Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

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Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
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EXECUTIVE SUMMARY

OPENING OF MEETING

1. The Interim Chair, Shelton Harley (New Zealand) opened the second regular session of the Scientific Committee which took place at Manila, Philippines, from 7–18 August 2006. He welcomed participants to the meeting.

2. The matters considered by the Scientific Committee and its Specialist Working Groups (SWGs) included:

a) a review of the fisheries in the area of competence of the Commission ("the Convention Area") and the eastern Pacific Ocean;

b) a review of the key stocks, including bigeye, yellowfin, skipjack and South Pacific albacore tunas, as well as swordfish and striped marlin in the southwestern Pacific Ocean, with a focus on requests for advice and recommendations arising from the second regular session of the Commission at Pohnpei, Federated States of Micronesia in December 2005;

c) bycatch mitigation issues associated with seabirds, sea turtles and juvenile bigeye and yellowfin;

d) issues associated with the priorities and objectives of the regional observer programme;

e) data confidentiality and dissemination;

f) cooperation with other relevant organizations;

g) the special requirements of small island developing states and territories;

h) the future work programme for the Scientific Committee; and

i) administrative matters associated with the functioning of the Scientific Committee.

Election of chairman

3. Dae-Yeon Moon, Korea, was elected by consensus as the Chair of the Scientific Committee until the conclusion of the fifth regular session of the Commission in December 2008.

OVERVIEW OF THE WESTERN AND CENTRAL PACIFIC OCEAN FISHERIES

4. The provisional total tuna catch for 2005 in the Convention Area was estimated at 2,145,367 mt (Fig. 1), the highest annual catch recorded, and an increase of around 5% on the previous record in 2004 (2,047,013 mt). During 2005, the purse-seine fishery accounted for an estimated 1,523,373 mt (71% of the total catch — the highest catch ever for this fishery), with pole-and-line taking an estimated 205,872 mt (10%), the longline fishery an estimated 242,059 mt (11%), and the remainder (7%) taken by troll gear and a variety of artisanal gears, mostly in eastern Indonesia and the Philippines.

5. The tuna catch (2,145,367 mt) for 2005 in the Convention Area represented 77% of the total Pacific Ocean catch of 2,799,625 mt and 49% of the global tuna catch (the provisional estimate for 2005 is just over 4.3 million mt).

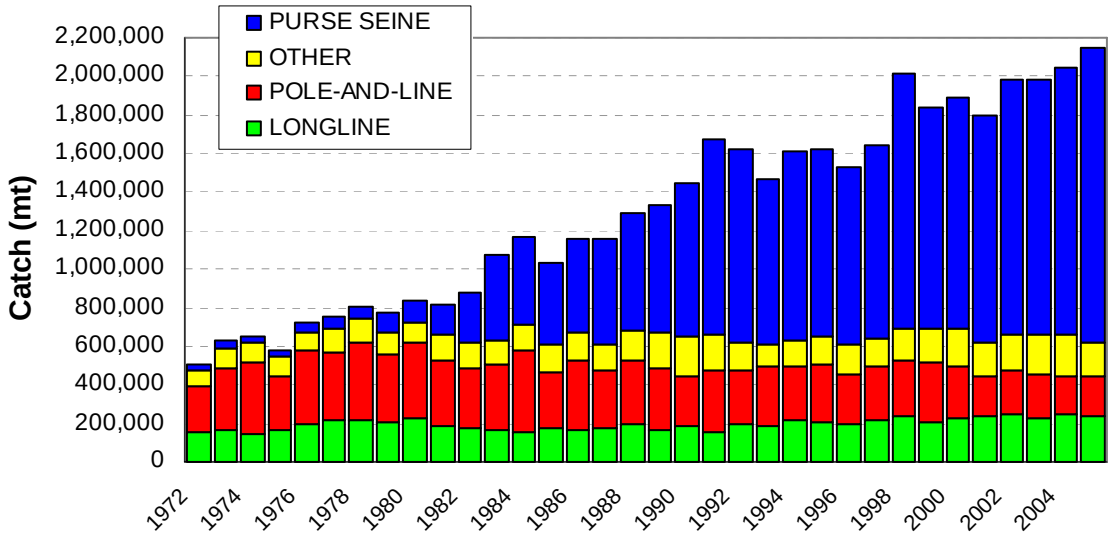

Figure 1. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the Convention Area, by longline, pole-and-line, purse seine and other gear types

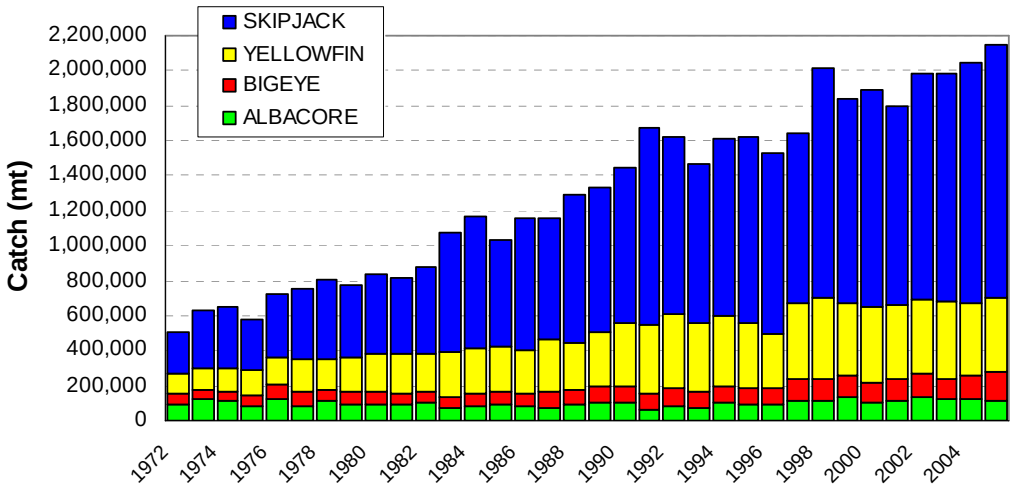

Figure 2. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the Convention Area

6. The 2005 catch of skipjack in the Convention Area (1,443,127 mt; 67% of the total catch) was the highest ever and more than 5% higher than the previous record catch taken in 2004 (Fig. 2). The yellowfin catch for 2005 in the Convention Area (423,468 mt – 20%) was slightly higher than in 2004 (a poor catch year for yellowfin) but around 10% lower than the record catch in 1998 (466,468 mt). The bigeye catch for 2005 in the Convention Area (163,419 mt – 8%) was the highest on record, although the albacore catch in the Convention Area (115,353 mt – 5%) was the lowest for five years.

STATUS OF THE STOCKS AND MANAGEMENT ADVICE AND IMPLICATIONS

Bigeye tuna

Status and trends

7. The 2006 assessment results were reviewed and confirmed as consistent with the 2005 assessment, although the point estimate for $F_{current}/F_{MSY}$ was slightly more pessimistic in this assessment. The assessment using the six-region model indicates that there is a high probability that overfishing of bigeye has been occurring in the western and central Pacific Ocean (WCPO) ($F_{current}/F_{MSY} \geq 1$, with >99% probability) since 1997. While the stock is not yet in an overfished state ($B_{current}/B_{MSY} > 1$, with >99% probability; Fig. 3) further biomass decline is likely to occur at 2001–2004 levels of fishing mortality at long-term average levels of recruitment, moving the stock into an overfished state (Fig. 4).

8. The greatest impact from the fishery is in the equatorial region, while the temperate regions are estimated to be moderately exploited. Furthermore, the attribution of depletion to various fisheries or groups of fisheries indicates that the longline fishery has the greatest impact; the purse-seine fishery operating on associated sets has a lesser, but still substantial effect, particularly in the equatorial regions.

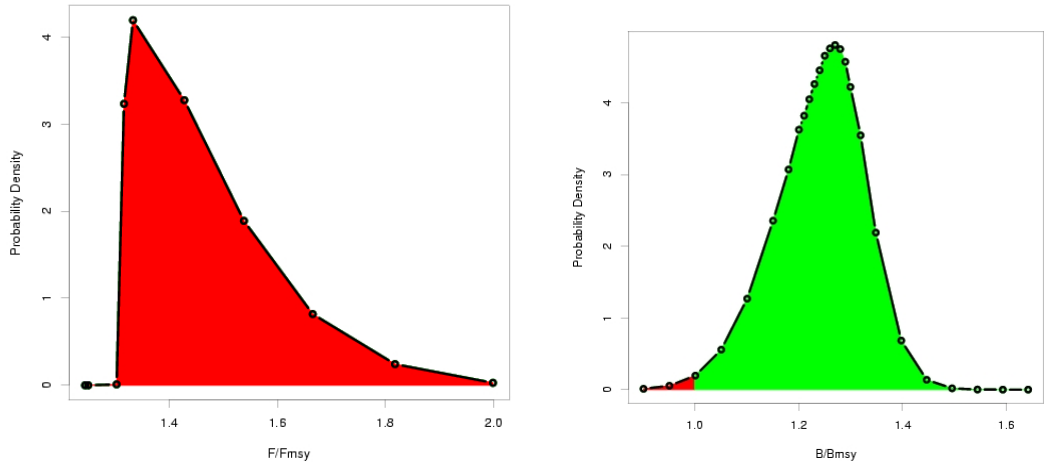

Figure 3. Probability of overfishing occurring (left panel) and the stock being overfished (right panel) for bigeye tuna in the WCPO.

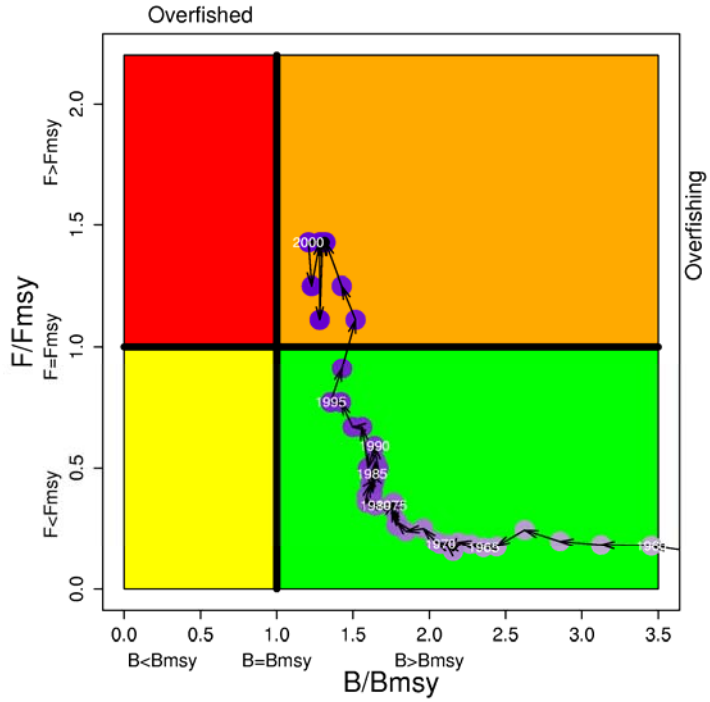

Figure 4. Temporal trend in annual stock status of bigeye tuna, relative to B_{MSY} (x-axis) and F_{MSY} (y-axis) reference points, for the model period (1952–2005). The colour of the points is graduated from mauve (1952) to dark purple (2005) and the points are labelled at five-year intervals.

Management advice and implications

9. In order to maintain the bigeye stock at a level capable of producing the maximum sustainable yield the Scientific Committee recommended a 25% reduction in fishing mortality from the average levels for 2001–2004. If the Commission wishes to maintain equilibrium average biomass at levels above B_{MSY}, further reductions would be required. The various levels of fishing mortality reduction required to maintain the biomass at specified levels above B_{MSY} (relative to the average levels for 2001–2004) are given in Figure 5. For example, a 39% reduction in fishing mortality would be required to maintain biomass at a level 20% above that which will produce the maximum sustainable yield. Fishing impacts in the equatorial WCPO have been increasing over recent years and more urgent management actions may be required for this area.

10. Stock projections for 2006–2015, which attempt to simulate the conservation and management measures adopted at the second regular session of the Commission, indicate that the point estimate of B_t/B_{MSY} declines below 1.0 during the projection period. The increasing uncertainty in the future projections (e.g. distribution of effort, recruitment variability) results in a greater probability (86%) of the biomass being below B_{MSY} by the end of the projection period (Fig. 6). The projections indicate a strong shift in the spatial distribution of biomass, with continued depletion occurring in the equatorial regions.

11. An alternative projection was undertaken under a scenario that assumes recruitment to be consistent with recent levels (1995–2004 average recruitment), which have been well above the long-term average (Fig. 7). Under this scenario, the stock was projected to remain above the B_{MSY} level throughout the projection period of 2006–2015. However, overfishing would still be occurring under this scenario. There is no robust information available concerning future recruitment levels. However, most Cooperating Non-members and participating Territories (CCMs) considered that continuation of relatively high recruitment over the long term was less likely than a return to the long-term average (stock-recruitment relationship recruitment).

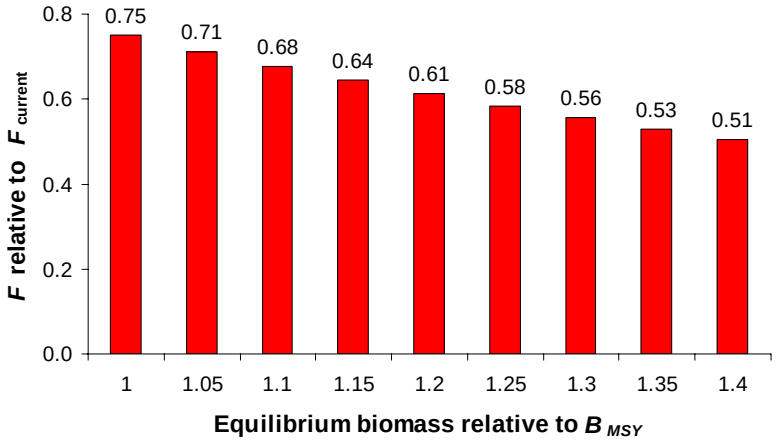

Figure 5. Estimates of the equilibrium level of fishing mortality (relative to current levels) required to sustain biomass of bigeye tuna at the indicated levels (relative to B_{MSY}) based on the LOWSAMP (six-region) model.

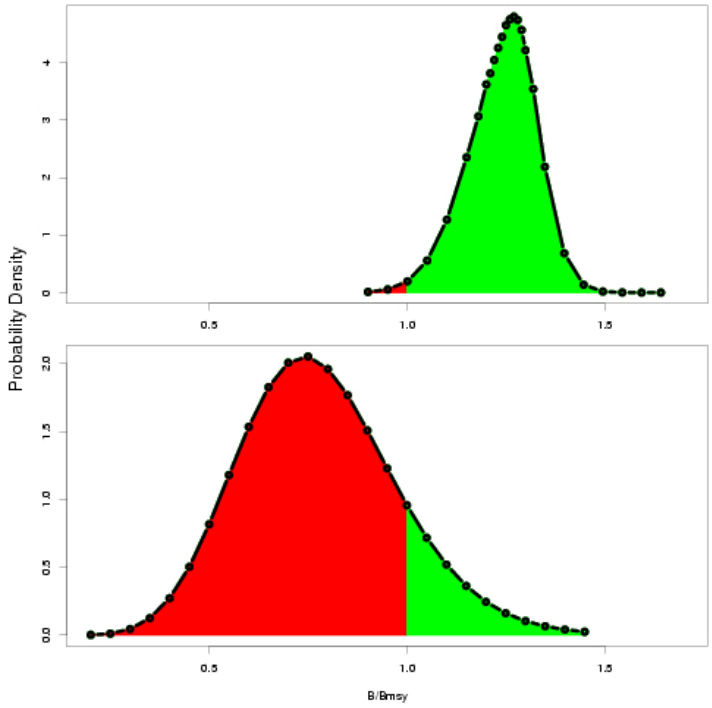

Figure 6. Comparison of the probability distribution of B/B_{MSY} for a) the current period (top panel), and for b) end of the 10-year projection period (bottom panel).

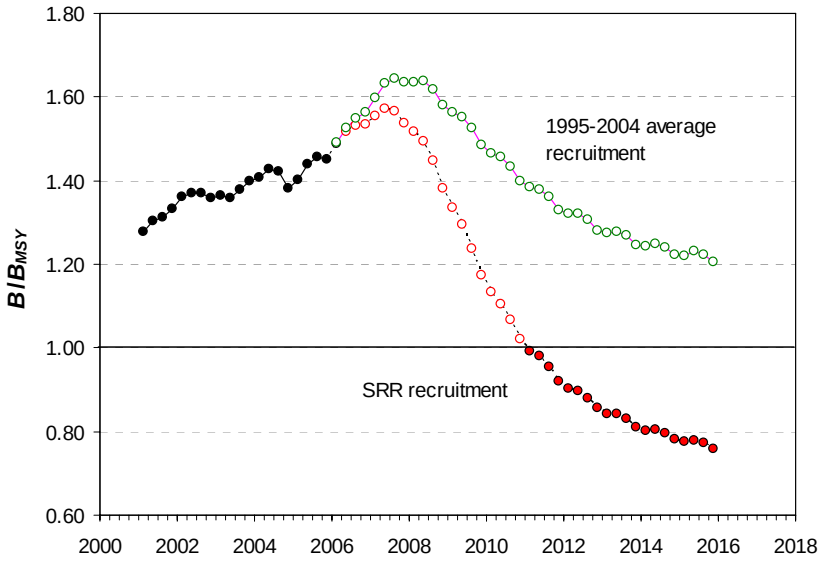

Figure 7. Projected ratio of $B_t / \widetilde{B}_{MSYfinal}$ for bigeye tuna where $\widetilde{B}_{MSYfinal}$ is computed based on the average *F*-at-age in the final year (10) of the projection. Projections using the estimated stock–recruitment relationship (stock–recruitment relationship based on long-term average) and the average recruitment in 1995–2004 to predict recruitment in the projection period are shown for comparison.

Yellowfin tuna

Status and trends

12. The 2006 assessment results were reviewed and confirmed as consistent with the 2005 assessment, although the point estimate for $F_{current}/F_{MSY}$ was slightly more optimistic in this assessment. The assessment using the six-region model indicates that overfishing is occurring in the WCPO ($F_{current}/F_{MSY} \geq 1$, with 73% probability), but the stock is not yet in an overfished state ($B_{current}/B_{MSY} >1$, with 95% probability) (Fig. 8). The trajectory of these stock status reference points (Fig. 9) indicates that the stock has been declining rapidly in recent years, and fishing mortality at current levels will probably move the yellowfin stock into an overfished state.

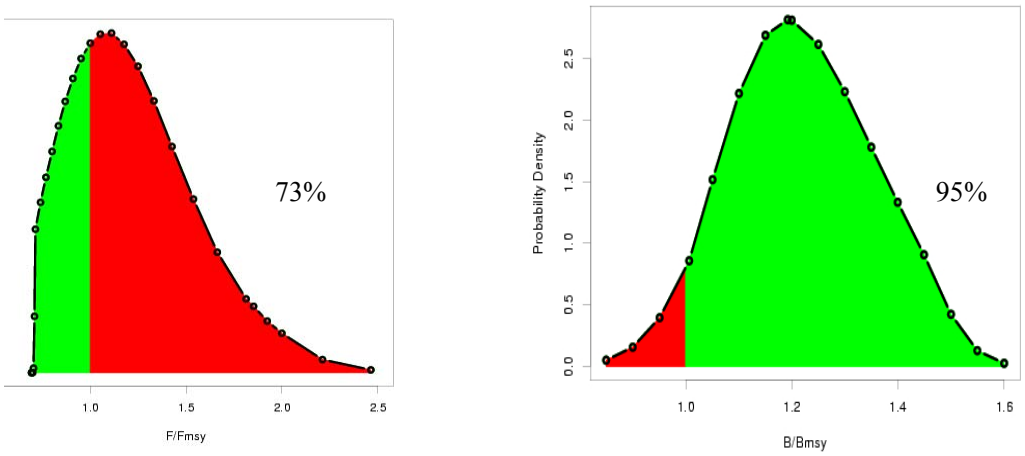

Figure 8. Probability of overfishing occurring (left panel) and the stock being overfished (right panel) for yellowfin tuna in the WCPO. The probability (expressed as a percentage) of $F/F_{MSY} > 1$ (overfishing) and $B/B_{MSY} < 1$ (overfished) is presented on the respective figure.

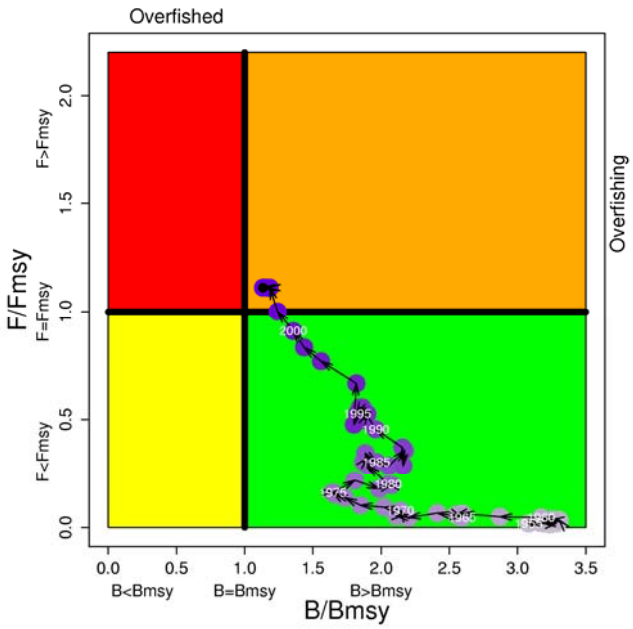

Figure 9. Temporal trend in annual stock status of yellowfin tuna, relative to B_{MSY} (x-axis) and F_{MSY} (y-axis) reference points, for the model period (1952–2005). The colour of the points is graduated from mauve (1952) to dark purple (2005) and the points are labelled at five-year intervals.

13. The greatest impact from the fishery is in the equatorial region, while the temperate regions are estimated to be only lightly exploited. Furthermore, the attribution of depletion to various fisheries or groups of fisheries indicates that the Indonesian/Philippines domestic fishery probably has the greatest impact, particularly in the western equatorial region, and is also estimated to impact the other regions, to some extent, through fish movement, although the movement rates out of this region are not estimated to be very large. The purse-seine fishery has a lesser, but still substantial effect, particularly in the equatorial regions. Unlike the case for bigeye, the impact of the longline fishery on yellowfin is relatively small.

Management advice and implications

14. In order to maintain the yellowfin stock at a level capable of producing the maximum sustainable yield, the Scientific Committee recommended a 10% reduction in fishing mortality from the average levels for 2001–2004. If the Commission wishes to maintain equilibrium average biomass at levels above B_{MSY}, further reductions would be required. The various levels of fishing mortality reduction required to maintain the biomass at specified level above B_{MSY} (relative to the average levels for 2001–2004) are given in Figure 10. For example, a 26% reduction in fishing mortality would be required to maintain biomass at a level 20% above that which will produce the maximum sustainable yield. As noted in 2005, fishing impacts in the western equatorial WCPO have been increasing over recent years and more urgent management actions may be required for this area.

15. Stock projections for 2006–2010, which attempt to simulate the conservation and management measures adopted at the second regular session of the Commission, indicate that the point estimate of B_t/B_{MSY} remains above 1.0 throughout the projection period, although the biomass is still predicted to decline. However, the increasing uncertainty in the future projections

(e.g. distribution of effort, recruitment variability) results in a greater probability (29%) of the biomass declining below B_{MSY} by the end of the projection period (Fig. 11). The projections indicate a strong shift in the spatial distribution of biomass, with continued depletion occurring in the equatorial regions.

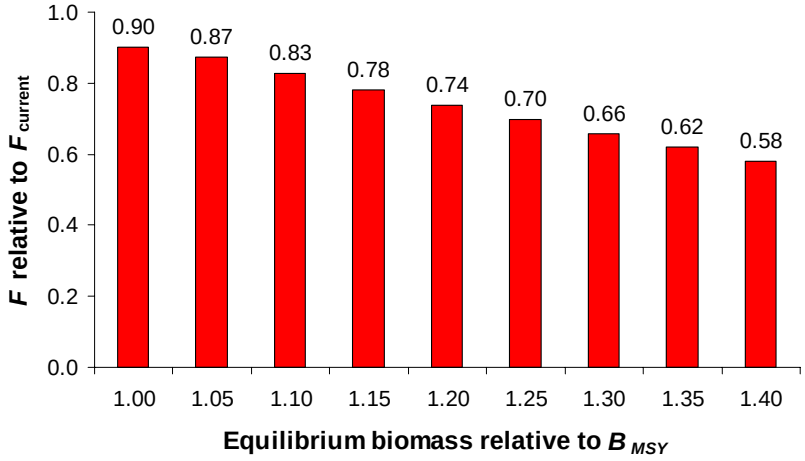

Figure 10. Estimates of the equilibrium level of fishing mortality (relative to average levels for 2001-2004) required to sustain biomass of yellowfin tuna at the indicated levels (relative to B_{MSY})

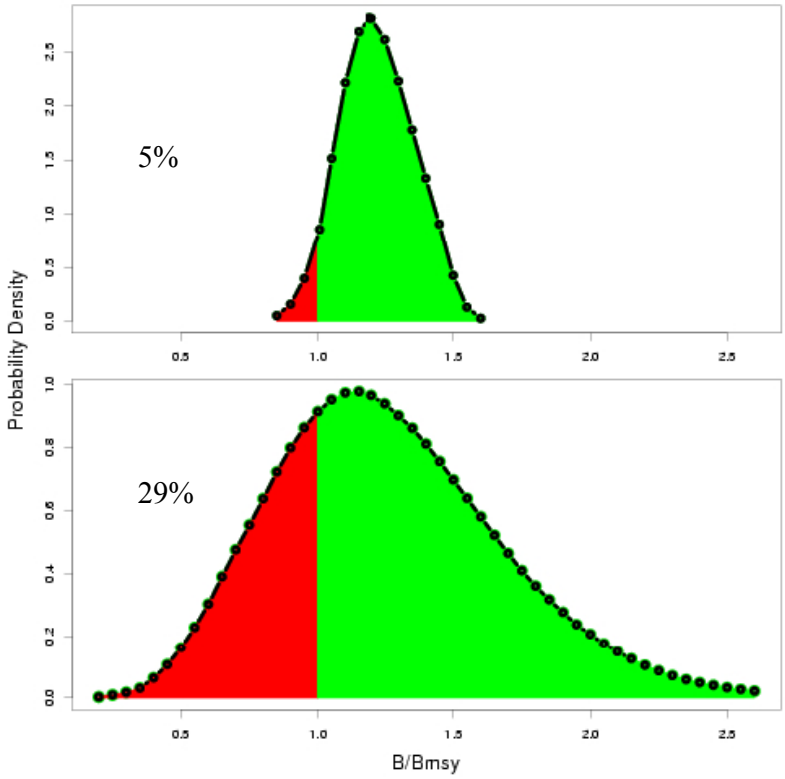

Figure 11. Comparison of the probability distribution of B/B_{MSY} of yellowfin tuna for the current period (top panel) and for a five-year projection period (bottom panel). The probability (expressed as a percentage) of $B/B_{MSY} < 1$ (i.e. overfished) at each time period is presented on each figure.

Further considerations for bigeye and yellowfin

16. The Scientific Committee reviewed the data collected on "other commercial fisheries". Available data indicate that the annual catches from these fisheries have represented 14–22% of the total bigeye catch and 29–38% of the total yellowfin catch in the Convention Area during 2001–2005. The Scientific Committee noted the need for more specific information concerning the needs of the Commission with regard to formulating advice on specific management measures for these fisheries. The Scientific Committee recommended that the Executive Director should liaise with the Scientific Service Providers to formulate some technical guidance to the Commission on the subject of purse seine closures.

Skipjack tuna

Status and trends

17. No new assessment was conducted for skipjack in 2006 so there was no basis to modify the conclusions from 2005. The 2005 stock assessment indicates that for the skipjack stock in the WCPO over fishing is not occurring ($F_{current}/F_{MSY} < 1$), that the stock is not in an overfished state ($B_{current}/B_{MSY} > 1$) and that exploitation is modest relative to the stock's biological potential.

Management advice and implications

18. Catches increased in 2005 from their previous historical high in 2004. These high catches are sustainable unless recruitment falls persistently below the long-term average. However, any increases in purse-seine catches of skipjack may result in a corresponding increase in fishing mortality for yellowfin and bigeye tunas.

South Pacific albacore

Status and trends

19. A full stock assessment was not undertaken for South Pacific albacore in 2006, but the 2005 assessment was updated using new data for 2004 and 2005. The key conclusions were similar to those of the 2003 and 2005 assessments: that overfishing is not occurring ($F_{current}/F_{MSY} <1$) and the stock is not in an overfished state ($B_{current}/B_{MSY} >1$). Overall, fishery impacts on the total biomass are low (10%), although considerably higher impacts occur for the portion of the population vulnerable to longline. The model estimates that recent recruitment is below average and, consequently, the portion of the population vulnerable to longline is predicted to decline further in the next two to three years. The assessment conclusions were relatively insensitive to a range of different assumptions regarding the key biological parameters included in the model, although the analysis highlighted the need to refine some of these key parameters.

Management advice and implications

20. The key management implications are unchanged from the 2005 assessment. Current catch levels from the South Pacific albacore stock appear to be sustainable and yield analyses suggest that increases in fishing mortality and yields are possible. However, given the age-specific mortality of the longline fleets, any significant increase in effort would reduce CPUE to low levels with only moderate increases in yields. CPUE reductions may be more severe in areas of locally concentrated fishing effort.

Swordfish in the southwest Pacific

Status and trends

21. The swordfish stock assessment covers the southwestern Pacific Ocean (0–50^{0}S, 140E–175^{0}W) for the period 1952–2004. Since 1997, catch rates and mean size of swordfish have been declining in the core areas of the fishery, raising concerns about the biological and economic sustainability of the fishery. The status summary is based upon the results from a subset of 10 models (the most plausible ensemble) selected from several hundred examined to represent model uncertainty. The most reliable reference points are the relative changes in total stock biomass, which predict that the total stock biomass in 2004 was between 56% and 74% of the biomass in 1995. The model predicts that total biomass in 2004 was between 31% and 69% of the unfished level, and that spawning stock biomass in 2004 was between 15% and 65% of the unfished level. Most projections undertaken using 2004 effort levels predicted further declines in biomass over the next five years.

22. Model uncertainty and estimated variability in the stock–recruitment relationship undermined the usefulness of the MSY-related reference points. However, in so far as these reference points have been calculated, the majority of estimates from the plausible model ensemble suggest that total biomass and spawning biomass are probably above levels that would sustain MSY and fishing mortality is probably below F_{MSY}. Nevertheless, the results also indicate the possibility that the stock may currently be in an overfished state and that overfishing may be occurring (Fig. 12).

Management advice and implications

23. The Scientific Committee reviewed the first regional assessment undertaken for swordfish in the southwestern Pacific region. Although the estimates of stock status relative to standard biological reference points (e.g. B_{MSY}) cannot identify whether the stock is presently overfished or not, this assessment has indicated consistent declines in stock abundance in recent years, and most model projections predict further declines at current levels of fishing mortality. Until estimates of stock status are more certain, the Scientific Committee recommended as a precautionary measure that there be no increases in fishing mortality on this stock, as this is likely to move the stock towards an overfished state.

24. This recommendation applies particularly to the area encompassing the western component of the southwest Pacific as these fisheries account for most of the swordfish catch in the southwest Pacific.

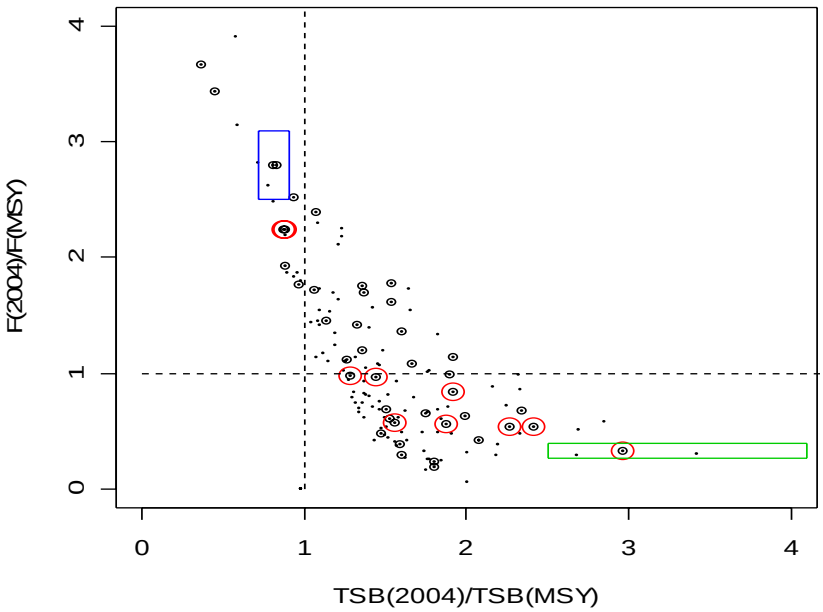

Figure 12. Stock status summary plot for swordfish in the southwestern Pacific Ocean. Points indicate the estimates corresponding to the MULTIFAN (MFCL) models examined. Large (red) circles indicate the most plausible model ensemble used for stock status determination. Example model 1 (vertical blue) and 2 (horizontal green) are indicated by the large rectangles that encompass the two-dimensional, 95% confidence limits (without the correlation).

Northern stocks

25. The International Scientific Committee (ISC) Chair provided a general summary of the current recommendations for management of the northern stocks and future activities of the ISC. It was noted that the key conclusions for North Pacific albacore remain unchanged in that the stock is considered to be fully exploited. The management measures introduced by both the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC) are consistent with ISC recommendations. For Pacific bluefin tuna, recent recruitment is estimated to have been at a high level. However, there is a high level of uncertainty in the estimates, so ISC recommended that there be no increase in fishing mortality. A similar recommendation was made for the northern striped marlin stock as an interim measure, until the results are available from the final stock assessment in 2007. Over the next few years, work will be undertaken to develop Pacific-wide assessments for both swordfish and blue marlin.

26. The Scientific Committee noted that as detailed presentations of the relevant stock assessments were not considered by the Scientific Committee, it had no basis to comment upon the substance of the recommendations from the ISC.

Other stocks: striped marlin

27. The only other stock for which an assessment was presented was striped marlin in the southwest Pacific. This was the first attempt to carry out an assessment for this stock and further improvements of the methods used are expected for future assessments. It was noted that the results should be considered preliminary as there remains significant uncertainty regarding the most important parameters of the model. In the absence of other assessments for this stock the

following two paragraphs were developed on the basis of the results of the preliminary assessment.

Status and trends

28. Several of the plausible model scenarios investigated indicate that current levels of fishing mortality may approximate or exceed the reference level F_{MSY} and current spawning biomass levels may approximate or be below the biomass based reference point B_{MSY}.

Management advice and implications

29. On the basis of this preliminary assessment, it is recommended as a precautionary measure that there should be no increase in fishing mortality (i.e. fishing effort) on striped marlin in the southwestern Pacific. This recommendation applies particularly to the area encompassing the Coral Sea and the Tasman Sea as these fisheries account for most of the striped marlin catch in the southwest Pacific.

BYCATCH MITIGATION

Seabirds

30. In response to the Rsolution-2005-01, as an initial measure to reduce seabird bycatch by longline fishing vessels operating in the Convention Area, the Scientific Committee recommended the following two items: 1) seabird bycatch mitigation, and 2)improved data collection and research programme.

31. ***Recommendation*** 1) Seabird bycatch mitigation

1. All longliners should thaw their bait before it is deployed.

2. In addition, south of 30ºS and north of 23ºN, CCMs should require their longline vessels to use at least two of the mitigation measures presented in Table 1, including at least one from Column A.

Table 1. Recommended mitigation measures*

Column A	Column B
Side setting with bird curtain	Tori line[1]
Night setting with minimum deck lighting	Weighted branch lines
Tori line	Blue-dyed bait
	Deep setting line shooter
	Bait caster
	Underwater setting chute
	Management of offal discharge

*If accepted by the Commission, detailed definitions and specifications of each measure would need to be developed.

3. In other areas, where necessary, CCMs are encouraged to employ one or more of the seabird mitigation measures listed in Table 1.

4. Other mitigation measures may be tested under bona fide research programmes.

5. Every effort should be made to ensure that seabirds captured alive during longlining are released alive and that wherever possible hooks are removed without jeopardising the life of the seabird concerned.

6. CCMs are encouraged to seek feedback from fishers and observers on the effectiveness and practicality of mitigation measures.

7. These measures should be reviewed regularly, particularly when information becomes available on new or existing measures or on seabird interactions from observer or other monitoring programmes. An updated suite of recommended measures should then be considered.

8. To the extent possible CCMs should endeavour to harmonise their national plans of action (NPOAs) with these measures.

32. ***Recommendation*** 2) Improved data collection and research programme

a) Data collection

Objective: to identify areas of spatial and temporal overlap of seabird species and fishing effort (areas of high and low interaction rates for seabirds) so that CCMs can target mitigation measures in areas where they will be most needed

Activity: Improved Observer Programme

1) Coverage

To adequately characterize rare events, up to 100% observer coverage may be required statistically. But bearing in mind the practicalities involved, the programme should:

i. Initially be spatially and temporally representative of each fishery operating in the Commission area. Given diminishing benefits of greater coverage, the programme should aim to observe 20% of the fishing effort over a two-year period. As a practical matter, however, a sudden increase to this level (from the current level of 0.5%) is unlikely to occur, as a result, the Statistics SWG recommended that initially a minimum of 5% of the fishing effort be observed. When areas of greater importance are found, the observer programme may be restructured to optimize coverage in these areas.

ii. If the operation requires the observer to work below deck, in order to ensure that both fishery data, as well as seabird and turtle catches are

[1] If tori line is selected from both Column A and Column B this equates to simultaneously using two (i.e. paired) tori lines.

quantified within a statistically correct framework, at least 50% of hooks should be observed during the haul. The observer must report the portion of the haul that was monitored.

2) Data to collect

a. Cross-check the SPC observer manual and data sheets with other regional fisheries management organizations (RFMOs) and national programmes to ensure that all the necessary data collection details are included (to be addressed through the Statistics SWG recommendation on observer data (Statistics SWG report, paragraph 30 (a)).

Although these will be addressed through the Statistics SWG's recommendations, the data elements for observers on longliners required to ensure that the objectives of the Data Collection and Research Programme are met, should include:

- gear (e.g. branch line length, light sticks, bait type)
- operational (e.g. time of set, position)
- seabird catch (e.g. number and species caught)
- seabird abundance estimate (e.g. number of seabirds around the vessel)
- use of and effectiveness of mitigation measures (e.g. tori lines)

b. Ensure standardized data collection and clearly specify programme priorities for observer monitoring of seabird catches, interactions during hauling and setting, and mitigation measures.

b) Research programme

Objective: Reduce the capture and injury of seabirds by fishing gear. Research into mitigation directed at ensuring fewer seabirds are caught should continue to focus on the development and implementation of effective mitigation measures.

Activities

1) Encourage parties to conduct experimental tests of mitigation measures, and to develop appropriate measures for particular fisheries and areas. In particular, the benefits of offal discharge management and mitigation measures during the haul need to be investigated.

2) Quantify the survival rates of released birds (e.g. bird banding).

3) Conduct Industry Education and Training:

i. CCMs should be responsible for providing training to fishers on seabird identification, handling and release, including provision of a manual on seabirds (which would include information on mitigation, identification, handling and release). This may facilitate fishers assisting in data collection.

a. Self-reporting (logbook reporting) of seabird identification and release condition (alive, dead, how hooked, gear remaining on seabird).

b. Commission should make available existing education material which CCMs could use to provide information to their fishers on how to reduce captures and mortality of seabirds.

c) Cooperation

Given the distribution of albatrosses and petrels across regions and ocean basins, the WCPFC Secretariat is encouraged to collaborate with relevant RFMOs (e.g. IATTC, CCSBT) and other organizations (e.g. ACAP and the Commission for the Conservation of Southern Bluefin Tuna – CCAMLR) to address seabird bycatch issues.

Sea turtles

Recommendations

33. Regarding sea turtles, the Scientific Committee recommended to the Commission that the Commission adopt the proposed sea turtle data collection and research programme (Attachment M of the main Scientific Committee meeting report).

34. Advice on circle hooks

a) New information presented at the Ecosystem and Bycatch SWG confirms previous understanding of the efficacy of circle hooks in reducing hook ingestion by sea turtles and the efficacy of large sized circle hooks in reducing turtle bycatch.

b) Some of the new results have indicated variations in catch rates with some sizes of circle hooks (e.g. reduced target species catch rates. This is also similar to previous findings).

c) The magnitude of impacts on sea turtle bycatch and target species catch varies between the studies conducted to date.

d) Notwithstanding the above, results presented to the Ecosystem and Bycatch SWG clearly show that a specifically designed management regime employing sea turtle bycatch mitigation measures, such as circle hooks and fish baits, applied to a fishery sector with a turtle bycatch problem can substantially reduce sea turtle bycatch while maintaining viable target species catch rates.

35. Advice on sea turtle mitigation: Based on the above, and information that other measures (e.g. fish bait, deep setting) may also reduce turtle bycatch, the Scientific Committee recommended that the Commission adopt a flexible approach to sea turtle bycatch mitigation

based on scientific experiments/observations testing a range of mitigation techniques to determine the appropriate mitigation measures for a particular fishery.

Juvenile bigeye and yellowfin tuna

Recommendations

36. The Commission's Science Service Provider should review spatio-temporal aspects of catches of juvenile bigeye and yellowfin tuna caught in association with fish aggregating devices (FADs) and refine analyses of potential management options that the Commission might adopt in order to reduce such catches, including cooperation with other RFMOs to identify appropriate mitigation measures.

37. CCMs should continue research into acoustic selectivity to avoid juvenile bigeye and yellowfin as well as research into the vertical distribution and residence time of juvenile bigeye and yellowfin tuna on FADs.

38. CCMs should ensure that relevant information (relevant to mitigation based on gear and operational modes) is being collected through observer programmes and port sampling and submitted to the Commission in order to assess the impacts of FADs and other technological aspects on catches of juvenile bigeye and yellowfin.

Other fish and non-fish bycatch: Sharks and other species

Recommendations

39. The Scientific Committee endorsed the Ecological Risk Assessment exercise in general, and the productivity-susceptibility analysis (PSA) in particular, as an appropriate way to assist the Commission in prioritising species for management action or further research. There was agreement to further refine the PSA risk assessment approach and to encourage members to further develop this approach.

