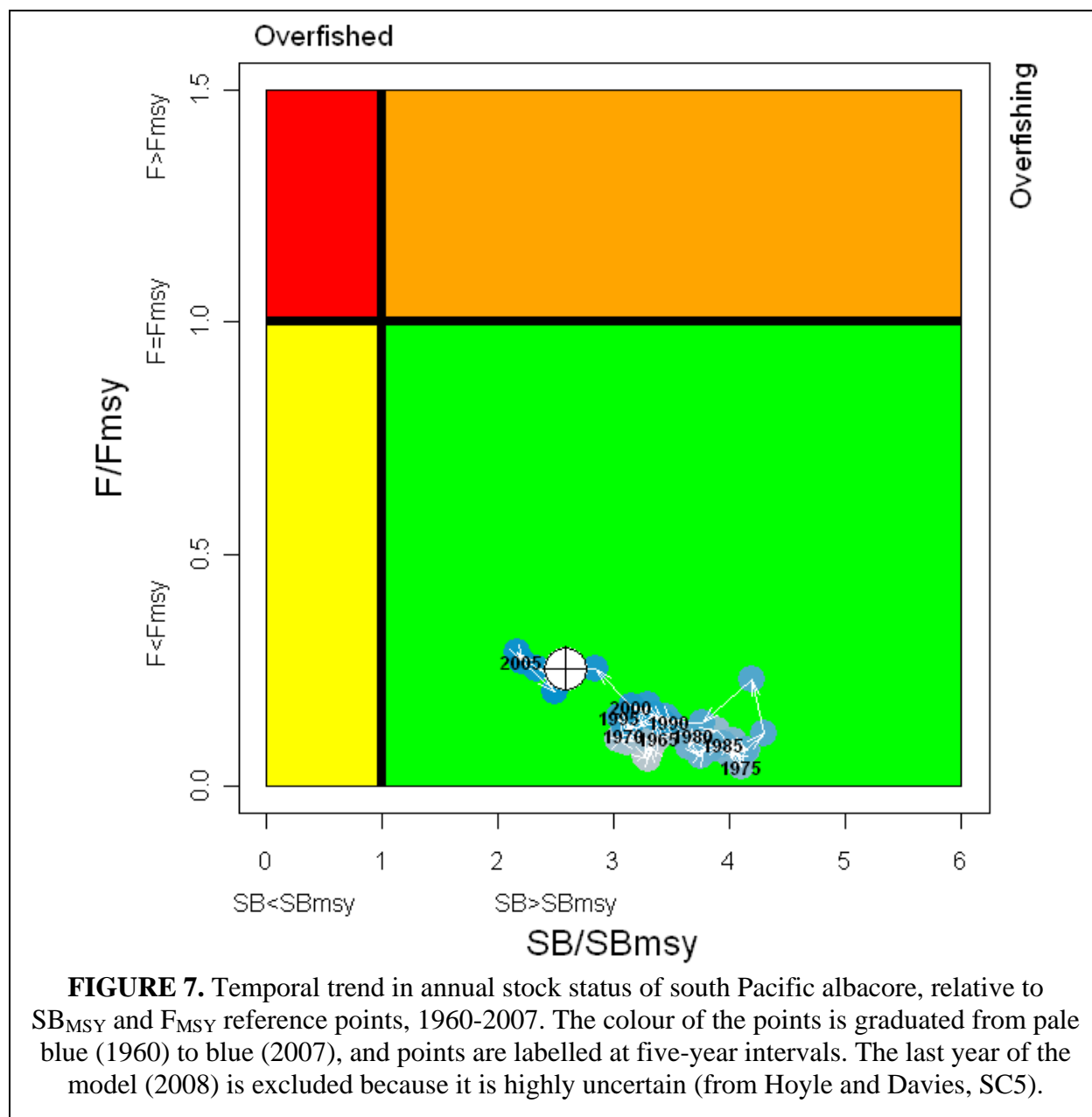
A comparative stock assessment using MULTIFAN-CL was conducted for southern Pacific albacore using catch statistical data through mid-2008, and the results, presented at the SC5 meeting, were compared with the 2008 assessment results. A number of major changes with respect to input data for the model and model structure were made over the 2008 assessment. The changes, included, *inter alia*, revised CPUE data for DWFN longline fisheries and changes to growth modelling; as was the case in the previous assessment, the full range of steepness values was used to characterize stock status.

For all runs of the model, $F_{\text{current}}/F_{\text{MSY}}$ was less than 1.0, indicating that overfishing was not occurring. Similarly, $SB_{\text{current}}/SB_{\text{MSY}}$ was much greater than 1.0, varying between 1.7 and 4.9, indicating that the stock is not in an overfished state. Much of the variability in these ratios was attributable to the steepness of the spawner-recruit relationship.