40. The Commission should develop a dedicated shark research programme to support stock assessment of shark species that rank highly in the Ecological Risk Assessment, in cooperation with other RFMOs. Alternative methods of analysis other than stock assessment should also be explored.

41. The Commission should develop long-term data collection, monitoring and research programmes dedicated to all species identified as higher risk in the productivity-susceptibility analysis.

DATA AND INFORMATION

Observer programme

Recommendations

42. The Committee endorsed five recommendations together with accompanying notes, as follows:

Recommendation: Objectives (longline and purse seine): That there are five scientific objectives that should be considered in the development of the regional observer programme, all of which are high priority:

a) Record the species, fate (retained or discarded) and condition at capture and release (e.g. alive, barely alive, dead, etc.) of the catch of target and non-target species; depredation effects; and interactions with other non-target species, including species of special interest (i.e. sharks, marine reptiles, marine mammals and sea birds);

b) Collect data to allow the standardisation of fishing effort, such as gear and vessel attributes, fishing strategies, the depths of longline hooks, FAD use and setting activities of purse seiners, and other factors affecting fishing power;

c) Sample the length and other relevant measurements of target and non-target species;

d) Sample other biological parameters, such as gender, stomach contents, hard parts (e.g. otoliths, first dorsal bone), tissue samples and collect data to determine relationships between length and weight, and processed weight and whole weight;

e) Record information on mitigation measures utilised and their effectiveness.

43. ***Recommendation***: Objectives (other methods): That the Secretariat commissions the drafting of objectives and priorities for data to be collected by observers for fisheries other than purse seine and longline, for consideration of the Statistics SWG at its next meeting.

44. ***Recommendation***: Initial minimum coverage: That the objective of the regional observer programme should initially be to attain a minimum coverage of 5% of fishing effort (longline: total hooks deployed; purse seine: days fished and searched) across all strata to allow identification of specific issues. The distribution of observer effort is to be representative of species of interest, fishing areas, seasons, and fishing fleets (types).

45. Note: Initial minimum coverage: That the initial coverage will not deliver on all possible objectives (e.g. 5% coverage may not be adequate to reliably quantify the incidental catch of sea turtles and seabirds).

46. Note: Area: The Scientific Committee clarified that it was developing recommendations for observer coverage over the Convention Area.

47. ***Recommendation***: Coverage required to address specific issues of concern: That the data collected from initial levels of coverage should be used to further determine the levels of coverage required to address specific issues of concern to the Commission. For example, coverage rates may need to be higher in certain areas or circumstances to obtain reliable estimates of the catch of some species (e.g. seabirds, sea turtles, marine mammals) or species populations that are particularly vulnerable, for fisheries for which information is currently unavailable, and for other specific issues of concern to the Commission.

48. ***Recommendation***: Data collection requirements (longline and purse seine): That the Secretariat develop a draft list of fields of data that observers should collect, for consideration at the next meeting of the Statistics SWG.

Data confidentiality, security and dissemination

Recommendations

49. The Executive Director, in collaboration with the Chair of the Commission and officers of WCPFC subsidiary bodies, develop a framework for access to non-public domain data by CCMs. The framework may include, *inter alia,* guidelines for access to different data types, the possibility of standing authorizations, compliance with the Commission's policy for the provision of data and a mechanism for resolving disputes.

50. Pending comments from the Technical and Compliance Committee, the Commission adopt the Draft Rules and Procedures for the Access to and Dissemination of Data Compiled by the Commission (Summary Record of the Ad Hoc Task Group [data).

51. The Secretariat proceeds with further development of an Information Security Policy, based on ISO17799 Information Security Management Standards.

52. The Secretariat is allocated sufficient resources to further develop and implement the Information Security Policy.

Indonesia and Philippines Data Collection Project (IPDCP) update and review

Recommendations

53. The following recommendations on the issue of funding were endorsed by the Scientific Committee.

a) The Steering Committee recommended that the Executive Director continue to liaise with the Global Environment Facility (GEF), Indonesia, the Philippines and Vietnam to develop a data collection and governance project for those countries.

b) Noting that GEF funding, if forthcoming, would not be available for 18–24 months, the Steering Committee recommended that CCMs continue to be invited to contribute, as soon as possible, an additional $100,000 to support the project in Indonesia in 2007–2008.

c) Concern was expressed with respect to the continuity of the collection of data in Indonesia, the Philippines and Vietnam, given that catches from this area represent about 30% of the catch in the Convention Area and that the lack of data has been an important source of uncertainty in assessments of the stocks of tuna. In this regard, it was recommended that the Commission provide funding support to the IPDCP through the core budget.

Tagging initiatives

Recommendations

54. The Scientific Committee noted its strong support for the Phase 1 component of the Regional Tuna Tagging Project in Papua New Guinea. The Scientific Committee recommended that:

a) The Commission endorse the Phase II extension of the tagging project as a Commission-sponsored research project;

b) A Steering Committee be established to plan the Phase II component of the project; and

c) A voluntary fund be established by the Commission to encourage CCMs to provide the necessary funding for the project.

COOPERATION WITH OTHER ORGANIZATIONS

Recommendations

55. The Scientific Committee recommened to the Commission that the Executive Director attend the FAO Coordinating Work Party meeting in March 2007 with a view to providing advice to the third regular session of the Scientific Committee as to whether more formal, ongoing involvement would be beneficial and achievable.

56. The Scientific Committee recommended that the Commission develop memoranda of understanding (MOUs) with the Agreement for the Conservation of Albatross and Petrels (ACAP), the Secretariat of the Pacific Regional Environment Programme (SPREP), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), and the Indian Ocean Tuna Commission (IOTC).

CONSIDERATION OF THE SPECIAL REQUIREMENTS OF DEVELOPING STATES AND PARTICIPATING TERRITORIES

Recommnedations

57. The Scientific Committee recommended that stock assessment workshops for small island developing states and territories, similar to the workshop conducted by the Secretariat of the Pacific Community's Oceanic Fisheries Programme (SPC-OFP) in July 2006, should be continued in the future, beginning in 2007. These sorts of workshops should be the types of projects that the Commission should fund through the special requirements fund. The Scientific Committee urged further contributions to the special requirements fund.

FUTURE WORK PROGRAMME

58. The Scientific Committee recommended the Strategic Research Plan 2007–2011 for the Scientific Committee (Attachment P of the main Scientific Committee report) be submitted to the Commission for approval.

2007 work programme

59 The Scientific Committee recommended to the Commission the following work programme and budget (Table 2).

Table 2. Work Programme for 2007 and budget. Core funding is shown against high priority (#1) items on the basis of that only $250,000 indicative funding will be avalable in 2007 (indicative funding of $375,000 will be available in 2008). Additional funding for other high and lower priority items will need to be obtained from other sources.

Strategic Research Priority/Research Activity or Project	2007 funding required		2008 funding required		Priority	Comments
	Core	Other	Core	Other		
Collection, compilation and verification of data from the fishery						
Data management services (SPC-OFP services)	139,000	1,000,000	146,000		1	Total costs based on SPC costs of employment of 1 scientific position plus travel, computer support. "Other funding" currently secured by OFP.
Develop a draft list of fields of data that observers should collect for longline and purse-seine, for consideration at the 2007 meeting of the ST-SWG					1	Costs included in SPC-OFP services
Indonesian and Philippines Data Collection Project (including FAD related studies)	30,000		100,000		1	College of Fisheries and Ocean Sciences, University of the Philippines in the Visayas, Miag-ao, Iloilo, Philippines
Rescue of historical commercial catch data from the Philippines (and Indonesia and Vietnam)	15,000		15,000		1	
Develop a draft list of objectives and priorities for data to be collected by observers for fisheries other than purse-seine and longline, for consideration at the 2007 meeting of the ST-SWG					2	Costs included in SPC-OFP services

Publication and distribution costs for reproducing materials developed by the FT-SWG in languages useful for the Scientific Committee		5,000			2	
Quantification of changes in fishing efficiency due to changes in fishing gears and fish finding technologies					2	Used to assess changes in fishing power over time for incorporation in CPUE standardisation analyses. SPC-OFP services, as time allows.
Quantification of changes in longline selectivity due to changes in gears and patterns of deployment					2	Used to model changes in selectivity over time required in MFCL assessment models. SPC-OFP services as time allows.
Undertake a study to develop a database that clearly defines vessel and gear attributes and operational details.		10,000			3	
Sub-total (non SPC-OFP services)	45,000	15,000	115,000			
Monitoring and Assessment of Stocks						
Stock assessment and modelling						
Detailed stock assessments for selected stocks (SPC-OFP services)	139,000	500,000	146,000		1	Total costs based on SPC costs of employment of 1 scientific position plus travel, computer support. "Other funding" currently secured by OFP.
Continued refinement of stock assessment models	30,000		30,000		1	Includes refinement of models to standardise CPUE. Costs included in SPC-OFP services.
Exploration of sensitivity of assessment outcomes to structural assumptions in models					1	This work would also include the development of better diagnostics to more objectively determine plausible model structure. Costs included in SPC-OFP services.
Investigation of alternative stock status reference points	10,000				2	Includes identification of appropriate target and limit reference points
Development of an appropriate index of abundance for region 7					2	Needed to index the time-series of recruitment in MFCL assessment models. Costs included in SPC-OFP services.

Development of recruitment indices independent of the MFCL model					2	Required to index recruitment in stock assessment models. Currently funded SPC-OFP project.
Biological studies						
Ongoing and newly funded research with sonic and archival tags in Hawaii, PNG and other areas					1	Currently funded SPC-OFP and Univ. of Hawaii projects
Comprehensive study of bigeye tuna reproductive biology	0	40,000		40,000	1	
Supply TDRs and hook timers to regional observer programmes (48 TDRs @ $600 ea, 400 hook timers @ $45 ea)	50,000				1	
Better determination length-weight relationships for the principal target species		5,000			3	Includes investigation of possible spatial-temporal differences and required for input into MFCL assessment models.
Tagging studies						
Contribution to Regional Tuna Tagging Project		500,000		1,500,000	1	Voluntary funding contributions from CCMs, SPC projects provide equivalent level of support. In kind support from CCMs and IATTC desireable.
Sub-total (non SPC-OFP services)	60,000	545,000		1,540,000		

Monitoring and assessment of the ecosystem						
Ecological Risk Analysis (including PSA)	100,000		100,000		1	Detailed analyses of high risk spp from PSA analysis. Level 1 in 2007 and Level 2 in 2008, Level 3 dedicated assessments in 2009
Turtle/sea bird interactions and fishery overlaps	30,000		30,000		1	Desk top study
Seabird and turtle education and extension of fishers		100,000		100,000	1	Includes travel and publication costs
Turtle de-hooking devices		50,000		50,000	1	Half of these funds are for personnel costs, half for equipment
Development / review of models for evaluation of impacts on ecosystem, including development of reference points		100,000		100,000	2	Required to model and assess fishery impacts on the ecosystems
Studies on biology of high risk species		30,000		30,000	2	Scholarships for tertiary study
Turtle population assessments		50,000		50,000	2	Three year project to continue into 2009, involving collation of data eventually leading to quantitative assessments
Survival of hooked and released seabirds		30,000		30,000	2	Will require sourcing external funding for satellite/archival tags
Turtle tagging and associated materials		30,000		30,000	2	Will require sourcing external funding for satellite/archival tags. Conventional tags can probably be obtained at little or no cost from SPREP
Offal discards and haul-back mitigation studies		250,000		250,000	3	
Sub-total	130,000	640,000	130,000	640,000		

Evaluation of management options						
Continued development of methods to evaluate potential management strategies, including MSE development and uncertainty		100,000		100,000	1	Required to evaluate efficacy of candidate management options. Current evaluation of options included in SPC-OFP services. Additional funding required to development comprehensive MSE framework.
Sub-total		100,000		100,000		
GRAND TOTAL (non SPC-OFP services)	265,000	1,300,000	245,000	2,280,000		
SPC-OFP	278,000	1,500,000	292,000			
Independent Review of Science Structre and Function	80,000					WCPFC Core Budget
Information Security Policy	15,000		25,000			

ADMINISTRATIVE MATTERS

Rules of procedure

Recommendations

60. The Scientific Committee recommended that the proposed Rules of Procedure (Attachment Q of the main Scientific Committee report) be forwarded to the Commission for adoption at the third regular session of the Commission and also be provided to the Technical and Compliance Committee and Northern Committee for their consideration.

Independent review of the commission's science structure and functions

Recommendations

61. The Scientific Committee recommended the process, terms of reference and schedule for the proposed independent review of the scientific structure and functions of the Commission, appended at Attachment R of the main Scientific Committee report, be forwarded to the Commission for consideration and endorsement.

Future operation of the scientific committee

62. The Chair of the Commission should be asked to participate for a few days during future sessions of the Scientific Committee to present the requests from the Commission to the Scientific Committee and provide an indication of the Commission's views on the expected outcomes from the Scientific Committee session.

Next meeting

63. The Scientific Committee recommended to the Commission that the date and venue for the third regular session of the Scientific Committee should be 13–24 August 2007, in Pohnpei, Federated States of Micronesia.

Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

SUMMARY REPORT

AGENDA ITEM 1 — OPENING OF MEETING

1. The Interim Chair, Shelton Harley (New Zealand) opened the Second Regular Session of the Scientific Committee, which took place at Manila, Philippines, from 7–18 August 2006. The Interim Chair welcomed participants to the meeting.

2. The matters considered by the Scientific Committee and its Specialist Working Groups (SWGs) included:

a) a review of the fisheries in the Western and Central Pacific Fisheries Commission Convention Area and the eastern Pacific Ocean;

b) a review of the key stocks, including bigeye, yellowfin, skipjack and South Pacific albacore tunas, as well as swordfish and striped marlin in the southwestern Pacific Ocean, with a focus on requests for advice and recommendations arising from the Second Regular Session of the Commission at Pohnpei, Federated States of Micronesia in December 2005;

c) bycatch mitigation issues associated with seabirds, sea turtles and juvenile bigeye and yellowfin tunas;

d) issues associated with the priorities and objectives of the regional observer programme;

e) data confidentiality and dissemination;

f) cooperation with other relevant organizations;

g) the special requirements of small island developing states and territories;

h) the future work programme for the Scientific Committee; and

i) administrative matters associated with the functioning of the Scientific Committee.

3. The following countries attended the session as Members of the Commission and as participating territories: Australia, China, Cook Islands, European Community, Federated States of Micronesia, Fiji, French Polynesia, Japan, Kiribati, Korea, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Chinese Taipei, Tonga, Tuvalu, and Vanuatu.

4. Indonesia and the United States of America (USA) attended as Cooperating Non-members. The Pacific Islands Forum Fisheries Agency (FFA), Secretariat of the Pacific Community (SPC), Agreement for the Conservation of Albatross and Petrels (ACAP), International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), Birdlife International, Sea Turtle Restoration Project, World Wildlife Fund (WWF), and Greenpeace attended as Observers.

5. Apologies were received from Canada and the Inter-American Tropical Tuna Commission (IATTC) for their absence.

6. A list of participants is appended as Attachment A.

Welcoming address

7. Malcolm Sariemento, Director of Bureau of Fisheries and Aquatic Resources presented an address welcoming participants to the meeting.

8. He introduced Andrew Wright, Executive Director of the Western and Central Pacific Fisheries Commission (WCPFC), who provided the meeting with a brief opening statement (Attachment B) in which he thanked the Government of the Philippines for the hospitality and logistical support provided to the meeting.

9. The Secretary of the Department of Agriculture, Domingo F. Panganiban provided a key note address (Attachment C) in which he noted the importance of tuna to the Philippine economy ranging from small-scale fishermen to large commercial fisheries.

Election of chairman

10. Dae-Yeon Moon (Korea) was elected by consensus as the Chair of the Scientific Committee until the conclusion of the fifth Regular Session of the Commission in December 2008.

Adoption of agenda

11. The agenda was adopted by the Scientific Committee (Attachment D).

Meeting arrangements

12. The Scientific Committee adopted a schedule of work to support discussions in the SWGs during the first week of the meeting, while the second week was reserved for plenary discussions.

13. The Scientific Committee was advised of arrangements to support the third Steering Committee meeting of the Indonesia and Philippines Data Collection Project (IPDCP).

14. The Scientific Committee selected rapporteurs for each agenda item. In addition, small working groups were selected to progress issues associated with procedural items on the agenda outside of session.

15. For the purposes of this meeting only, the Scientific Committee selected Gerard Dinardo (USA), as co-convenor of the Stock Assesssment SWG. He served in this role in the absence of Max Stocker (Canada) who was unable to attend the meeting.

Reporting arrangements

16. The Chair noted that each SWG would produce both a full SWG report, to be annexed to the Summary Report of the Scientific Committee, and a summary SWG report, for inclusion within the main text of the Summary Report of the Scientific Committee.

17. The Chair noted that the Summary Report of the Scientific Committee would be accompanied by an Executive Summary that would serve as the basis of the presentation to the Third Regular Session of the Commission when it meets in Apia, Samoa in December 2006.

18. A list of abbreviations and acronyms used in this report and a list of documents for the Scientific Committee are included as Attachment E and Attachment F, respectively.

Intersessional activities of the Scientific Committee

19. The Secretariat made a brief report on the intersessional activities of the Scientific Committee.

AGENDA ITEM 2 — REVIEWS OF FISHERIES

Overview of the western and central Pacific Ocean (WCPO) fisheries

20. Peter Williams and Chris Reid co-presented Overview of Tuna Fisheries in the Western and Central Pacific Ocean, Including Economic Conditions – 2005 (SC2 GN WP-1). The presentation is summarised here in two parts, a general overview and an overview of the economic condition of the fishery.

General overview

21. Peter Williams presentation described broadly each of the fisheries in the Convention Area by gear and fleet, with emphasis on 2005 catches relative to those in recent years.

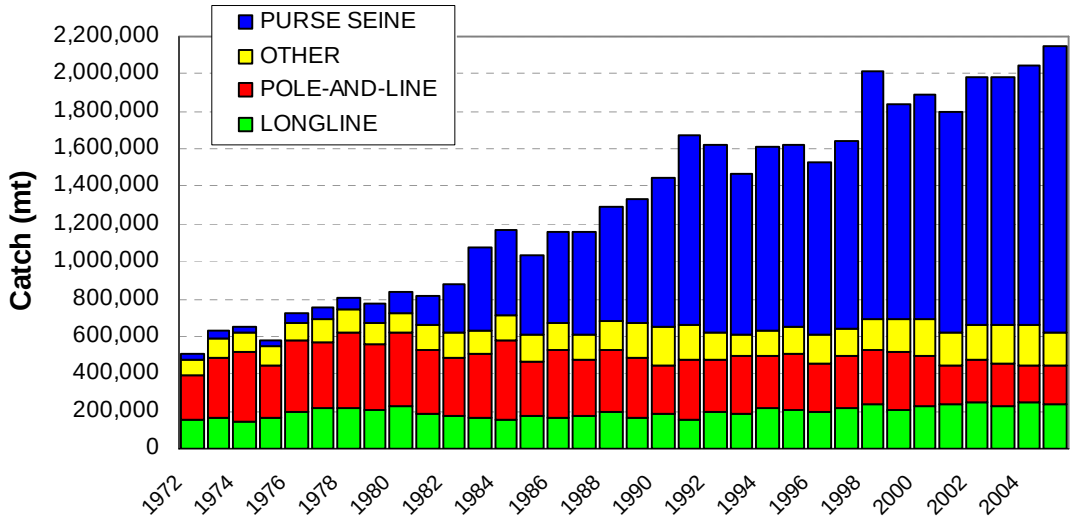

Figure 1. Catch (in metric tonnes – mt) of albacore, bigeye, skipjack and yellowfin in the Convention Area, by longline, pole-and-line, purse seine and other gear types

22. The provisional total Convention Area tuna catch for 2005 was estimated at 2,145,367 mt (Fig. 1), the highest annual catch recorded, and an increase of around 5% on the previous record in 2004 (2,047,013 mt). During 2005, the purse-seine fishery accounted for an estimated 1,523,373 mt (71% of the total catch — the highest catch ever for this fishery), with pole-and-line taking an estimated 205,872 mt (10%), the longline fishery an estimated 242,059 mt (11%), and the remainder (7%) taken by troll gear and a variety of artisanal gears, mostly in eastern Indonesia and the Philippines.

23. The Convention Area tuna catch (2,145,367 mt) for 2005 represented 77% of the total Pacific Ocean catch of 2,799,625 mt and 49% of the global tuna catch (the provisional estimate for 2005 is just over 4.3 million mt).

24. The 2005 Convention Area catch of skipjack (1,443,127 mt – 67% of the total catch) was the highest ever and more than 5% higher than the previous record catch taken in 2004 (Fig. 2). The Convention Area yellowfin catch for 2005 (423,468 mt – 20%) was slightly higher than in 2004 (a poor catch year for yellowfin) but around 10% lower than the record catch in 1998 (466,468 mt). The bigeye catch in the Convention Area for 2005 (163,419 mt – 8%) was the highest on record, although the albacore (115,353 mt – 5%) catch in the Convention Area was the lowest for five years.

25. The provisional 2005 purse-seine catch of 1,523,373 mt was the highest on record and around 10% higher than the previous record in 2004 (1,390,764 mt), with the purse-seine catch being in excess of 1,300,000 mt for the past four years. The purse-seine skipjack catch for 2005 (1,249,711 mt – 82%) was the highest on record and the yellowfin catch for 2005 (231,241 mt – 15%) was a significant improvement (~28%) on the low 2004 catch (180,253 mt). The estimated purse-seine bigeye catch[2] for 2005 (41,502 mt – 3%) was also a record, contrasting the trend of reduced catches since the previous record in 1999 (38,327 mt).

26. The 2005 catch estimates for most pole-and-line fleets operating in the Convention Area have yet to be provided, although the total catch estimate is expected to be similar to the level of recent years (i.e. 200,000–230,000 mt). Skipjack tends to account for the vast majority of the catch (typically around 70–80% of the total catch), while albacore, taken by the Japanese coastal and offshore fleets in the temperate waters of the North Pacific (typically around 15–20% of the total catch), yellowfin (5–7%) and a small component of bigeye (~1%) make up the remainder of the catch.

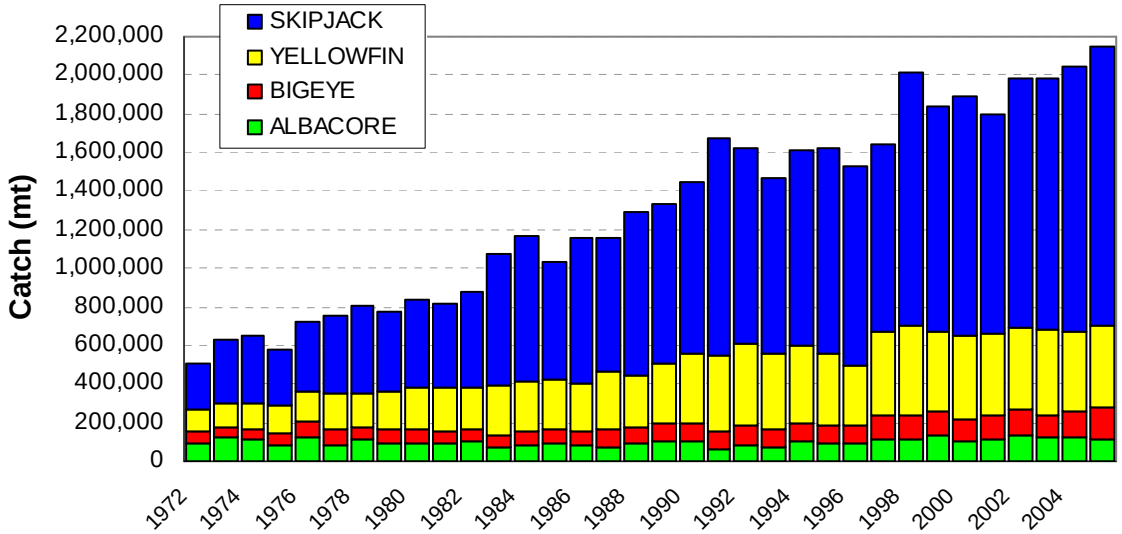

Figure 2. Catch (in metric tonnes – mt) of albacore, bigeye, skipjack and yellowfin in the Convention Area.

27. The provisional Convention Area longline catch (242,059 mt) for 2005 was only 3,000 mt lower than the highest on record which was attained in 2002 (245,335 mt). The albacore longline catch (73,400 mt – 30%) in the Convention Area in 2005 was similar to catch levels of in recent years, although catches have declined slightly since 2001, primarily due to a drop in catches by key fleets that continue to move away from albacore as a target species. The provisional bigeye catch (87,159 mt – 36%) for 2005 was the third highest on record, and the yellowfin catch (76,521 mt – 32%) was at a similar level to catches in recent years, but notably, the highest since 2000.

Economic condition of the fishery

28. Chris Reid's presentation on economic conditions in the fishery noted that while skipjack prices continued to display short-term volatility during 2005, the 12-month moving averages had been relatively stable since mid-2004 (Bangkok 4–7.5 lb, cost and freight, or "c&f"; $840/mt[3] to $920/mt; purse-seine caught skipjack at Yaizu $880/mt to $975/mt).

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[2] Purse-seine bigeye catches have been adjusted to account for the mis-identification of bigeye as yellowfin in operational catch data and reports of unloadings. This analysis (see WCPFC-SC1-2005/ST WP-3) was updated in 2006 to include recently available observer data and to estimate adjustment factors for all types of school association.

[2] $ refers to US dollars throughout this report unless otherwise stated.

29. Yellowfin prices have trended upward for much of the period since 2000, with the average price in Bangkok (20 lb and up, c&f) and for Yaizu purse-seine caught yellowfin in 2005, reaching their highest level since 1997 and 1995, respectively.

30. The estimated delivered value of the purse-seine tuna catch in the Convention Area for 2005 is $1.46 billion, the highest level since at least 1995. This represents an increase of $176 million (13%) on the estimated delivered value of the catch in 2004, which was driven by a $103 million (50%) increase in the delivered value of the yellowfin catch, with an increase of $61 million (6%) for skipjack. It was also noted that the delivered value of catch per active vessel for most purse-seine fleets had risen sharply since 1999/2000.

31. The Yaizu price of pole-and-line caught skipjack in waters off Japan averaged ¥129/kg[4] ($1171/mt), a decline of nearly one-third from 2004, while the Yaizu price of pole-and-line caught skipjack in waters south of Japan averaged ¥146/kg ($1,326/mt) during 2005, a decline of just 5% relative to 2003

32. The estimated delivered value of the total catch in the pole-and-line fishery in the Convention Area for 2004 is $283 million. This represents a decline of $20 million or 7% on the estimated value of the catch in 2003.

33. Japanese market prices for longline-caught yellowfin and bigeye tuna have been reasonably steady since 2002/2003, with some recent signs that Japanese market conditions were improving. USA prices for fresh imports of bigeye and yellowfin continued to rise in 2005.

34. In 2005, fresh and frozen albacore prices rose in all markets examined, with the Thai import prices (c&f) for frozen albacore continuing its upward trend, which started back in late 2002, to average $2,438/mt.

35. The estimated delivered value of the longline tuna catch in the Convention Area for 2005 was $1.28 billion. This represented an increase of $32 million or 3% on the estimated value of the catch in 2004 and was driven by a $18 million (11%) increase in value of the albacore catch and a $15 million (3%) increase in the value of the yellowfin catch, while the delivered value of the bigeye catch was steady.

36. The relative importance of the major tuna species targeted by longliners — in terms of the estimated delivered value per 100 hooks set for selected fleets — was examined. Of particular note was the increased importance of bigeye, and decreased importance of albacore tuna, to the fleet of Chinese Taipei.

37. During subsequent discussions, several items were noted. First, canneries located in Pago Pago, American Samoa, are important markets for many of the surrounding Pacific Island countries' domestic longline fisheries, but Pago Pago albacore prices continue to be unavailable. Second, it was noted that there has not been any specific investigation into the economic reasons why the 2005 purse-seine catch for the Convention Area increased. Third, the increased catch of bigeye by Vietnamese has most likely been taken in the South China Sea (although there is some uncertainty around location data for the Vietnamese fishery).

Overview of the eastern Pacific Ocean fisheries

38. Shelton Harley presented a Review of the Eastern Pacific Ocean Fishery for the 2005 Fishing Year, on behalf of the Inter-American Tropical Tuna Commission (IATTC), which was not present at the meeting. The total combined catch, excluding discards, of yellowfin, skipjack, bigeye and Pacific bluefin tunas, increased from 606,000 mt in 2004 to 655,000 mt in 2005, however this was still a significant decrease from 2003 (over 804,000 mt). Ecuador (34%), Mexico (25%) and Panama (12%) accounted for most of the catch of these species in 2005. Management measures are in place for three stocks in the eastern Pacific Ocean (EPO): yellowfin, bigeye, and Northern albacore.

39. The purse-seine catch of yellowfin tuna in 2005 was 268,000 mt, almost equivalent to the 1990–2004 annual catch average (272,000 mt), with more than half of this catch taken in sets associated with dolphins. The mean size of yellowfin taken in the fishery has declined from 14.6 kg in 2002 to 9.1 kg in 2005. In the most recent stock assessment, biomass is estimated to have declined slightly in 2005, while the current spawning biomass ratio (SBR) may be close to the SBR required to produce average maximum sustainable yield (AMSY). The current fishing mortality rates are close to those required to produce AMSY.

40. Since 1993, skipjack catches have increased with the use of FADs. Before 1993, annual catches were mostly less than 150,000 mt and since 1993, catches have regularly exceeded that amount. The purse-seine catch of skipjack tuna in 2005 was 260,000 mt, an increase of 83% from the 1990–2004 average annual catch. Catch is mostly split between unassociated sets and sets on floating objects.

41. The total bigeye catch has fluctuated around 100,000 mt since 1985, but the catch by fleet (i.e. gear type) has changed dramatically after the use of FADs began by purse seiners. Before 1993, almost all the catch was taken by longline; subsequently, purse seining has taken about half the catch. The purse-seine catch of bigeye tuna in 2005 was 70,000 mt, a 21% increase from the 1990–2004 annual average catch. The majority of the purse-seine catches of bigeye tuna were taken in sets on floating objects. In the most recent assessment, the bigeye stock is estimated to be lower than the level that would provide the AMSY, and current management measures are insufficient to allow the stock to recover to AMSY levels. The assessment of bigeye as an EPO stock was consistent with the results of a Pacific-wide assessment.

Fishery reports from members, participating territories and cooperating non-members (CCMs)

Australia

42. The following is a summary of key points from Fisheries Report (FR) Working Paper (WP)-1. Domestic longlining in the Australian Eastern Tuna and Billfish Fishery (ETBF) has a long history, with sporadic activity in the early 1960s and late 1970s. Longlining expanded rapidly after 1985 with the successful air-freighting of yellowfin tuna. In the late 1990s, longliners started targeting swordfish at mid latitudes, and the fishery expanded geographically and increased the fishing effort (to 12.5 million hooks, and over 120 active longliners).

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[4] ¥ refers to Japanese yen.

43. There have been significant reductions in swordfish targeted effort since 2004, which is largely attributed to increased fuel and bait costs. Fishing effort declined to 8.6 million hooks in 2005, with fewer than 100 active longliners. Albacore catches have subsequently increased, and annual catches are expected to reach several thousand tonnes to be landed over the next 12 months. Catches of other major species declined in 2005. The yellowfin catch reported in logbooks was 1,286 mt, which was a substantial decline from the 2003 peak catch of 3,096 mt. The catch of bigeye (702 mt) was less than the 2001peak (1,050 mt); and the 355 mt of striped marlin was down on the 2003 level (634 mt). The 2005 swordfish catch (1,517 mt) dropped from the 2002 peak of 2,163 mt.

44. The Australian Fisheries Management Authority (AFMA) imposed a total allowable catch of 1,400 mt swordfish for 2006 because of concerns over the status of the southwest Pacific Ocean swordfish stock and localised depletion. A limit of 9.5 million hooks will also be implemented with the introduction of a management plan. In 2005, Australia announced a major restructuring package for fisheries, worth a total of Aus$ 220 million. The ETBF is one of the three fisheries targeted, and many permits are expected to be decommissioned over the next 6–12 months. That initiative also involves the development of harvest strategies for the five major species, which will be implemented in 2007.

Canada

45. The following is a summary of key points from FR WP-2. The Canadian fishery for albacore tuna (*Thunnus alalunga*) in the Pacific is a troll fishery using tuna jigs. Canadian fishermen have been fishing albacore since the mid-1930s. The fishery targets albacore over an expanded range broadly classified into four fishing areas: 1) British Columbia (BC) coastal, 2) BC/USA coastal, 3) highseas north Pacific Ocean, and 4) high-seas south Pacific Ocean. The coastal fleets contain the majority of the vessels, but in recent years, some of the fleet, such as USA-based troll vessels, follow albacore concentrations into offshore waters.

46. The 2005 catch estimates are still preliminary. The distribution of the total north Pacific Canadian catch between FAO Statistical Areas was based on the distribution of reported catches from logbooks. Logbooks coverage was 94% of an estimated fleet of 220 vessels that were fishing in 2004, and 94% of an estimated fleet of 208 vessels that were fishing in 2005. The total estimated Canadian catch in the north Pacific for 2005 was 4,810 mt, compared with 7,842 mt in 2004. Most of this catch (99.7%) was taken in FAO Area 67, which comprises the USA and Canadian Exclusive Economic Zones. The catch in 2005 was 39% smaller than the catch in 2004.

47. In recent years, a small number of Canadian flag vessels have fished southern albacore stocks below the equator from November to March. These vessels fished primarily in an area that extends from 130^{o}W to 165^{o}W and 30^{o}S to 45^{o}S. They have landed their catch at ports in American Samoa, Fiji, French Polynesia (Papeete) and Canada. The estimated catches for the 2003/2004 and 2004/2005 fishing seasons were 63 mt and 72 mt, respectively.

48. The Canadian Albacore Tuna Catch and Effort Relational Database Management System was developed by Fisheries and Oceans Canada to address the issues of tracking albacore catch and effort data from fishing logbooks and sales slips landings from the Canadian troll fleet operating in the Pacific Ocean. A project to document the existing relational database for the Canadian Pacific albacore catch and effort data is underway.

China

49. The following is a summary of key points from FR WP-3. China operates two types of tuna fisheries in the Convention Area: tuna longline and purse seine. The number of longline vessels in 2004 and in 2005 was 212. The size of the longline vessels ranged from 67 gross registered tonnage (GRT) GRT to 742 GRT. The number of small sized vessels (<100 GRT) is 15, and the number of large sized vessels is 197. The longline vessels mainly targeted bigeye tuna and albacore, from the EEZs of the Federated States of Micronesia, Marshall Islands, Fiji and other Pacific Island countries. The number of purse-seine vessels in 2004 was six and increased to eight in 2005.

50. The catch of tuna and tuna-like species by the longline fishery in 2004 was 22,121 mt (a record) but this declined to 15,005 mt in 2005. The catch by the purse-seine fishery amounted to 20,699 mt in 2004 and increased to 48,660 mt in 2005. The longline fishery catches comprise mostly bigeye tuna, yellowfin tuna and albacore. The purse-seine fishery catches comprise mostly skipjack tuna and yellowfin tuna.

51. Longline-caught bigeye and yellowfin were exported to the Japanese sashimi market. Albacore catches were landed in Fiji for canning. Catches by the purse-seine fishery were mostly transshipped to Thailand for canning.

52. The government of the People's Republic of China has strictly complied with the international resolution for tuna data collection and statistics. Observer programmes have been carried out in order to collect more tuna fishery data and biological information.

Cook Islands

53. The following is a summary of key points from FR WP-4. The number of vessels licensed to fish in the Cook Islands continued to drop from a high of 51 in 2003, to 27 in 2005, and is currently 22 in 2006. The total annual catch however, has increased from 1,186 mt in 2002, to 3,430 mt in 2005. The highest proportion of this catch is albacore tuna (70–80%), most of which is caught in the northern part of the Cook Islands EEZ and unloaded in Pago Pago. The catch rates for this fishery have also recovered somewhat, from around 20 kg/100 hooks in 2004, to around 50 kg/100 hooks in 2005. Catches in the southern half of the EEZ remain lower, with the majority of the catch (primarily yellowfin, bigeye and swordfish) being consumed domestically.

54. Efforts continue to be made to revive the domestic industry, including the development of a national fisheries management plan, and a review of key policies governing the current licensing system. A comprehensive economic appraisal of the longline fishery has also been undertaken, examining the different fishing strategies employed, and the identification of new potential avenues by which to increase the profitability of the domestic longline industry. A port-sampling programme, swordfish tagging project, and improved observer coverage will be taking place in 2006–2007, which should greatly enhance the understanding of the fishery and key stocks caught within the Cook Islands EEZ.

European Community

55. The following is a summary of key points from FR WP-5. The European purse-seine fleet (EC-SPAIN) has operated on a sporadic basis in the Convention Area since 1999. This fleet comprises five large tuna purse-seine vessels with a total hold volume of 11,997 m^3 (ranging from

1,881 m^3 to 3,161 m^3). Preliminary data for 2005 suggest nominal catches of 3,431 t in total, comprising yellowfin (321 mt), bigeye (817 mt) and skipjack (2,293 mt) in areas of the Convention Area. These vessels have 100% on-board observer coverage, in keeping with the Agreement on the International Dolphin Conservation Program (AIDCP) managed by the IATTC. Three information documents showing the results from two experimental fisheries in the Indian Ocean were presented (FT WP-8; FT IP-6 and EB IP-11).

56. The Spanish surface longline fleet began fishing in Convention Area waters in 2004. Eight Spanish flag longline vessels, targeting swordfish, were fishing during 2005. These vessels were an average of 291.8 GTR, 861.8 horse power (hp) and 10.8 m in length. The overall catches of the main species are: swordfish (1,226 mt), blue shark (1,299 mt), shortfin mako (303 mt), billfish (67 mt) and tuna species (44 mt). Data on fin to body weight ratios of shark species and other biological parameters were recorded. Opportunistic tagging and release activities were also carried out. Specific observations to evaluate turtle interactions were incorporated within the protocols of the scientific observers. Although the incidental rates obtained are low, a scientific experiment is planned to be started in the southeastern Pacific Ocean in 2007 to assess the impact of different hook types and gear configurations on target and incidental bycatch species.

Federated States of Micronesia

57. The following is a summary of key points from FR WP-6. Twenty six Federated States of Micronesia (FSM) flag vessels fished in the FSM EEZ in 2005, with a combined catch of 27,838 mt. Of this catch, 92% (27,504 mt) was caught by six purse-seine vessels, with skipjack the dominant species making up 94% of the catch. The purse-seine catch is slightly higher than the previous year's total with the same level of effort. The longline catch on the other hand declined from 842 mt to 334 mt with a similar level of reduction in effort of over 42 million hooks in 2004 to about 18 million hooks in 2005.

58. The foreign purse-seine fleet has a combined total tuna catch of 110,055 mt, comprising skipjack (83%), yellowfin (14%) and bigeye (less than 2%). This total catch is slightly higher than the total 2004 catch of 102,355 mt. The foreign longline fleet contributed 4,244 mt and the pole and line vessels contributed 1,049 mt to the total catch in the FSM EEZ.

Fiji

59. The following is a summary of key points from FR WP-7. The Fisheries Department of the Ministry of Fisheries and Forests continues to execute and implement control, monitoring and surveillance regimes on its offshore fishery, which operates under the relevant regulations and under the guidelines set forth in its Tuna Development and Management Plan.

60. For the last decade, longlining has been the preferred method of tuna fishing in Fiji. Catch logsheets are completed by vessels and provided to the Fiji Fisheries Department as a condition of the fishing license. The Fiji domestic longline fleet comprises licensed longline vessels plus other unlicensed longline vessels that are based in Fiji's ports. Catches from these longline fleets in 2005 totalled 13,010 mt of which, 11,313 mt comprised tuna. The species composition of the tuna catch is primarily made up of albacore (typically more than 60%), followed by yellowfin, and bigeye. The 2005 catches of the non-target species totalled 1,697 mt, representing a 40% reduction in catch from 2004.

61. The Fisheries Department, in collaboration with the fishing industry, is looking at avenues to strengthen the industry in terms of increased processing and value adding, efficient

vessel servicing, and the provision of support and welfare services for the crews. Plans are under way to develop a new multi-purpose fisheries port at the head of Suva Bay to cater for increasing trade volumes. The present wharf is limited by the lack of room for expansion. This port will offer greater bunkering and provisioning services, encourage the unloading of fish, and in turn, help to reduce the number of transshipments made on the high seas.

62. Subsequent discussion noted that there were some concerns over the potential for localised depletions of albacore in Fijian waters, and that the relative distribution of longline effort inside or outside the Fiji EEZ changes between years, in part driven by this issue.

French Polynesia

63. The following is a summary of key points from FR WP-8. Tuna fisheries in French Polynesia are divided into two components: a small-scale inshore fishery (273 boats), which uses a variety of gears, and an offshore longline fishery (72 boats).

64. The inshore fishery comprises two types of boat: the *poti marara* (6–8 m in length, made of wood or fiberglass) and the *bonitiers* (10–12 m in length, mainly made of wood). Although the size of the *poti marara* fleet has fluctuated over the years, this fleet seems to have reached a stable level and the individual fishing effort will probably remain steady in the future. It is worth noting that there is also a large number of non-professional *poti marara* whose fishing effort and catches are difficult to estimate. The *bonitiers*' fleet has steadily decreased and it is likely that this trend will continue in the future. Catches by the coastal fleet for 2005 are estimated to be 1,857 mt. Skipjack is the main species captured (749 mt), followed by yellowfin (344 mt) and dolphin fish (308 mt).

65. The development of the longline fishery began in the early 1990s. After a rapid increase, the size of the fleet remained stable for several years. However, fishing effort continued to increase during that time. In accordance with the fishery development policy of the government of French Polynesia, the size of the longline fleet has significantly increased since 2002. In two years, the number of longline boats increased by 33% and the number of hooks set has increased by 54%. Unfortunately, in the same time period, the overall catch per unit of effort (CPUE) fell by 54% (36% during 2003 alone), mainly due to a drop in albacore CPUE (-65% from this period, and -57% during 2003 alone). Albacore CPUE has not recovered and has remained steady. As a consequence, the overall longline catches fell by 31% over two years (21% during 2003) and the catches of albacore dropped by 47%, (relative to 1996 levels). In 2005, the overall catch of the longline fleet was 5,083 mt, which included 2,425 mt of albacore, 793 mt of yellowfin and 606 mt of bigeye tuna. Regarding these recent trends in CPUE, the government of French Polynesia has decided to postpone the further development of the longline fleet.

Indonesia

66. The following is a summary of key points from FR WP-9. For fisheries management purposes, the Indonesian marine area is divided into nine marine fisheries management areas: 1) Malacca Strait, 2) South China Sea, 3) Java Sea, 4) Makassar Strait and Flores Sea, 5) Banda Sea, 6) Seram Sea and Tomini Bay, 7) Sulawesi Sea and Pacific Ocean, 8) Arafura Sea, and 9) Indian Ocean.

67. The Indonesian fishery is dominated by small-scale fisheries. More than 75% percent of fishing vessels are engineless or outboard motor powered vessels, while the remaining vessels have inboard engines. Most of the latter vessels are less than 10 GT.

68. The catch of tuna and tuna-like fish landed from the Sulawesi Sea and Pacific Ocean waters contributed around 20% of the total catch of tuna and tuna-like species in Indonesian waters. The main catches are skipjack tuna, followed by yellowfin, bigeye, and albacore tuna. There is also a significant catch of eastern little tuna species, including longtail tuna, kawa-kawa, frigate tuna and bullet tuna. During the period 2000–2003, the catch of skipjack tuna increased sharply, before declining in 2004. Catches of other tuna (including little tuna) increased over the past five years, although not by a significant level. In 2004, the total catch of tuna by species was: yellowfin (26,733 mt), bigeye (7,917 mt), albacore (5,254 mt), skipjack (51,944 mt), eastern little tuna (15,992 mt).

69. The main gears used by local fishermen to catch tuna are pole-and-line, handline, and purse seine. Fishermen usually operate these gears in the territorial and Indonesia EEZ waters. Prior to 2000, some tuna longliners (51–200 GT) began operating in this area, as did some purse-seine vessels (500–1,000 GT).

70. Preliminary monitoring of the tuna fisheries in this area was conducted in the 2005–2006 period. In particular, monitoring was undertaken for the following landing sites: Sorong, Bitung, Ternate, Jayapura and Kendari. This research was undertaken in collaboration with Commonwealth Scientific and Industrial Research Organisation (CSIRO)-Australia to help identify which fishing ports or landing sites need to be considered for tuna catch monitoring. There is still a need to improve catch monitoring methods; in particular, a focus is needed on training monitoring officers in how to collect accurate data.

Japan

71. The following is a summary of key points from FP WP-10, which describes the most recent information for Japanese fisheries operating in the Convention Area, and the associated catches (tuna and billfishes) and fishery types (longline, pole-and-line, purse seine and miscellaneous fisheries). Data for 2005 were incomplete for these fisheries with the exception of the tropical purse-seine fishery.

72. For the longline fishery, the total number of longline vessels was 1,291 in 2004, a drop of 99 vessels (7%) from 2003. The number of vessels less than 200 GRT, which operate mostly within the Convention Area, was 836 in 2004. This is 94 vessels (10%) less than in 2003. The number of pole-and-line vessels was 437 in 2004, a decline of 14 vessels (3%) from 2003. The number of vessels larger than 200 GRT, which operate in a wide area of the Convention Area, was 43 in 2004 and only one less than in 2003. The number of vessels less than 200 GRT, which operated in the waters in the vicinity of Japan, has declined significantly. For the purse-seine fleet, the number of vessels over 200 GRT, which operate in the equatorial waters, was 35 (equivalent to 2003). The number of the purse-seine vessels of 50–200 GRT, which operate to catch tunas off Japan, north of 20° north latitude, was 92 (1 less than in 2003).

73. The total catch of tunas (Pacific bluefin, albacore, bigeye, yellowfin and skipjack) in the Convention Area by the Japanese fishery in 2004 was 456,000 mt (compared with 475,000 mt in 2003). In 2004, the catch of tunas by the purse-seine fishery was 216,000 mt (47% of the total catch of tunas), with 150,000 mt (33%) taken by pole-and-line, 68,000 mt (15%) by longline, and the remaining (5%) by other gears. For the longline fishery (>20 GRT), the bigeye catch increased from 18,000 mt in 2003 to 22,000 mt in 2004, the albacore and swordfish catches also increased, and the yellowfin catch was equivalent to the 2003 level.

74. For the pole-and-line fishery (>20 GRT), catches of skipjack, albacore, yellowfin and bigeye tunas in 2004 were 98,000 mt, 35,000 mt, 2,000 mt and 3,300 mt, respectively. The skipjack catch declined by 17%, while albacore catches were equivalent to those in 2003. For the tuna purse-seine fishery, skipjack was the dominant catch species, and accounted for more than 75% of the total catch in recent years. In 2005, the skipjack and yellowfin catches were 219,000 mt and 26,000 mt, respectively.

75. Subsequent discussions raised questions regarding the fleet capacity and patterns in the catch rates of Japanese coastal longliners. Clarification of these issues, however, was deferred to occur outside the session.

Kiribati

76. The following is a summary of key points from FR WP-11. In 2005, Kiribati had only one active flag purse-seine vessel. The vessel belonged to KAO Fishing Company, which is a joint venture between the Kiribati government and the Otoshiro Company from Japan. The vessel's catch of over 7,100 mt in 2005 represents an increase of over 50% on that taken in 2004. The vessel predominantly fished in waters of Papua New Guinea, FSM, and in the high seas pockets between those two countries. The vessel has a number of major ports for discharging catches in the Philippines and Japan.

77. Over 280 fishing vessels were licensed in 2005. The number of licenses issued dropped by around 20% from 2004. Korean vessels hold over 50% of the total licenses issued. Licences were issued to 163 longline vessels, 107 purse-seine vessels, 3 pole and line vessels, and 9 bunker vessels.

78. Total catch increased by 90% in 2005 (relative to 2004). Purse-seine catches represented over 90% of the total catch for the past five years. The highest total catch for all fishing gears was observed in 2002 (347,000 mt) but declined in 2003 (89,000 mt). Bigeye tuna is the dominant species taken in the longline fishery, representing over 40% of the total catch for the past five years. The highest catch for the longline fishery was taken in 2001 (~14,400 mt), however only 3,000 mt were taken by the longline fishery in 2005, the lowest recorded catch for that fishery. This reduction in catch is due to the decrease in the number of longline vessels, and to the outstanding logsheets from incomplete fishing trips.

79. Purse-seine catches were dominated by skipjack for the period 2001–2005. The highest catch was recorded in 2002 with a total catch of more than 330,000 mt. The pole-and-line fishery comprises predominantly Japanese vessels. The highest catch for this fishery was recorded in 1989 (19,700 mt) and the lowest catch was in 1998 (7 mt). In 2003, only 240 mt were recorded in the pole-and-line fishery and this increased to 580 mt in 2004. There was no catch data for 2005.

80. Transshipment activities in 2005 took place in Kiribati, at Betio, Canton and Christmas islands. Port sampling work by fisheries observers, with the assistance of fisheries staff, is continuous. Less than 20 fisheries observers are currently active or available for placement, however, despite the substantial reduction in the total number of observers, there has been a steady increase in the number of observer placements conducted on licensed foreign fishing vessels. In 2005, 15 observer placements were made. Three observers went on a regional observer programmeme covering purse-seine vessels and the remaining 12 went on the national observer programme. From the 12 national placements, 5 observers operated on Korean longline fishing vessels and 7 on purse-seines fishing vessels (1 Vanuatu, 2 Japanese and 4 Korean vessels). All

port sampling and observer data in 2005 were sent to the Ocean Fisheries Programme (OFP) of the Secretariat of the Pacific Community (SPC) for processing.

Korea

81. The following is a summary of key points from FR WP-12. Doo Hae An presented Korea's national report. Over 90% of Korea's total tuna catches in the Pacific Ocean are taken from the Convention Area. Convention Area catches fluctuated from 210,000 mt to 260,000 mt and averaged 230,000 mt. Purse-seine catches during the last five years ranged from 180,000 mt to 210,000 mt, averaging 190,000 mt. Skipjack and yellowfin tuna comprised 82.3% and 17.4% of this catch, respectively. The Korean longline fishery targets bigeye and yellowfin tuna, with minor catches of albacore, and comprises 80–88% of the total catch. Billfish and other fish species are incidentally caught in this fishery. The total annual catches in the western and central Pacific Ocean ranged from 33,000 mt to 54,000 mt during the past five years. The number of longliners and purse seiners fishing in 2005 was 153 and 28, respectively, which represents a decrease of 9 longliners from the previous year. Korean tuna fisheries depend on overseas markets, with a large portion of the catch exported to Japan and other international markets. About 30,000–50,000 mt of longline-caught tuna and 60,000–90,000 mt of purse seine-caught tuna have been exported annually.

82. Korea's Ministry of Maritime Affairs and Fisheries (MOMAF) initiated the development of an observer programme for distant-water fisheries, including tuna fisheries, in 2002. In 2005, a total of six observer trips were conducted to monitor Korean tuna longline and purse-seine fisheries, of which four cruises were carried out in the Pacific Ocean. Monthly biological sampling for purse-seine catches has been carried out at a domestic landing site once a month since 1993, to obtain size data and information on the reproductive biology of yellowfin and skipjack tuna. A total of 1,827 skipjack and 230 yellowfin tuna were sampled for morphometric measurements and gonad somatic index (GSI) during 2005.

83. Since concerns regarding sea turtle bycatch in longline fisheries have been raised in various international meetings, the Korean government has funded an experiment to investigate if circle hooks can solve the international problem of sea turtle mortality. The experiment was carried out by National Fisheries Research and Development Institute (NFRDI) scientists aboard a commercial Korean longliner operating in the eastern Pacific during July–August 2005, in collaboration with a USA scientist from the National Marine Fisheries Service (Honolulu Laboratory). This experimental survey will be repeated with various types of circle hooks during the period August–September 2006. To solve practical problems that fishermen usually encounter when they record bycatch species, NFRDI issued a fishermen's guide to bycatch species in the tuna longline and purse-seine fisheries in 2005.

Marshall Islands

84. The following is a summary of key points from FR WP-13. In the Republic of the Marshall Islands (RMI), the tuna fishery is the most important fishery, both in terms of scale and economics. The fishery comprises longline, purse seine, and pole-and-line vessels fishing under various access arrangements.

85. Seven vessels (one longline and six purse-seine vessels) comprise RMI's national fleet. The number of vessels has been steady for the past three years. In comparison, there were 288 foreign vessels licensed to fish in RMI waters (92 longline, 43 pole-and-line, 153 purse-seine). There was a steady increase in overall foreign vessel numbers, despite a slight decline in foreign

purse-seine vessel numbers when compared to 2004. In 2005, the total catch taken by the RMI purse-seine fleet was 56,164 mt, an increase of 17% on 2004. Within the RMI EEZ, the catch taken by foreign purse-seine and pole-and line vessels decreased by approximately 4% and 60% (13,979 and 466 mt), respectively, while there was significant increase in the longline catch (4,370 mt).

86. Data coverage for the national fleet in the period 2003–2005 was high. Catch and effort coverage for the longline fishery was at a medium level. For foreign vessels, purse-seine vessels had high catch and effort coverage, but medium size data coverage. Foreign longline vessels had medium coverage for catch and effort data, and high coverage for size data.

87. The Marshall Islands Fishing Venture (MIFV) operates the Longline Fishbase with locally based foreign longline vessels. Compared with 2004 records, 2005 records revealed an increase of 30% and 50% for export and local markets, respectively. MIFV exports mainly fresh chilled tuna species to markets in Japan, the USA and Canada. Frozen fish (rejects and bycatch) are shipped to Taiwan by carriers and are sold locally.

88. Onshore developments include the joint venture between MIMRA and Koo's Fishing Company, Ltd. (KFC), which is now fully operational. The vessel, F/V *Marshalls 201*, is newly-registered and ismfishing under the FSM Arrangement. There has been a revitalization of the loining plant through a sub-lease agreement with Shanghai Deep Sea Fisheries Company.

89. The port sampling programme has been further enhanced by the assignment of two observers to undertake port sampling work. Collated data has been sent to SPC's OFP on a bi-weekly basis. The observer programme continues to expand with 9 active observers, who undertook a total of 1,058 sea days in 2005 (619 on purse-seine vessels and 439 on longliners).

90. RMI has recently adopted its revised Tuna Plan and has since undergone significant changes in implementation. RMI is also working closely with its domestically based foreign fleet management to explore possible charter arrangements to further boost the domestic fishing industry.

Nauru

91. The following is a summary of key points from FR WP-14. The Nauru EEZ has a rich purse-seine fishery and thus attracts considerable DWFN fishing interest from all the major fleets that hold fishing agreements with Nauru. The development of any significant domestic fleet is precluded due to the amount of investment needed for purse-seining gear. There are two small longliners operated by the National Fisheries Authority. These vessels serve the local market but both were grounded during the last 12 months while undergoing mechanical upgrades.

92. In 2005, the number of DWFN purse seiners was 146 and the total catch from this fleet was 44,606 mt, which is down from the previous year. Nauru expects an increase in catch for the current year as a result of the impending El Niño season.

93. Other initiatives relating to WCPFC obligations include improving the data collection capacity through the receipt of a Catch Report Form Scanner from SPC's OFP, the imminent introduction of the Tuna Fisheries Management Database (TUFMAN) system, and visits of staff from the OFP Port Sampling Section to set up a catch data regime for Nauru.

New Caledonia

94. The following is a summary of key points from FR WP-15. In 2005, 27 domestic tuna vessels (longliners) were licensed to fish in New Caledonia's EEZ, compared with a peak of 29 vessels in 2004 and 2003. However, in 2005, only 23 of the boats were active, 8 of which were less than 50 GRT and the others ranging from 50–100 GRT. It should be noted that no licenses have been issued to foreign vessels since early 2001. A local vessel monitoring system is now in place, and it is used to check the logsheet coverage (South Pacific regional longline form), which is now nearing 100%.

95. In 2005, the overall catch dropped by 5% (2,473 mt), although the CPUE globally has increased by 26% over the last three years. Seasonality — in relation to fluctuations of environmental conditions — is an important feature of the tuna catch in New Caledonian waters. A study carried out in 2005, in collaboration with SPC's OFP, showed that the variability of catch can be explained by seasonal climatic changes, such as El Niño-Southern Oscillation (ENSO) events, as well as local heterogeneity in the ecosystem. With regards to albacore, the distribution of fish is mainly driven by water front movements in surface and sub-surface waters.

96. It is worth noting that no interaction with sea turtles, marine mammals or birds have been reported by the observer programme, which has been carried out on the domestic longliners since early 2002. A project is in progress to describe the typical New Caledonian longline hook depth distribution. However, at this point, the data collected are not accurate enough to describe the depth profile for the New Caledonian longliners, but efforts will be made to try and provide information to the Scientific Committee for the standardization of the fishing effort.

New Zealand

97. The following is a summary of key points from FR WP-16. New Zealand has four main tuna fisheries: the albacore troll fishery; the domestic and near-EEZ longline fisheries, which mostly target southern bluefin, bigeye tuna and swordfish; the domestic purse-seine fishery, which targets skipjack tuna; and the tropical purse-seine fishery, which targets skipjack and yellowfin tuna.

98. Skipjack, primarily taken by purse seine, comprises the greatest portion of the New Zealand catch of all tuna species, both inside (5,000–10,000 mt) and outside (10,000–15,000 mt) New Zealand's EEZ. Outside of New Zealand's EEZ, 2,000–3,500 mt of yellowfin and bigeye are taken by purse seine annually. Juvenile bigeye and yellowfin are not taken by the domestic purse-seine fishery and FADs are not used. Inside New Zealand's EEZ, albacore is the second most important component of the tuna catch and is taken mostly by troll gear (3,000–4,000 mt), but also by longline (1,000–2,500 mt). Longline catches of around 2,000 mt (tunas and swordfish) arise mostly from target fishing for bigeye and southern bluefin tunas, but the greatest part of the catch consists of albacore and swordfish. Following the expansion of the domestic longline fishery, which peaked in 2002, the fleet size declined.

99. New Zealand also has important sport fisheries for striped marlin (which cannot be landed by commercial fleets) and Pacific bluefin tuna.

100. New Zealand has a detailed research plan for highly migratory species and has directed research for swordfish, albacore tuna, and bycatch species (e.g. pelagic sharks). There is 100% coverage of logbooks for all fleets, and dedicated port sampling programmes for albacore (troll fishery), swordfish, and other high value species from the longline fishery. New Zealand has an

observer programme that covers longline and purse-seine fleets and will include albacore troll vessels in the upcoming season. The target coverage rate for the longline fishery is around 10% of effort, which should reflect approximately 10% percent of the highly migratory species catch. Since 2001, coverage of "hooks fished" has ranged from 8.4–19.9% (mean 15.2%), but there are concerns about the representativeness of this coverage.

Niue

101. The following is a summary of key points from FR WP-17. Niue's fishery is undergoing considerable development and is moving towards fully commercialised operations in response to the opening of a new fish processing factory. Local fishers have acquired much larger vessels and experienced overseas crews, which will enable them to target export tuna. The offshore fishery consists of three components: the small local artisanal fishery, a much smaller sports and recreational fishery, and the new commercial longline fishery.

102. The average catch rate for the tuna longline fishery has increased by more than 60% from May–December 2005, attaining an average CPUE of 100–200 kg/100 hooks. Albacore, the dominant species caught, makes up nearly 50% of the catch, while yellowfin makes up 28%, and bigeye 8%. The remainder of the catch includes a range of other species, including wahoo — a species of considerable importance for Niue. Catch monitoring via port sampling was originally 100%; however, due to a lack of staff, reporting has scaled back to 70–80%. The catch is sold to overseas markets via airfreight (Air New Zealand) once a week and is also sold on the local market.

103. Two of the fishing vessels currently in operation are locally owned and manned. These vessels can operate within the three-mile zone around Niue, while the foreign charter vessels will fish outside this zone. The success of locally owned vessels may encourage a few more local entries to the fishery, hence adding to the country's economy. Fleet size is expected to increase with three additional vessels from French Polynesia due to gain a license to fish in Niue's waters.

Palau

104. The following is a summary of key points from FR WP-18. The Palau EEZ is relatively small (629,000 km^2), bordering the EEZs of Indonesia, Philippines and FSM to the south, west and east, with high seas areas to the north and southeast (the Palau-FSM-PNG corridor). The tuna fishery primarily involves the activities of locally based longline fleets (Chinese and Taiwanese vessels) and Japanese vessels (offshore longliners, purse seiners and pole-and-liners) licensed under access agreements. The Taiwanese longline fleet has generally increased in numbers throughout the years and this has contributed to the increase in catch. The Chinese fleet has been decreasing for the past five years. The Taiwanese and the Japanese vessels dominate the longline fleet in Palauan waters.

105. Republic of Palau Law No.6-36 was approved on August 2003, to amend Chapter 1 of Title 27, which prohibits foreign fishing vessels from fishing within a 50-nautical-mile radius to the east of the reef entrance to Malakal Harbor. Subsection 181 of RPPL 6-36 prohibits foreign fishing vessels from fishing for sharks, removing shark fins, and otherwise intentionally mutilating or injuring sharks.

Papua New Guinea

106. The following is a summary of key points from FR WP-19. The tuna fishery in Papua New Guinea (PNG) is principally a surface fishery targeting skipjack. The fishery represents a balance of both domestic industry development and foreign DWFN access arrangements. In certain years, around 10% of the global catch of the main market species of tuna has been taken within the PNG EEZ. The development of the fishery has been guided by a National Tuna Management Plan since 1999. The plan establishes an overall management structure, and an application framework for purse-seine, longline, pole-and-line, and handline fisheries, including license limits and limits on total allowable catch (TAC). The fishery operates within guidelines of several important regional and sub-regional arrangements such as the Parties to Nauru Agreement (PNA), Palau and the Federated States of Micronesia Arrangements (FSMA).

107. PNG's national fleet comprises 51 longline and handline vessels, and 22 domestic purse-seine vessels. Eight of the purse-seine vessels are PNG flag vessels, and the remainder are associated with onshore facilities and fish only in the PNG EEZ, but are not PNG flag ships. Nineteen larger vessels, operating under the locally based foreign category, fish under FSMA. The foreign fleet consists only of purse-seine vessels, and numbers some 155 vessels that operate under bilateral access arrangements and the multilateral treaty with the United States.

108. Data coverage for the PNG longline fleet for the period 2003–2005 was high, for both CPUE data and size data. The purse-seine fishery data coverage was high for CPUE, but medium for size data in the same years. Data coverage for the PNG purse-seine fleet is similar to that for the foreign fleet operating in PNG waters

109. Catch by PNG domestic and localled based foreign vessels in the Convention Area is steadily increasing and exceeded 220,000 mt in 2005. The catch is dominated by skipjack (76%), yellowfin (24%) and small amounts of bigeye tuna. The catch within PNG waters by PNG associated vessels also shows an increasing trend and was 112,602 mt in 2005. Catch by all vessels and all gear types was 284,204 mt in 2005, slightly lower than in the previous two years. Albacore now dominates the catch in the longline fishery.

110. Catch composition, size data and other relevant data are monitored through the observer programme, which also has compliance functions. Trained observers (now numbering 100) are available for deployment, and some of them are engaged in port sampling duties in various ports around the country.

111. Onshore fisheries development is still being strongly pursued by PNG. A third plant started operation in early 2006. It produces 60 mt/day, and complements the two existing plants, which have a 150 and 200 mt/day production capacity, respectively. Projects under implementation, or yet to be implemented, include a 40 mt/day loining plant that is under construction, a 200 mt/day loining plant that has been planned by Thai interests, and a proposed Marine Industrial Park by the PNG government to support its fishing industry. In terms of further development in the fishery, PNG will be looking at developing the handline fishery that will operate in inshore areas.

Philippines

112. The following is a summary of key points from FR WP-20. The Philippines has long been a major tuna producer in the Convention Area. Tunas continue to contribute over 20% of marine fisheries production in most years. The Philippine tuna fishing fleet is composed of large

purse seine vessels (>250 GRT), small and medium purse seine vessels (<250 GRT), and handlines or pumpboats. Large purse seiners catch yellowfin and skipjack, while the small and medium purse seiners target round scads, mackerels, small tunas and other small pelagic fish. Handliners target large yellowfin and bigeye tunas.

113. The total estimated catch of tunas and billfish in the Philippines EEZ (by Philippine vessels) is in the range of 341,000–536,000 mt in recent years, with pelagic tuna contributing 189,000–279,000 mt (over 50%) of this catch. For 2005, the provisional estimated catch by species is as follows: skipjack – 143,064 mt; yellowfin – 114,027 mt; bigeye – 21,686 mt; frigate/bullet tuna – 173,960 mt; and eastern little tuna – 77,674 mt. Prior to the 2005 national fisheries statistics, yellowfin and bigeye tunas were grouped together, although beginning in 2005, these two species have been reported on separately.

114. Most of the "municipal" tuna catch (i.e. tuna caught within 15 km of the coastline and by vessels equal to and less than 3 GRT) is processed by drying, salting and smoking, while commercial catches are mostly sent to the canneries. Tuna exports are classified as fresh/chilled/frozen (chilled sashimi quality fish), dried/smoked, and canned.

115. The Indonesia-Philippine Data Collection Project (IPDCP), supported by the WCPFC, commenced in January 2005 and is being implemented as scheduled to collect data on the catches of pekagic tunas. Aside from this, the Philippine government through the National Stock Assessment Programme (NSAP) continues to collect port sampling data (species composition, length frequency and vessel catch and effort information). While the Philippine Tuna Management Plan has yet to be officially implemented, due to some government requirements needing to be fulfilled, the Bureau of Fisheries and Aquatic Resources, together with the private sectors, are already discussing and considering management and conservation activities to manage the tuna resources.

Samoa

116. The following is a summary of key points from FR WP-21. Samoa's tuna fishery is purely dominated by longlining, and its fishing fleet operates exclusively in domestic waters. The tuna longline fishery, which targets albacore tuna, began in the mid-1990s and expanded rapidly with *alia* fishing vessels (aluminum catamaran boats ranging from 9–11 meters in length) and constituting the major component of the fleet. Over time, larger vessels (over 12.5 meters) were introduced into the fishery.

117. The industry suffered a major setback when longline catches declined dramatically in 2002, resulting in a drop in the number of vessels engaged in longline fishing. Gradual improvement in longline catch rates has been noted since May 2005 with June being the peak month with a nominal CPUE of around 90 kg/100 hooks for all species caught. While the estimates of the total longline catch in 2005 was below the 2004 estimates, more albacore were caught in 2005 than in 2004. Around 89% of the total domestic longline catch was exported, which generated considerable revenue for Samoa’s economy (compared with other exporting sectors).

118. Various projects are now underway to support the development of the tuna fishery. Given recent trends in tuna catch rates and the associated oceanographic conditions that appear to influence these trends, Samoa is in a better position to introduce measures for consideration in reviewing the Samoa National Tuna Management and Development Plan (2005–2009).

Solomon Islands

119. The following is a summary of key points from FR WP-22. Licensed fishing vessels from four locally registered tuna companies fished in the Solomon Islands EEZ during 2005. These vessels included three purse seiners from the National Fisheries Development (NFD), five pole-and-line vessels from a fleet of ten pole-and-line vessels from Soltai Fishing and Processing Company, four small purse seiners (<100 GRT) from the Global Fishing Company, and two longliners from a fleet of five longline vessels from Solgreen Enterprises Ltd.

120. In addition, licensed purse-seine vessels under the regional FSM Arrangement and the US Multilateral Fisheries Treaty also fished last year for tunas in the Solomon Islands EEZ. Licensed Taiwanese purse seine and longline vessels, Japanese purse seine, longline and pole-and line vessels, and Korean purse-seine vessels under bilateral fisheries access agreements also fished in the Solomon Islands EEZ during 2005.

121. The annual total tuna caught from Solomon Islands waters during 2005 by both domestic and foreign-licensed vessels amounted to 94,924 mt. This was an increase of 12.3% over that for the 2004 licensing period. From this annual total catch, 17,280 mt representing 18.2% was taken by licensed domestic fishing vessels and about 77,644 mt, accounting for 81.8% of the catch, was taken by licensed foreign vessels. The total domestic tuna catch in 2005 was 38% lower than that for 2004. Purse seiners dominated the catch (79.1%), followed by pole-and-line vessels (20.8%), and the balance from the longliners. The total foreign fleet catch was also dominated by purse-seine vessels which accounted for 97.5% of that catch, followed by longline vessels, which accounted for 2.5% of the catch. Tuna catch data by Japanese long range pole-and-line vessels, however, has not been received.

122. It is likely that the future anticipated tuna developments in the country from the current government's fisheries policy will result in increased tuna catches from Solomon Islands waters.

Chinese Taipei

123. The following is a summary of key points from FR WP-23. There are three major Chinese Taipei tuna fisheries operating in the Convention Area: the large tuna longline, distant water purse seine, and small tuna longline fisheries. The total number of large tuna longline vessels in the Convention Area declined from 137 in 2004 to 117 at the end of 2005. Albacore, bigeye and yellowfin tuna are the major catches of the large tuna longline fishery in the Convention Area. The albacore tuna catch by the large tuna longline fishery in the South Pacific Ocean has declined from 13,307 mt in 2004 to 9,248 mt in 2005. The catch of Northern Pacific albacore was 4,210 mt, a slight increase from 2004. Catches of bigeye tuna in the Convention Area declined from 16,888 mt in 2004 to 9,855 mt in 2005. The yellowfin tuna catch (also in the Convention Area) has declined from 9,018 mt in 2004 to 6,354 mt in 2005.

124. The total number of distant water purse-seine vessels in the Convention Area was 34 in 2005. Skipjack accounted for 86% of the total tuna catch, followed by yellowfin (13%), and bigeye (1%). In 2005, catches of skipjack, yellowfin and bigeye tunas were 165,298 mt, 27,572 mt and 2,178 mt, respectively.

125. The total number of small tuna longline fisheries vessels in the Convention Area was 1,421 in 2005. The dominant species caught included yellowfin and bigeye tunas, and swordfish. The 2004 catches of yellowfin and bigeye tunas, and swordfish, were 13,957 mt, 4,104 mt and 4,671 mt, with preliminary 2005 estimations of 13,816 mt, 5,415 mt and 5,722 mt, respectively.

126. Subsequent discussion focussed on why there has been a sharp increase in bigeye tuna catches in recent years by the Chinese Taipei longline fishery. This fishery has typically targeted albacore tuna, and vessel numbers have not increased. It was noted that this may due to a number of contributing factors, including an adjustment of the area being fished in response to management measures of relevant regional fisheries management organizations, including the International Commission for the Conservation of Atlantic Tunas (ICCAT), as well as increased market competition, which has made albacore a less attractive target species. It was also noted that Pacific Island fleets now account for more than 50% of the southern albacore tuna catch.

Tonga

127. The following is a summary of key points from FR WP-24. All tuna fishing vessels operating in Tongan water in 2005 were domestic longline vessels (15 in total). The number of fishing vessels increased rapidly from the late 1990s and peaked at 29 vessels in 2002–2003 and 28 vessels in 2004, before dropping to the current level. The total annual tuna catch increased rapidly from the late 1990s and peaked at almost 2,000 mt in 2001, before declining to a low of just above 500 mt in 2004 and 2005. The low level of tuna landed in the last couple of years was mainly due to low CPUE experienced by local fishermen, coupled with higher operational costs due to escalating fuel prices. At the same time, all data requirements were collected from log book and port samplings that are required in the Terms and Conditions of Fishing License. All catch data are verified with data from local vessel monitoring systems (maintained by the Tonga Fisheries Department), before submission to SPC for further analysis.

Tuvalu

128. The following is a summary of key points from FR WP-25. Over the past five years, the tuna fishery in Tuvalu has been operated mainly by DWFNs. Tuvalu fishers have been involved in the tuna fishery mostly at the subsistence and artisanal level. The artisanal market has gradually expanded, with many fishers on the main island targeting tuna as the main species.

129. The type of gears used by DWFN fleets in Tuvalu waters are mainly purse seine, longline, and pole-and-line. Over the last five years, the use of purse seine and longline gears has been steady, while the use of pole-and-line gear has declined dramatically. Attempts have been made recently to develop the domestic longline fleet but this has been constrained mainly by the lack of funds to fully implement such a programme.

United States of America

130. The following is a summary of key points from FR WP-26. Information on USA fisheries is provided in the annual report, and pelagic research during 2005 is described. USA fisheries include purse seine, longline, and distant water troll fisheries operating on the high seas, within the USA EEZ, and within the EEZs of other states, and small-scale troll, handline, pole-and-line, and miscellaneous gears operating in the nearshore waters of the USA's EEZ. The purse-seine fishery was the largest USA fishery, accounting for 82% of the total USA catch of pelagic species in the western and central Pacifici Ocean (WCPO) during 2005. The longline, distant water troll, and small-scale fisheries accounted for 14%, 1%, and 3% of the total catch, respectively. The tuna catch in 2005 consisted primarily of skipjack (62%), yellowfin (22%), bigeye (11%), and albacore tuna (5%).

131. The number of vessels active in the USA purse-seine fishery in the WCPO continued to decline from 32 in 2001 to 15 in 2005, and catches declined by 35.9% over the same period. The

Hawaii- and California-based longline fleets target bigeye tuna and swordfish, and the American Samoa-based fleet targets albacore. The total catch of the USA longline fisheries in the WCPO remained steady over the period 2001–2005, while the number of boats collectively declined from 197 to 162. The dominant species in the 2005 catch were bigeye tuna, albacore, swordfish, and yellowfin tuna, in descending order.

132. In the WCPO, the number of vessels participating in the South Pacific distant water troll fishery declined from 33 to 10, and in the North Pacific from 115 to 15. Due to rising fuel costs in 2005 and in 2006, the North Pacific troll fleet fished mostly in the eastern Pacific Ocean. Landings, which are composed exclusively of albacore, likewise declined.

Vanuatu

133. The following is a summary of key points from FR WP-27. The Vanuatu fleet comprises 24 purse seiners, 55 longliners, and 3 pole-and-line fishing vessels. The vessels fished in the various coastal state jurisdictions and in the high seas enclaves within the Convention Area. CPUE data coverage for the Vanuatu fleet is high but the size data coverage is uncertain. CPUE data coverage for the Vanuatu EEZ has been high only for the Fiji fleet.

134. In the period 2001–2005, the annual catch estimates of the Vanuatu fleet have generally increased as did the fishing effort (number of sets and number of fish per 100 hooks). There were more sets on unassociated schools than on associated schools. The purse-seine fleet's total catches have increased from 11,196 mt to 160,989 mt, comprising 85% skipjack, 14% yellowfin, and 2% bigeye tuna. Some of these purse-seine vessels fished under the FSM Arrangement "home party" criteria as PNG and, therefore, may have been included in the PNG fleet's catch statistics.

135. The major tuna species in the Vanuatu longline fleet catch were albacore (60%), yellowfin (16%) and bigeye (10%). The 2005 catch was mainly caught in the high seas enclaves (i.e. high seas areas enclosed by the EEZs of coastal states). Unraised and provisional estimates for the longline fleet in 2005 were 9,339 mt, 1,558 mt and 936 mt for albacore, bigeye and yellowfin, respectively. Data for the Vanuatu EEZ were based on unraised logsheet data (i.e. catches that are estimated by logsheet data). Fishing in the Vanuatu EEZ continued to be by foreign fleets from China, Fiji, Chinese Taipei and Korea. The Chinese Taipei fleet has decreased but the Chinese and Fiji fleet have increased rapidly. Based on unraised logsheet data, a total of 25 million hooks were deployed in the Vanuatu EEZ during this period, but may have actually exceeded 40 million hooks.

136. The estimated annual catches of the main tuna species have increased significantly along with increased effort. However, CPUE was still well below the 1992 levels for the respective major tuna species. For 2005 the CPUEs were: albacore ~1.6 fish/100 hooks, yellowfin ~0.1 fish/100 hooks and, bigeye ~0.04 fish/100 hooks. In the period 200–2005, the total annual catch for all fleets undertaking fishing operations in Vanuatu increased from 1,933–8,842 mt, more than a four-fold increase. The tuna catch composition was dominated by albacore (73%), yellowfin (19%) and bigeye (3%) making up much of the rest of the catch. Some data "gaps" have been identified and these must be addressed. In particular, there is a need to estimate coverage rates in the Vanuatu fleet, including the foreign fleets that operate within the Vanuatu EEZ.

Fishery reports from regional fisheries organizations and other agencies

Greenpeace

137. Greenpeace noted that their Effort Reduction Management Measures Report was available to the Scientific Committee and that the report contains a series of effort reduction measures targeted towards the sustainability of bigeye and yellowfin tuna in the WCPO tuna fishery. Greenpeace called for a series of effort reduction measures including among others: a 50% effort reduction across all fisheries, the establishment of strategic marine reserves to act as refuges and nurseries for key marine species, an immediate moratorium on the construction of new large purse-seine and longline vessels, and the immediate prohibition of at-sea transshipments. Greenpeace also reminded the Scientific Committee of the importance of applying the precautionary principles of ecosystem based fisheries management.

AGENDA ITEM 3 — SPECIALIST WORKING GROUPS (SWGS)

SWG reports

Report of the Biology SWG

138. The Biology SWG (BI-SWG) met for over two hours on 9 August. The meeting was convened by Chi-Lu Sun (Chinese Taipei). One paper was presented to the SWG describing the reproductive biology of bigeye tuna. The BI-SWG also discussed current biological uncertainties in stock and risk assessments, and scientific priorities of the Commission observer programme. Issues relating to the Terms of Reference of the BI-SWG were also discussed in the Ecosystem and Bycatch SWG, the Fishing Technology SWG and the Stock Assessment SWG. The BI-SWG provided advice to the Scientific Committee for consideration under Agenda Item 9 (Future work programme). The full report of the BI-SWG is provided as Attachment G.

Report of the Ecosystem and Bycatch SWG

139. The Ecosystem and Bycatch SWG (EB-SWG) met all day on 10 August. The meeting was co-convened by Paul Dalzell (USA) and Peter Ward (Australia). Twelve working papers and eleven information papers were submitted by participants, and a representative of Birdlife International also submitted two papers and was invited to present these to the SWG. The 13 presentations covered research and analyses on ecological modelling and risk assessment, seabirds, sea turtles and pelagic sharks. The EB-SWG provided advice to the Scientific Committee for consideration under Agenda Item 5 (Bycatch Mitigation). The full report of the EB-SWG is provided as Attachment H.

Report of the Fishing Technology SWG

140. The Fishing Technology SWG (FT-SWG) met for over four hours on 11 August. The meeting was convened by David Itano (USA). Eight working papers and seven information papers were submitted to the group in response to the directives from the second regular session of the Commission and the first regular session of the Scientific Committee. Ten papers were presented to the meeting, covering behavioural and mitigation research relating to FADs, the development of electronic tags and autonomous monitoring buoys, operational characterization of longline fleets and gear, effective fishing effort, vessel/gear/operational level data, and fishery terminology for use by the Scientific Committee. Five papers on fishing capacity, gear targeting and training materials to promote species-specific catch and effort data were briefly noted. In relation to observer programmes, it was noted that onboard observers are in a unique position to

verify and collect operational level data that can not be reliably obtained by any other means. The use of directed observer projects to characterize fisheries and fleets for which little or no documented information exists and represent fisheries of high potential impact to stock condition was also noted. Short and medium-term work plans for the FT-SWG were developed and adopted by the meeting. The full report of The FT-SWG is provided as Attachment I to this report.

Report of the Methods SWG

141. The Methods SWG (ME-SWG) met during the two morning sessions on 8 August. Robert Campbell (Australia) served as the convenor. Under its Terms of Reference, the ME-SWG will coordinate research and make recommendations to the Scientific Committee on technical questions relating to analytical methods used to generate scientific advice for fishery management. For this meeting it had as specific tasks the review of work undertaken to address a number of research issues identified at the first regular session of the Scientific Committee. Four working papers were presented covering: i) changes and enhancements made to the MULTIFAN-CL (MFCL) models used for assessing the principal target species in the WCPO (especially for yellowfin and bigeye tuna); ii) research directed at improving the standardization of longline CPUE (in particular, the incorporation of factors to better describe the relationship between catchability and habitat); and, iii) CASAL (C++ algorithmic stock assessment laboratory) and MFCL stock assessment models developed for assessing the status of the swordfish stock in the southwest Pacific. The full report of the ME-SWG is attached as Attachment J.

Report of the Statistics SWG

142. The Statistics SWG (ST-SWG) met for two hours on 7 August and four hours on 11 August. Kim Duckworth (New Zealand) served as convenor. One working paper (Scientific aspects of observer programmes for tuna fisheries in the western and central Pacific Ocean), two information papers (Scientific data available to the Western and Central Pacific Fisheries Commission, and observer coverage rates and reliability of CPUE estimates for purse seiners in the western and central Pacific Ocean) and the Summary Record of the Ad Hoc Task Group [data] were presented. The deliberations of the ST-SWG focused primarily on developing recommendations for required minimum coverage levels for the regional observer programme, and secondarily on scientific objectives for the regional observer programme and the work programme for the following year. The ST-SWG had less detailed discussions on gaps in scientific data available to the Commission, priorities and data collection requirements for the regional observer programme, and the report of the Ad Hoc Task Group [data]. The full report of the ST-SWG is attached as Attachment K to this report.

Report of the Stock Assessment SWG

143. The Stock Assessment SWG (SA-SWG) met over eight hours between 8 and 9 August. The meeting was co-convened by Naozumi Miyabe (Japan) and Gerard DiNardo (USA). Gerard DiNardo was selected as a replacement co-convenor for the SA-SWG for this meeting due to the unavailability of Max Stocker (Canada). Seven working papers were presented covering assessments of bigeye, yellowfin, South Pacific albacore, southwest Pacific swordfish, and southwest Pacific striped marlin as well as information on the likely impact on skipjack catches of potential purse-seine closures. The assessments of southwest Pacific swordfish and southwest Pacific striped marlin were new assessments. The other assessments provided updated assessment results. No new assessment was conducted for skipjack this year, as decided at the first regular session of the Scientific Committee. All these assessments utilized MFCL, the standard stock assessment tool that has been applied to tuna and billfish stocks in the WCPO. The SA-SWG

reviewed these working papers and provided advice to the Scientific Committee for consideration under Agenda Item 4 (Status of the stocks and management advice and implications). The stock assessment activities for the northern stocks, northern Pacific albacore, Pacific bluefin tuna and North Pacific striped marlin were reported to the group. In addition, the SA-SWG discussed and identified short- to long-term research items for Agenda Item 9 (Future work programme). The full report of the SA-SWG is provided as Attachment L.

Acceptance of the reports of the SWGs

144. The reports of the SWGs were accepted by the Scientific Committee as a record of the meetings of the SWGs.

Terms of reference for the SWGs

145. The Scientific Committee agreed that the independent review of the science structure and functions of the Commission would cover the terms of reference for the SWGs (See Attachment R)**.**

AGENDA ITEM 4 — STATUS OF THE STOCKS AND MANAGEMENT ADVICE AND IMPLICATIONS

Bigeye tuna

Status and trends

146. The 2006 assessment results were reviewed and confirmed as consistent with the 2005 assessment, although the point estimate for $F_{current}/F_{MSY}$ was slightly more pessimistic in this assessment. The assessment, using the 6 region model, indicates that there is a high probability that overfishing of bigeye has been occurring in the WCPO ($F_{current}/F_{MSY} \geq 1$, with >99% probability) since 1997. While the stock is not yet in an overfished state ($B_{current}/B_{MSY} > 1$, with >99% probability; Fig. 3), further biomass decline is likely to occur at 2001–2004 levels of fishing mortality at long-term average levels of recruitment, moving the stock into an overfished state (Fig. 4).

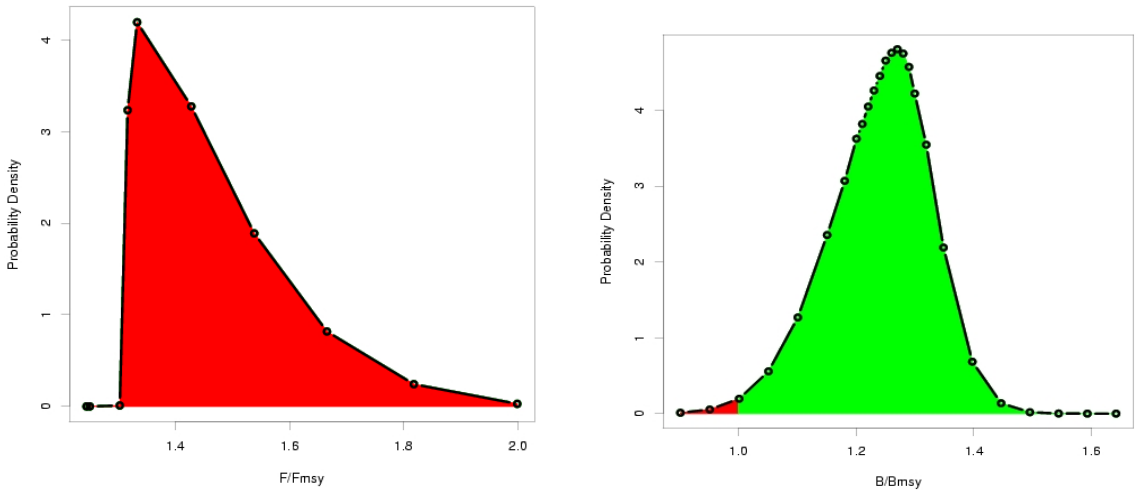

Figure 3. Probability of overfishing for bigeye tuna occurring (left panel) and the stock being overfished (right panel) in the western and central Pacific Ocean.