Estimates of recruitment over the period of years examined showed no trends, and were not related to spawning biomass. The results of the assessment give no indication that current catch levels are not sustainable.

There is no indication that current levels of catch are not sustainable in terms of recruitment





overfishing, particularly given the age selectivity of the fisheries. One of the factors contributing to the healthy outlook for the stock is the that the mean size of the fish in the longline catches is very near the optimum size in terms of maximizing the yield per recruit. Nevertheless, current levels of fishing pressure appear to be affecting longline catch rates.

Similar to the previous assessments, **overfishing of southern albacore is not occurring, nor is the stock in an overfished state.**

Figures 6 and 7, which show time trends relative to MSY reference points, reflect the healthy state of the stock.

2.5. North Pacific albacore

The most recent assessment of north Pacific albacore was in 2006, using data through 2005;

there has been no complete assessment since then, but one is planned for 2011. Lacking a complete assessment, there is no new information on the status of the stock, nor recommendations regarding conservation and management. It was reported during the SC5 meeting that the International Scientific Committee (ISC) continues to consider that the rate of fishing mortality, which during 2002-2004 was 0.75, should not be increased, even though the spawning biomass is at the second highest level in the history of the fishery. It was noted that, if fishing mortality stays at current rates, the spawning biomass will be reduced to the long-term average by the middle of 2010.

3. MANAGEMENT MEASURES: YELLOWFIN AND BIGEYE

The WCPFC utilizes binding conservation and management measures (CMMs) for addressing the issue of conservation and management. The most recent CMM approved for conservation of yellowfin and bigeye was CMM 2008-01, whose objectives are to: 1) ensure that bigeye and yellowfin tuna stocks are maintained at levels capable of producing their maximum sustainable yield and to achieve, through the implementation of a package of measures, over a three-year period commencing in 2009, a minimum 30% reduction in bigeye tuna fishing mortality from the annual average during the 2001-2004 period or 2004, and, 2) ensure that there is no increase in fishing mortality for yellowfin tuna beyond the annual average during the 2001-2004 period or 2004. The details of this conservation program are available in an earlier ISSF report, available on the ISSF website (<http://iss-foundation.org/>).

In a study prepared for the SC5 meeting (WCPFC-SC5-2009/GN-WP-17), Hampton and Harley presented an evaluation of CMM 08-01 to determine whether the measures mandated therein are capable of meeting its objectives with respect to bigeye and yellowfin in the WCPO. Two different models were used to make projections over a 10-year period. The ratios of F/F_{MSY} and B/B_{MSY} projected to 2018 were used as indicators of performance in achieving the goals of CMM 08-01. For bigeye, these projections suggested that the spawning biomass would fall to about 0.4-0.6 of the level corresponding to MSY by 2018, and that there would be little, if any, reduction in F over the high levels estimated for 2007-2008. The analysis showed that “the main reasons for the lack of effectiveness of the measure are (i) the reductions in longline catch do not result in the required reduction in fishing mortality on adult bigeye tuna; (ii) the increase in purse seine effort allowed under the measure, and the increase in purse seine catchability (fishing mortality per unit effort) that has occurred since 2001-2004, is not sufficiently offset by the FAD and HSP closures to reduce purse seine fishing mortality below 2001-2004 average levels; and (iii) the exclusion of archipelagic waters, which encompasses most of the fishing activity of the Indonesian and Philippines domestic fleets and significant amounts of purse seine effort in Papua New Guinea and Solomon Islands, from the measure effectively quarantines an important source of fishing mortality on juvenile bigeye tuna.”

The projections for yellowfin tuna are much more optimistic than those for bigeye. As pointed out above, current fishing mortality for yellowfin is well below the MSY level, while the spawning biomass is well above the MSY level. Given the provisions of CMM 08-01, the evaluation projected that fishing mortality in 2018 will range from about 8% below to 15% above the 2001-2004 average. The spawning biomass of yellowfin in 2018 is predicted to be close to what it was during 2001-2004, remaining at or above the corresponding level at MSY.

This study, as well as some additional information (WCPFC6-2009/IP18), was also reported to the WCPFC sixth annual session in December 2009. The latter paper re-emphasized that

substantial cuts in bigeye catch and/or fishing effort directed at bigeye tuna in all components of the fishery will be required to reduce fishing mortality to levels consistent with MSY. The WCPFC accepted these conclusions , and agreed to consider the issues raised during the meetings of the Scientific Committee and the Technical and Compliance Committee in 2010, with a view to bringing forward a new package of measures for consideration at the next session of the WCPFC in December 2010.

4. MANAGEMENT MEASURES: ALBACORE

No new management recommendations have been made by either the Inter-American Tropical Tuna Commission (IATTC) or the WCPFC during 2009.