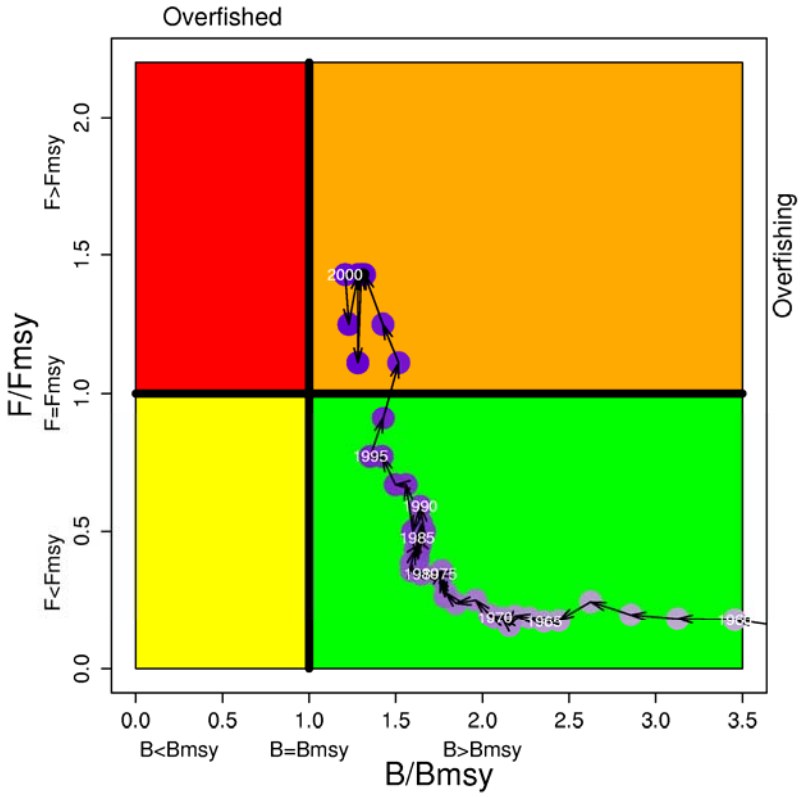

Figure 4. Temporal trend in annual stock status of bigeye tuna, relative to B_{MSY} (x-axis) and F_{MSY} (y-axis) reference points, for the model period (1952–2005). The colour of the points is graduated from mauve (1952) to dark purple (2005) and the points are labelled at five-year intervals.

147. The greatest impact from the fishery is in the equatorial region, while the temperate regions are estimated to be moderately exploited. Furthermore, the attribution of depletion to various fisheries or groups of fisheries indicates that the longline fishery has the greatest impact; the purse-seine fishery operating on associated sets has a lesser, but still substantial, effect particularly in the equatorial regions.

Management advice and implications

148. In order to maintain the bigeye stock at a level capable of producing the maximum sustainable yield, the Scientific Committee recommended a 25% reduction in fishing mortality from the average levels for 2001–2004. If the Commission wishes to maintain equilibrium average biomass at levels above B_{MSY}, further reductions would be required. The various levels of fishing mortality reduction required to maintain the biomass at specified levels above B_{MSY} (relative to the average levels for 2001–2004) are given in Figure 5. For example, a 39% reduction in fishing mortality would be required to maintain biomass at a level 20% above that which will produce the maximum sustainable yield. Fishing impacts in the equatorial WCPO have been increasing over recent years and more urgent management actions may be required for this area.

149. Stock projections for 2006–2015, which attempt to simulate the conservation and management measures adopted at the second regular session of the Commission, indicate that the point estimate of B_t/B_{MSY} declines below 1.0 during the projection period. The increasing uncertainty in the future projections (e.g. distribution of effort, recruitment variability) results in a greater probability (86%) of the biomass being below B_{MSY} by the end of the projection period (Fig. 6). The projections indicate a strong shift in the spatial distribution of biomass, with continued depletion occurring in the equatorial regions.

150. An alternative projection was undertaken under a scenario that assumes recruitment to be consistent with recent levels (1995–2004 average recruitment), which have been well above the long-term average (Fig. 7). Under this scenario, the stock was projected to remain above the B_{MSY} level throughout the projection period of 2006–2015. However, overfishing would still be occurring under this scenario. There is no robust information available concerning future recruitment levels. However, most Cooperating Non-members and participating Territories (CCMs) considered that continuation of relatively high recruitment over the long-term was less likely than a return to the long-term average (stock-recruitment relationship recruitment).

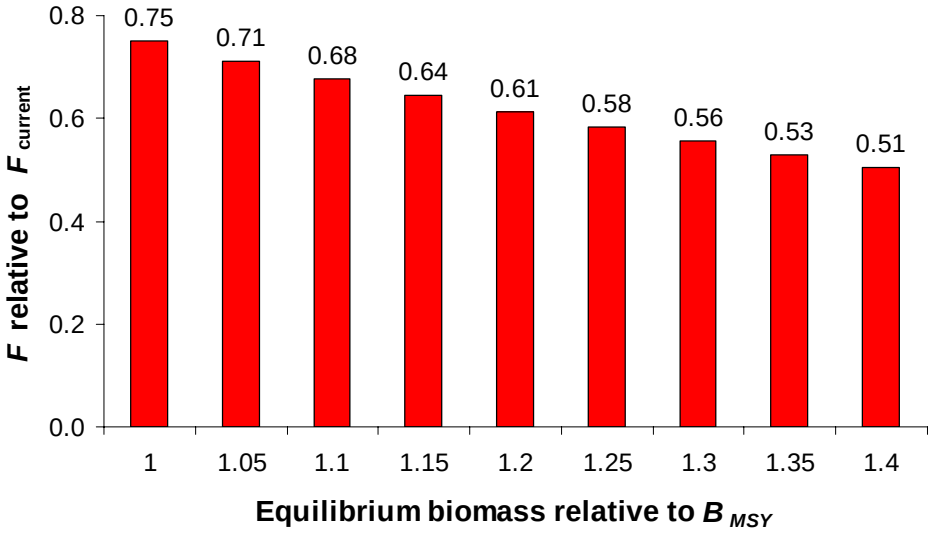

Figure 5. Estimates of the equilibrium level of fishing mortality (relative to current levels) required to sustain biomass of bigeye tuna at the indicated levels (relative to B_{MSY}) based on the LOWSAMP (six-region) model.

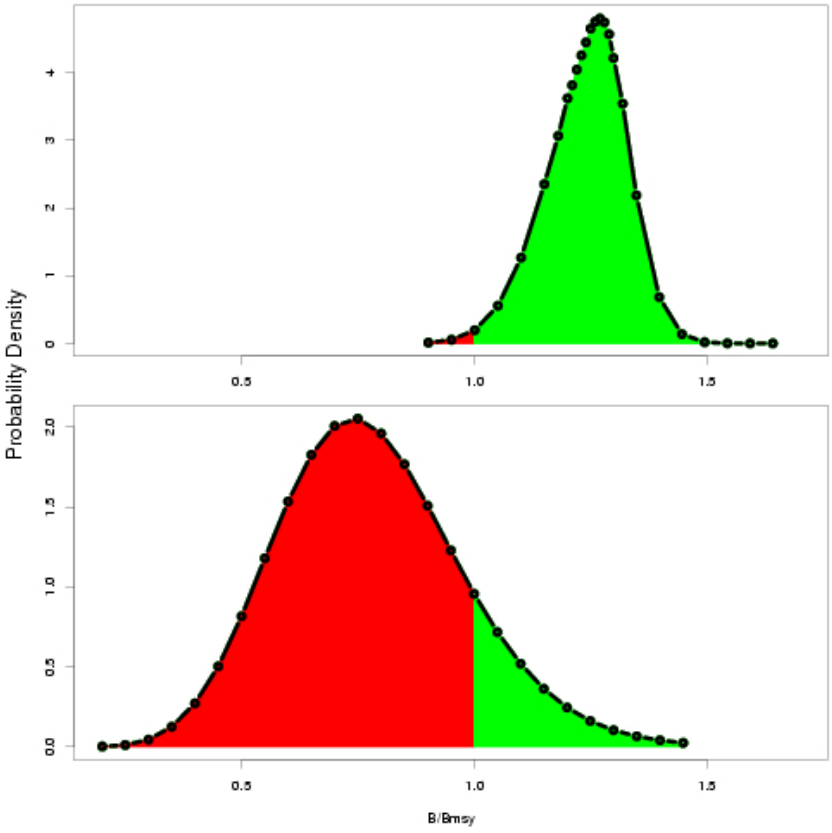

Figure 6. Comparison of the probability distribution of B/B_{MSY} of bigeye tuna for a) the current period (top panel) and for b) end of the 10-year projection period (bottom panel)

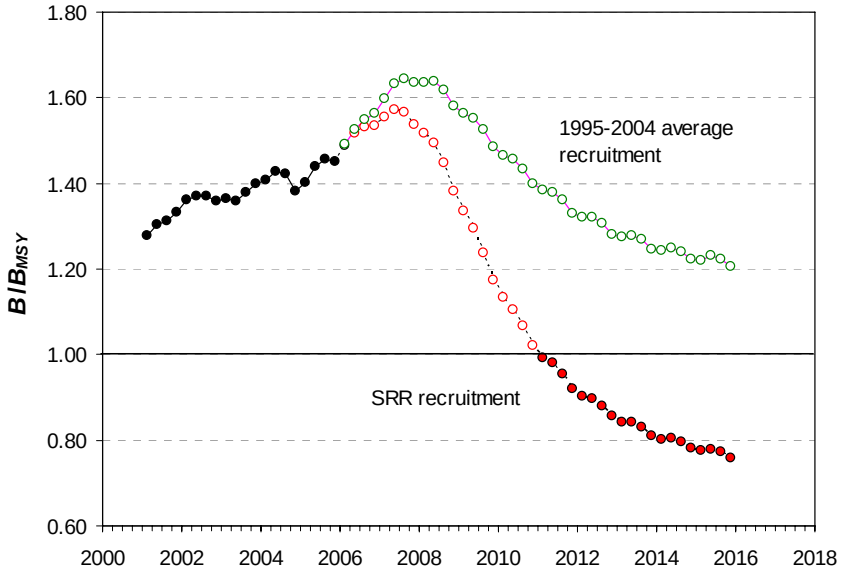

Figure 7. Projected ratio of $B_t / \widetilde{B}_{MSYfinal}$ for bigeye tuna where $\widetilde{B}_{MSYfinal}$ is computed based on the average *F*-at-age in the final year (10) of the projection. Projections using the estimated stock-recruitment relationship (stock-recruitment relationship based on long-term average) and the average recruitment in 1995–2004 to predict recruitment in the projection period are shown for comparison.

Yellowfin tuna

Status and trends

151. The 2006 assessment results were reviewed and confirmed as consistent with the 2005 assessment, although the point estimate for $F_{current}/F_{MSY}$ was slightly more optimistic in this assessment. The assessment using the 6 region model indicates that overfishing is occurring in the WCPO ($F_{current}/F_{MSY} \geq 1$, with 73% probability), but the stock is not yet in an overfished state ($B_{current}/B_{MSY} >1$, with 95% probability) (Fig. 8). The trajectory of these stock status reference points (Fig. 9) indicates that the stock has been declining rapidly in recent years, and fishing mortality at current levels will probably move the yellowfin stock into an overfished state.

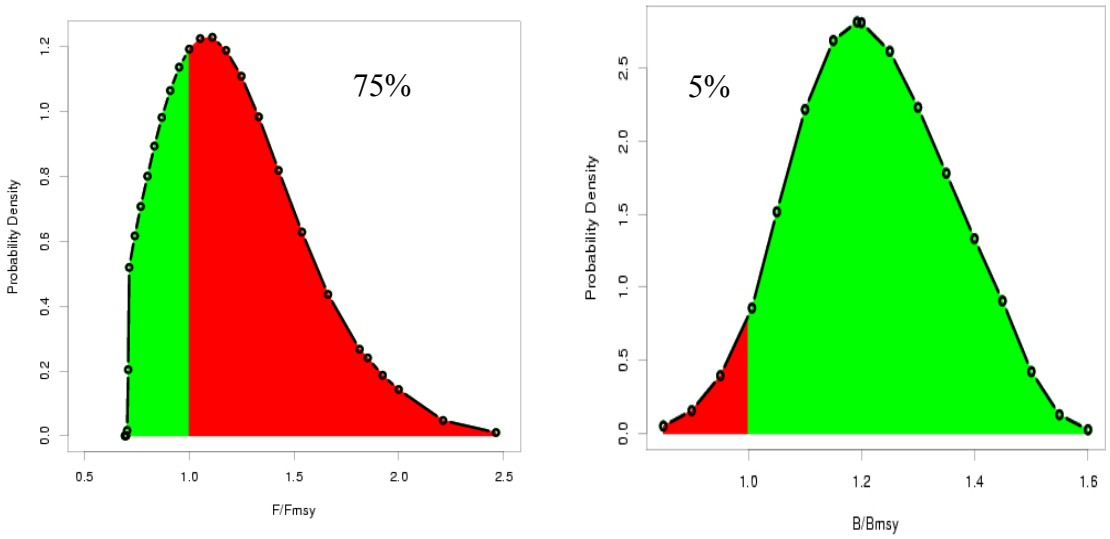

Figure 8. Probability of overfishing occurring for yellowfin tuna (left panel) and the stock being overfished (right panel) in the WCPO. The probability (expressed as a percentage) of $F/F_{MSY} > 1$ (overfishing) and $B/B_{MSY} < 1$ (overfished) is presented on the respective figure.

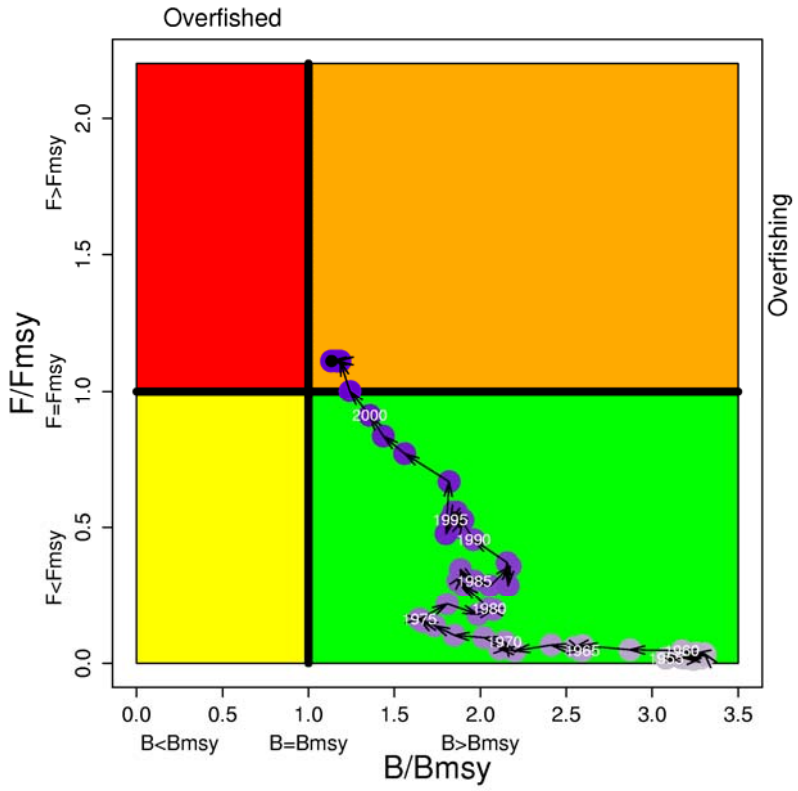

Figure 9. Temporal trend in annual stock status of yellowfin tuna, relative to B_{MSY} (x-axis) and F_{MSY} (y-axis) reference points, for the model period (1952–2005). The colour of the points is graduated from mauve (1952) to dark purple (2005) and the points are labelled at five-year intervals.

152. The greatest impact from the fishery is in the equatorial region, while the temperate regions are estimated to be only lightly exploited. Furthermore, the attribution of depletion to various fisheries or groups of fisheries indicates that the Indonesian/Philippines domestic fishery probably has the greatest impact, particularly in the western equatorial region. The Indonesian/Philippines domestic fishery is also estimated to impact other regions, to some extent, through fish movement, although the movement rates out of this region are not estimated to be very large. The purse-seine fishery has a lesser, but still substantial, effect particularly in the equatorial regions. Unlike the case for bigeye tuna, the impact of the longline fishery on yellowfin tuna is relatively small.

Management advice and implications

153. In order to maintain the yellowfin stock at a level capable of producing the maximum sustainable yield, the Scientific Committee recommended a 10% reduction in fishing mortality from the average levels for 2001–2004. If the Commission wishes to maintain equilibrium average biomass at levels above B_{MSY}, further reductions would be required. The various levels of fishing mortality reduction required to maintain the biomass at specified level above B_{MSY} (relative to the average levels for 2001–2004) are given in Figure 10. For example, a 26% reduction in fishing mortality would be required to maintain biomass at a level 20% above that which will produce the maximum sustainable yield. As noted in 2005, fishing impacts in the western equatorial WCPO have been increasing over recent years and more urgent management actions may be required for this area.

154. Stock projections for 2006–2010, which attempt to simulate the conservation and management measures adopted at the second regular session of the Commission, indicate that the point estimate of B_t/B_{MSY} remains above 1.0 throughout the projection period, although the biomass is still predicted to decline. However, the increasing uncertainty in the future projections (e.g. distribution of effort, recruitment variability) results in a greater probability (29%) of the biomass declining below B_{MSY} by the end of the projection period (Fig. 11). The projections indicate a strong shift in the spatial distribution of biomass, with continued depletion occurring in the equatorial regions.

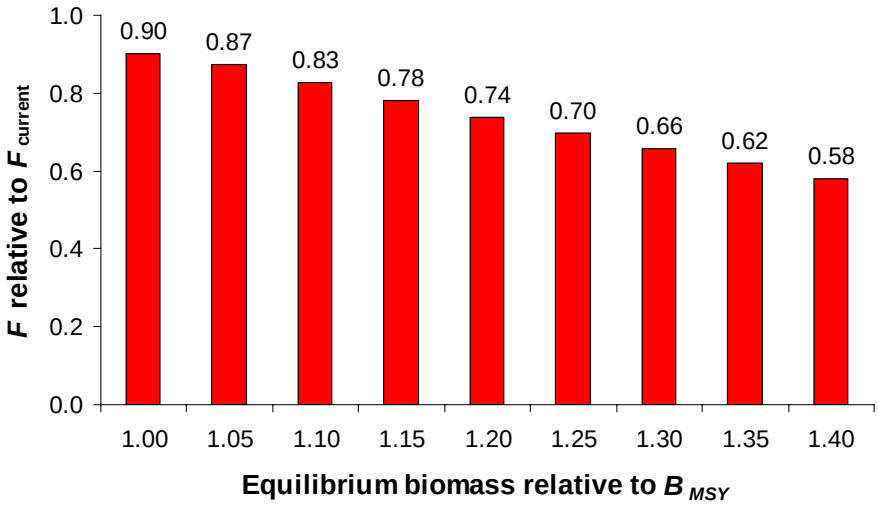

Figure 10. Estimates of the equilibrium level of fishing mortality (relative to average levels for 2001–2004) required to sustain biomassof yellowfin tuna at the indicated levels (relative to B_{MSY})

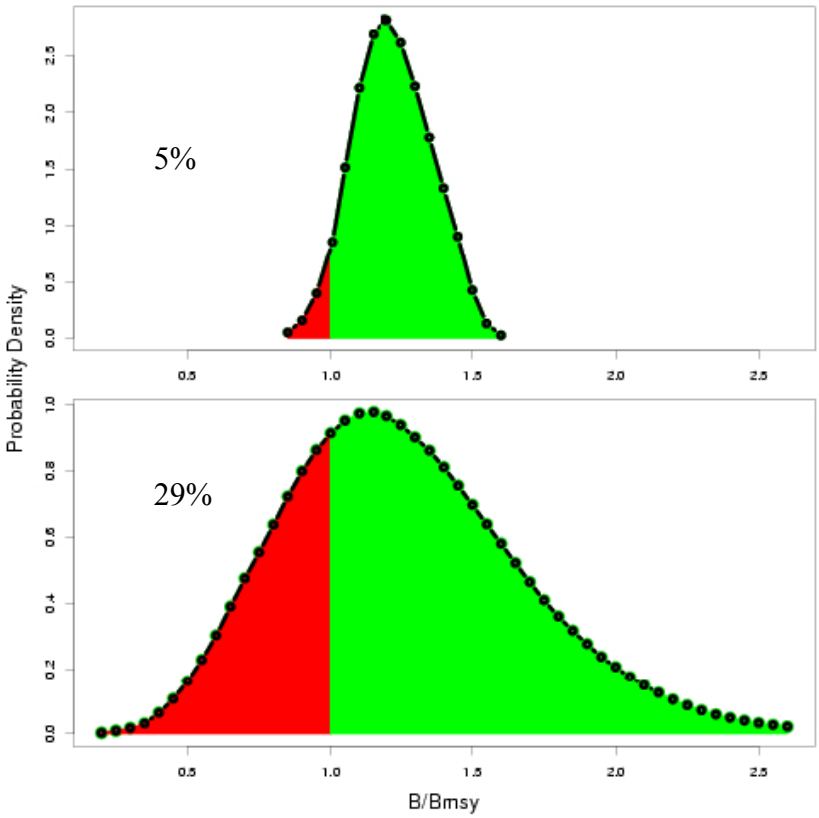

Figure 11. Comparison of the probability distribution of B/B_{MSY} of yellowfin tuna for the current period (top panel) and for a five year projection period (bottom panel). The probability (expressed as a percentage) of $B/B_{MSY} < 1$ (i.e. overfished) at each time period is presented on each figure.

Further considerations for bigeye and yellowfin tuna

155. The Scientific Committee reviewed the data collected on "other commercial fisheries". Available data indicate that the annual catches from these fisheries have represented 14–22% of the total bigeye catch and 29–38% of the total yellowfin catch in the Convention Area during 2001–2005. The Scientific Committee noted the need for more specific information concerning the needs of the Commission with regard to formulating advice on specific management measures for these fisheries. The Scientific Committee recommended that the Executive Director should liaise with the Scientific Service Providers to formulate some technical guidance to the Commission on the subject of purse-seine closures.

Skipjack tuna

Status and trends

156. No new assessment was conducted for skipjack in 2006 so there was no basis to modify the conclusions from 2005. The 2005 stock assessment indicates that for the skipjack stock in the WCPO over fishing is not occurring ($F_{current}/F_{MSY} < 1$), that the stock is not in an overfished state ($B_{current}/B_{MSY} > 1$), and that exploitation is modest relative to the stock's biological potential.

Management advice and implications

157. Catches increased in 2005 from their previous historical high in 2004. These high catches are sustainable unless recruitment falls persistently below the long-term average. However, any increases in purse-seine catches of skipjack tuna may result in a corresponding increase in fishing mortality for yellowfin and bigeye tunas.

South Pacific albacore

Status and trends

158. A full stock assessment was not undertaken for South Pacific albacore in 2006, but the 2005 assessment was updated using new data for 2004 and 2005. The key conclusions were similar to those of the 2003 and 2005 assessments, that is, that overfishing is not occurring ($F_{current}/F_{MSY} <1$) and the stock is not in an overfished state ($B_{current}/B_{MSY} >1$). Overall, fishery impacts on the total biomass are low (10%), although considerably higher impacts occur for the portion of the population vulnerable to longline. The model estimates that recent recruitment is below average and, consequently, the portion of the population vulnerable to longline is predicted to decline further in the next two to three years. The assessment conclusions were relatively insensitive to a range of different assumptions regarding the key biological parameters included in the model, although the analysis highlighted the need to refine some of these key parameters.

Management advice and implications

159. The key management implications are unchanged from the 2005 assessment. Current catch levels from the South Pacific albacore stock appear to be sustainable and yield analyses that suggest that increases in fishing mortality and yields are possible. However, given the age-specific mortality of the longline fleets, any significant increase in effort would reduce CPUE to low levels with only moderate increases in yields. CPUE reductions may be more severe in areas of locally concentrated fishing effort.

Swordfish in the southwestern Pacific Ocean

Status and trends

160. The swordfish stock assessment covers the southwestern Pacific Ocean (0–50^0S, 140–175^0W) for the period 1952–2004. Since 1997, catch rates and mean size of swordfish have been declining in the core areas of the fishery, raising concerns about the biological and economic sustainability of the fishery. The status summary is based upon the results from a subset of 10 models (the most plausible ensemble) selected from several hundred examined to represent model uncertainty. The most reliable reference points are the relative changes in total stock biomass, which predict that the total stock biomass in 2004 was between 56% and 74% of the biomass in 1995. The model predicts that total biomass in 2004 was between 31% and 69% of the unfished level, and that spawning stock biomass in 2004 was between 15% and 65% of the unfished level. Most projections undertaken using 2004 effort levels predicted further declines in biomass over the next five years.

161. Model uncertainty and estimated variability in the stock-recruitment relationship undermined the usefulness of the maximum sustainable yield (MSY)-related reference points. However, in so far as these reference points have been calculated, the majority of estimates from the plausible model ensemble suggest that total biomass and spawning biomass are probably above levels that would sustain MSY and fishing mortality is probably below F_{MSY}. Nevertheless, the results also indicate the possibility that the stock may currently be in an overfished state and that overfishing may be occurring (Fig. 12).

Management advice and implications

162. The Scientific Committee reviewed the first regional assessment undertaken for swordfish in the southwestern Pacific region. Although the estimates of stock status relative to standard biological reference points (e.g. B_{MSY}) cannot identify whether the stock is presently overfished or not, this assessment has indicated consistent declines in stock abundance in recent years, and most model projections predict further declines at current levels of fishing mortality. Until estimates of stock status are more certain, the Scientific Committee recommended as a precautionary measure that there be no increases in fishing mortality on this stock, as this is likely to move the stock towards an overfished state.

163. This recommendation applies particularly to the area encompassing the western component of the southwest Pacific as these fisheries account for most of the swordfish catch in the southwest Pacific.

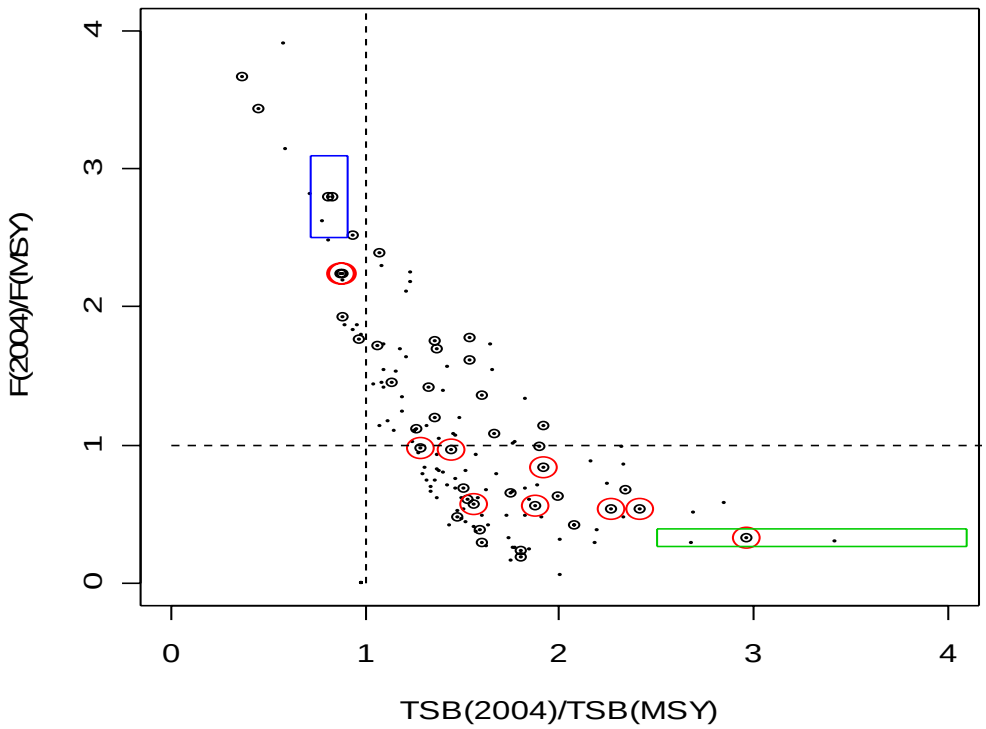

Figure 12. Stock status summary plot for swordfish in the southwestern Pacific Ocean. Points indicate the estimates corresponding to the MULTIFAN-CL models examined. Large (red) circles indicate the most plausible model ensemble used for stock status determination. Example model 1 (vertical blue) and model 2 (horizontal green) are indicated by the large rectangles that encompass the two-dimensional 95% confidence limits (without the correlation).

Northern stocks

164. The International Science Committee (ISC) Chair provided a general summary of the current recommendations for management of the northern stocks and future activities of the ISC. It was noted that the key conclusions for North Pacific albacore remain unchanged in that the stock is considered to be fully exploited. The management measures introduced by both the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC) are consistent with the ISC recommendations. For Pacific bluefin tuna, recent recruitment is estimated to have been at a high level. However, there is a high level of uncertainty in the estimates, so ISC recommended that there be no increase in fishing mortality. A similar recommendation was made for the northern striped marlin stock as an interim measure, until the results are available from the final stock assessment in 2007. Over the next few years, work will be undertaken to develop Pacific-wide assessments for both swordfish and blue marlin.

165. The Scientific Committee noted that as detailed presentations of the relevant stock assessments were not considered by the Scientific Committee, it had no basis to comment upon the substance of the recommendations from the ISC.

Other stocks — stripped marlin

166. The only other stock for which an assessment was presented was striped marlin in the southwest Pacific. This was the first attempt to carry out an assessment for this stock and further improvements of the methods used are expected for future assessments. It was noted that the results should be considered preliminary as there remains significant uncertainty regarding the most important parameters of the model. In the absence of other assessments for this stock the following two paragraphs were developed on the basis of the results of the preliminary assessment.

Status and trends

167. Several of the plausible model scenarios investigated indicate that current levels of fishing mortality may approximate or exceed the reference level F_{MSY} and current spawning biomass levels may approximate or be below the biomass based reference point B_{MSY}.

Management advice and implications

168. On the basis of this preliminary assessment, it is recommended as a precautionary measure that there should be no increase in fishing mortality (i.e. fishing effort) on striped marlin in the southwestern Pacific. This recommendation applies particularly to the area encompassing the Coral Sea and the Tasman Sea as these fisheries account for most of the striped marlin catch in the southwest Pacific.

AGENDA ITEM 5 — BYCATCH MITIGATION

Seabirds

169. The Chair reviewed the requests from the Commission wth respect to seabirds (Resolution 2005-01) and information on seabird mitigation measures of other regional fisheries management organizations (RFMOs) (SC2 GN IP-3). In response to Resolution-2005-01, as an initial measure to reduce seabird bycatch by longline fishing vessels operating in the Convention Area, the Scientific Committee recommended the following:

Recommendation 1: seabird bycatch mitigation

9. All longliners should thaw their bait before it is deployed.

10. In addition, south of 30ºS and north of 23ºN, CCMs should require their longline vessels to use at least two of the mitigation measures presented in Table 1, including at least one from Column A.

Table 1. Recommended mitigation measures*

Column A	Column B
Side setting with bird curtain	Tori line[5]
Night setting with minimum deck lighting	Weighted branch lines
Tori line	Blue-dyed bait
	Deep setting line shooter
	Bait caster
	Underwater setting chute
	Management of offal discharge

*If accepted by the Commission, detailed definitions and specifications of each measure would need to be developed.

11. In other areas, where necessary, CCMs are encouraged to employ one or more of the seabird mitigation measures listed in Table 1.

12. Other mitigation measures may be tested under bona fide research programmes.

13. Every effort should be made to ensure that seabirds captured alive during longlining are released alive and that whenever possible, hooks are removed without jeopardising the life of the seabird concerned.

14. CCMs are encouraged to seek feedback from fishers and observers on the effectiveness and practicality of mitigation measures.

15. These measures should be reviewed regularly, particularly when information becomes available on new or existing measures or on seabird interactions from observer or other monitoring programmes. An updated suite of recommended measures should then be considered.

16. To the extent possible, CCMs should endeavour to harmonize their National Plan of Action with these measures.

Recommendation 2: improved data collection and research programme

Data collection

170. Objective: to identify areas of spatial and temporal overlap of seabird species and fishing effort (areas of high and low interaction rates for seabirds) so that CCMs can target mitigation measures in areas where they will be most needed.

171. Activity: Improved Observer Programme

3) Coverage:

To adequately characterize rare events, up to 100% observer coverage may be required statistically. But bearing in mind the practicalities involved, the programme should:

a. Initially be spatially and temporally representative of each fishery operating in the Convention area. Given diminishing benefits of greater coverage, the programme should aim to observe 20% of the fishing effort over a two-year period. As a practical matter, however, a sudden increase to this level (from the current level of 0.5%) is unlikely to occur, as a result, the ST-SWG recommended that initially a minimum of 5% of the fishing effort be observed. When areas of greater importance are found, the observer programme may be restructured to optimize coverage in these areas.

b. If the operation requires the observer to work below deck, in order to ensure that both fishery data, as well as seabird and turtle catches, are quantified within a statistically correct framework, at least 50% of all hooks should be observed during the haul. The observer must report the portion of the haul that was monitored.

4) Data to collect:

a. Cross-check the SPC observer manual and data sheets with other RFMO and national programmes to ensure that all the necessary data collection details are included (to be addressed through the ST-SWG recommendation on observer data (ST-SWG report, paragraph 30 (a)).

Although these will be addressed through the ST-SWG's recommendations, the data elements for observers on longliners required to ensure that the objectives of the Data Collection and Research Programme are met, should include:

- gear (e.g. branch line length, light sticks, bait type)
- operational (e.g. time of set, position)
- seabird catch (e.g. number and species caught)
- seabird abundance estimate (e.g. number of seabirds around the vessel)
- use and effectiveness of mitigation measures (e.g. tori lines)

b. Ensure standardized data collection and clearly specify programme priorities for observer monitoring of seabird catches, interactions during hauling and setting, and mitigation measures.

Research programme

172. Objective: Reduce the capture and injury of seabirds by fishing gear. Research into mitigation directed at ensuring fewer seabirds are caught should continue to focus on the development and implementation of effective mitigation measures.

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[5] If tori line is selected from both Column A and Column B this equates to simultaneously using two (i.e. paired) tori lines.

1. Encourage parties to conduct experimental tests of mitigation measures, and to develop appropriate measures for particular fisheries and areas. In particular, the benefits of offal discharge management and mitigation measures during the haul need to be investigated.

2. Quantify the survival rates of released birds (e.g. bird banding).

3. Conduct industry education and training:

    c. CCMs should be responsible for providing training to fishers on seabird identification, handling and release, including provision of a manual on seabirds (which would include information on mitigation, identification, handling and release). This may facilitate fishers assisting in data collection.

    d. Self-reporting (logbook reporting) of seabird identification and release condition (alive, dead, how hooked, gear remaining on seabird).

    e. Commission should make available existing education material which CCMs could use to provide information to their fishers on how to reduce captures and mortality of seabirds.

173. Cooperation: Given the distribution of albatrosses and petrels across regions and ocean basins, the Secretariat is encouraged to collaborate with relevant RFMOs (e.g. IATTC and the Commission for the Conservation of Southern Bluefin Tuna – CCSBT) and other organizations (e.g. the Agreement on the Conservation of Albatrosses and Petrels, and the Commission for the Conservation of Antarctic Marine Living Resources) to address seabird bycatch issues.

174. In response to the request from the second regular session of the Commission for estimates of seabird mortality in the Convention Area (Resolution-2005-01, paragraph 3), the Scientific Committee noted that several CCMs included estimates of seabird interactions (including catches) in their Annual Reports to the Scientific Committee. Without the recommended expansion in observer coverage, however, the Scientific Committee was unable to develop reliable estimates of seabird mortality in the Convention Area. Consequently, the Scientific Committee deferred responding to the request for estimates of seabird mortality until the next Scientific Committee meeting.

Sea turtles

175. The Chair reviewed the requests from the Commission with respect to sea turtles and also the WCPFC resolution on sea turtles (Resolution-2005-04). The Chair also reviewed the IATTC Resolution (C-04-07) on a three-year programme to mitigate the impact of tuna fishing on sea turtles. The Chair also noted information papers EB IP-8 and EB IP-10.

176. The Scientific Committee reviewed the draft Sea Turtle Data Collection and Research Programme, provided by the small working group on turtles, which was based on discussions in the EB-SWG. The Scientific Committee then recommended the following to the Commission with respect to sea turtles:

Recommendations

177. The Scientific Committee recommended that the Commission adopt the proposed sea turtle data collection and research programme (Attachment M).

178. Advice on circle hooks:

1. New information presented at the EB-SWG confirms previous understandings of the efficacy of circle hooks in reducing hook ingestion by sea turtles and the efficacy of large sized circle hooks in reducing turtle bycatch.

2. Some of the new results have indicated variations in catch rates with some sizes of circle hooks (e.g. reduced target species catch rates). This is also similar to previous findings.

3. The magnitude of impacts on sea turtle bycatch and target species catch varies between the studies conducted to date.

4. Notwithstanding the above, results presented to the EB-SWG clearly show that a specifically designed management regime employing sea turtle bycatch mitigation measures, such as circle hooks and fish baits, applied to a fishery sector with a turtle bycatch problem can substantially reduce sea turtle bycatch while maintaining viable target species catch rates.

179. Advice on sea turtle mitigation: Based on the above, and information that other measures (e.g. fish bait, deep setting) may also reduce turtle bycatch, the Scientific Committee recommends that the Commission adopt a flexible approach to sea turtle bycatch mitigation based on scientific experiments/observations testing a range of mitigation techniques to determine the appropriate mitigation measures for a particular fishery.

Juvenile bigeye and yellowfin tuna

180. David Itano (USA) presented some background information on juvenile bigeye and yellowfin tuna bycatch. It was noted that the directive from the Commission to the Scientific Committee (Conservation and Management Measure-2005-01) was specific to the evaluation of mitigation measures for juvenile bigeye and yellowfin tuna taken around FADs.

181. Discussion covered various options to reduce the catch of juvenile bigeye and yellowfin tuna, including various scenarios of catch and effort reduction (including time–area closures and FAD-specific effort reduction), research on acoustic selectivity and aggregative behavior on FADs and input controls of fishing gear and practices. It was suggested that research should be focussed on mitigation studies related to selectivity, targeting and tuna behaviour, and statistical analysis of effort reduction scenarios.

182. Further discussion in this session is documented in full in Attachment N. The following recommendations were developed by the meeting and adopted by consensus.

Recommendations

183. The Commission's Science Service Provider should review spatio-temporal aspects of catches of juvenile bigeye and yellowfin tuna caught in association with FADs and refine

analyses of potential management options that the Commission might adopt in order to reduce such catches, including cooperation with other RFMOs to identify appropriate mitigation measures.

184. CCMs should continue research into acoustic selectivity to avoid juvenile bigeye and yellowfin as well as research into the vertical distribution and residence time of juvenile bigeye and yellowfin tuna on FADs.

185. CCMs should ensure that relevant information (relevant to mitigation based on gear and operational modes) is being collected through observer programmes and port sampling, and submitted to the Commission in order to assess the impacts of FADs and other technological aspects on catches of juvenile bigeye and yellowfin.

Other fish and non-fish bycatch

Sharks and other species

186. The Scientific Committee reviewed presentations on the analysis of pelagic shark CPUE data collected by research and training vessels, and on the effects of hook type (tuna hook vs circle hook) on pelagic longline catches of blue sharks. It was noted during the EB WP-1 presentation on productivity susceptibility analysis (PSA), that most shark species are ranked as high risk species due to their low productivity, high encounter rates with fisheries, and low rates of live discards. Conservation measures that prohibit the removal of fins from live-landed sharks (when the trunk is not retained) could result in a 30% decrease in fishing mortality on sharks.

Recommendations

187. The Scientific Committee endorsed the Ecological Risk Assessment exercise in general, and the PSA in particular, as an appropriate way to assist the Commission in prioritizing species for management action or further research. There was agreement to further refine the PSA risk assessment approach and to encourage members to further develop this approach.

188. The Commission should develop a dedicated shark research programme to support stock assessment of shark species that rank highly in the Ecological Risk Assessment, in cooperation with other RFMOs. Alternative methods of analysis other than stock assessment should also be explored.

189. The Commission should develop long-term data collection, monitoring and research programmes dedicated to all species identified as higher risk in the productivity–susceptibility analysis.

AGENDA ITEM 6 — DATA AND INFORMATION

Observer programmes

190. The Scientific Committee considered five recommendations on observer programmes agreed on by the ST-SWG on the following topics:

1. objectives (longline and purse seine);

2. objectives (other methods);

3. initial minimum coverage;

4. coverage required to address specific issues of concern; and

5. data collection requirements (longline and purse seine).

191. The Committee endorsed these recommendations together with accompanying notes, as follows.

Scientific priorities and objectives of the regional observer programme

192. Recommendation: Objectives (longline and purse seine): There are five scientific objectives that should be considered in the development of the regional observer programme, all of which are high priority:

1. Record the species, fate (retained or discarded), and condition at capture and release (e.g. alive, barely alive, dead, etc.) of the catch of target and non-target species; depredation effects; and interactions with other non-target species including species of special interest (i.e. sharks, marine reptiles, marine mammals and sea birds);

2. Collect data to allow the standardisation of fishing effort, such as gear and vessel attributes, fishing strategies, the depths of longline hooks, FAD use and setting activities of purse seiners, and other factors affecting fishing power;

3. Sample the length and other relevant measurements of target and non-target species;

4. Sample other biological parameters, such as gender, stomach contents, hard parts (e.g. otoliths, first dorsal bone), tissue samples and collect data to determine relationships between length and weight, and processed weight and whole weight;

5. Record information on mitigation measures utilised and their effectiveness.

193. Recommendation: Objectives (other methods): The Secretariat commissions the drafting of objectives and priorities for data to be collected by observers for fisheries other than purse seine and longline, for consideration of the ST-SWG at its next meeting.

Level of observer coverage

194. Recommendation: Initial minimum coverage: The objective of the regional observer programme should initially be to attain a minimum coverage of 5% of fishing effort (longline: total hooks deployed; purse seine: days fished and searched) across all strata to allow identification of specific issues. The distribution of observer effort is to be representative of species of interest, fishing areas, seasons, and fishing fleets (types).

195. Note: Initial minimum coverage: The initial coverage will not deliver on all possible objectives. For example, 5% coverage may not be adequate to reliably quantify the incidental catch of sea turtles and seabirds.

196. Note: Area: The Scientific Committee clarified that it was developing recommendations for observer coverage over the Convention Area.

197. Recommendation: Coverage required to address specific issues of concern: The data collected from initial levels of coverage should be used to further determine the levels of coverage required to address specific issues of concern to the Commission. For example, coverage rates may need to be higher in certain areas or circumstances to obtain reliable estimates of the catch of some species (e.g. seabirds, sea turtles, marine mammals) or species populations that are particularly vulnerable, for fisheries for which information is currently unavailable, and for other specific issues of concern to the Commission.

198. Note: Seabirds and sea turtles: The more detail on and recommendations for observer coverage of seabirds and sea turtles have been provided under Agenda Item 5.

199. Note: Process for implementation of the regional observer programme: In discussions on the process for the implementation of the regional observer programme, it was noted by the Executive Director that the institutional structure for the regional observer programme was still in the process of being developed. It was agreed that consideration by the ST-SWG of the process for the implementation of the regional observer programme should be deferred.

Data collection requirements

200. Recommendation: Data collection requirements (longline and purse seine): That the Secretariat develop a draft list of fields of data that observers should collect, for consideration at the next meeting of the ST-SWG.

201. Notes: Nature of regional observer programme

1. That the Convention states that the programme should be coordinated, to the maximum extent possible, with other regional, subregional and national observer programmes.

2. That the Commission has previously agreed to proceed with the hybrid option recommended by PrepCon Working Group 1 and identified in WCPFC/TCC1/14.

3. That the Technical and Compliance Committee has previously agreed that with regard to the hybrid approach. This approach would incorporate components of the "CCAMLR approach" and the use of existing sub-regional observer programmes. Under this approach Commission Members would be free to choose the source of observers from either the national observer programmes of other members or from the existing sub-regional programmes.

4. That the Convention states that the regional observer programme shall consist of independent and impartial observers authorised by the Secretariat of the Commission. The programme should be coordinated to the maximum extent possible with other regional, subregional and national observer programmes.

Data confidentiality, security and dissemination

Recommendations

202. The Scientific Committee discussed the work of the Ad Hoc Task Group (data) and endorsed the recommendations of the Ad Hoc Task Group (data) that:

1. The Executive Director, in collaboration with the Chair of the Commission and officers of its subsidiary bodies, develop a framework for access to non-public domain data by CCMs. The framework may include, *inter alia,* guidelines for access to different data types, the possibility of standing authorizations, compliance with the Commission's policy for the provision of data and a mechanism for resolving disputes.

2. The Executive Director should be tasked with developing a Data Request Form and Confidentiality Agreement to be used in association with the rules and procedures for the access to and dissemination of data compiled by the Commission. The Executive Director shall be responsible for reporting the logs of requests for public and non-public domain data. The Executive Director will submit a draft of the Data Request Form and Confidentiality Agreement for adoption by the Commission.

3. Pending comments from the Technical and Compliance Committee, the Commission adopt the Draft Rules and Procedures for the Access to and Dissemination of Data Compiled by the Commission (Attachment G of the Summary Record of the Ad Hoc Task Group [data]).

4. The Secretariat proceeds with further development of an Information Security Policy, based on ISO17799 Information Security Management Standards.

5. The Secretariat is allocated sufficient resources to further develop and implement the Information Security Policy.

Indonesia and Philippines Data Collection Project (IPDCP) update and review

203. The Chair of the Standing Committee of the IPDCP briefly presented a summary report of the two sessions of the third Steering Committee meeting, held on 4 and 8 August 2006, in Manila, Philippines, during the second regular session of the Scientific Committee (Attachment O).

204. The main issue discussed was the status of financial contributions. An amount of $140,000 was contributed from Chinese Taipei, New Zealand and the United States for the IPDCP for port sampling and surveys in the Philippines for 2005 and 2006. An additional contribution of $40,000 — confirmed at the second regular session of the Commission in 2005 — is anticipated from France. However, this addition from France is not enough to pay for the two-year activities in Indonesia ($100,000 required).

205. The Chair of the Steering Committee recalled the discussion during the ST-SWG meeting that the Executive Director advised of the possibility of obtaining funds from the Global Environment Facility (GEF) for data collection and governance in Indonesia, the Philippines and Vietnam. However, it was noted that it may take 18–24 months to secure those funds.

206. Chinese Taipei encouraged new donors to make contributions to the project. The Scientific Committee has endorsed three recommendations submitted from the Steering Committee on the issue of funding.

207. Regarding the review of IPDCP activities in the Philippines, the Steering Committee was satisfied with the two years of fishery monitoring that has been conducted in the Philippines. That information has been used to improve catch estimates from the country. The Steering Committee

also noted that, through this project, the Philippines has been developing a logbook system for implementation on purse seiners and that this should occur next year.

208. With regard to IPDCP activities in Indonesia, it was noted that a review of the tuna fisheries and statistical systems in Indonesia was recently been carried out by Craig Proctor of Commonwealth Scientific and Industrial Research Organization (CSIRO) in Hobart, Australia, and Budi Nugraha of the Research Centre for Capture Fisheries (RCCF) in Jakarta. The Scientific Committee held a workshop in Indonesia (from 27 to 28 November 2006) to consider recommendations on improvements to the statistical systems in Indonesia. This workshop may also be useful in assisting the development of the possible GEF project.

209. There was a short presentation on the review of the eastern Indonesian tuna fisheries from Wudianto, the new director of the RCCF in Indonesia.

Recommendations

210. The following recommendations on the issue of funding were endorsed by the Scientific Committee.

1. The Steering Committee recommended that the Executive Director continue to liaise with GEF, Indonesia, the Philippines and Vietnam to develop a data collection and governance project for those countries.

2. Noting that GEF funding, if forthcoming, would not be available for 18–24 months, the Steering Committee recommended that CCMs continue to be invited to contribute, as soon as possible, an additional $100,000 to support the project in Indonesia from 2007–2008.

3. Concern was expressed with respect to the continuity of the collection of data in Indonesia, the Philippines and Vietnam, given that catches from this area represent about 30% of the catch in the Convention Area and that the lack of data has been a primary source of uncertainty in assessments of the stocks of tuna. In this regard, it was recommended that the Commission provide funding support to the IPDCP through the core budget.

Tagging initiatives

211. Information was presented on the new SPC/National Fisheries Authority (NFA) tagging initiative in PNG (SC2 GN WP-11). The project is intended to represent Phase I of a new Regional Tuna Tagging Project. Two three-month-long tagging cruises will be undertaken in PNG from August–November 2006 and from March–June 2007. The project is designed to provide information on a range of questions relating to skipjack, yellowfin and bigeye tuna, including small- to large-scale movement, behaviour in relation to FADs, and exploitation rates. The project will provide information pertinent to regional stock assessment, as well as management of tuna fisheries in PNG. The project is aiming to release 30,000 conventional tags, 300 archival tags, and 300 acoustic tags and associated FAD monitors in PNG. A pole-and-line vessel from Solomon Islands (F/V *Soltai # 6*) has been chartered to carry out this work. The vessel began working in PNG waters on 14 August 2006. John Hampton of SPC's OFP, invited cooperation from national agencies in the return of tags, noting that arrangements for tag return mechanisms are well advanced. He also thanked those donors that had contributed to the project, including PNG's NFA, NZAID, the Australian Centre for International Agricultural Research

(ACIAR), the Pelagic Fisheries Research Programme, the French Pacific Fund, European Commission, and the Global Environment Facility.

212. The Scientific Committee was requested to consider the role of the Commission in extending this project to a Phase II, which potentially could undertake tuna tagging throughout the Convention Area.

213. The Chair indicated enthusiasm and support for the beginning of this important research initiative and called for discussion on the presentation. The high proportion of skipjack tuna in the anticipated tag release strategy was queried in light of the priorities regarding juvenile bigeye and yellowfin tuna, especially their association with FADs. It was noted during the presentation that efforts would be made to maximize bigeye tag releases through special fishing techniques or night fishing, but it was anticipated that skipjack would be readily available and would be tagged in considerable numbers. Also, the skipjack stock assessment is more dependent on tagging data than the other species assessments; therefore, this work could be seen as a good investment.

214. The level of recaptures and subsequent budget for tag rewards might be expected to be as high as 20% with an anticipated conventional tag release target of 30,000 fish. It was explained that the tagging work will provide information on recent fishing mortality that will be useful for estimating recruitment into the fishery.

215. It was noted that tag recovery and reward mechanisms were a key component of any successful tagging project and that CCMs have been, or would be, contacted during the meeting to foster collaboration. It was also noted that the project will benefit from the experience and contacts of Tony Lewis and David Itano, who have been contracted to support the planning and fieldwork of the project.

216. With respect to funding, it was noted that it has not been necessary to seek funding support from the Commission for the PNG work due to the generous contributions of many CCMs and other sources. However, this project is seen to be Phase I of a new WCPO tagging initiative that is hoped to be expanded across the region.

217. Expansion of tagging work into Phase 2 (to address a larger region) will require Commission and other inputs. It was noted that the Japan National Research Institute of Far Seas Fisheries has indicated an interest in participating in Phase 2 and the IATTC fully supports linking efforts in coordination with Pacific-wide tagging efforts. It was suggested that a Project Steering Committee be formed from the second Scientific Committee meeting participants in order to further the planning and identification of funding for expansion of this tagging work into a wider-scale project. The Chair suggested that the Scientific Committee endorse the formation of a Project Steering Committee to plan the next phase of tagging for presentation to the Commission.

218. It was noted that SPC would likely be able to commit one-third to one-half of these required funds through projects already funded or expected to be funded in the near future.

219. It was also noted that collaboration in tag release and return with national agencies and with the IATTC would be essential elements of Phase II.

Recommendations

220. The Scientific Committee noted its strong support for the Phase 1 component of the Regional Tuna Tagging Project in PNG. The Scientific Committee recommended that:

- The Commission endorse the Phase II extension of the tagging project as a Commission-sponsored research project;
- A Steering Committee be established to plan the Phase II component of the project; and
- A voluntary fund be established by the Commission to encourage CCMs to provide the necessary funding for the project.

AGENDA ITEM 7 — COOPERATION WITH OTHER ORGANIZATIONS

221. The Executive Director provided an overview of the paper GN WP-6, which had been prepared by the Secretariat. In the overview, the Executive Director advised that the Secretariat was implementing collaborative arrangements with a number of like-minded organizations. The majority of these arrangements were memoranda of understanding (MOUs), detailing the sharing of information and/or ways in which the Commission could collaborate with other parties to achieve mutual benefits.

Technical and Compliance Committee

222. The Executive Director recalled numerous discussions in which a mechanism for collaboration between the Scientific Committee and Technical and Compliance Committee had been discussed. It was suggested that the Chair of the Scientific Committee should attend the Technical and Compliance Committee meetings, and that the Chair of the Technical and Compliance Committee should attend Scientific Committee meetings in the future for the purpose of developing collaborative approaches.

223. The Scientific Committee supported this position as such an approach would provide a focal point for the Scientific Committee to contact the Technical and Compliance Committee on matters of relevance and vice versa.

IATTC

224. At the 74th annual IATTC meeting the MOU between WCPFC and IATTC was endorsed by the IATTC. The MOU will be presented to the third regular session of the Commission in December 2006 for final consideration prior to signing.

225. China proposed that, because bigeye was a species of common interest between IATTC and WCPFC, the MOU should incorporate data exchange on this species. The point was also raised that this data exchange could extend to marlin and shark species of common interest. Members were advised that SPC and IATTC currently exchange data, and ongoing discussions are undertaken on ways to improve data exchange.

ISC

226. A draft MOU between WCPFC and ISC has been prepared. This draft was discussed at the ISC session in La Jolla in March 2006. The recommendation of the meeting was that the amendments incorporated at that meeting be referred to the Northern Committee for final consideration before being presented to the third regular session of the Commission for final endorsement at Apia in December 2006.

SPC

227. It was noted that a draft schedule of work for implementation under the MOU between WCPFC and SPC in 2007 was available for review. The Executive Director invited members to provide comments on the MOU and the work schedule. No comments for incorporation into the MOU for consideration at the Commission meeting in Apia in December were received.

CCSBT

228. Members of the Scientific Committee were asked for comments for consideration by the Commission when reviewing the MOU between WCPFC and CCSBT at the third regular session of the Commission in Apia in December 2006. No comments were provided.

SPRFMO

229. The Scientific Committee was asked if there were any areas of potential interaction and cooperation with the future proposed new RFMO for straddling fish stocks and discrete high seas fish stocks in the South Pacific Ocean. Chinese Taipei advised that its fleet undertook extensive fishing operations in the area south of 30^0S latitude, and as such, would be involved with the new RFMO. All members undertaking fishing operations in this area were encouraged to become involved in the activities of the new RFMO.

FAO

230. Sachiko Tsuji provided an overview of the FAO Coordinating Work Party (CWP) on Fish Statistics. The CWP has three objectives:

1. Review requirement for fishery statistics in research, policy and management;

2. Provide information to support standard concepts, definitions and interpretations; and

3. Coordinate activities and avoid duplication.

231. A brief overview of the Fishery Resource Monitoring System (FIRMS) as a global inventory of resources was also provided. FAO encouraged active participation from WCPFC in both the CWP and FIRMS.

232. It was noted that FIRMS only deals with publicly available or published information and does not have links to background data or statistics. Therefore, issues relating to data sensitivity and confidentiality are less likely to be a significant impediment to participation. There was also general discussion about whether formal involvement in FIRMS may be too resource intensive, noting that the WCPFC is still in its infancy.

Recommendations

233. The Scientific Committee recommened to the Commission that the Executive Director attend the CWP meeting in March 2007 with a view to providing advice to the third regular session of the Scientific Committee as to whether more formal, ongoing involvement would be beneficial and achievable.

234. The Scientific Committee recommended that the Commission develop MOUs with ACAP, SPREP, CCAMLR and the Indian Ocean Tuna Commission (IOTC).

AGENDA ITEM 8 — CONSIDERATION OF THE SPECIAL REQUIREMENTS OF DEVELOPING STATES AND PARTICIPATING TERRITORIES

Special Requirements Fund

Review of 2005/2006 activities

235. The Executive Director informed the Scientific Committee that the current balance of the fund is $35,266 and there have been no contributions to the fund in 2005/2006.

236. SPC's OFP informed the Scientific Committee that it held a stock assessment workshop for small island developing states and territories, in July, in Noumea, New Caledonia. The workshop was identified as an activity to be funded by the special requirements fund in 2006; however, owing to insufficient funds within the special requirements fund, the workshop was instead funded through GEF's Pacific Islands Oceanic Fisheries Management Project. The workshop was a successful and very useful capacity-building exercise for small island developing states and territories.

237. At the second regular session of the Commission, Pacific Islands Forum Fisheries Agency (FFA) members informed the Commission that they would prepare a strategy to guide the capacity building work of the Commission for developing states and territories that would be supported by the Special Requirements Fund. To meet this commitment the FFA secretariat has contracted consultants to prepare a discussion paper that will be presented at a meeting of the Forum Fisheries Committee (FFC) in October 2006. It is anticipated that the FFC will subsequently lodge a paper dealing with this issue at the WCPFC Secretariat.

238. Pending the adoption of a strategy for the capacity building work of the Commission for developing States and territories that would be supported by the Special Requirements Fund, FFA members noted that the priorities with respect to data and scientific research as provided in the report of the first regular session of the Scientific Committee remain valid.

Advice and recommendations to the Commission

239. The Scientific Committee recommended that stock assessment workshops for small island developing States and territories, similar to the workshop conducted by SPC-OFP in July 2006, should be continued in the future, beginning in 2007. These sorts of workshops should be the types of projects that the Commission should fund through the special requirements fund. The Scientific Committee urged further contributions to the special requirements fund.

Other matters

240. No other matters were raised.

AGENDA ITEM 9 — FUTURE WORK PROGRAMME

Research plan for the Scientific Committee

241. The Scientific Committee reviewed the Strategic Research Plan 2007–2011 for the Scientific Committee (Attachment P) and recommended it be submitted to the Commission for approval.

2007 work programme

242. The Scientific Committee recommends to the Commission the following work programme and budget (Table 2).

Table 2. 2007 work programme and budget. Core funding is shown against high priority items (#1) on the basis that only $250,000 indicative funding will be available in 2007 (indicative funding of $375000 will be available in 2008). Additional funding for other high and lower priority items will need to be obtained from other sources.

Strategic Research Priority/Research Activity or Project	2007 funding required		2008 funding required		Priority	Comments
	Core	Other	Core	Other		
Collection, compilation and verification of data from the fishery						
Data management services (SPC-OFP services)	$139,000	$1,000,000	$146,000		1	Total costs based on SPC costs of employing 1 scientific position plus travel, computer support. "other funding" currently secured by OFP
Develop a draft list of data fields that observers should collect for longline and purse seine, for consideration at the 2007 meeting of the ST-SWG					1	Costs included in SPC-OFP services
Indonesian and Philippines Data Collection Project (including FAD related studies)	30,000		100,000		1	College of Fisheries and Ocean Sciences, University of the Philippines in the Visayas, Miag-ao, Iloilo, Philippines
Rescue of historical commercial catch data from the Philippines [and Indonesia and Vietnam]	15,000		15,000		1	
Develop a draft list of objectives and priorities for data to be collected by observers for fisheries other than purse seine and longline, for consideration at the 2007 meeting of the ST-SWG					2	Costs included in SPC-OFP services

Publication and distribution costs for reproducing materials developed by the FT-SWG in languages useful for the Scientific Committee		5,000			2	
Quantification of changes in fishing efficiency due to changes in fishing gears and fish finding technologies					2	Used to assess changes in fishing power over time for incorporation in CPUE standardisation analyses. SPC-OFP services, as time allows.
Quantification of changes in longline selectivity due to changes in gears and patterns of deployment					2	Used to model changes in selectivity over time required in MFCL assessment models. SPC's OFP services as time allows.
Undertake a study to develop a database that clearly defines vessel and gear attributes and operational details.		10,000			3	
Sub-total (non SPC-OFP services)	45,000	15,000	115,000			
Monitoring and Assessment of Stocks						
Stock assessment and modeling						
Detailed stock assessments for selected stocks (SPC-OFP services)	139,000	500,000	146,000		1	Total costs based on SPC costs of employment of 1 scientific position plus travel, computer support. "Other funding" currently secured by OFP.
Continued refinement of stock assessment models	30,000		30,000		1	Includes refinement of models to standardise CPUE. Costs included in SPC-OFP services.
Exploration of sensitivity of assessment outcomes to structural assumptions in models					1	This work would also include the development of better diagnostics to more objectively determine plausible model structure. Costs included in SPC-OFP services.
Investigation of alternative stock status reference points	10,000				2	Includes identification of appropriate target and limit reference points.

Development of an appropriate index of abundance for region 7					2	Needed to index the time-series of recruitment in MFCL assessment models. Costs included in SPC-OFP services.
Development of recruitment indices independent of the MFCL model					2	Required to index recruitment in stock assessment models. Currently funded SPC-OFP project.
Biological studies						
Ongoing and newly funded research with sonic and archival tags in Hawaii, PNG and other areas					1	Currently funded SPC-OFP and University of Hawaii projects
Comprehensive study of bigeye tuna reproductive biology	0	40,000		40,000	1	
Supply TDRs and hook timers to regional observer programmes (48 TDRs @ $600 ea, 400 hook timers @ $45 ea)	50,000				1	
Better determination length-weight relationships for the principal target species		5,000			3	Includes investigation of possible spatial-temporal differences and required for input into MFCL assessment models.
Tagging studies						
Contribution to Regional Tuna Tagging Project		500,000		1,500,000	1	Voluntary funding contributions from CCMs, SPC projects provide equivalent level of support. In kind support from CCMs and IATTC desireable.
Sub-total (non SPC-OFP services)	60,000	545,000		1,540,000		
Monitoring and assessment of the ecosystem						

Ecological Risk Analysis (including PSA)	100,000		100,000		1	Detailed analyses of high risk spp from PSA analysis. Level 1 in 2007 and Level 2 in 2008, Level 3 dedicated assessments in 2009.
Turtle/sea bird interactions and fishery overlaps	30,000		30,000		1	Desk top study
Seabird and turtle education and extension of fishers		100,000		100,000	1	Includes travel and publication costs
Turtle de-hooking devices		50,000		50,000	1	Half of these funds are for personnel costs, half for equipment
Development/review of models for evaluation of impacts on ecosystem, including development of reference points		100,000		100,000	2	Required to model and assess fishery impacts on the ecosystems
Studies on biology of high risk species		30,000		30,000	2	Scholarships for tertiary study
Turtle population assessments		50,000		50,000	2	Three year project to continue into 2009, involving collation of data eventually leading to quantitative assessments
Survival of hooked and released seabirds		30,000		30,000	2	Will require sourcing external funding for satellite/archival tags
Turtle tagging and associated materials		30,000		30,000	2	Will require sourcing external funding for satellite/archival tags. Conventional tags can probably be obtained at little or no cost from SPREP
Offal discards and haul-back mitigation studies		250,000		250,000	3	
Sub-total	130,000	640,000	130,000	640,000		

Evaluation of management options						
Continued development of methods to evaluate potential management strategies, including MSE development and uncertainty		100,000		100,000	1	Required to evaluate efficacy of candidate management options. Current evaluation of options included in SPC-OFP services. Additional funding required to development comprehensive MSE framework.
Sub-total		100,000		100,000		
GRAND TOTAL (non SPC-OFP services)	265,000	1,300,000	345,000	2,280,000		
SPC-OFP	278,000	1,500,000	292,000			
Independent Review of Science Structre and Function	80,000					WCPFC Core Budget
Information Security Policy	15,000		25,000			

AGENDA ITEM 10 — ADMINISTRATIVE MATTERS

Rules of procedure

243. As proposed at the first regular session of the Scientific Committee, the Secretariat provided a draft Rules of Procedure to the Acting Chair of the Scientific Committee intersessionally. The Acting Chair circulated this draft to official Scientific Committee contacts for comment. The Secretariat incorporated the changes and this revised document was provided to the meeting as SC2 GN WP-2. A small working group worked in the margins of the Scientific Committee meeting to provide a revised Rules of Procedure for consideration by the Scientific Committee.

244. Clarification was provided on the process for development and adoption of Rules of Procedure for subsidiary bodies. It was recognized that while the Scientific Committee could develop its own Rules of Procedure, the adoption of these Rules of Procedure for the Scientific Committee was a decision for the Commission.

245. It was noted that the proposed rules, based on those of the Commission, were greatly simplified to allow for more flexibility in the operation of the Scientific Committee and to allow for full participation of all CCMs. While recognizing that some CCMs may have difficulties with Rules of Procedure that include the terms "Chairman and Vice-Chairman", the meeting noted that it is important that the functions of the Scientific Committee not be consumed by bureaucracy, and it would be preferable to some CCMs to have a Chairman rather than a Convenor.

246. Clarification was provided on the role of observers in relation to decision making and drafting of recommendations. It was noted that the Rules of Procedure did not provide for the removal of a Convenor or Vice-Convenor if there was a lack of confidence in that person.

247. Given that the Commission Rules of Procedure would still apply in some instances it was recognized that some careful thought was given to how the Rules of Procedure for the Scientific Committee were structured (e.g. numbered) to avoid confusion when referring to Rules of Procedure.

248. It was noted that while the Rules of Procedure were proposed for the Scientific Committee, they were written in a general manner that would include the other subsidiary bodies of the Commission — the Technical and Compliance Committee and the Northern Committee — as there had been general agreement among participants at the first regular session of the Scientific Committee that it would be good if the Rules of Procedure for the different Commission subsidiary bodies were harmonized as much as possible.

249. However, in noting that these subsidiary bodies have not yet sought to develop their own Rules of Procedure, it was recognised that it was not appropriate to include text referring to these bodies in this draft at this time. Therefore, the text was modified to remove all references to the Technical and Compliance Committee and Northern Committee and was clearly titled "Rules of Procedure for the Scientific Committee".

Recommendations

250. The Scientific Committee recommended that the proposed Rules of Procedure (Attachment Q) be forwarded to the Commission for adoption at the third regular session of the

Commission and also be provided to the Technical and Compliance Committee and Northern Committee for their consideration.

Independent review of the science structure and functions of the Commission

251. The Secretariat presented SC2 GN WP-3, which drew on the advice and recommendations of the first regular session of the Scientific Committee in relation to the scope, terms of reference, and schedule for an independent review of the interim science structure and functions of the Commission. A small working group, which convened during the Scientific Committee meeting in Manila, reviewed and revised the draft prepared by the Secretariat, and subsequently, the Scientific Committee, and adopted the terms of reference and schedule for the proposed review.

Recommendations

252. The Scientific Committee recommended the process, terms of reference, and schedule for the proposed independent review of the scientific structure and functions of the Commission, appended at Attachment R, be forwarded to the Commission for consideration and endorsement.

Future operation of the Scientific Committee

Submission of papers

253. The submission of papers for sessions of the Scientific Committee should be in accordance with the specified timeline (Attachment S). Where possible, working papers should be made available to delegates a minimum of two weeks in advance of the start of the Scientific Committee.

254. All papers, including national fishery reports (Annual Report to the Commission Part 1), submitted to sessions of the Scientific Committee should be accompanied by an abstract that is ready to be incorporated into the Summary Report of the Scientific Committee or SWG reports as appropriate.

255. All papers for the Scientific Committee should address specific requests from the Commission or issues highlighted in the work programme of the Scientific Committee papers should contain specific advice to the Scientific Committee for its consideration.

256. SWG Convenors in consultation with the Chair of the Scientific Committee would have the final say on which SWG will consider each paper, which papers are presented (i.e. working papers), and which are simply provided for information (information papers).

257. The development and use of a file-server or meeting intranet should be further explored by the Secretariat. Such an arrangement during meetings would reduce the amount of paper produced during meetings, would facilitate the centralizing of files, and would provide improved access for all delegates and participants to meeting files, particularly most-up-to-date drafts of text to be considered. This sort of arrangement would rely on internet/intranet access and each CCMs having access to computers. There was also support for establishing a FTP site to enable the downloading of large documents and having mirror sites for the WCPFC website when large amounts of material was being accessed and downloaded just prior to the Scientific Committee. The system used by CCSBT should be considered.

258. The date of each WP (working paper) and IP (information paper) should be clearly marked on each paper as papers are revised.

259. The Scientific Committee had a wide ranging discussion in relation to provision of data to accompany working papers and agreed to consider such matters at a future session of the ST-SWG.

Appointment of rapporteurs and facilitators

260. Where possible, notice of appointment of rapporteurs and SWG facilitator(s) should be given well in advance of the meeting.

Chair's brief

261. For the second regular session of the Scientific Committee the Chair's brief, an expanded annotated agenda for the meeting was included as an official document of the Scientific Committee. An expanded annotated agenda should be included as an official document with an allocated number but the Chair's brief should not be an official document as it may contain some advice to the Chair that would not be appropriate to share with the meeting.

Improving clarity of commission requests to the Scientific Committee

262. The paper on requests from the Commission (SC2 GN WP-7) should be expanded to include reference to the specific agenda items within the Scientific Committee and SWG agendas where the requests from the Commission will be addressed.

263. The Chair of the Commission should be asked to participate for a few days during future sessions of the Scientific Committee to present the requests from the Commission to the Scientific Committee and provide an indication of the Commission's views on the expected outcomes from the Scientific Committee session.

264. The Executive Summary of the Summary Report of the second regular session of the Scientific Committee will be a document that concisely outlines the scientific advice from the Scientific Committee to the Commission.

Arrangements during Scientific Committee sessions

265. During presentation of working papers, presenters should be encouraged in the conclusions to their paper to address the subject of the particular agenda item(s) that their paper relates.

266. CCM national fishery report presentations (of three minute duration, with the opportunity for questions) should be continued, because they are a valuable way for the Scientific Committee to gain information on key trends in each CCM fisheries.

267. Small working groups were a successful way during the second regular session of the Scientific Committee to produce draft text on a particular agenda item.

268. In relation to the conduct of Scientific Committee regular sessions, the Independent Review of the Scientific Structure and Function of the Commission should consider the following:

- How can the Scientific Committee reduce repetition in the consideration of papers and discussions of issues?

- Is there scientific value in technical discussions occurring within a SWG context and broader discussions occurring in the Scientific Committee plenary?

- Do all SWGs need to meet each year?

- Could some of the work of the Scientific Committee be done during sessions dedicated to a particular issue?

2007 provisional budget and 2008 indicative budget for the Scientific Committee

269. This agenda item is incorporated into Table 2.

Next meeting

270. The Scientific Committee recommends to the Commission that the date and venue for the third regular session of the Scientific Committee be 13–24 August 2007 in Pohnpei, Federated States of Micronesia.

AGENDA ITEM 11 — OTHER MATTERS

Commission's Publication Policy

271. The Secretariat presented a draft Publication Policy (SC2 GN WP-5) that was requested by the first regular session of the Scientific Committee. The Secretariat had used the guidance prepared at that session to research the publication policy of related organizations and had prepared estimates for supporting an effective document management process within the Secretariat. With the approval of SPC, that organization's Publication Policy was adopted as a framework for the Commission. FAO had also provided approval to use its style guide for the Commission's publications. The Scientific Committee welcomed the work that had been undertaken and encouraged the Secretariat to finalize the draft Publication Policy.

AGENDA ITEM 12 — ADOPTION OF REPORT

Adoption of the Summary Report and Executive Summary of the second regular session of the Scientific Committee

272. The Summary Report and Executive Summary of the second regular session of the Scientific Committee were adopted by consensus.

AGENDA ITEM 13 — CLOSE OF MEETING

273. In closing the meeting, the Chair thanked, on behalf of the Scientific Committee, the Government of the Philippines for hosting the second regular session of the Scientific Committee. He also thanked all participants for their contributions to the meeting, as well as the Vice-Chair, SWG convenors, rapporteurs, and the Secretariat and local staff for their hard work in drafting and distributing meeting documents and providing logistical support. The Chair acknowledged the financial support provided by the Commission.

274. In responding to the Chair's closing remarks, the Executive Director also thanked all participants for their cooperation and collaboration and highlighted meeting outcomes. He also expressed appreciation to the government of Philippines for its significant support to the meeting.

275. Noel Barut, on behalf of the government of the Philippines, expressed his pleasure to be a part of the Scientific Committee and thanked all participants for their cooperation and contribution to the successful outcomes of the meeting.

276. The Chair closed the meeting on Friday, 18 August 2006.

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee

Second Regular Session

7–18 August 2006
Manila, Philippines

ATTACHMENTS

Attachment A

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

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Attachment B

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

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OPENING STATEMENT BY EXECUTIVE DIRECTOR

Secretary Domingo Panganiban, Mr. Chairman, Dignitaries from the diplomatic community, Distinguished Delegates, and Ladies and Gentlemen,

Today, on the occasion of the opening of the second regular session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, I would like to express, on behalf of the Commission Secretariat, my deep gratitude to the Philippines Government for the warm hospitality that has been extended to us all. I wish to express my special thanks to you Secretary Panganiban, Director Malcolm Sarmiento, Mr. Noel Barut, and all organizing staff for your hard work to prepare for this meeting.

The Western and Central Pacific Ocean hosts the most productive tuna fisheries in the world with an annual harvest in 2005 that again exceeds 2 million tonnes. The WCPFC is thus responsible for a resource of global significance. The Scientific Committee has a key role in supporting the decisions promoting long-term sustainable use and conservation of this resource. It is charged with providing advice to the Commission in respect of the impacts of current fisheries, the sustainability of current harvests on target resources and the impacts of these fisheries more broadly in the ecosystem.

Although the WCPO has a long history of consultation on science matters, that was principally established through the Standing Committee on Tuna and Billfish, this is only the second time we have formally met as the Scientific Committee of the Commission. So, there is no doubt that we are still at the early stages in a learning process to determine how best this Committee can serve the needs and expectations of the Commission.

There are three specific items I would like the meeting to give some thought to as we move through the next two weeks with the objective of ensuring that the work of the Scientific Committee remains focussed on these needs and expectations.
The first is in terms of identifying gaps in our current knowledge base and the impacts that these gaps are having on the quality of advice and recommendations that the Scientific Committee is able to provide to the Commission. While we will have an opportunity to consider priorities and needs when we come to discuss a research plan of the Scientific Committee, a critical need relates to the information available for some of the more important components of the fishery. In this respect, while there are encouraging indications that data is improving in relation to the Philippines, there are other areas in the west of the Convention Area for which our data requires considerable attention.

The second item that I invite the Scientific Committee to consider, informally at this stage, is the role of economics in the work of the Commission — and if there is a need to start exploring ways for more formal consideration of economic issues as a group. The potential to take up economic issues is provided for in the Convention. Economics is a science that has a major impact on the final conservation and management measures that are adopted by the Commission so there may be a need to give this matter more attention? This is not a formal suggestion on my part — simply an indication to give it consideration.

The third item relates to how the Scientific Committee might better serve the needs of the Commission. We have two important agenda items before us over the next two weeks that relates to this — in terms of an invitation to review the operations of the Scientific Committee itself and in considering the Terms of Reference for the review of scientific functions and services.

The experience from last year suggests that the Scientific Committee could better serve the needs of the Commission if more guidance on management objectives, and how to achieve these objectives, is available. Last year, the Commission accepted that the specification of management objectives, particularly with respect to the desired levels of stock biomass, would provide a better basis for comparing management options. This remains to be done. We continue to operate in an environment where the only real management objective is to sustain stocks at levels capable of producing maximum sustainable yields (MSYs). We are yet to give consideration to how different components of the fishery may be managed more efficiently — or for the overall ecosystem and economic impacts of different management strategies. It's not a new issue, having been raised previously in the Scientific Coordinating Group, and last year's meeting. The Scientific Committee might consider how it can seek to encourage more concrete consideration of this matter.

Thank you again Director for your introduction. And Secretary, I speak on behalf of us all when I say we are deeply honoured to have you here with us today for the opening of this important meeting.

Thank you.

Attachment C

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

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WELCOME ADDRESS BY DOMINGO F. PANGANIBAN, THE SECRETARY OF THE DEPARTMENT OF AGRICULTURE,

Mabuhay!

On behalf of the Filipino people and President Gloria Macapagal-Arroyo, welcome to the Philippines!

The Department of Agriculture (DA), through the Bureau of Fisheries and Aquatic Resources (BFAR), is honored to host this 2nd Regular Session of the Scientific Committee, in cooperation with the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.

As member of the Commission, the Philippines is committed to ensuring the long-term and sustainable conservation of tuna, other migratory fish stocks, including non-target species, in the Western and Central Pacific Ocean or WCPO.

We commend the various committees and technical working groups of the Western and Central Pacific Fisheries Commission (WCPFC) for their painstaking efforts through the years.

And it is fitting to congratulate, in particular, the members of the Scientific Committee for their continuing work. We fully acknowledge and appreciate your critical role in advising the Commission on conserving and sustaining the harvest levels of tuna and other non-target species from the WCPO.

Rest assured that the Philippine Government through the DA and BFAR will extend the needed support and cooperation in continuously assessing the status of the region's tuna, other migratory fish, and non-target species taken incidentally during fishing operations.

Thus, we are one with fellow Commission members in employing sustainable conservation and management measures relating to tuna, including the reduction of bycatch of juvenile bigeye and yellowfin tuna, as well as non-target species like sea birds and sea turtles.

Indeed, the long-term sustainability of the Pacific Ocean is of prime importance to all of us, mainly because of its socioeconomic benefits, and more importantly because millions of our constituents depend on fishing and related enterprises as their main source of food and livelihood.

For instance, about 1.4 million Filipinos directly depend on fishing, and thousands more are employed in related enterprises.

Our fishing industry thus contributes one-fourth to our total agricultural production. In 2005 alone, our fish harvest amounted to 4.16 million metric tons, worth P146.8 billion (roughly $2.8 billion). This performance was 6.5% better than in 2004.

Last year, of the total fish production, some 27% came from commercial fishing operations, totaling 1.1 million metric tons. It was roughly the same level taken from municipal fishing grounds, or areas within 15 kilometers from our shores.

All told, tuna accounts for about 12% of our total fish production. It also ranks among our top agricultural exports, bringing some $102 million last year. Further, the Philippines ranks second in the region in terms of tuna catch, about 400,000 metric tons annually, and fifth in tuna canning.

The tuna industry is therefore one of our top livelihood and employment providers. In Southern Mindanao alone, more than 100,000 Filipinos directly depend on the industry — from handline fishers, boat workers and entrepreneurs, fishport workers, and tuna processing workers, among other related jobs.

All told, these are the reasons and benefits why we fully support and take an active role in the Commission in pursuit of its goals.

Related to this, we have been implementing a National Tuna Management Plan, which was formulated in 2004, in close cooperation with the Philippine National Tuna Industry Council.

And may we take this opportune time to thank the Commission for extending financial support to enhance our data gathering of tuna statistics and other biological information on various tuna species caught and landed in the Philippines.

For this initiative, we acknowledge the financial support extended by the United States, Chinese Taipei and France through the Commission. We ensure you that we are also doing our share through counter-parting, which is extended by BFAR and two other agencies of the Department of Agriculture, namely the Bureau of Agricultural Statistics and Bureau of Agricultural Research.

So, ladies and gentlemen, as you buckle down to discuss technical and policy issues, and map out strategies to conserve and maintain our common rich fishing ground, that is the Western and Central Pacific Ocean, let us ensure that our children, grandchildren, and succeeding generations will likewise benefit from its enormous bounty.

Once again, welcome! And may your two-week visit be pleasant, productive and memorable!

Mabuhay!

Attachment D

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

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AGENDA FOR THE SECOND REGULAR SESSION OF THE SCIENTIFIC COMMITTEE

AGENDA ITEM 1 OPENING OF MEETING

1.1 Welcome address
1.2 Election of Chairman
1.3 Adoption of agenda
1.4 Meeting arrangements
1.5 Reporting arrangements
1.6 Intersessional activities of the Scientific Committee

AGENDA ITEM 2 REVIEW OF FISHERIES

2.1 Overview of the western and central Pacific Ocean (WCPO) fisheries
2.2 Overview of eastern Pacific Ocean (EPO) fisheries
2.3 Fishery reports from members, participating territories and cooperating non-members (CCMs)
2.4 Reports from regional fisheries bodies and other organizations

AGENDA ITEM 3 SPECIALIST WORKING GROUPS (SWGs)

3.1 Reports of the SWGs
3.2 Acceptance of the reports of the SWGs, including advice and recommendations
3.3 Terms of reference for the SWGs

AGENDA ITEM 4 STATUS OF THE STOCKS AND MANAGEMENT ADVICE AND IMPLICATIONS

4.1 Bigeye tuna
  a. Status and trends
  b. Management advice and implications
4.2 Yellowfin tuna
  a. Status and trends
  b. Management advice and implications

4.3 Skipjack tuna
   a. Status and trends
   b. Management advice and implications
4.4 South Pacific albacore tuna
   a. Status and trends
   b. Management advice and implications
4.5 Swordfish in the Southwestern Pacific Ocean
   a. Status and trends
   b. Management advice and implications
4.6 Northern stocks
   a. Status and trends
   b. Management advice and implications
4.7 Other stocks
   a. Status and trends
   b. Management advice and implications

AGENDA ITEM 5 BYCATCH MITIGATION

5.1 Seabirds
5.2 Sea turtles
5.3 Juvenile bigeye and yellowfin tuna
5.4 Other fish and non-fish bycatch

AGENDA ITEM 6 DATA AND INFORMATION

6.1 Observer programmes
   a. Scientific priorities and objectives of the regional observer programme
   b. Levels of observer coverage
   c. Data collection requirements
6.2 Data confidentiality, security, and dissemination
6.3 Indonesia and Philippines Data Collection Project (IPDCP) update and review
6.4 Tagging initiatives

AGENDA ITEM 7 COOPERATION WITH OTHER ORGANISATIONS

7.1 Technical and Compliance Committee
7.2 IATTC
7.3 ISC
7.4 SPC
7.5 CCSBT
7.6 SPRFMO
7.7 FAO

AGENDA ITEM 8 CONSIDERATION OF THE SPECIAL REQUIREMENTS OF DEVELOPING STATES AND PARTICIPATING TERRITORIES

8.1 Special Requirements Fund
   a. Review of 2005/2006 activities
   b. Advice and recommendations to the Commission
8.2 Other matters

AGENDA ITEM 9 FUTURE WORK PROGRAMME

9.1 Research plan for the Scientific Committee
9.2 2007 work programme

AGENDA ITEM 10 ADMINISTRATIVE MATTERS

10.1 Rules of procedure
10.2 Independent review of the science structure and functions of the Commission
10.3 Future operation of the Scientific Committee
10.4 2007 provisional budget and 2008 indicative budget for the Scientific Committee
10.5 Next meeting

AGENDA ITEM 11 OTHER MATTERS

11.1 Commission's publication policy

AGENDA ITEM 12 ADOPTION OF THE REORT OF THE SECOND SESSION OF THE SCIENTIFIC COMMITTEE

12.1 Adoption of the Summary Report and Executive Summary of the second regular session of the Scientific Committee

AGENDA ITEM 13 CLOSE OF MEETING

Attachment E

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

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ABBREVIATIONS AND ACRONYMS USED

ACAP	Agreement for the Conservation of Albatross and Petrels
AFMA	Australian Fisheries Management Authority
AIDCP	Agreement on the International Dolphin Conservation Program
ALB	Albacore (*Thunnus alalunga*)
AMSY	average maximum sustainable yield
$B_{current}$	average biomass over the period 2001–2004
B_t	biomass at year t (used in projections)
BET	bigeye tuna (*Thunnus obesus*)
BI-SWG	Biology Specialist Working Group
B_{MSY}	biomass that will support the maximum sustainable yield
c&f	cost and freight
CASAL	C++ algorithmic stock assessment laboratory (a stock assessment modeling approach)
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCM	Cooperating Non-members and participating Territories
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
COFI	Committee on Fisheries (FAO)
the Commission	The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
the Convention	The Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
the Convention Area	The area of competence of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
CPUE	catch per unit of effort
CSIRO	Commonwealth Scientific and Industrial Research Organization (Australia)
DWFN	distant water fishing nation
EB-SWG	Ecosystems and Bycatch Specialist Working Group
ECOPATH	An ecosystem modeling tool
EEZ	exclusive economic zone
ENSO	El Niño-Southern Oscillation

EPO	Eastern Pacific Ocean
ETBF	Eastern Tuna and Billfish Fishery (Australia)
EU	European Union
F	fishing mortality rate
FAD	fish aggregating device
FAO	Food and Agriculture Organization of the United Nations
$F_{current}$	Average fishing mortality over the period 2001-2003
FFA	Pacific Islands Forum Fisheries Agency
FIGIS	Fisheries Global Information System
FIRMS	Fishery Resource Monitoring System
FL	fork length
F_{MSY}	fishing mortality that will support the maximum sustainable yield
FPOW	fishing power
FR	Fisheries Reports
FSM	Federated States of Micronesia
FSMA	Federated States of Micronesia Agreement
FT-SWG	Fishing Technology Specialist Working Group
FTWG	Fishing Technology Working Group (of the SCTB)
F/V	fishing vessel
GEF	Global Environment Facility
GLM	general linear model
GRT	gross registered tonnage
GSI	gonad somatic index
HBF	hooks between floats
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IOTC	Indian Ocean Tuna Commission
IPDCP	Indonesia and Philippines Data Collection Project
ISC	International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean
IUU	illegal, unregulated and unreported fishing
m	meters
ME-SWG	Methods Specialist Working Group
MFAD	moored fish aggregating device
MFCL	MULTIFAN-CL (a stock assessment modeling approach)
MOU	memorandum of understanding
MSY	maximum sustainable yield
mt	metric tons
NZ	New Zealand
NZAID	New Zealand Agency for International Development
OFP	Oceanic Fisheries Programme of the Secretariat of the Pacific Community
p.a.	per annum
PFRP	Pelagic Fisheries Research Program (Hawaii, US)
PNA	Parties to the Nauru Agreement
PNG	Papua New Guinea
Prep Con	Preparatory Conference
PSA	productivity susceptibility analysis
RFMO	regional fisheries management organization
RMI	Republic of the Marshall Islands
SA-SWG	Stock Assessment Specialist Working Group
SBR	spawning biomass ratio
SCG	Scientific Coordinating Group
SCG3	Third Meeting of the Scientific Coordinating Group of the WCPFC

SCTB	Standing Committee on Tuna and Billfish
SEAPODYM	spatial ecosystem and population dynamics model
SHBS/STATHBS	statistical habitat based standardization
SKJ	skipjack tuna (*Katsuwonus pelamis*)
SPC	Secretariat of the Pacific Community
SSB	spawning stock biomass
SSH	sea surface height
SST	sea surface temperature
ST-SWG	Statistics Specialist Working Group
SWG	Specialist Working Group
TAC	total allowable catch
TAL	temperate albacore longline
TCC	Technical and Compliance Committee of the WCPFC
TDL	tropical deep longline
TDR	time and depth recorder
TOR	terms of reference
TSL	tropical shallow longline
TUFMAN	Tuna Fisheries Management Database
UNCLOS	1982 United Nations Convention on the Law of the Sea
USA	United States of America
VMS	vessel monitoring system
WCPFC	Western and Central Pacific Fisheries Commission (the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean)
WCPO	Western and Central Pacific Ocean
WG	Working Group
WG II	Working Group II of the Prep Con
WWF	World Wildlife Fund
YFN	yellowfin tuna (*Thunnus albacares*)

Attachment F

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

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LIST OF DOCUMENTS

WCPFC-SC2-2006/06 (Rev. 5)

MEETING INFORMATION

WCPFC-SC2-2006/01	Notice of meeting and meeting arrangements
WCPFC-SC2-2006/02	Registration form
WCPFC-SC2-2006/03 (Rev. 2)	Provisional agenda
WCPFC-SC2-2006/04	Provisional annotated agenda
WCPFC-SC2-2006/05	Indicative schedule
WCPFC-SC2-2006/06 (Rev. 5)	List of documents
WCPFC-SC2-2006/07	Chair's brief

GENERAL PAPERS

GN WP–1	Williams, P. & C. Reid. **Overview of the Western and Central Pacific Ocean (WCPO) tuna fisheries, including economic conditions – 2005.** Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia and Forum Fisheries Agency. Honiara, Solomon Islands.
GN WP–2	Secretariat. **Draft rules of procedure for WCPFC subsidiary bodies**.
GN WP–3	Secretariat. **Draft terms of reference: Independent review of transitional science structure and functions**.
GN WP–4	Secretariat. **Draft research plan**.
GN WP–5	Secretariat. **Draft publication policy for publications of the Commission**.
GN WP–6	Secretariat. **Cooperation with other organizations**.
GN WP–7	Harley, S. **A summary of requests to the Scientific Committee from**

	WCPFC-2. Ministry of Fisheries, Wellington, New Zealand.	
GN WP–8	Secretariat. **The Commission's regional observer program.**	Removed
GN WP–9	Secretariat. **Principles and procedures for dissemination of compliance and science data by the Commission.**	Posted on the AHTG page
GN WP–10	Secretariat. **Rules and procedures for the security of data held by the WCPFC.**	Posted on the AHTG page
GN WP–11	SPC. **Regional tuna tagging project, Phase 1: Papua New Guinea.**	
GN IP–1	Secretariat. **Consolidated terms of reference of the Specialist Working Groups.**	
GN IP–2	Secretariat. **Steering Committee report on the progress of IPDCP.**	3rd SC-IPDCP Report
GN IP–3	Secretariat. **Information on seabird mitigation measures of other RFMOs.**	

STATISTICS SPECIALIST WORKING GROUP PAPERS

ST WP–1	Lawson, T. **Scientific aspects of observer programmes for tuna fisheries in the Western and Central Pacific Ocean.** Oceanic Fisheries Programme, Secretariat of the Pacific Community, Noumea, New Caledonia.
ST IP–1	Oceanic Fisheries Programme. **Estimates of annual catches in the WCPFC Statistical Area**. Oceanic Fisheries Programme, Secretariat of the Pacific Community, Noumea, New Caledonia.
ST IP–2	Oceanic Fisheries Programme. **Scientific data available to the Western and Central Pacific Fisheries Commission.** Oceanic Fisheries Programme, Secretariat of the Pacific Community, Noumea, New Caledonia.
ST IP–3	Lawson, T. **Observer coverage rates and reliability of CPUE estimates for purse seiners in the Western and Central Pacific Ocean.** Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.
ST IP-4	Oceanic Fisheries Programme. **Catches of bigeye and yellowfin tuna in other fisheries.** Oceanic Fisheries Programme, Secretariat of the Pacific Community, Noumea, New Caledonia.

METHODS SPECIALIST WORKING GROUP

ME WP–1	Langley, A. **Summary report from yellowfin and bigeye stock assessment workshop.** Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.

ME WP–2	Bigelow, K. **Incorporation of other oceanographic factors into CPUE Standardizations**. NOAA Fisheries, Honolulu, Hawaii.
ME WP–3	Kolody, D., R. Campbell, and N. Davies. **Multifan-CL Stock Assessment for South-West Pacific Broadbill Swordfish 1952-2004**. CSIRO, Division of Marine Research, Hobart, Australia. National Institute of Water and Atmospheric Research, Whangarei, New Zealand.
ME WP–4	Davies, N., R. Campbell, and D. Kolody. **CASAL Stock Assessment for South-West Pacific Broadbill Swordfish 1952-2004**. National Institute of Water and Atmospheric Research, Whangarei, New Zealand. CSIRO, Division of Marine Research, Hobart, Australia.
ME IP–1	Langley, A. **Spatial and temporal trends in yellowfin and bigeye longline CPUE for the Japanese fleet in the WCPO**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.
ME IP–2	Langley, A. **Spatial and temporal variation in the size composition of the yellowfin and bigeye longline catch in the WCPO**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.
ME IP–3	Langley, A., H. Okamoto, P. Williams, N. Miyabe, and K Bigelow. **A summary of the data available for the estimation of conversion factors (processed to whole fish weights) for yellowfin and bigeye tuna**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia. Japan National Research Institute of Far Seas Fisheries, Shimizu, Japan. Pacific Islands Fishery Science Center, National Marine Fisheries Service, Honolulu, Hawaii, USA.

FISHING TECHNOLOGY SPECIALIST WORKING GROUP

FT WP–1	Ward, P. and Hindmarsh, S. **An overview of historical changes in the fishing gear and practices of pelagic longliners**. Fisheries and Marine Sciences, Bureau of Rural Sciences, Canberra, Australia.
FT WP–2	Campbell, R. and J. Young. **Measuring effective longline effort in the Australian Eastern Tuna and Billfish Fishery**. CSIRO. Division of Marine Research, Hobart, Australia.

FT WP–3	Dagorn L., Holland K., Puente E., Taquet M., Ramos A., Brault P., Nottestad L., Georgakarakos S., Deneubourg J.-L., Aumeeruddy R., Josse E., Dalen J. **FADIO (Fish Aggregating Devices as Instrumented Observatories of pelagic ecosystems): a European Union funded project on development of new observational instruments and the behaviour of fish around drifting FADs**. Institute de recherche pour le développement (IRD), Seychelles, Indian Ocean. France.
FT WP–4	Itano, D., Holland, K. and L. Dagorn. **Behaviour of yellowfin (Thunnus albacares) and bigeye tuna (T. obesus) in a network of anchored Fish Aggregation Devices**. Pelagic Fisheries Research Program, Honolulu, Hawaii, USA: Hawaii Institute of Marine Biology, Kaneohe, Hawaii: Institute de recherche pour le développement (IRD), Seychelles, Indian Ocean.
FT WP–5	Itano, D. and D. Kirby. **Standardized fishery terms to facilitate communication within the Scientific Committee and with the WCPFC**. Pelagic Fisheries Research Program, Honolulu, Hawaii, USA,; Secretariat of the Pacific Community, Noumea, New Caledonia.
FT WP–6	Itano, D. **An examination of vessel, gear and operational details useful for fishery-specific effort standardization, including FAD-related gear and fishing strategies**. Pelagic Fisheries Research Program, Honolulu, Hawaii, USA.
FT WP–7	Babaran, R. **FAD Fishing and its Effects on Tuna Stocks**. College of Fisheries and Ocean Sciences, University of the Philippines in the Visayas, Miag-ao, Iloilo, Philippines.
FT WP–8	J. Miquel[2] , A. Delgado de Molina[1] , J. Ariz[1] , R. Delgado de Molina[1] , S. Déniz, N. Díaz[2] , Iglesias[2] , J.C. Santana1 y P. Brehmer[3]. **Acoustic Selectivity in Tropical Tuna (Experimental Purse-seine Campaign in the Indian Ocean)**. [1] Instituto Español de Oceanografía, Santa Cruz de Tenerife, Islas Canarias. [2] Instituto Español de Oceanografía, Palma de Mallorca, España. [3] Institut de Recherche pour le Développement, Sete, France.
FT IP–1	Bigelow, K., Musyl, M.K., Poisson, F., and P. Kleiber. **Pelagic longline gear depth and shoaling**. *Fisheries Research* 77 (2006) 173-183. NOAA Fisheries, Honolulu, Hawaii, USA; Joint Institute for Marine and Atmospheric Research, University of Hawai'i at Manoa, Honolulu, Hawaii, USA; Indian Ocean Tuna Commission, Seychelles, Indian Ocean.
FT IP–2	Miyake, P.M. **Factors affecting on recent development in tuna longline fishing capacity and possible options for management of longline capacity**. Federation of Japan Tuna Fisheries Co-operative Associations, Tokyo, Japan.
FT IP–3	Chapman, L., Sharples, P., Brogan, D., Desurmont, A., Beverly, S., and W. Sokimi. **Marine species identification manual for horizontal longline fishermen**. Secretariat of the Pacific Community, Noumea, New Caledonia.

FT IP–4	Itano, D and S. Fukofuka,. with development and translation assistance from M. de Beer, Yamasaki, G., Lewis, A.D., Taquet, M., Merta, G.S., Andamari, R., Proctor, C., Sarralde, R., Matsumoto, T., Kwoh, J.-R., Moon, D-Y, Choi, Y., Lu-Chen, JY, and the Interpretation and Translation Section of the Secretariat of the Pacific Community. **Handbooks for the identification of yellowfin and bigeye tunas in fresh, frozen and fresh but less than ideal condition – (***versions available in English, French, Spanish, Bahasa Indonesia, Japanese, Korean, and Chinese***)**. Pelagic Fisheries Research Program, Honolulu, Hawaii, USA.
FT IP–5	Itano, D., J. McGregor and S. Arceneaux. **Photographic identification guide for billfish, sharks, tuna-like, and non-tuna finfish taken in WCPO pelagic longline fisheries <<DRAFT>>.** Pelagic Fisheries Research Program, Honolulu, Hawaii, USA.; NOAA Fisheries, Honolulu, Hawaii.
FT IP-6	Delgado de Molina, A.1, J. Ariz, J.C. Santana and S. Déniz. **Study of Alternative Models of Artificial Floating Objects for Tuna Fishery (Experimental Purse-seine Campaign in the Indian Ocean).** Originally submitted as IOTC–2006-WPBy - 05. Instituto Español de Oceanografía, Spain.
FT IP-7	Matsumoto, T.[1], H. Okamoto1 and M. Toyonaga[2]. **Behavioural study of small bigeye, yellowfin and skipjack tunas associated with drifting FADs using ultrasonic coded transmitter in the central Pacific Ocean**. [1] National Research Institute of Far Seas Fisheries, Shimizu, Japan. [2] Marine Fisheries Research and Development Department, Center of Fisheries Research Agency, Yokohama, Japan.

BIOLOGY SPECIALIST WORKING GROUP

BI WP–1	Chi-Lu Sun, Su-ling Chu, Su-zan Yeh. **Reproductive Biology of bigeye tuna in the western and central Pacific Ocean**. Institute of Oceanography, National Taiwan University, Taipei, Taiwan.

STOCK ASSESSMENT SPECIALIST WORKING GROUP

SA WP–1	Hampton, J., Langley, A., Kleiber, P. **Stock assessment of yellowfin tuna in the western and central Pacific Ocean, including an analysis of management options**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia. NOAA Fisheries, Honolulu, Hawaii.

SA WP–2	Hampton, J., A. Langley, A., and P. Kleiber. **Stock assessment of bigeye tuna in the western and central Pacific Ocean, including an analysis of management options**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia. NOAA Fisheries, Honolulu, Hawaii.
SA WP–3	Langley, A.D. **The South Pacific albacore fishery: a summary of the status of the stock and fishery management issues of relevance to Pacific Island countries and territories**. Technical Report 37. Noumea, New Caledonia: Secretariat of the Pacific Community.
SA WP–4	Langley, A., and J. Hampton. **An update of the stock assessment for South Pacific albacore tuna, including an investigation of the sensitivity to key biological parameters included in the model**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.
SA WP–5	Langley, A., and J. Hampton. **Potential impact on catches of skipjack by the WCPO purse-seine fishery of various WCPFC conservation and management measures considered for bigeye and yellowfin**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.
SA WP–6	Langley, A., B. Molony, D. Bromhead, K. Yokawa, and B Wise.. **Stock assessment of striped marlin (*Tetrapturus audax*) in the southwest Pacific Ocean**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia. 2Bureau of Resource Sciences, Canberra, Australia. Japan National Research Institute of Far Seas Fisheries, Shimizu, Japan.
SA WP–7	Kolody, D., N. Davies, and R. Campbell. **SW Pacific Swordfish Stock Status Summary from multiple assessment models.** CSIRO. Division of Marine Research, Hobart, Australia. National Institute of Water and Atmospheric Research, Whangarei, New Zealand.
SA IP–1	Hampton, J., and M. Maunder. **An update of Pacific-wide assessment of bigeye tuna with comparisons with eastern Pacific assessment results**. Document SAR-7-07c.ii. IATTC Working Group to Review Stock Assessments, 7th meeting, La Jolla, California (USA), 15-19 May 2006.
SA IP–2	Sheng-ping Wang, Chi-lu Sun, N. Miyabe, Su-Zan Yeh, Nan-Jay Su, and Yi-Jay Chang. **Stock assessment of BET in the western and central Pacific Ocean using an age-structured production model**. Institute of Oceanography, National Taiwan University, Taipei, Taiwan.
SA IP-3	ISC. **Report of the Sixth Meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean**. International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean.

ECOSYSTEM AND BYCATCH SPECIALIST WORKING GROUP

EB WP–1	Kirby, D. S., Molony, B. **An ecological risk assessment for species caught in WCPO longline and purse seine fisheries**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.	
EB WP–2	Kirby, D. S., Briand, K. **Multivariate indicators for ecosystem regime shifts and links with long-term recruitment variability for target species**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.	
EB WP–3	Harley, S. J. **Preliminary characterization of sea turtle catches in New Zealand fisheries waters**. Ministry of Fisheries, Wellington, New Zealand.	
EB WP–4	Waugh, S. **Additional information on the distribution of seabirds in the WCPF Convention area**. Ministry of Fisheries, Wellington, New Zealand.	
EB WP–5	Bull, L.S. **A review of methodologies aimed at avoiding and/or mitigating incidental catch of protected seabirds**. Department of Conservation Research, Development, and Improvement Series. Department of Conservation, Wellington.	
EB WP–6	Small, C. **Summary of seabird bycatch rates recorded in the Western and Central Pacific.** Birdlife International Global Seabird Program.	Moved to NGO paper
EB WP–7	BirdLife International. **Distribution of albatrosses and petrels in the WCFPC Convention Area and overlap with WCPFC longline fishing effort**. Birdlife International Global Seabird Program.	Moved to NGO paper
EB WP–8	ACAP (Warren Papworth). **Seabird bycatch mitigation measures in pelagic longline fisheries: opportunities for WCPFC**. Agreement on the Conservation of Albatrosses and Petrels.	Withdrawn
EB WP–9	Minani, H., K. Yokota & M. Kiyota. **Japanese research activities to reduce incidental mortality of sea turtles in tuna longline fishery**. National Research Institute Far Seas Fisheries, Shimizu, Japan.	
EB WP–10	H. Matsunaga & H. Shono. M. **Analysis of longline CPUE of major pelagic shark species collected by Japanese research and training vessels in the Pacific Ocean**. National Research Institute Far Seas Fisheries, Shimizu, Japan.	
EB WP–11	Wilcox, C. **Predicting non-target species catch rates for in the absence of observer data: a statistical approach for Flesh Footed Shearwaters in Australia's Eastern Tuna and Billfish Fishery**. CSIRO, Pelagic Fisheries and Ecosystems.	Withdrawn

EB WP–12	Soon-Song Kim, Dae-Yeon Moon, Doo-Hae An and Jeong-Rack Koh. **Comparison of circle hooks and J hooks in the catch rate of target and bycatch species taken in the Korean tuna longline fishery**. National Fisheries Research and Development Institute. Republic of Korea.
EB WP–13	Dalzell, P & E. Gilman. **Turtle bycatch mitigation in the Hawaii longline fishery**. Western Pacific Regional Fishery Management Council & Blue Ocean Institute.
EB WP–14	Hobday, A. J., A. Smith, H. Webb, R. Daley, S. Wayte, C. Bulman, J. Dowdney, A. Williams, M. Sporcic, J. Dambacher, M. Fuller, T. Walker. **Ecological risk assessment for the effects of fishing: methodology**. CSIRO, Pelagic Fisheries and Ecosystems.
EB WP–15	Yokota K & M. Kiyota. **Preliminary report of side-setting experiments in a large sized longline vessel.** National Research Institute Far Seas Fisheries, Shimizu, Japan.
EB WP–16	Yokota K, M. Kiyota & H. Minami. **Shark catch in a pelagic longline fishery: comparison of circle and conventional tuna hooks.** National Research Institute Far Seas Fisheries, Shimizu, Japan.
EB IP–1	Gilman, E., D. Kobyashi, T. Swenarton, P. Dalzell, I. Kinan, and N. Brothers. **Analyses of observer data for the Hawaii-based longline swordfish fishery.** Blue Ocean Institute, National Marine Fisheries Service (NMFS) Pacific Islands Fisheries Science Center, NMFS Pacific Islands Regional Office.
EB IP–2	K. Yokota, H. Minami & M. Kiyota, **Measurement-points examination of circle hooks for pelagic longline fishery to evaluate effects of hook design**. National Research Institute Far Seas Fisheries, Shimizu, Japan.
EB IP–3	Doo-Hae An, Soon-Song Kim, Dae-Yeon Moon, and Seon-Jae Hwang. **A summary of the Korean tuna fishery observer program for the Pacific Ocean in 2005**. National Fisheries Research and Development Institute, Republic of Korea.
EB IP–4	Stobutzki, I. **Bycatch mitigation approaches in Australia's Eastern Tuna and Billfish Fishery: seabirds, turtles, marine mammals, sharks and non-target fish**. Bureau of Rural Sciences, Canberra, Australia.
EB IP–5	Allain,V., Kirby, D.S. and Kerandel, J. A. **Seamount Research Planning Workshop Report. 20-21 March 2006**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.
EB IP–6	Allain,V., and B. Leroy. **Ecosystem Monitoring and Analysis: stomach sampling overview of the GEF-SAP project 200-2005 and stomach sampling strategy of the GEF-OFM project 2005-2010**. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.
EB IP–7	IATTC. **Review of Seabird Status and Incidental Catch in Eastern Pacific Ocean Fisheries**. Inter-American Tropical Tuna Commission, La Jolla, USA.

EB IP–8	IATTC. **The Sea Turtle Bycatch Mitigation Program for the Coastal Longline Fleets and Preliminary Results of Circle Hook Experiments**. Inter-American Tropical Tuna Commission, La Jolla, USA.
EB IP–9	Watling, R. **Interactions Between Seabirds and Pacific Islands' Fisheries, Particularly the Tuna Fisheries**. Secretariat of the Pacific Community, Noumea, New Caledonia.
EB IP–10	IATTC **Interactions of fisheries in the eastern Pacific Ocean and marine turtles.** Inter-American Tropical Tuna Commission, La Jolla, USA
EB IP–11	J. Ariz, A. Delgado de Molina, Mª L. Ramos and J. C. Santana. **Check list and catch rate data by hook type and bait for bycatch species caught by Spanish experimental longline cruises in the southwestern Indian Ocean during 2005.** Instituto Español de Oceanografia, PO Box 1373, 38080 Santa Cruz de Tenerife, Spain.

NGO OBSERVERS

NGO-1	BirdLife International. **Distribution of albatrosses and petrels in the WCFPC Convention Area and overlap with WCPFC longline fishing effort**. BirdLife International Global Seabird Program.
NGO-2	Small, C. **Summary of seabird bycatch rates recorded in the Western and Central Pacific.** BirdLife International Global Seabird Program.
NGO-3	Greenpeace. **Scientific Report on Effort Reduction Measures in the Western and Central Pacific Ocean Tuna Fishery.** Greenpeace Australia Pacific.

FISHERIES REPORTS FROM MEMBERS AND OBSERVERS
(Annual Report, Part 1 – Information on Fisheries, Research, and Statistics)

FR WP-1	Australia
FR WP -2	Canada
FR WP -3	China
FR WP-4	Cook Islands
FR WP-5	European Community
FR WP-6	Federated States of Micronesia
FR WP-7	Fiji
FR WP-8	French Polynesia

FR WP-9	Indonesia
FR WP-10	Japan
FR WP-11	Kiribati
FR WP-12	Korea
FR WP-13	Marshall Islands
FR WP-14	Nauru
FR WP-15	New Caledonia
FR WP-16	New Zealand
FR WP-17	Niue
FR WP-18	Palau
FR WP-19	Papua New Guinea
FR WP-20	Philippines
FR WP-21	Samoa
FR WP-22	Solomon Islands
FR WP-23	Chinese Taipei
FR WP-24	Tonga
FR WP-25	Tuvalu
FR WP-26	USA
FR WP-27	Vanuatu

Attachment G

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

REPORT OF THE BIOLOGY SPECIALIST WORKING GROUP

INTRODUCTION

1. The Chair of the Biology Specialist Working Group (SWG) Chi-Lu Sun (Chinese Taipei) opened the meeting and selected David Kirby (Secretariat of the Pacific Community – SPC, Oceanic Fisheries Programme – OFP) as rapporteur. He apologized that there was only one research paper for presentation but noted that several papers scheduled for presentation in other SWGs could just as well have been presented in the Biology SWG.

2. The Agenda for the meeting (Appendix I attached to this report) was introduced and adopted.

RESEARCH

3. The following is a summary of key points from SC2 BI WP-1. Chi-Lu Sun presented a study on the reproductive biology of female bigeye tuna (*Thunnus obesus*) in the western Pacific Ocean. A total of 890 fish were examined. These had been caught by offshore longline fishing vessels from Chinese Taipei, fishing in the tropical western Pacific Ocean and landing at the Tungkang fish market, between November 1997 and November 1998 and in November–December 1999. The sex ratio was about 1:1, but males became predominant at sizes larger than 146 cm (fork length). Based on histological characteristics of ovaries, spawning was inferred to occur throughout the year, with a peak season from February to September. The smallest mature female was 99.7 cm. The spawning frequency estimated using the postovulatory follicle method was at intervals of 1.10 days for females in spawning condition. This implies that bigeye tuna spawn almost every day. The average relative batch fecundity was 59.5 oocytes per gram of body weight.

4. In the discussion following the presentation, it was noted that the estimates of size at maturity presented here are smaller than for the eastern Pacific Ocean (EPO), and that other biological differences occur across the Pacific. An earlier publication (Kume and Shiohama 1965)[1] noted that bigeye are larger in the EPO than in the western and central Pacific Ocean

[1]Kume S. and Shiohama T. 1965. Ecological studies on bigeye tuna. Part 2. Distribution and size composition of bigeye tuna *Parathunnus sibi* in the equatorial Pacific. Nankai Reg. Fis. Lab., Rept. 22:71–83.

(WCPO), suggesting migration from west to east. It was noted that only minimum length at maturity, not length at 50% maturity, had been defined, therefore further study was still needed. A clarification was made that the spawning of bigeye in Hawaii actually refers to waters southwest of Hawaii and below Johnston Atoll, and not around the Hawaiian islands. The near daily spawning frequency detected is typical of the genus and the Biology SWG was encouraged to see the results of this study being so consistent with previous work.

5. There was some discussion about the seasonal spawning period identified in the study, peaking around February to September. Local studies can create uncertainty as to whether observed patterns are typical for the population. This period may not be fixed throughout the region, although the results are consistent with recruitment estimates from the stock assessment. Further work is clearly required to identify seasonal spawning grounds but the sampling design must reflect the population biology of the stock. A previous study on the reproductive biology of yellowfin tuna by SPC-OFP could be used as a template for sampling design.

Biological uncertainties in stock assessments

6. Biological uncertainties were noted in stock assessments of albacore and other tunas reviewed by the Stock Assessment SWG. This was an attempt to consolidate biological uncertainties across a range of species. The group was asked to deliberate on a consolidated biological research plan that might help reduce uncertainty in stock assessment models.

7. Some outstanding issues were identified for yellowfin and bigeye, notably age and growth of younger age classes, to better define early growth; potential differences in size at maturity from west to east, which could affect assessment; improved estimates of current and future biomass using reliable environmental correlates of recent recruitment; and testing of the current assumptions concerning natural mortality at age.

8. The group was informed that Australia is seeking funding for a study on albacore, including biology, monitoring–sampling protocols, length–weight conversion, tissue sampling, age and growth using otoliths, spines, etc., and the impact of potential management measures.

9. For southwest Pacific swordfish, better identification of spawning grounds would improve stock assessments. The present assumption that spawning is concentrated off the east coast of Australia may only reflect where sampling has been done. There may also be spawning east of New Zealand and around other Pacific islands. Australia has done some work on age–length at maturity by sex, and there are some discrepancies between these maturity estimates and those from other oceans. There is also some work being carried out in Australia on swordfish growth for younger age classes.

10. There seem to be several different ways in which billfish are processed. There is therefore a need for conversion factors from dressed weight to whole weight.

11. There has been some collection of muscle samples from striped marlin for genetic analysis of stock structure and a report was presented at the Inter-American Tropical Tuna Commission (IATTC). There may be some potential for future work on swordfish stock structure using these methods.

Biological uncertainties in risk assessment

12. The group noted the Ecological Risk Assessment presented in the Ecosystems and Bycatch SWG (EB WP-1). This assessment attempted to compare life history characteristics for all species that have been observed caught in WCPO tuna fisheries.

13. The full list of target and non-target associated species comprised 236 species. Information was obtained on life history characteristics determining the productivity of these species and their susceptibility to longline and purse seine fisheries, to the extent listed below:

Maximum length	214 species
Maximum age	82 species
Length at maturity	106 species
Age at maturity	92 species
Fecundity	sharks only

Scientific objectives of observer programmes

14. The group considered the objectives of observer programmes. There are many biological research aspects, such as improved identification to species level and recording of condition and fate of species caught, biological sampling (e.g. tissue, stomach samples, gonads) that may be addressed by the Regional Observer Programme. There was also some discussion about what data can be collected by observers that cannot be collected by port sampling, especially when fish are landed whole at market; this may be pursued in the plenary of the Scientific Committee.

WORK PROGRAMME

15. The Biology SWG reviewed the 2006 work programme to assess progress against the key priorities. The group was encouraged to see that progress has occurred, or would occur in the near future against all priorities.

16. Considering the preceding discussions, the following short- and medium-term research needs were identified.

<u>Short term</u>

- Improved age and growth estimates for the younger age classes of bigeye and yellowfin tuna
- Length at 50% maturity for bigeye tuna
- Examination of differences in estimates of key biological parameters between the WCPO and EPO for bigeye in particular
- Age, growth, and maturity for South Pacific albacore, including a review of previous work
- Stock structure and movement dynamics for swordfish, using various methods.

<u>Medium term</u>

- Important life history characteristics of associated species to address biologically uncertainties identified in the ecological risk assessment
- Identification of spawning areas for major species including swordfish.

Appendix I

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

AGENDA FOR THE BIOLOGY SPECIALIST WORKING GROUP

WCPFC-SC2-2006/BI-SWG AGENDA

1. INTRODUCTION

2. SELECTION OF RAPPORTEURS

3. ADOPTION OF AGENDA

4. RESEARCH
- a. REPRODUCTIVE BIOLOGY
  SC2 BI WP-1: Reproductive biology of bigeye tuna in the central and western Pacific.
  Discussion
- b. Others

5. TOPICS FOR DISCUSSION
- a. Biological uncertainties in stock assessments
  Discussion
- b. Others

6. FUTURE PLANS
- a. Terms of reference
- b. Tasks for 2007

7. PREPARATION OF REPORT

Attachment H

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

REPORT OF THE ECOSYSTEM AND BYCATCH SPECIALIST WORKING GROUP

INTRODUCTION

1. In opening the meeting, the meeting convenors (Paul Dalzell and Peter Ward) reviewed the terms of reference (TORs) for the Ecosystem and Bycatch Specialist Working Group (EB-SWG). These TORs have been included in the appropriate sections of this report. The agenda is included as Appendix I to this report. The rapporteurs were Ilona Stobutzki, Stephen Brouwer and Christofer Boggs.

REPORT SUMMARIES

Ecological modelling and risk assessment

2. The first Scientific Committee meeting in 2005 recommended that the Scientific Committee undertake an ecological risk analysis in order to prioritize species of seabirds, sea turtles, sharks and non-target fish species for future research

SC2 EB WP-14 Ecological Risk Assessment for the Effects of Fishing: Methodology

3. Robert Campbell outlined a framework developed by Australian scientists for undertaking ecological risk assessments for the effects of fishing (ERAEF). The framework involves a hierarchical approach that moves from a comprehensive, but largely qualitative analysis of risk at Level 1, through a more focused and semi-quantitative approach at Level 2, to a highly focused and fully quantitative "model-based" approach at Level 3. This approach is efficient because many potential risks are screened out at Level 1, so that the more intensive and quantitative analyses at Level 2 (and ultimately at Level 3) are limited to a subset of the higher risk activities associated with fishing. It also leads to rapid identification of high-risk activities, which in turn can lead to immediate remedial action (risk management response). The approach is also precautionary, in the sense that risks will be scored high in the absence of information, evidence or logical argument to the contrary.

4. Under the ERAEF framework, five general ecological components are evaluated: 1) target species, 2) byproduct and bycatch species, 3) threatened, endangered and protected species (TEP species), 4) habitats, and 5) ecological communities. At the scoping stage, the activities (or

hazards) that occur in the fishery, together with the units of analysis (species, habitats and communities) potentially impacted by these activities, are identified. The set of objectives that the risks will be evaluated against is also decided at this stage.

5. The Level 1 analysis (or Scale-Intensity-Consequence-Analysis, SICA) evaluates the risk to each ecological component resulting from the stakeholder-agreed set of activities. SICA elements are scored on a scale of 1 to 6 (negligible to extreme) using a "plausible worst case" approach and any element that scores 2 or less is documented, but not considered further for analysis or management response. At Level 2 (or productivity susceptibility analysis, PSA) the units of analysis are the agreed set of species, habitat types or communities in each component identified during the scoping stage. A comprehensive set of attributes that are proxies for productivity and susceptibility are identified and combined to give an overall PSA score which is then used to assign the level of risk. Again, units assessed to be at low risk are not considered for further analysis. At Level 3 the risk assessment is fully-quantitative and relies on in-depth scientific studies on the units identified as at moderate or greater risk in the Level 2 PSA.

6. The assessment of risk at each level takes into account current management strategies and arrangements. A crucial process in the risk assessment framework is the involvement of all stake holder groups and the documentation of the rationale behind assessments and decisions at each step in the analysis. The decision to proceed to subsequent levels depends on i) the estimated risk at the previous level, ii) the availability of data to proceed to the next level, and iii) the management response (e.g. if the risk is high but immediate changes to management regulations or fishing practices will reduce the risk, then analysis at the next level may be unnecessary).

Discussion

7. Some of the impacts listed in the risk assessment could be natural (e.g. trophic cascades and regime shifts), and this fact needs to be considered in the assessment. This situation highlights the importance of expert opinion to guide the decisions and process.

8. A large number of habitat types were examined in the Australian Eastern Tuna and Billfish Fishery (ETBF) example, and it was queried whether the number of habitat types within the WCPO Convention Area would be even larger and whether it was necessary to study so many habitats. In Australia, the habitat types were based on those identified by the national marine bio-regionalisation and it was noted that for the ETBF impacts on habitat were identified as low risk in the Level 1 assessment. The issue of how many habitats need to be considered for the Convention area requires further consideration.

SC2 EB WP-1. Ecological Risk Assessment for WCPO Tuna Fisheries: Inherent Risk as Determined by Productivity Susceptibility Analysis

9. The WCPO Convention makes little distinction in terms of the management objectives for target and non-target associated and dependent species. The list of species for which the Commission has responsibility is therefore extremely long and there is a need for the Scientific Committee to develop a system for prioritisation of fisheries monitoring and research effort, and evaluation of potential conservation and management measures.

10. Australia has adapted its existing fisheries management systems to incorporate a hierarchical approach to ecological risk assessment (SC2 EB WP-14). Its Level 2 assessment PSA, which provides an objective biological basis for assessing the risk of adverse fisheries

impacts upon the many species caught. Life history characteristics and measures of fisheries interactions are scored and plotted along two respective axes: productivity and susceptibility.

11. A highly productive species is characterized by high birth, growth and mortality rates. Such species can usually sustain higher exploitation rates and can recover relatively rapidly. The productivity axis may therefore incorporate life-history characteristics such as: maximum size; size-at-maturity; maximum age; age-at-maturity; reproductive strategy; fecundity; trophic level. Risk is inversely proportional to productivity.

12. Susceptibility is the degree to which a species interacts with and is impacted by a fishery. It should consider the frequency and the effects of fisheries encounters, especially those that lead directly or indirectly to mortality. It therefore incorporates the notion of catchability (i.e. behaviour and distribution of the species relative to the distribution and other technical characteristics of the fishery). Risk is proportional to susceptibility.

13. The list of species included in the analysis presented here comprised all species that have been observed caught by scientific observers and are included in the Secretariat of the Pacific Community (SPC) database. Indicators of susceptibility were derived from the same database. Data queries were performed to determine condition at capture, length at capture and fate.

14. Susceptibility was considered to be proportional to condition-at-capture, defined as the proportion landed dead or dying. The ratios of length-at-capture/maximum length, and length-at-capture/length-atmaturity were calculated, with the result being proportional to susceptibility, under the assumption that natural mortality is higher at smaller size, so fishing mortality is a smaller component of total mortality.

15. Productivity was calculated using data obtained from the literature on maximum length, length-at-maturity; maximum age, age-at-maturity, and reproductive strategy (1: broadcast spawners; 2: egg layers; 3: live bearers). Fecundity data (i.e. number of pups per year) for live-bearing sharks were also obtained.

16. The results from the PSA for all species show that target species (tunas, billfish, mahi mahi, wahoo) often score highly on the susceptibility axis, as they are most often encountered and retained; however, these are all relatively highly productive, therefore they score low risk on the productivity axis.

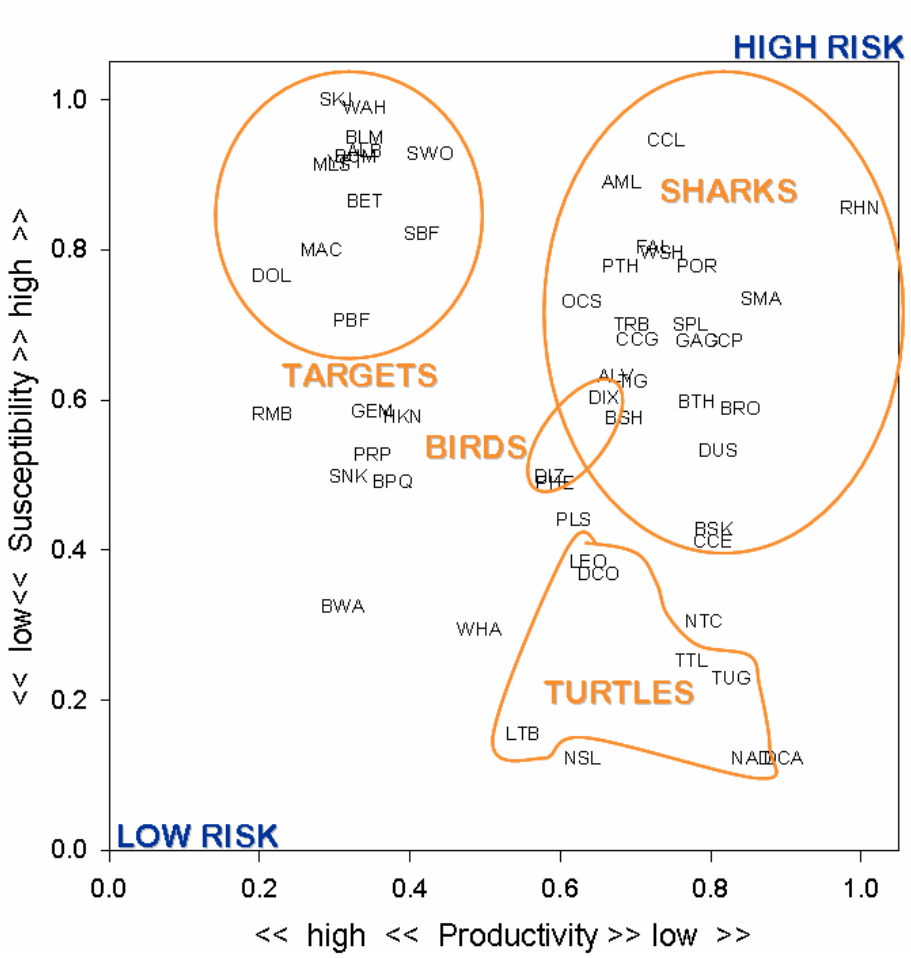

Figure 1. Productivity susceptibility analysis (PSA) based on age at maturity, maximum age, proportion retained (including fins only) and numbers of observed encounters (Note this figure was not included in EBWG-WP1).

17. Turtles and seabirds rank in the middle of the risk scores. Results on condition-at-capture show that birds are most often landed dead; effective conservation measures must therefore prevent capture in the first place. Turtles are often landed alive, therefore, effective conservation measures can be also directed at treatment post-capture (i.e. dehooking, rest and recovery, prior to release). Most shark species are ranked in the high risk portion of the plots, due to their low productivity, being live bearing with an average of 15 pups per year, and their high susceptibility, due to high encounter rates in the fisheries but low rates of live discards. The average proportion observed landed alive for all shark categories in longline fisheries is 64%. The average whole-body retention rate for all shark categories is 43%. The rest is discarded, but of the total shark discards in longline fisheries, the average proportion with fins removed and trunk discarded is 50%; for purse-seine fisheries this is 70%. Thus the average proportion discarded alive is 31% for longline and 39% for purse seine. Conservation measures that prohibited the removal of fins from sharks when the trunk is not retained (cf. WCPFC-2 Resolution on Non-target Fish Species) could result in a 50% decrease in fishing mortality on sharks, as the average proportion discarded alive could rise to the same proportion that is landed alive. This figure assumes the same whole-body retention rate and no delayed mortality for sharks released alive and intact. Improving observer coverage and the ability of observers to identify catch to species level is paramount in

order to improve future ecological risk assessments. This is particularly true for purse-seine fisheries, where length and condition-at-capture data are rarely recorded. The extent of vertical and horizontal habitat overlap with fishing effort would be an important factor to include in future PSAs, which should also try to utilise data collected for species groups, and to include additional species in the final analysis, by substituting life history characteristics from closely related species.

18. The second session of the Scientific Committee was invited to endorse ecological risk assessment generally, and PSA in particular, as a basis for prioritisation for fisheries monitoring and research and potential conservation and management measures. Further biological, ecological, and fisheries research must be carried out into the key variables used in the analysis such that there can be iterative improvement in future PSAs presented to the Scientific Committee Members of the Commission are also invited to carry out ecological risk assessments for their own tuna fisheries.

Discussion

19. There was general agreement that SPC had made more progress on risk assessment than expected and this was very positive to see. The risk assessment will assist the Scientific Committee in prioritising their research and recommendations. It was also noted that the risk assessment process represents progress towards an ecosystem based approach that was feasible to implement.

20. Points to consider in the further development of the risk assessment include:

- Improving the criteria for assessing the productivity of turtles and birds, particularly the reproductive strategy criteria. Inclusion of estimates of fecundity may assist in this.

- Incorporating additional information where available (e.g. leatherback turtles appear at low risk from fishing, but it is clear that the Pacific population is in serious trouble). Currently the assessment is influenced by the rarity of encounters and the fact that their age at maturity is younger than other species, and most encounters are with juveniles.

- The scale of the assessment, whether it should be undertaken for combined fisheries or separately for sub-fisheries which may pose different risks. However this requires more information on individual species and so can limit the amount of information that is available for each subcomponent.

- Consideration of the susceptibility criteria, the ratio of size at capture/maximum size and whether it is generally true that a species has high susceptibility if it has a high ratio of size at capture/maximum size. The ratio is based on an assumption that natural mortality is higher in younger animals, so fishing mortality is a smaller component.

21. The SWG highlighted that an important part of risk assessment is where interactions occur in space and time. When the spatial distribution of fishing effort and observer effort are compared it is clear that the observer coverage is not representative and therefore it is difficult to identify where issues are. It appears where observer programs have been in place, issues have been identified, whereas without an observer programme it is not clear whether there is an issue or not.

There was agreement to endorse and further refine the PSA risk assessment approach to assist the Scientific Committee in prioritising species for management action or further research. There was agreement to encourage members to further develop this approach.

SC2 EB-WP2 Multivariate Indicators for Ecosystem Regime Shifts and Links with Long-term Recruitment Variability for Target Species

22. The effect of ecosystem "regime shifts" (i.e. decadal scale environmental variability) on recruitment and biomass trends of tunas has been recognised as a significant issue of uncertainty. Recruitment estimates from stock assessments do exhibit decadal scale variability but it is uncertain whether these are correctly attributed to changes in fisheries characteristics (i.e. increasing number of small fish being targeted), or whether environmental variability is responsible. This work therefore seeks to characterize environmental variability through the development of univariate and multivariate ecosystem indicators and to use those indicators to improve the estimation of recruitment within the assessment model. This presentation reported on ecosystem indicators so far identified and their links with recruitment estimates from recent assessments.

23. Data on winds, ocean currents, temperature, primary production and epipelagic forage production were obtained. Wind data were used to calculate an index of water column turbulence, which may affect larval fish feeding success and therefore recruitment. Two regions were defined to approximate spawning grounds for tropical tunas (yellowfin, bigeye and skipjack) and for south Pacific albacore. Principal components analysis (PCA) was carried out to identify modes of variability and coherence among the data.

24. In the tropical region, the first principal component (PC1) accounted for 48% of the variance in the data. It is a generally flat signal with occasional interannual peaks and troughs but a very strong and prolonged phase change in 1998; windspeed, turbulence and east–west component of current velocity follow this pattern of variability. The second principal component (PC2) accounted for 23% of the variance and is strongly correlated with the Southern Oscillation Index (SOI). It also exhibits a strong phase change in 1998 in addition to an earlier phase change in 1981; temperature, primary production and north–south component of current velocity follow this pattern.

25. In the sub-tropical region, the two PCs each accounted for around 30% of the variance in the data. PC1 is correlated with the El Niño-Southern Oscillation Index, and exhibits phase changes in 1981 and 1998; windspeed, turbulence, V component current and epipelagic prey follow this pattern of variability. PC2 is correlated with the Pacific Decadal Oscillation, and exhibits increases in 1967, 1978 and 1994; temperature, primary production, U component current and east–west surface stress follow this pattern. Chronological clustering analysis confirmed the same patterns as PCA.

26. Generalised Additive Models (GAMs) were then developed to explore relationships between tuna recruitment and environmental variability. Statistically significant positive relationships were identified between primary production and recruitment for tropical tunas. For these species and for albacore there was a generally negative relationship between turbulence and recruitment. These results will be compared with laboratory work carried out at IATTC investigating the effects of food and turbulence on larval fish feeding and growth.

Discussion

27. A comment was made that the regions in the analysis are not completely the same as the regions in the Multifan-CL stock assessments. This may not be an issue because this analysis is examining effects that are at a smaller scale and the mobility of the fish.

28. There was discussion over the biological mechanisms driving the patterns (e.g. larval survival or adult behaviour). Some aspects clearly relate to larval survival, but adult movement could also be a factor. Better data regarding the definitions of spawning grounds would be valuable. The project is currently trying to define dynamic habitat boundaries, which will then be incorporated into future analyses.

29. Clarification was provided on the patterns seen for yellowfin tuna, where the analysis that uses the new recruitment estimates resulted in a diametrically opposite result to the analysis using the previous recruitment estimates. It was noted that this doesn't change results for the overall assessment.

30. The level of precision of some of the recruitment estimates needs to be considered in the development of predictive estimates. Currently SPC is working to refine the analysis inputs to use periods with more precise estimates of recruitment for predictive model.

Seabirds

31. The tasks allotted to the Scientific Committee for seabirds from the second meeting of the WCPFC were as follows:

- The Commission agreed that the Scientific Committee, in consultation with the Technical and Compliance Committee, should investigate seabird mitigation measures applied and being tested by other RFMOs, particularly those of the Commission for Conservation of Antarctic Marine Living Resources; investigate the utility of implementing compatible measures; and recommend specific seabird mitigation measures for consideration at the third regular session of the Commission.

- CCMs shall provide the Commission with all available information on interactions with seabirds, including incidental catches and details of species, to enable the Scientific Committee to estimate seabird mortality in all fisheries to which the WCPF Convention applies.

NGO-1 Distribution of Albatrosses and Petrels in the WCPFC Convention Area and Overlap with WCPFC Longline Fishing Effort

32. Cleo Small (BirdLife International) presented a paper summarizing albatross and petrel distribution in the WCPFC area using tracking data from the BirdLife Global *Procellariiform* Tracking Database. The results highlight the importance of the WCPFC area for albatross populations (41% of global distribution). Distribution is concentrated north of 20ºN and south of 30ºS, corresponding to an area overlapping with around 100–110 million hooks of WCPFC longline fishing effort per year. Some albatross species spend a significant proportion (>40%) of their time in high seas areas. The high degree of overlap with fisheries indicates key areas of risk of seabird bycatch. While seabird bycatch data have been collected within, New Zealand and Australian EEZs, and by the USA in waters within and adjacent to the EEZ surrounding Hawaii, few seabird bycatch data currently exist for WCPFC longline fisheries in high seas areas.

Moreover, many coastal areas are poorly covered. This emphasizes the urgent need for the collection of seabird bycatch data by WCPFC through its regional observer program. BirdLife International noted that it would also be valuable to extend the analysis presented in the paper to assess overlap with WCPFC longline fishing effort at finer spatial and temporal scales if fishing effort data can be made available.

Discussion

33. Most longline-seabird interactions occurred at high latitudes (north of about 20°N and south of about 30°S). In response to a question about the levels of interaction in tropical areas, the presenter informed the SWG that there was also evidence of interactions with shearwaters in Australia and NZ at 20–30°S, but there were little data for equatorial regions. Some observer data exist for those areas, and are now being analysed.

34. Most seabirds are dead upon landing, but the SWG questioned whether there was any information on post-release survival rates of seabirds that were alive and released. There seems to have been no studies that have assessed this.

NGO-2 Summary of Seabird Bycatch Rates Recorded in the Western and Central Pacific: BirdLife International

35. Cleo Small presented a summary of data on seabird bycatch rates in pelagic longline fisheries within the WCPO. The data indicate the high levels of seabird bycatch that have been recorded where no mitigation measures were used; the effectiveness of a range of mitigation measures at reducing seabird bycatch; and the low availability of seabird bycatch data from high seas areas. In addition, the data highlight the variability of recorded seabird bycatch rates, which reflects the seasonal and spatial clustering of seabird abundance, the effect of environmental factors, the significant effect of small differences in fishing gear configuration, and differences in methods of data collection by observers. The paper notes that the development of standardized methods for recording seabird bycatch within WCPFC's regional observer programme for longline fisheries will be important in helping to reduce this variability and/or understand the factors that cause it. The paper also notes that the nature of pelagic longline gear (e.g. long branch lines, less line weighting) means that it has an inherently slower sink rate than demersal gear. Vessels targeting swordfish also often use squid bait and light sticks which increase buoyancy further. These characteristics must be taken into account in order to design effective seabird bycatch mitigation strategies. A number of experiments are currently underway to further develop seabird bycatch mitigation measures for pelagic fisheries (e.g. tori lines, side setting, bait capsule, bait pod).

Discussion

36. Participants highlighted the need to assess the risk to seabirds where overlap with fisheries occurs. Albatrosses are often found at high latitudes where they use high altitude winds. Consequently they tend to have a broad longitudinal distribution, but narrower latitudinal ranges. By contrast, petrels tend to migrate across the tropics (e.g. sooty shearwaters do cross the tropics but remain in high latitudes to feed and breed). Some species breed in the tropics and they will be most susceptible to tropical fisheries. More information is required on post-fledging distribution (as this life stage can last up to seven years) and finer spatial data are required to assess any overlap with fisheries. This is also required on a fine spatial scale, due to seasonal variation in fishery and bird distributions (e.g. southern bluefin tuna vessels may overlap with albatross

distributions in the Tasman Sea during winter), but there may be less overlap with vessels targeting other species in the same area during summer.

37. There is good information on seabird interactions in the tropical equatorial band from the USA longline fleet based in Hawaii which has 25% observer coverage. These data, however, are limited longitudinally. In addition, a new observer programme is being initiated to be based on American Samoan vessels, which will provide additional data, although again this will be restricted spatially. Initial indications are that seabird interaction rates are low in American Samoa.

38. The Agreement on the Conservation of Albatrosses and Petrels (ACAP) informed the SWG that they are working towards assessing threats to albatross and petrel populations. Data collated by BirdLife International suggests that longlining may be the biggest threat to several albatross populations. The question was raised as to what the population size of petrels and albatrosses actually is. It was noted that good data are available for some species. Some species are listed by the IUCN indicating that they have shown large declines in population numbers. The Convention states that the Commission must avoid and mitigate bycatch wherever possible and this should be applied to seabird bycatch.

39. The SWG also considered whether other fishing methods used in the WCPFC Convention Area, such as purse seining, trolling and poling, interact with seabirds. Generally, those other fishing methods are not of great concern because they are pursued in tropical areas. Albacore trolling, which occurs at high latitudes, may need to be assessed because there has been little observer coverage. New Zealand intends to deploy observers on albacore trolling vessels in the upcoming season. Seabird mortalities are also known to occur in gillnet fisheries, but these fisheries are not extensive in the Convention Area. Low seabird catch rates occur in purse-seine fisheries. However, northern giant petrels are caught by the purse-seine fishery but observer coverage is not adequate to assess this interaction effectively.

40. There is a need to assess the ecological and life history characteristics of birds in the Convention Area as they could be impacted by other perturbations (e.g. rodents feeding on eggs and young), necessitating a holistic approach to managing and rebuilding seabird populations. Rodent impacts tend to be high on small seabird species. Longlining has been assessed to have the most significant impact on albatross populations. It was noted that managers need to consider the life cycle of albatrosses, which mature late and have very low fecundity. Therefore, relatively low levels of mortality from fishery interactions may put these species in a vulnerable position.

41. The SWG agreed that it was important for researchers to clearly define what interactions reported by observers represent. For example, definitions of interactions might include birds following boats, or feeding on offal, or diving for baits, or being hooked and brought on board.

SC2 EB WP-4: Towards a Seabird Mortality Risk Assessment: Distribution of Seabirds in the WCPFC Area and Potential Overlap with Fisheries

42. SC2 EB WP-4 reviewed the distribution of seabird species with the WCPFC Area. The work was based on the recent publication “Albatrosses and Petrels across the World”, which reviewed information from a combination of at-sea sightings, band recoveries, satellite telemetry, and individual-species studies. From the review of the distributions of 99 species of albatross (Procellaridae) and petrel (Diomedeidae), 16 species of albatross and 60 species of petrel occur within the area of the WCPFC, and are potentially vulnerable to fisheries bycatch. These include species with IUCN classification of Critically Endangered (n = 1), Endangered (n = 7),

Vulnerable (n = 26) and Near Threatened (n = 7). The remaining 30 species are classified by the IUCN as Least Concern.

43. Species with Critical to Near Threatened threat classifications exist for both Procellaridae and Diomedeidae families and occur across the WCPFC Convention area. Effective mitigation that is adapted to the albatross or petrel community encountered in different areas is therefore needed to mitigate any effect of WCPFC fishing on these species' populations.

44. The paper recommended that:

- Ongoing revisions of the risk assessment should be undertaken with new data and at finer scales where data become available.
- Mitigation measures are developed and adapted according to the community of seabirds in specific fishery areas, taking into account their specific behaviours and distributions.
- Mitigation of seabird mortalities in tropical as well as temperate and sub-Antarctic regions may be warranted, given the ranges and latitudinal migration or distribution patterns of albatross and petrel species.
- Data on seabird mortality is collected on a fine scale to allow a more detailed assessment of risk within the WCPFC Convention Area, to assess the efficacy of any mitigation deployed

Discussion

45. With regards observer coverage, 100% was considered the ideal, particularly for quantifying rare and highly variable events, such as seabird interactions. The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) and the Hawaii swordfish fishery, for example, have 100% coverage. This level, however, is not always practical for all fisheries. As a first step, it was suggested that high rates of coverage (e.g. 20%) might be initially implemented for several years to obtain a detailed understanding of levels and associated variability of quantities. Effective observer programmes could then be designed on the basis of that initial information.

46. There are crew-safety concerns with weighted swivels which have been advocated as a seabird mitigation measure. In the USA, it appears that forty-five gram weights are safer than the heavier ones and seem to be as effective. Several experiments have shown side-setting to be highly effective in reducing seabird interactions during longline setting. The SWG agreed that mitigation measures need to be used correctly to be effective and observers must monitor this, and possibly advise crew on using the measures properly.

47. Controls on offal discharge are another measure that has been considered for the mitigation of seabird bycatch. In some situations, the discharge of offal during setting had actually reduced interactions by distracting seabirds from the setting operations. In general, however, it was considered better not to encourage seabirds to follow fishing vessels. For small vessels there may also be practical limitations on their ability to store offal.

SC2 EB WP-5: A Review of Methodologies Aimed at Avoiding and/or Mitigating Incidental Catch of Seabirds in Longline Fisheries

48. Information on methods aimed at mitigating incidental mortality resulting from fisheries interactions have been released in a variety of local, national and international media. This report presents the results of a review to reduce contacts and mortalities of seabirds due to interactions

with longline fishing gear. While having a New Zealand fisheries focus, the results of this review are likely to be applicable to longline fisheries worldwide. Factors influencing the appropriateness and effectiveness of a mitigation device include the fishery, vessel, location, seabird assemblage present and time of year (i.e. season). As such, there is no single magic solution to reduce or eliminate seabird bycatch across all fisheries. It is recommended that a combination of measures is required, and even within a fishery there is likely to be individual vessel refinement of mitigation techniques in order to maximise their effectiveness at reducing seabird bycatch. Retention or strategic management of offal and discards are has the potential to avoid seabird bycatch. Other methods recommended to mitigate against seabird bycatch include paired bird-scaring lines, line weighting and night setting.

Discussion

49. Key conclusions from the review were that flexibility was needed for different situations and that the effects of mitigation measures tend to be multiplicative. For example, the use of tori lines with night-setting resulted in larger reductions in seabird bycatch than either method used in isolation.

50. Several participants described national involvement in seabird bycatch mitigation.

51. In Australia, longlining is listed as a key threatening process under environmental legislation; therefore a threat abatement plan has been developed. This was first developed in 1998 and has recently been reviewed and revised. Australia has taken the approach of having performance measures for fisheries to provide flexibility for fisheries to adopt appropriate mitigation measures. The performance measure recognises that in the long term the goal is to reach zero bird bycatch but in the short term for the Australian Eastern Tuna and Billfish Fishery (ETBF), the target is to ensure a catch rate less than 0.05 birds per 1000 hooks in all fishing areas and seasons. To achieve this target, mandatory measures have been put in place for the ETBF. General measures across the fishery include management of offal discard, to avoid attracting birds to boats and the use of thawed bait to assist sink rates. Other mitigation measures are divided by the line 25^{o}S. Under the original threat abatement plan the mitigation measures were divided by the line 30^{o}S based on knowledge of albatross and petrel distribution. However, from the observer programme it was clear that high catches of flesh-footed shearwater occurred north of 30^{o}S, therefore the line was moved. South of 25^{o}S fishers must use a tori line system while setting hooks, in addition vessels must either set lines at night or use a specified line weighting regime. If the fishery experiences bycatch rates above the target additional measures will be implemented. The details of the Australian mitigation measures are provided in SC2 EB IP-5.

52. The United States has implemented a suite of mitigation measures, with some differences between areas, as described in SC2 EB IP-1. The shallow swordfish fishery had a combination of mandatory mitigation measures (e.g. night-setting (total darkness), blue-dyed bait, thawed bait, and bird handling measures. Fishers are able to shorten the list of required mitigation measures if they use side-setting. Training courses of fishers on safe handling and release procedures for seabirds and turtles have also been conducted. The importance of education for fishers was emphasised.

53. New Zealand research has shown that night setting significantly reduces seabird bycatch. Currently the New Zealand charter fleet has a code of practice with multiple measures (e.g. night-setting, bait-thawing and reducing offal discharge). The New Zealand tuna longline fleet is required by law to deploy tori lines while fishing south of 30^{o}S. The New Zealand experience has

shown that the mitigation measures must be practical and enforceable. Fishers are more likely to use mitigation measures that are practical.

54. Chinese Taipei highlighted the progress that has been made with their National Plan of Action for Seabirds and encouraged other members to develop these. They also reported briefly on a workshop of experts and fishers that was a useful exercise, with bird experts learning from fishers.

55. Japan also reported on its National Plan of Action for Seabirds and the use of mitigation measures in the southern bluefin tuna fishery and tuna fisheries north of 20ºN including tori lines and other measures (e.g. bait-casting, night-setting and blue-dyed bait). In some areas (e.g. waters around Torishima Island) more rigorous measures are applied to reduce albatross catch. In addition, research and training vessels are being used to explore other mitigation measures and train people involved in fishery.

56. China reported that their observer programme has reported seabird interactions to the Inter-American Tropical Tuna Commission (IATTC) and other regional fisheries management organizations (RFMOs). They noted that few seabirds are caught in the tropical bigeye tuna fleet. China indicated that they would report on the observer programme at the third session of the Scientific Committee.

57. In general discussion it was emphasised that fishers should be involved in the development of mitigation measures to increase ownership and also generate new ideas on bycatch mitigation. Fishers can identify ways to reduce seabird catch that may not have been considered by scientists. The proper training of observers, and standardized data collection was also highlighted.

SC2 EB WP-15: Preliminary Report of Side Setting Experiments in a Large Sized Longline Vessel

58. Experiments on side setting methods were conducted in April–May 2006 using a large-sized longline research vessel (total length 54 m, 450 GRT) to examine the applicability of side setting to large distant water type Japanese longline vessels. Two sets of line setting equipment were installed at the end and side of the stern deck, and the performances of stern setting and side setting were compared. Preliminary analysis of the results indicated satisfactory performance of side setting in practical feasibility and in improvement of sink rates of baited hooks.

Discussion

59. There was general support from the meeting for these types of experiments. It was noted that interactions with seabirds would be expected to be lower if the line is set from closer to the bow of the vessel. In response to a question regarding whether there were significant differences in seabird bycatch between set types, the presenter indicated that the results were preliminary and seabird bycatch rates were not currently available.

60. The potential advantage of combining side setting with a bird curtain and tori lines was also discussed. The presenter noted that this may be examined in further experiments that were planned.

General discussion on advice to the scientific committee

61. There was general agreement that a combination of several mitigation measures, used simultaneously, appears to be the most effective approach to reducing seabird bycatch. Australia, New Zealand, USA and some other members have implemented a range of seabird bycatch mitigation measures. The EB-SWG recognised that seabird interactions (and consequently the appropriateness of mitigation measures) may vary among fisheries and areas, and that research is continuing on other, new measures. The EB-SWG emphasised the value of a targeted observer programme covering the Convention area for one or two years to identify areas and seasons of importance for seabird bycatch, to provide targeting for mitigation measures. This programme would also enable the assessment of spatial coverage needs for future observer programmes.

Sea turtles

62. The EB-SWG co-convenor opened the second half of the session by summarizing the tasks that were set for this SWG.

63. With respect to turtles, the tasks allotted to the Science Committee from the second meeting of the WCPFC were as follows:

- In relation to the Resolution relating to sea turtles, it was agreed that the Commission, through the Scientific Committee and Technical and Compliance Committee, should develop a programme that includes: research and development of gear and bait alternatives, promotion of the use of available bycatch mitigation technology, promotion and strengthening of data collection programmes to obtain standardized information to develop reliable estimates of the bycatch of seas turtles, biological research on sea turtles, including the identification of migration routes or other areas of spatial or temporal importance, industry education, development and promotion of safe handling techniques and other techniques to improve sea turtle conservation.

- This programme will take into account the sea turtle conservation efforts undertaken in other international organizations, in particular the IATTC.

64. The co-convenor also referred to the Resolution-2005-04 from the second WCPFC meeting in December 2005, which urges CCMs to:

- undertake research trials of appropriate-sized circle hooks in commercial pelagic longline fisheries;

- undertake research and trials on the use of circle hooks in recreational and artisanal fisheries; and

- require longline vessels flying their flags to carry on board and, when sea turtle interactions occur, employ the necessary equipment (e.g. de-hookers, line cutters, and scoop nets) for the prompt release of incidentally caught sea turtles.

SC2 EB WP-9: Japanese Research Activities to Reduce Incidental Mortality of Sea Turtles in Tuna Longline Fishery

65. The effects of circle hooks on catch rates of target species and sea turtles were investigated through scientific fishing surveys in the western North Pacific from May to September 2005. There was no difference in hooking rates of loggerhead turtles (*Caretta caretta*) between tuna hooks and small-sized circle hooks, but large-sized circle hooks had the potential to reduce the hooking rates of loggerheads. The ingestion of circle hooks, especially the large-sized hooks, occurred less frequently than with tuna hooks, which suggests that circle hooks have the potential to improve post-hooking survival of sea turtles. The use of circle hooks had little effect on the catch rates of tuna, but large-sized circle hooks showed negative impacts on billfish catch. Analysis of the resultant data indicated that the effect was variable among the types of circle hooks associated with hook morphology. The shape and size of circle hooks was being explored in order to reduce incidental mortality of sea turtles through fishing and captive experiments. To improve post-hooking survival of sea turtles, simple and practical de-hooking devices were developed and distributed to some fishermen for on-site performance tests.

Discussion

66. The group discussed the result that the circle hooks were sometimes less effective for catching swordfish and marlins than the traditional tuna hooks. Fishermen have said that swordfish pull free from the circle hooks because these hooks catch fish on the edge of the mouth more often than other hooks. Other types of hooks (e.g. tuna and J hooks) tend to be more deeply ingested and hold better. For marlins, the mechanism might be the same. It was pointed out that the Hawaii swordfish fishery operating under new gear restrictions has been achieving a higher catch rate of swordfish with circle hooks, than it did previously with J hooks. However, the switch to circle hooks was coincident with a mandated change in bait from squid to fish. The bait change was intended to overcome an anticipated decline in swordfish CPUE if the only switch had been from J to circle hooks. Trials comparing the two hook types without bait changes have repeatedly shown a significant decrease in swordfish CPUE with circle hooks (experiments in Hawaii, the USA fishery in the North Atlantic, and elsewhere), although not every study shows a decrease or a statistically significant decrease (e.g. preliminary study results from the Italian swordfish longline fishery off Sicily or from the Brazilian longline fishery in the South Atlantic).

SC2 EB WP-3. Preliminary Characterization of Sea Turtle Catches in New Zealand Fisheries Waters

67. The paper described information available on sea turtle interactions in the New Zealand tuna longline fishery. Over the period 2001–2005, 11 turtles have been reported from the longline fishery from these two data sources. Seven of the turtles were leatherbacks, whilst the remainder were reported as green turtles (two), loggerhead (one), and one was unidentified. All turtles were alive when caught, and were released alive, except for one green turtle caught in 2001 which was dead when it came onboard.

68. All but two of the sea turtle interactions occurred during the period of highest sea surface temperatures in New Zealand (February–May), with the other two caught in November and June. Most sea turtle interactions occurred in the north of New Zealand, though one leatherback turtle interaction occurred off the southwestern tip of New Zealand. While most longline fishing effort during the first half of the year occurs off the east coast of the North Island, most sea turtle interactions occurred in the Bay of Plenty region slightly north.

69. The paper also described attributes of the characteristics of the fishery. It was found that the domestic vessels used circle hooks, typically size 16/0 and 17/0 and while they most often used a 50–50 mix of squid and fish, they often used a higher proportion of squid bait.

70. In noting that the Commission had requested advice on a sea turtle programme, the paper provided some ideas of types of information that it would like to see collated under such a programme:

- details of fishery operations are most important for sea turtle issues and should be recorded by fisher and observers;
- spatial and temporal distributions of the different sea turtle species;
- diving abilities of the various species
- Advice on the best mitigation measures for sea turtles, including an differences among sea turtles species; and
- the effect of these mitigation measures on the catches of target (e.g. tunas and swordfish) and bycatch (e.g. sharks and other fish and non-fish species) species.

Discussion

71. The proposed programme was supported and comments were: that the Hawaii longline logbook and observer programmes provide a good description of the necessary data collection; that there are extensive data from telemetry studies on turtle diving depths for most species; and that there are problems in getting conventional tagging data for turtles. The Secretariat of the Pacific Regional Environmental Programme (SPREP) has established a turtle tagging database that members are encouraged to contribute data to. There have been studies in other fisheries using time–depth recorders (TDRs) to indicate hook depth that may provide help in designing additional studies.

72. Regarding a question on how much fishing effort produced the observed catch of turtles, the observer coverage was about 2–5% of the domestic longline fishery overall but may have been higher in the particular area where turtle captures appeared to be most frequent as this is not the area of greatest longline effort. Once a better understanding of the relevant spatial and temporal strata has been determined, estimates of total catch will be undertaken.

SC2 EB WP-13: Turtle Bycatch Mitigation in the Hawaii Longline Fishery

73. This paper examined the impacts of regulations to reduce sea turtle interactions for the shallow set swordfish fishery in Hawaii. These regulations were based on research conducted in the USA North Atlantic longline swordfish fishery and came into effect for the Hawaii-based pelagic longline swordfish fishery in May 2004. There were significant reductions in sea turtle and shark capture rates and reduced proportion of deeply hooked turtles, indicating increased post release survival prospects, without comprising target species catches. This study also included examination of the viability and potential for temporal and/or spatial closures to reduce turtle capture rates, a comparison between 2005 and 2006 turtle catch rates and the hook position in a basket catching turtles and retained fish.

Discussion

74. One comment emphasized that the reported increase in “entangled” (usually meaning hooked and entangled) turtles using size 18 circle hooks with fish bait was an increase in

proportion among capture categories, and not an increase in capture rate. Capture rate of turtles either solely entangled (rare) or entangled as well as hooked is much lower with circle hooks, both in the Hawaii swordfish fishery, and in the previous study in the US North Atlantic fishery. It was also emphasized that this paper compared data from the recent 100% observed swordfish fishery with the total observed data from before the gear was changed, but the latter is only a small sub-sample of the prior fishery. Before the gear was changed the annual modelled estimates of turtle captures were an order of magnitude higher than afterwards. It was noted that none of the catch rate changes for turtles or fish were adjusted to account for potential changes in population abundance over the time span of when the gear was changed.

75. The technical meaning of turtle "take" (in the USA meaning any alteration of protected species behaviour by the fishing vessel) versus catch was discussed and it was clarified that all the turtle data from the Hawaii fishery is on turtles that were actually caught and released, or that were caught and observed to free themselves from being hooked or entangled.

SC2 EB WP-12. Comparison of Circle Hooks and J Hooks in the Catch Rate of Target and Bycatch Species Taken in the Korean Tuna Longline Fishery

76. The National Fisheries Research and Development Institute (NFRDI) in Korea conducted a circle hook experiment in the tuna longline fishery of the eastern Pacific Ocean during the summer 2005. The purpose of this experiment was to compare the catch rates of target and bycatch species between J hook and circle hooks. For this experiment, two scientists were deployed to one Korean longliner (411 GRT) fishing in the eastern Pacific Ocean between 1°48'S and 7°00'S, and 142°00' and 149°13'W from 15 July to 12 August 2005. In the target species group, no significant differences among three types of hooks, between size 4.0 traditional tuna hooks (J-4) and size 15 circle hooks (C15), and between C15 and size 18 circle hooks (C18) were revealed, but significant differences were found between J-4 and C18. In the bycatch species group, significant differences were found among three types of hooks, between J-4 and C15, and between J-4 and C18, but no significant differences were revealed between C15 and C18. Large circle hooks (C18) had the lowest catch rate for tunas and for other fishes, and the small circle hooks (C15) had the lowest rate for billfishes and sharks. The length distributions for bigeye tuna are very similar for the three hook types. There were very slight differences in length size between hook types in the bycatch species.

Discussion

77. It was noted that this type of hook performance study on both catch and bycatch is very beneficial both for application to turtle mitigation and to stock assessment, as the differences between hooks have effects on fishing power. Preliminary Australian work on circle hooks also indicated few size differences between fish caught on the different hook types, as well as the existence of differences in fish condition at capture (alive vs dead), suggesting benefits in product quality with circle hooks as more fish are boated alive.

78. It was noted that biases in hook performance among hook types can result if there are systematic differences in their position along the longline (e.g. hook depth along the catenary between floats). This study carefully avoided such biases by using a rigourously alternating (J-4, C15, C18, J4, C15, C18, etc) sequence with 17 hooks (not a multiple of three types) between floats. This is a very important consideration in the design of such studies which should be emphasized in the research program. It was noted that six different types of bait were used in the experiment. Although studies have repeatedly shown that bait type can affect the catchability of

fish and turtles, the scientists did not have control over the bait choices of the commercial fishing vessel used in this experiment.

SC2 EB IP-11 Checklist and Catch Rate Data by Hook Type and Bait for Bycatch Species Caught by Spanish Experimental Longline Cruises in the Southwestern Indian Ocean during 2005

79. Catch rate data were presented, in number and round weight per thousand hooks, from experimental cruises conducted out by the Instituto Español de Oceanografía (IEO) with two surface Spanish longliners in international waters of the southwestern Indian Ocean. A total of 531,916 hooks were deployed in 539 sets, resulting in a total catch of 1,162 t, of which 30 t was bycatch. Detailed information was presented about the catch of sea turtles, marine mammals and sea birds. Finally, the total catch, in number and weight, for all of the species or species groups caught during this survey, was presented, indicating if they were included as commercial catch or as bycatch.

Discussion

80. The number of turtles caught on J versus circle hooks, and the type of turtle and marine mammal capture (hooks ingested or external, and whether entanglement often included hooking, particularly for leatherbacks) was questioned. Because the presenter was not an author no information beyond that in the paper was available. It was noted that leatherback turtle entanglement (usually including external hooking) has been reduced by the use of circle hooks in published studies and in the Hawaii fishery, and that it would be useful to know which of the hook types were associated with the leatherback entanglements in this study (not reported). Regarding the damage to fish shown caught in this study being caused by sharks or mammals the presenter thought that some of the damage might have been caused by birds or squid. It was noted that this study occurred where a South African pelagic longline fishery also operates. The South African fishery has a much higher seabird bycatch (about 20 times the values in this study), even though it uses mitigation measures such as night setting, tori lines and weighted branchlines. The Spanish study, which employed green-dyed bait and circle hooks, had a relatively low discard rate.

General discussion

81. The EB-SWG noted that research as well as demonstrations with altered gear in regular longline fisheries have clearly shown that hook and bait combinations can reduce sea turtle bycatch. An issue that remains is the uncertain impacts on target species catch rates in particular fisheries. In fisheries where the turtle bycatch rate is low (e.g. in all the deep-setting fisheries targeting bigeye tuna that have so far been examined), experimental determination of the effects of hook type and bait on turtle bycatch is not practicable because of the low statistical power available and the huge sampling effort that is required. Therefore, a goal of the research programme in these fisheries can be to test whether gear alterations believed to reduce turtle bycatch or turtle injury based on other studies (e.g. use of larger hooks, circle hooks, deeper set hooks, or fish bait) can maintain commercial catch rates for valued catch species. If these studies show success, then wide commercial adoption of the improved gear could eventually demonstrate benefits to turtles when sufficient effort has been observed.

82. Post-release mortality studies are underway, and more are needed, to look for more evidence of reduced injury and improved post-release survival in turtles (and other bycatch) that is hooked externally or in the mouth in comparison with bycatch that ingests the hooks. The most

consistent benefit of the shape of circle hooks versus other hook shapes is in reduced hook ingestion. Although this appears an obvious benefit for improving turtle post-release survival, more rigorous scientific evidence would be very helpful to resolve debate over the merits of circle hooks.

83. The EB-SWG recommended that the turtle programme should include collaboration between scientists, the fishing industry, fishery agencies and NGOs such as has been so effective in the programs in Hawaii, Latin America, Australia, Japan, Indonesia and South Africa and elsewhere. It is also important to view the reduction of turtle and other bycatch as a process of improvement and refinement in fishing practices in relation to a spectrum of environmental impacts including captures of other protected and endangered species, changes in fishing effort, target species, and fishing grounds in response to management measures, and other fishery and socioeconomic consequences. The research programme should employ an ecosystem based approach to developing and evaluating management measures. The process of improvement and refinement may well involve changing management measures as fishers, scientists, and other collaborators try measures and develop alternatives. The hook type, hook size, bait type, fishing depth, and fishing effort measures to reduce turtle bycatch will need testing and evaluation as they are tested and adopted in various fisheries. It will be important that management measures not inhibit the testing of new alternatives, such as deeper fishing, hooks with appendages, alternate light lures, and other possible measures that are now being investigated.

84. The story of the reduction of fishery interactions with seabirds in Hawaii is a good illustration of this process, with the initial research and management measures focused on solutions developed elsewhere (tori lines, weighed lines, dyed bait) then noting the striking effectiveness of a measure that was required without much testing (night setting) and then moving on towards allowing alternative, more effective, measures to be developed in the local fishery (e.g. side setting). An effective programme should involve dynamic management over time.

85. Clearly the research programme should provide bycatch reduction mitigation measures that are science based. The much wider area and need for comprehensive biological research on turtles is beyond the Commission's programme. The Commission's programme should focus on manageable goals based on the expertise, infrastructure, and resources that are available and rely heavily on the wider turtle research community for support.

86. The Commission's programme will require an observer programme that provides a much more representative view of the deployed effort (see Fig. 2) and pursue other means of determining the spatial and temporal distribution of sea turtle vulnerability to fishing gears. The programme should focus on tracking and tagging work as well as observer programme development to reveal such patterns. Continuing research into bycatch mitigation measures must also continue to monitor and evaluate impacts on other species (e.g. sharks), with respect to circle hooks.

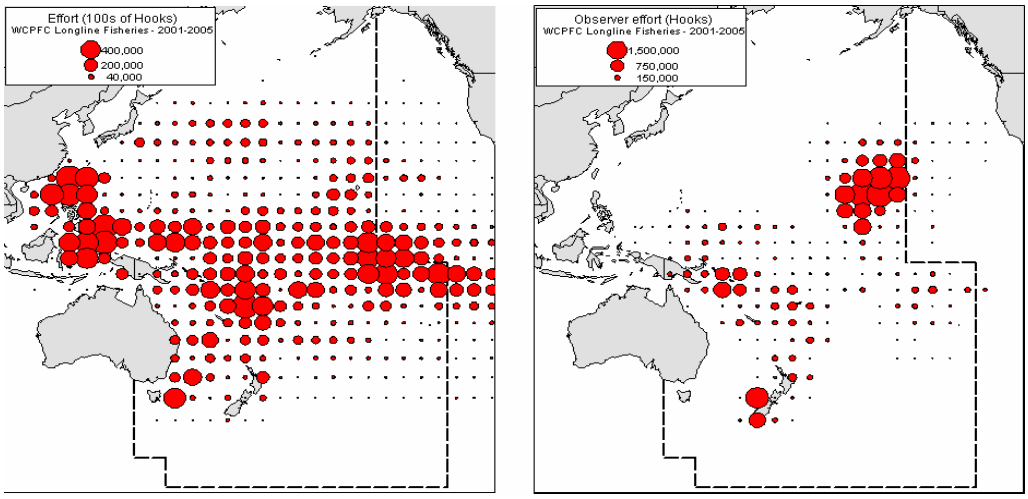

Figure 2. Distribution of longline fishing effort (left) and observer coverage (right) held by SPC in the WCPO. Note that observer data for the Australian Eastern Tuna and Billfish Fishery have not been included in this figure due to technical difficulties.

87. Also, to assess the impact of fisheries on turtle populations there is need to encourage the wider research community to assist in understanding turtle population dynamics. A vigorous and comprehensive research programme already exists on stock identity and heterogeneity. To evaluate the need and efficacy (for population recovery) of reducing bycatch in particular fisheries, the Commission's programme needs to include investigation, modelling, and assessment of the sources of turtle mortality throughout their life cycle.

88. A particular impact on populations, which was recommended for examination and which may be amenable to mitigation, is the entanglement and mortality of sea turtles in FADs. In a broader context, the programme needs to seek information on impacts of fisheries and other anthropogenic impacts within and outside its jurisdiction, and to learn more about the extent and status of nesting habitats as well as foraging habitats where turtle populations are most impacted by human activity. Without such information it is not possible to select and require a management programme that will be effective for population recovery, or to counter proposals to eliminate whole fisheries.

Information papers on turtles (not presented)

SC2 EB IP-2: Measurement-points Examination of Circle Hooks for Pelagic Longline Fishery to Evaluate Effects of Hook Design

SC2 EB IP-3: A Summary of the Korean Tuna Fishery Observer Programme for the Pacific Ocean in 2005

SC2 EB IP-1: Analyses of Observer Data for the Hawaii-based Longline Swordfish Fishery

SC2 EB IP–8: The Sea Turtle Bycatch Mitigation Programme for the Coastal Longline Fleets and Preliminary Results of Circle Hook Experiments

SC2 EB IP–10: Interactions of Fisheries in the Eastern Pacific Ocean and Marine Turtles

Sharks

SC2 EB WP-10: Analysis of Longline CPUE of Major Pelagic Shark Species Collected by Japanese Research and Training Vessels in the Pacific Ocean

89. The standardized CPUE for blue shark, bigeye thresher and silky shark were calculated using research data collected by Japanese research and training vessels in the Pacific Ocean from 1992–2003. Blue shark, bigeye thresher and silky shark are the main pelagic shark species caught by tuna longline fishing in the Pacific. Though there were fluctuations in the CPUE data, substantial changes of standardized CPUEs were not observed for the three species during this period. Further, three mathematical models for standardizing CPUE were compared using the data for bigeye thresher to assess the differences in CPUE trends due to model selection.

Discussion

90. It was pointed out that the CPUE of blue sharks over a much broader time period appeared to have declined by half. In response, it was noted that this trend does not match that in the blue shark stock assessment for the North Pacific, which is currently being updated. There are two approaches being compared in this assessment, showing many similarities, and one approach was presented at the last International Scientific Committee (ISC) meeting. It was noted that the apparent increase in blue shark CPUE at the beginning of the time series in SC2 EB WP-10 might be the result of the removed impact of the high-seas driftnet fishery. Further evaluation of the training vessel series and comparison with the assessment model and other data may reveal the full meaning of the decline apparent in the training vessel data series. It was emphasized that the training vessel data series is a very detailed and comprehensive data set, akin to a fully observed fishery of significant size, and that it should provide a very powerful tool for further examination of shark stock status. The series reflects very little change in fishing methods over time, with 10–20 hooks per basket and the same line materials used over time.

SC2 EB IP-16: Shark Catch in a Pelagic Longline Fishery: Comparison of Circle and Conventional Tuna Hooks

91. The effects of circle hooks on blue shark catch in a pelagic longline fishery were assessed in fishing experiments on two research vessels in the western North Pacific off the coast of Japan from May–September 2005. Conventional tuna hooks (standard Japanese hook size; 3.8-*sun*) and two sizes of circle hooks (4.3-*sun* and 5.2-*sun*) were used for each fishing operation and compared catch rates, size compositions and mortalities of blue shark between hooks. One vessel used stainless steel wire leaders and the other vessel used nylon-monofilament leaders. The total numbers of blue shark caught were 755 and 2,598 for the respective vessels. Catch rates did not differ significantly between the three hook types on either vessel ($P = 0.48$ and $P = 0.43$, two-way ANOVA). The proportion of dead individuals was not significantly different between the three hook types on either vessel ($P = 0.31$ and $P = 0.70$, Chi-square test of independence). The difference in mean length between hook types was insignificant for one vessel, but significant for the other ($P = 1.00$ and $P = 0.03$, ANOVA). These results indicate that the circle hooks used in this study had little impact on catch rates and mortality of blue shark. The possible relationships between hook type, leader material, hooking location, and catch rate of sharks were also discussed in this presentation.

Discussion

92. It was noted that the paper suggests that circle hooks may improve survival rate of blue sharks by reducing deeply ingested hooking.

Information papers on sharks (not presented)

SC2 EB IP-2. Measurement-points Examination of Circle Hooks for Pelagic Longline Fishery to Evaluate Effects of Hook Design

Recommendations

93. Other than the recommendations for PSA risk assessment and on fishery agency/fishing industry/NGO collaboration on turtle issues, no other recommendations were generated during the EB-SWG session. However, following the EB-SWG session, a small working group met to discuss the session outcome in order to formulate responses to requests from the Commission for seabirds and turtles. A draft summary of the text is appended to this report (Appendix II and Appendix III), which will be considered in the full plenary of the Science Committee under agenda item 5 (Bycatch Mitigation).

94. Report adopted by consensus.

Appendix I

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

AGENDA FOR THE ECOSYSTEM AND BYCATCH SPECIALIST WORKING GROUP

WCPFC-SC2-2006/EB-SWG AGENDA

1. Preliminaries i. Adoption of agenda ii. Finalization of documents	Paul Dalzell
2. Requests from the Commission	
a. Ecological modeling and risk assessment. (This wasn't a request from the Commission.)	Peter Ward (rapporteur: Ilona Stobutzki)
Presentations SC2 EB WP-14. Ecological risk assessment for the effects of fishing: methodology	Rob Campbell
SC2 EB WP-1. An ecological risk assessment for species caught in WCPO tuna fisheries: Inherent risk as determined by productivity-susceptibility analysis	David Kirby
SC2 EB WP-2. Ecosystem indicators for ecosystem regime shifts and links with long-term recruitment variability for tunas	David Kirby
Information Papers SC2 EB IP-5 Seamount Research Planning Workshop Report. 20-21 March 2006	V. Allain et al
EPIP-6. Ecosystem Monitoring and Analysis: stomach sampling overview of the GEF-SAP project 200–2005 and stomach sampling strategy of the GEF-OFM project 2005–2010.	V. Allain and B. Leroy
b. Sea Birds	Peter Ward (rapporteur: Brouwer)
Presentations	

Distribution of albatrosses and petrels in the WCFPC Convention Area and overlap with WCPFC longline fishing effort	Cleo Small
SC2 EB WP-4. Towards a seabird mortality risk assessment: Distribution of seabirds in the WCPF Convention area and potential overlap with fisheries.	Shelton Harley
Summary of seabird bycatch rates recorded in the Western and Central Pacific	Cleo Small
SC2 EB WP-5. A review of methodologies aimed at avoiding and/or mitigating incidental catch of seabirds in longline fisheries	Shelton Harley
SC2 EB WP-15. Preliminary report of side-setting experiments in a large sized longline vessel.	Matsunaga
Information Papers	
SC2 EB IP-4. Bycatch mitigation approaches in Australia's Eastern Tuna and Billfish Fishery: seabirds, turtles, sharks and non-target fish	Ilona Stobutzki
SC2 EB IP-7 Review of seabird status and incidental catch in Eastern Pacific Ocean fisheries	IATTC
SC2 EB IP–9 Interactions Between Seabirds and Pacific Islands' Fisheries, Particularly the Tuna Fisheries	R.Watling
Advice to the Scientific Committee	
c. Sea Turtles	Paul Dalzell (rapporteur: Chris Boggs)
Presentations	
SC2 EB WP-9. Effects of circle hooks and feasibility of de-hooking devices to reduce incidental mortality of turtles in the Japanese tuna longline fishery	Matsunaga
SC2 EB WP-3. Preliminary characterization of sea turtle catches in New Zealand fisheries waters	Shelton Harley
SC2 EB WP-13. Turtle bycatch mitigation in the Hawaii longline fishery	Paul Dalzell
SC2 EB WP-12. Comparison of circle hooks and J hooks in the catch rate of target and bycatch species taken in the Korean tuna longline fishery	Dae-Yeon Moon
SC2 EB IP-11 Check list and catch rate data by hook type and bait for Bycatch species caught by Spanish	Roberto Sarrade

experimental longline cruises in the southwestern Indian Ocean during 2005	
Information Papers	
SC2 EB IP-2. Measurement-points examination of circle hooks for pelagic longline fishery to evaluate effects of hook design	Matsunaga
SC2 EB IP-3. A summary of the Korean tuna fishery observer programme for the Pacific Ocean in 2005	Doo-Hae An et al
SC2 EB IP-1. Analyses of observer data for the Hawaii-based longline swordfish fishery	E. Gilman et al
SC2 EB IP–8. The sea turtle bycatch mitigation program for the coastal longline fleets and preliminary results of circle hook experiments	IATTC
SC2 EB IP–10. Interactions of fisheries in the eastern Pacific Ocean and marine turtles. Inter-American Tropical Tuna Commission, La Jolla, USA	IATTC
Advice to the Scientific Committee	
d. Sharks (This wasn't a request from the Commission)	Paul Dalzell (rapporteur: Chris Boggs)
Presentations	
SC2 EB WP-10. Analysis of longline CPUE of major pelagic shark species collected by Japanese research and training vessels in the Pacific Ocean	H. Matsunaga and H. Shono
SC2 EB IP-16. Shark catch in a pelagic longline fishery: comparison of circle and conventional tuna hooks	K. Yokota et al
Information Papers	
SC2 EB IP-2. Measurement-points examination of circle hooks for pelagic longline fishery to evaluate effects of hook design	K. Yokota et al
Advice to the Scientific Committee	
3. Other Research	Paul Dalzell
4. Research planning	Paul Dalzell
i. Medium Term Research Plan	
ii. Operational Research Plan for 2006/07	

Appendix II

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

SMALL WORKING GROUP ON SEA TURTLES

Improved Data Collection and Research Programme

The research programme should acknowledge the huge breadth of biological research being undertaken by the worldwide turtle research community and focus the Commission's activities to support objectives for which it has particular expertise, resources, and responsibility.

Objective: Identification of areas of spatial and temporal importance to fishery interactions and population impacts on sea turtles, so that the Commission can target time area strata of major importance for bycatch mitigation measures and other actions. An illustrative example of achieving this objective would be the much clearer picture available on seabird distributions in relation to fishing effort that has allowed some Commission members to efficiently target management measures in specific regions. The research programme should support the following activities directed towards defining sea turtle stock distributions and vulnerability to fishing gear.

1. Activity: A More Comprehensive Fishery Observer Programme

    a. Coverage

        i. Should initially be spatially and temporally representative of each fishery operating in the Commission Area. When areas of greater importance are found, observer programme focus may be optimized for particular objectives.

        ii. Should ideally aim for 20% of effort/vessels/trips over a two year period (based on the paper by Lawson finding diminishing benefits/cost for greater coverage). As a practical matter, overall observer coverage throughout the region is well below 1%, so any increases would provide a high benefit/cost ratio.

    b. Data collection

        i. Should use the SPC observer manual, reporting forms, and standards are available as a model, and should be cross–checked with the corresponding Hawaii and other manuals and standards to ensure all the necessary turtle data collection details are included, and, where relevant, other species potentially

affected by new mitigation measures. Some of these programmes have focused intensely on the requirements for sea turtle bycatch management.

ii. Should clearly specify programme priorities and specify how observation time is directed towards sea turtle observation versus other objectives. Other activities can effectively prevent effective bycatch observation, so this documentation is essential for interpreting the effective observer coverage.

iii. Observer data submitted to SPC for centralized collection and analysis.

c. Activity: Tagging and Telemetry

i. Flipper tagging should be widely expanded to include conventional styles of tagging by trained fishermen and observers (see Fishermen Education) to provide information on post-release survival and movements.

ii. Satellite and Archival Telemetry should be encouraged to achieve broader coverage than is sometimes achieved by the very active turtle telemetry research community. The Commission should encourage and support further effort of this trained community by making observers available for satellite/archival tagging on fishing vessels. Researchers should be encouraged and supported to broaden the habitats and regions where turtles are tagged.

iii. Information from flipper tagging should be deposited with SPREPs flipper tagging database (Note: development of TREDS database with SPREP and SEAFDEC).

d. Activity: Documenting Other Sources/Areas of Population Impact

i. Turtle nesting beach habitats should be comprehensively surveyed, monitored, and evaluated for the opportunity to undertake activities supporting population recovery.

ii. Comprehensive information and investigation of impacts on turtle populations from sources outside the fisheries jurisdiction of the Commission should be requested from members. Information on overall anthropogenic mortality is just as essential as information on other vital rates (e.g. age and growth, natural mortality) for assessing the dynamics and status of the populations and for choosing effective management strategies.

Objective: Reducing the capture and injury of sea turtles in fishing gear. Research directed towards ensuring that fewer turtles are caught and more are released alive should continue to be focused on development and implementation of improved mitigation measures and turtle handling and release methods. The Small Working Group believed that the SWG provided a good review of recent progress as well as a recommended approach for research on gear improvements and for incremental, flexible implementation of management measures. In this separate document the Small Working Group emphasized several other activities towards achieving the general objective of reduced capture and improved survival of sea turtles.

1. Industry Education

a. Training fishermen in sea turtle identification, handling and release. This may facilitate fishers assisting in data collection.

b. Self-reporting (logbook reporting) of turtle identification and release condition (alive, dead, how hooked, gear remaining on turtles).

c. Tagging of sea turtles by trained fishermen prior to release.

d. Scientists of member nations should use the wealth of educational materials available from many organizations in many languages to preparing education information for dissemination in their fisheries

2. Development and Sharing of Improved Release Methods. New methods for releasing sea turtles caught on circle hooks are needed and are under development. Observers and fishermen's recent experiences with circle hooks indicate greater difficulty in releasing turtles caught with circle hooks that with more traditional J and tuna hook types. Programs in the USA and Latin America are experimenting with new methods. The Programme should monitor and potentially adopt these newly developed methods as appropriate.

3. Addressing Turtle Mortality from FAD Entanglement. This is an area of concern that should be evaluated for its priority and for potential management measures.

Appendix III

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
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7–18 August 2006
Manila, Philippines

SMALL WORKING GROUP ON SEABIRDS

The Small Working Group on Seabirds met immediately after the Small Working Group on Sea Turtles in response to the Commission's requests. It recommended the pursuit of similar, high priority objectives.

As an initial management measure, the Small Working Group on Seabirds recommended the following:

1. South of 25ºS and north of 23ºN (30 ºS is used by CCBST, if we use 25ºS we need clear reasons why this latitude has been selected as opposed to 30ºS.), CCMs should require their longline vessels to use at least two of the following mitigation measures, including at least one from Column A. In other areas CCMs are encouraged to employ one or more of the seabird mitigation measures where necessary.

Column A	**Column B**
Side setting with bird curtain	Tori line[1]
Night setting[2]	Weighted branch lines
Tori line[3]	Blue-dyed bait
	Line shooter
	Bait caster
	Underwater setting chute
	Integrated weight line

In addition, vessels should use thawed bait.

Other variations in the design of mitigation measures may be tested under a specific research programme.

2. These measures shall be reviewed regularly and additional measures can be included as new data become available.

[1] If Tori line selected from both column A and column B = use of two (i.e. paired) tori lines
[2] Define night set: e.g. an hour after local sunset
[3] Tori line must fit specification , possibly use CCMLR, CCSBT, or NOAA specifications

3. CCMs are encouraged to seek feedback from fishers on mitigation measures effectiveness.
4. Time frame: The programme should be reviewed when more data is available from the observer programme, at which time an updated suite of recommendations should be made assessed.

Improved Data Collection and Research Programme

Data Collection

Objective: Identifying areas of spatial and temporal importance (areas of high catchability for seabirds) so members can target mitigation measures to these areas. In this regard the information on seabirds is already greater than that for sea turtles. This information should be used to find spatial and temporal overlap of seabird species and fishing effort.

1. Activity: Improved Observer Programme (see also details from the Sea Turtle Group):

    a. Coverage

        To adequately characterize statistically rare events, up to 100% observer coverage can be required. But bearing in mind the practicalities involved, a bare minimum should:

        - Should initially be spatially and temporally representative of each fishery operating in the Commission area. When areas of greater importance are found, observer programme focus may be optimized for particular objectives.

        - Should ideally aim for 20% of effort/vessels/trips over a two year period, given diminishing benefits/cost for greater coverage (SC2 ST WP-1). As a practical matter, overall observer coverage throughout the region is well below 1%, so any increases would provide a high benefit/cost ratio.

        - A dedicated and quantified proportion of the trip should be allocated to seabirds (and turtles), e.g. ensure at least 50% of hooks are monitored at the hauling station, or that some other ensured sample size or time fraction be observed .

    b. Data to collect

        - Compare SPC observer manual and data sheets and cross-check with CCAMLR manual and data sheets to ensure that all the necessary data collection details are included (This activity will be addressed through the statistics SWG recommendation on observer data (ST SWG report, par. 29 (a)).

            Data requirements to ensure objectives are met are listed in the data sheets, these include:
            - Gear (e.g. branchline length, light sticks, bait type)
            - Operational (e.g. time of set, position)
            - Seabird catch (e.g. number and species caught)
            - Seabird abundance estimate (e.g. number of birds around the boat)
            - Use of and effectiveness of mitigation measures (e.g. use of a bird-scaring

line)

ii. Ensure standardized data collection and clearly specify programme priorities and how the observer is directed towards seabirds over other objectives.

Research Programme

Objective: Reduce the capture and injury of seabirds in fishing gear. Research into mitigation directed at ensuring fewer birds are caught should continue to focus on the development and implementation of effective mitigation measures.

1. Encourage parties to conduct experimental tests of mitigation measures to develop appropriate measures for fisheries/areas

2. Quantify the survival rates of released birds (e.g. bird banding).

3. Conduct Industry Education and Training. CCMs should be responsible for implementing education and training programmes for fishers and observers, this may include working collaboratively with the Commission if necessary.

4. Given the distribution of albatrosses and petrels across ocean basins, the WCPFC Secretariat is encouraged to collaborate with relevant RFMOs (e.g. IATTC, CCSBT, CCAMLR) in addressing seabird bycatch issues.

5. Conduct research into the value of not discharging offal while hooks are being set, and on the avoidance of dumping of offal during the haul. Such research is needed to address the potential to achieve greater benefits than the short term benefits achieved in some longline fisheries (e.g. Hawaii) where strategic offal discards are required as a mitigation measure. This strategic offal discard measure was shown by research to distract birds from attacking baited hooks in the Hawaii longline fishery for swordfish, and to reduce the bird catch. However, it is hypothesized that if birds could be “trained” not to follow vessels at all, by eliminating offal discards, this might have greater long-term benefits, especially in the context where access to the baited hooks has been greatly reduced through the use of other measures. For the reason that such research on pelagic longline fishing is thus far lacking (which should be checked) avoidance of offal discards was not included in the draft management recommendation (below).

Attachment I

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

REPORT OF THE FISHING TECHNOLOGY SPECIALIST WORKING GROUP

PRELIMINARIES

1. The agenda was adopted as set out in Appendix 1 of this report. The convenor summarized the requests been made to the SWG by the Scientific Committee and the Commission, and the agreed Fisheries Technology research and data priorities for 2006.

REQUESTS FROM THE SCIENTIFIC COMMITTEE AND THE COMMISSION

2. Eight working papers and seven information papers were submitted to the Fishing Technology (FT)-SWG for consideration by SC2 (see Attachment F of main report). All of these papers were either presented or noted briefly during the session. These papers described research or descriptive materials on fish aggregating devices (FADs); operational characterization of longline fleets and gear; vessel and gear attributes useful for effort standardization; definition of terms; capacity issues; and materials to improve reporting of species-specific catch and effort data. A list of acronyms used in this report is included as Appendix 2 to this report.

Studies related to the use of FADs: monitoring and behaviour

SC2 FT WP-3: FADIO (Fish Aggregating Devices as Instrumented Observatories of Pelagic Ecosystems): a European Union-funded project on development of new observational instruments and the behaviour of fish around drifting FADs.

3. The convenor presented SC2 FT WP-3, describing the European Union-funded project Fish Aggregation Devices as Instrumented Observatories of pelagic ecosystems (FADIO)[1]. This project, coordinated by Laurent Dagorn, Institute de recherche pour le développement (IRD) is supported by 10 international partners from Europe, USA, and the Seychelles. The project is based on developing new observational tools and gaining behavioural data on fish communities found in association with drifting FADs. The project, which began in 2003, has two main objectives: 1) the development and testing of prototype electronic sensor tags and instrumented buoys to observe fish aggregations around FADs; and 2) improving knowledge on the behaviour of pelagic fish around FADs. The programme is structured within nine work packages that address these objectives through a combination of active tracking, sonic tagging, visual and acoustic surveys, fishermen interviews, the development of autonomous monitoring buoys and modelling. Five field cruises have been conducted in the western Indian Ocean using a multi-disciplinary approach to collect data on

[1] http://www.fadio.ird.fr/

fish aggregated to drifting FADs belonging to the French and Spanish purse seine fleets based in the Seychelles.

Discussion

4. The ecosystem based approach of the project was noted with tagging and survey of both market tuna species and non-tuna finfish. FADIO was identified as being the only existing major research programme working on drifting FADs. The convenor noted the large volume of reports and publications that will result from FADIO of relevance to the Commission, including papers on residence time and acoustic selectivity of fish aggregated to drifting FADs. While the project is due for completion in October 2006 it was noted that published reports may not be available for another 6–12 months. A brief discussion on the effect of acoustics/sonar on the behaviour of tuna suggested that tuna schools do not appear to scatter as a result of being subject to powerful acoustic beams.

*SC2 FT WP-4: Behaviour of Yellowfin (*Thunnus albacares*) and Bigeye Tuna (*T. obesus*) in a Network of Anchored Fish Aggregation Devices*

5. The convenor (author) presented SC2 FT WP-4, describing ongoing research in Hawaii on the behaviour of yellowfin and bigeye tuna found in association with anchored FADs. The project methodology involves mounting acoustic receivers on the mooring chain of the thirteen anchored FADs that surrounding the island of Oahu, located in the middle of the main Hawaiian Island group. These receivers record the presence of sonic tagged fish that swim within approximately 700 m of these FADs and this is used as a conservative proxy for FAD aggregation. Simple coded acoustic tags, as well as depth sensing tags, have been surgically implanted within the peritoneal cavity of yellowfin, bigeye, and skipjack tunas, as well as striped marlin, silky shark and pelagic white tipped shark.

6. SC2 FT WP-4 describes information on the residence time, between FAD movements, inferred school behaviour and differential vertical behaviour of different sized tuna aggregated to anchored FADs in Hawaii. Detailed information will be published soon and made available to the Scientific Committee. The convenor noted the results of these studies should be viewed in relation to the environment and relatively low FAD density that exists in Hawaii. The same approach will be applied to the large-scale anchored FAD area of northern Papua New Guinea as a component of the new SPC tagging initiative described in SC2 GN WP-11.

Discussion

7. High recapture rates of sonic tagged fish were recorded. Discussion on movement of yellowfin and bigeye tuna around anchored FADs in Hawaiian waters indicated that most recaptures were recorded and recaptured on the same FAD at which the fish were initially tagged, with smaller numbers recaptured on adjacent FADs and at neighboring Hawaiian Islands. The utility of the observed behaviour of yellowfin and bigeye tuna from this study in mitigating the catch of juvenile yellowfin and bigeye tuna by purse-seine gear was not conclusive, though there appeared to be different behaviour for different size fish at varying depths. Substantially more fish, particularly larger bigeye tuna, needed to be tagged and monitored to make more robust conclusions. The time of day that purse seines are deployed was discussed as perhaps being a factor in determining rates of capture of yellowfin and bigeye tuna. It was advised that the planned Papua New Guinea sonic tagging work on anchored FADs should provide value information in this regard.

8. The optimal distance between anchored FADs, in optimising tuna aggregation, while not competing with neighbouring FADs was suggested to be a minimum of about 10 nautical miles, based on this and previous studies. Preliminary observations on fundamental

differences in the behaviour of tuna around anchored and drifting FADs indicate that fish appeared to aggregate down current of drifting FADs and upstream of anchored FADs. However, a closer look at the results of FADIO with further investigations into residence times and schooling dynamics at FADs were required.

SC2 FT IP-7: Behavioural Study of Small Bigeye, Yellowfin and Skipjack Tunas Associated With Drifting Fads Using Ultrasonic Coded Transmitter in the Central Pacific Ocean

9. Hiroaki Okamoto presented SC2 FT IP-7, which describes active tracking and time residence data obtained during National Research Institute of Far Seas Fisheries (NRIFSF) studies for tropical tuna on drifting FADs. Swimming behaviour of bigeye, yellowfin and skipjack tunas associated with drifting FADs was observed using coded transmitters in the equatorial area of central Pacific in 2005 (July and August). In the two successful trackings that consisted of 105 (30 skipjack tuna, 43 yellowfin tuna and 32 bigeye tuna) individuals, or about 26 days of monitoring, we succeeded in monitoring swimming behaviour of several individuals for all three species simultaneously for several days. It seems that swimming depth of bigeye and yellowfin tunas was similar and related with the depth of upper limit of the thermocline. That is, both species mainly stayed in, or just under, the mixed layer, where water temperature was greater than 24℃ in the first tracking and greater than 26℃ in the second tracking, although they sometimes dived to the middle or lower part of the thermocline (up to about 150–200 m). Swimming depth of skipjack was shallower on average than that of the other two species, especially during the night. Swimming depth during night tended to be shallower than that during daytime for all species.

Discussion

10. Discussions on behaviour of small bigeye, yellowfin and skipjack tunas associated with drifting FADs, using ultrasonic transmitters focused on the apparent long residency time of tuna on studied FADs. The SWG agreed that information on the numbers and density of other FADs in the vicinity of the monitored FADs would be beneficial. The estimated cost of sonic transmitters used in this study was about $500 each. The tracking system described in the paper was capable of tracking multiple fish at any one time and was quite expensive. However, more basic tracking systems are available at a much lower cost. Given the use of lights by some fishers on FADs there was general agreement by the SWG that the effect of lights on the behaviour of tuna around FADs required more investigation. It was noted that the use of lights or other operational aspects of FAD use could only be observed and recorded by at-sea observers. Discussions indicated that there was a perception that skipjack moved towards lights, allowing their successful targeting, although this hypothesis has not been confirmed by studies.

SC2 FT WP-7: FAD Fishing and its Effects on Tuna Stocks

11. Ricardo Babaran presented SC2 FT WP-7, which examined landed catch and effort monitoring (LCEM) data from purse seine, ringnet and handline gear and assessed the possible impacts of anchored FAD (*payao*) fishing on tuna stocks in the Philippines and Indonesian waters and to address some information gaps that are deemed essential for the management of tuna stocks in the western and central Pacific Ocean (WCPO). The sizes of skipjack, yellowfin and bigeye landed by Philippine purse seiners and ring netters are generally small, especially between July and September. This condition probably reflects the nature of tuna stocks captured within Indonesian waters and in the Moro Gulf, which have been identified previously as spawning grounds for some of these tuna species.

12. However, there is also a need to address possible uncertainties in the LCEM data because larger fish landed by large purse seiners that utilize larger-mesh seines at private wharves were not well sampled by this study. No conclusions can be drawn yet on the effect

of set type on fish size because the number of data records available for school sets are few. To address this issue, data gathering activities may have to be expanded, possibly including the use of on-board scientific observers or controlled fishing experiments. Similar experiments should also be considered to independently determine the appropriate mesh sizes for both gears to mitigate gear impacts on juvenile tuna. For handlines, the likelihood of recruitment overfishing remains a possibility but for bigeye tuna, this may be mitigated by low occurrence in the catch. The latter preliminary result should be verified further, possibly through tagging experiments to clarify impacts of the gear on the spawning stocks.

Discussion

13. The SWG expressed enthusiasm and appreciation on the presentation of such work on the Philippines tuna fisheries and strongly encouraged expansion of such work into the future. The results of similar studies were considered extremely valuable in incorporating the "character" of the Philippines tuna fishery into stock assessments. There was some discussion that suggested that comparisons between FAD and unassociated catches needed further development due to the low number of unassociated sets examined. It was noted that such comparisons may not be possible because there may be very few unassociated tuna schools available in Philippine waters due to the large numbers of FADs. The author acknowledged that better efforts at monitoring non-FAD associated catches would be beneficial. It was advised that some purse-seine nets used could fish as deep as 200 m, but this is not well documented. This prompted discussion that the maximum depth that purse seines fish should be standard data recorded by observers and depth recorders should be more available for use. There was some comment questioning the importance of Philippine waters for the spawning and early recruitment of tuna species, and it was advised that such spawning of yellowfin tuna in particular was well documented.

Studies related to the mitigation of juvenile bigeye and yellowfin caught in association with FADs

SC2 FT WP-8: Acoustic Selectivity in Tropical Tuna (Experimental Purse-Seine Campaign in the Indian Ocean

14. Roberto Sarralde presented SC2 FT WP-8, a research initiative of the Instituto Español de Oceanografía (IEO), Spain. The project is an experimental fishery Pilot Action, aimed at determining the size and composition of schools by species and length class prior to fishing, with a view to establishing guidelines and criteria that will enable more selective fishing. The project was conducted from 15 May to 15 November 2005 in the western Indian Ocean. Acoustic data were collected onboard a Spanish purse-seine vessel and a purse-seine/FAD support vessel. Data from six drifting object sets surveyed with echo sounder and eight sets using sonar data were presented. The following day, the drifting object was fished for species and size verification. Echo sounder analysis produced species estimates that were very close to subsequent catches, supporting the utility of acoustic surveys for the identification of tuna on FADs. From the sonar echo traces, yellowfin schools appear to have a different structure to skipjack schools, though these results are to be considered preliminary. The possibility of creating an "expert system" seems possible, which would lead to improved selectivity within the tuna fishery based on echo sounder and sonar data.

Discussion

15. Discussions confirmed that purse seine vessel captains were generally able to characterise the species composition and size of fish in schools via acoustic methods. This expertise was likely acquired by verification of what was observed on sonar units with actual catches landed. It was advised that further multi-frequency and target strength acoustic work

was needed to develop and refine the discrimination of different sizes and species in mixed aggregations.

SC2 FT IP-6: Study of Alternative Models of Artificial Floating Objects for Tuna Fishery (Experimental Purse-seine Campaign in the Indian Ocean)

16. Roberto Sarralde presented SC2 FT IP-6 detailing the testing of alternate drifting FAD designs to mitigate bycatch entanglement, which was a main objective of the Spanish Experimental Fishery Action in the Indian Ocean. Experiments have involved various prototypes of artificial floating objects and their performance, with a view to finding a design that would result in fewer non-target interactions, with particular emphasis on eliminating entanglement of sea turtles without reducing catches of target species. Work was undertaken on two Spanish tuna purse-seine vessels and two support vessels. New materials for floating object manufacture were tested, with tuna purse seine netting replaced by alternative materials that fulfil the same function of aggregating tuna, but reduce or eliminate the likelihood of sea turtles becoming entangled. The new material covering the experimental objects seems to be very useful to avoid the death of turtles and produced higher catch rates of target tuna species. However, the number of trial sets was not high and more research is required.

Discussion

17. The convenor commended IEO for initiating this research that represents a pro-active response to reducing bycatch of species of special concern. However, the SWG generally recognized that fishers prefer to use purse seine netting as FAD material because it is readily available, easily stored, and essentially free as surplus/used webbing can be used. Some of the new FAD designs produced a positive result in regards to reduction of turtle entanglements with increased catches of target species. However, further investigations will be necessary. The presenter advised that one fishing vessel captain could see benefits in using FADs made of alternative materials while another captain preferred to use more traditional FADs.

RESEARCH AND DATA PRIORITIES

Operational characterization, effective effort and targeting in major WCPO longline fleets

SC2 FT WP-2: Measuring Effective Longline Effort in the Australian Eastern Tuna and Billfish Fishery

18. Robert Campbell presented SC2 FT WP-2. For longline CPUE to be used as indices of resource abundance, it is important to be able to measure the “effective” effort directed at individual species. This involves understanding those factors which influence the depths attained by longline hooks and the relationship between these depths and the depth preferences of the species. This two-year project aims to collect and analyse the data on a number of factors which influence the operational effectiveness of longline fishing gears. Observers are being used to collect a wide range of data from Australian longline vessels operating off eastern Australia. Temperature-depth data loggers (TDRs) are being used to monitor the depths attained by hooks while hook-timers (HT) are being used to monitor the time of capture of individual species.

19. To date, 43 trips have been undertaken with TDRs being deployed during 196 sets (with 1575 TDR data sets being collected) and HTs deployed during 166 sets (with 595 HTs having been triggered). The pre-2006 depth profiles indicate that nearly all hooks fished above 120 m, while the 2006 profile indicates a significant proportion of hooks are fishing below 120 m, with some hooks attaining depths below 300 m. This change is related to the

increased targeting of albacore tuna by vessels and the concomitant setting of deeper longlines.

20. Depth profiles for those sets for which yellowfin tuna where the primary target species shows a strong unimodal distribution with hooks spending around 90% of their time between 20 and 70 m. Hooks targeting bigeye tuna and broadbill swordfish display similar unimodal distributions, with hooks spending 90% of their time between 20–80 m and 30–100 m respectively. Alternatively, hooks targeting albacore tuna display a significantly different distribution, with hooks spending 90% of their time between 50 m and 270 m. These latter sets use between 25 and 30 hooks between floats compared with 6–11 hooks per float for the other sets.

21. From the HT data, a profile of the time of day that fish are observed caught can be obtained and the results indicate different behaviours for different species. For example, both yellowfin tuna and dolphin fish have a high propensity to the caught during the afternoon, while both swordfish and bigeye are most likely caught during the night. However, these results still need to take into account differences in the depth profiles of the species and the fishing gears. The former will be obtained from archival tag data whilst the latter are being obtained from the TDR data.

Discussion

22. Discussion followed on the relatively large number of hook timers triggered without catch which the author proposed was the result of baits being taken by fish that were not hooked or had escaped. A suggestion was made that observers should record the presence or condition of retrieved baits. It was noted that wider use of TDRs and hook timers in the region was important to characterize efficiency and species-specific hooking by depth strata and time of day. The author noted that fishers appreciated and found value in the information that could be provided by TDRs and HTs.

SC2 FT WP-1: An Overview of Historical Changes in the Fishing Gear and Practices of Pelagic Longliners

23. Peter Ward presented SC2 FT-WP1, “An overview of historical changes in the fishing gear and practices of pelagic longliners”. Pelagic longline fishers have continuously modified their gear and practices to reduce operating costs, ease labour or to improve fishing power or catchability. Changes to fishing power and catchability will alter the relationship between catch rates and abundance, which will affect abundance indices used in stock assessments. Advances in technology resulted in the introduction of many electronic devices to assist in navigation, communication, and finding target species. The development of synthetic materials allowed improvements to lines and hooks that increase the probability of hooking target species and landing them. Other changes increased fishing power by improving searching efficiency (e.g. satellite imagery) or the time spent on fishing grounds (e.g. freezers).

24. The number of hooks deployed in daily longline operations has steadily increased since 1951. However, soak times did not change significantly because faster longline retrieval and deployment speeds balanced the increased hook numbers. There has also been a shift from having all baits available at dawn to having more bait available at dusk. In the 1970s, several longline fleets began to exploit a much greater depth range, resulting in increased catchability for deep-dwelling species (e.g. opah) and mesopelagic species (e.g. bigeye tuna), and reduced catchability for epipelagic species such as blue marlin. The information on fishing gear and practices provides insights into how variations in operations have affected catch rates and estimates of abundance. Progressive improvements in expertise and

technological improvements in the gear are likely to affect fishing power, but are particularly difficult to quantify.

Discussion

25. The SWG noted the value of this kind of systematic study of factors that affected fishing power, and recalled the SC1 research task of the FT-SWG and agreement that work of this kind should be specifically undertaken for all major fleets. Discussion highlighted the pattern of the introduction of technological changes that had steadily increased longline fishing power, but recognized that other factors may have reduced efficiency, such as access limitations, reduced crew skills and loss of experienced fishing masters over time. The effect on fishing power of the large increases over time in hook numbers per set was seen as an important factor that required further research.

SC2 FT IP-1: Pelagic Longline Gear Depth and Shoaling

26. The convenor noted SC2 FT IP-1, which discusses work to better describe longline depth and shoaling as determined by time depth recorders on commercial longline gear which was described during the presentation of SC2 ME WP-2 during the Methods SWG session.

Identification of key vessels, gear and operational details necessary for fishery-specific effort standardization

SC2 FT WP-6: An Examination of Vessel, Gear and Operational Details Useful for Fishery-Specific Effort Standardization, Including FAD-related Gear and Fishing Strategies

27. The convenor (author) presented SC2 FT WP-6, which that described and reviewed vessel, gear and operational data that may be useful for effort standardization studies, with some emphasis on FAD-related information. The paper compiled and reviewed information on vessel and gear attributes developed during meetings of the SCTB and SC1. SC2 FT WP-4 from SC1 was noted as a primary reference document as it categorizes and lists fishing technology-related papers that are relevant to gear and vessel attributes, fishing gear and technology, FADs and fleet characterization, from all meetings of the Standing Committee on Tuna and Billfish (SCTB).

28. The paper notes that information on FADs remains incomplete for all fleets and what information is available is not compiled or well documented. The importance of operational characterization was also noted as essential to effort standardization and the kind of information that can usually be collected only by experienced observers. To illustrate the importance of observers, the convenor presented pictures of drifting FADs that illustrated their design that could not be detected by in port based inspection or vessel registries.

Discussion

29. Technical details that may be useful for effort standardization have been compiled by individuals but no agreement on a workable list has been developed for Commission use. The author suggested that the selection of useful vessel, gear and operational details should be developed collaboratively with input from researchers and the industry experienced with gear technology and researchers who will eventually use the data for effort standardization studies. In discussion, the SWG emphasized the importance of improving information on FAD-related gear and fishing strategies.

Development of standardized fishery terms for the Scientific Committee

SC2 FT WP-5: Standardized Fishery Terms to facilitate Communication within the Scientific Committee and with the WCPFC

30. The convenor (co-author) presented SC2 FT WP-5, which examined key fishery terms and their definitions for use by the Scientific Committee. The impetus for the work was to promote precise communication within the Scientific Committee with the Commission. It was noted that different interpretations of some fishery terms have hampered communication during SCTB and Scientific Committee discussions and that some terms could be misinterpreted by the public or NGOs, which could reflect badly on the Commission. The paper took a three step approach when examining fishery terms, initially searching out and listing any specific definitions of fishery terms as listed in the Convention, the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the 1995 UN Fish Stocks Agreement. [2]

31. The FAO Fisheries Glossary[3] was adopted in the paper as a primary source of definitions for fishery terms useful to the Scientific Committee to which the Convention definitions were compared. The FAO Fisheries Glossary was selected as it is maintained, referenced and updated by the organization (FAO) that has facilitated the development and implementation of many of the international agreements upon which the Convention is based. Also, the FAO Fisheries Glossary solicits comments for revision or new definitions from the scientific community at large. The NOAA Fisheries Glossary[4] (USA) was rejected as a source document for the paper as it is more specific to the special language and regulations of the USA federal system. However, its existence was noted as an example of an online and updated glossary developed to facilitate clear communication within a large resource management organization.

32. The authors suggested that the Scientific Committee examine and consult the FAO Fisheries Glossary as a general source for common fishery terms for use by the Scientific Committee and when communicating recommendations to the WCPFC, endorsing the FAO Fisheries Glossary in principal while recognizing that some of the definitions contained therein may be inadequate or unsuitable for the needs of the Scientific Committee. The authors suggested the Scientific Committee should examine the FAO Fisheries Glossary to identify terms that may require modification and recommended that the Scientific Committee work to develop its own online fisheries glossary. Finally, the authors strongly suggested that persons submitting work to the Scientific Committee clearly define their use of common fishery terms if they differ substantively from those contained in the FAO Fisheries Glossary or a Scientific Committee Fisheries Glossary if one is developed.

Discussion

33. No comments from the meeting were received.

OTHER RESEARCH

Studies on vessel efficiency and capacity

SC2 FT IP-2: Factors Affecting Recent Development in Tuna Longline Fishing Capacity and Possible Options for Management of Longline Capacity

[2] 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.
[3] http://www.fao.org/fi/glossary/
[4] http://www.st.nmfs.gov/st4/documents/FishGlossary.pdf (NOAA Technical Memorandum NMFS-F/SPO-69, October 2005, Revised Edition June 2006)

34. The convenor noted SC2 FT IP-2, which describes recent developments and management options related to tuna longline capacity and called attention to three recent or upcoming meetings related to the management of fishing capacity:

- 8–12 May 2006, La Jolla, California
FAO Project on the Management of Tuna Fishing Capacity: Conservation and Socio-economics. "Methodological Workshop on the Management of Tuna Fishing Capacity"

- 10–12 October 2006, University of California San Diego, La Jolla, California
Regional Economic Cooperation in the Pacific Fishery for Tropical Tunas. Workshop sponsored by the Department of Economics, University of California San Diego in Collaboration with the Inter-American Tropical Tuna Commission.

- January 2007, Kobe, Japan
Joint Meeting of Tuna RFMOs (organized by FAO to harmonize various issues among the RFMOs, particularly on IUU fishing, fishing capacity and vessel registries.

Mechanisms to improve the submission of species-specific catch and effort data - training materials to promote species-specific reporting

SC2 FT IP-3: Marine Species Identification Manual for Horizontal Longline Fishermen

35. The convenor noted SC2 FT IP-3, which is an illustrated identification guide to all taxa of target and non-target species that could potentially interact with WCPO longline fisheries. Copies of this SPC publication were made available to SC2 CCMs and participants. The convenor noted that additional copies could be requested of the SPC contact person identified in SC2 FT IP-3.

SC2 FT IP-4: Handbooks for the Identification of Yellowfin and Bigeye Tunas in Fresh, Frozen, and Fresh but Less than Ideal Condition

36. SC2 FT IP-4 was noted by the convenor. This paper describes guides for the identification of and dsitinction between yellowfin and bigeye tuna at all size classes and in different condition: fresh as would be seen by fishermen; brine frozen as would be seen by purse seine port sampling programmes; and fresh but in less than ideal condition as may be seen at unloading ports. These guides have been translated into several languages to aid the training of observers, port samplers and fishermen throughout the region. Special acknowledgement was given to volunteer efforts that produced new translations during 2006 into Japanese, French, Korean and Chinese language versions. The information paper provides instructions to access the Pelagic Fisheries Research Program (PFRP) FTP site for access and downloading all versions.

37. SC2 FT IP-4 was noted by the convenor as describing the development of a photographic identification guide for non-target finfish species taken by WCPO longline fisheries developed through collaboration with the PFRP and the National Marine Fisheries Service (NMFS) Pacific Islands Regional Office. The guide is illustrated with digital colour photographs from the NMFS Hawaii Longline Observer Program. The guide is currently in draft form but will be finalized and made available on the PFRP online FTP site after the second session of the Scientific Committee.

RESEARCH PLANNING AND COORDINATION

Operational research plan for 2006–2007

38. Short-term work plan:

- Operational characterisation of the major WCPO longline and purse seine fleets (Use of TDRs, hook timers and net depth recorders is encouraged)

- Identification of operational level data useful for effort standardization and the evaluation of fishing efficiency, targeting and bycatch mitigation;

- Studies related to the use of FADs and the behaviour of target and non-target species taken in association with FADs with a view to identifying measures to mitigate catches of juvenile tuna and non-target species by purse seine gear;

- Studies related to vessel efficiency and capacity or total effective effort by regional fisheries;

- The production of material to facilitate the identification of target and non-target species by fishermen, observers, and port samplers with the objective of improving data quality.

- Definition of fishery terms for reference by the Scientific Committee, initially through an examination of the FAO glossary for terms that may or may not be appropriate for use by the Scientific Committee.

39. Medium-term work programme:

- Characterisation of the major WCPO fishing fleets. This information, including historical and current details of fishing gear and practices, will be used in standardising catch rates, specifically to document changes in efficiency, primarily for longline and purse-seine gear.

- In collaboration with the Methods SWG, promote, review and conduct effort standardisation analyses using technical, biological and other data inputs;

- Work to identify and refine the necessary technical data inputs for effort standardisation;

- Monitor and report on new developments in fishing gear and practices, fishing modes and related shore side developments as they relate to changes in fishing power;

- Develop training materials to improve species-specific identification of target and non-target species to improve the quality of submitted data and data collection programmes;

- Investigate and promote studies on socioeconomic influences on fishing strategies, spatio-temporal fishing patterns and influences on effective fishing effort;

- Examine and review the technical aspects of capacity measurement and monitoring of fisheries within the Convention Area.

Data requirements for observer programmes

40. In a general sense, the convenor suggested that highly trained observers could be used by the Commission in parallel with national and regional observer programmes to

characterise specific fisheries of special interest. These fisheries or fleets would be those for which little or no documented information exists and represent fisheries of high potential impact to stock assessment; for example, those that are believed to have significant landings of juvenile tuna, species of special concern, or report anomalous catch and effort data.

41. Specific duties of observer programmes of special concern to the FT-SWG were simply described as gear and operational level data that can not be obtained or verified in port. These include the degree of use of equipment, adoption of new types of gear or employment of novel fishing techniques.

ADMINISTRATIVE MATTERS

42. No further business was discussed. The convenor thanked those present and those who had contributed papers, noting the importance of their contributions to the scientific work of the Commission.

43. The Report of the FT-SWG was adopted by consensus.

Appendix I

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

AGENDA FOR THE
FISHING TECHNOLODY SPECIALIST WORKING GROUP

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1. Preliminaries
1.1. Adoption of agenda
1.2. Meeting format, rapporteurs and anticipated outcome

2. Requests from the Scientific Committee (Report of WCPFC-2) and the Commission
2.1. Studies related to the use of FADs

a) SC2 FT WP-3: **FADIO (Fish Aggregating Devices as Instrumented Observatories of pelagic ecosystems): a European Union funded project on development of new observational instruments and the behavior of fish around drifting FADs**
<<Presenter: Itano>>

b) SC2 FT WP-4**: Behaviour of yellowfin (*Thunnus albacares*) and bigeye tuna (*T. obesus*) in a network of anchored Fish Aggregation Devices**
<<Presener: Itano>>

c) SC2 FT IP-7**: Behavioural study of small bigeye, yellowfin and skipjack tunas associated with drifting FADs using ultrasonic coded transmitter in the central Pacific Ocean**. ***<<Presenter: Okamoto>>***

d) SC2 FT WP-7**: FAD Fishing and its Effects on Tuna Stocks**
<<Presenter: Babaran>>

2.2. Studies related to the mitigation of juvenile bigeye and yellowfin caught in association with FADs.
a) SC2 FT WP-8: **Acoustic Selectivity in Tropical Tuna (Experimental Purse-seine Campaign in the Indian** ***<<Presenter: Sarralde>>***
b) SC2 FT IP-6: **Study of Alternative Models of Artificial Floating Objects for Tuna Fishery (Experimental Purse-seine Campaign in the Indian Ocean)**
<<Presenter: Sarralde>>

3. Research and data priorities identified by during SC-1 (Report of SC-1)
3.1. Operational characterization and measurement of effective effort in major WCPO longline fleets
a) SC2 FT WP-2: **Measuring effective longline effort in the Australian Eastern Tuna and Billfish Fishery** ***<<Presentor: Campbell>>***
b) SC2 FT WP-1: **An overview of historical changes in the fishing gear and practices of pelagic longliners** ***<<Presentor: Ward>>***
c) SC2 FT IP-1: **Pelagic longline gear depth and shoaling**
<<noted>>

3.2. Identification of key vessel, gear and operational details necessary for fishery-specific effort standardization
   a) SC2 FT WP-6: **An examination of vessel, gear and operational details useful for fishery-specific effort standardization, including FAD-related gear and fishing strategies** **<< *Presentor: Itano* >>**

3.3. Development of standardized fishery terms for the Scientific Committee
   a) SC2 FT WP-5: **Standardized fishery terms to facilitate communication within the Scientific Committee and with the WCPFC** **<<*Presentor: Itano*>>**

4. Other research

4.1. Studies on vessel efficiency and capacity
   a) SC2 FT IP-2: **Factors affecting on recent development in tuna longline fishing capacity and possible options for management of longline capacity<<*noted*>>**

4.2. Mechanisms to improve the submission of species-specific catch and effort data
   a) SC2 FT IP-3: **Marine species identification manual for horizontal longline fishermen** **<<*noted*>>**
   b) SC2 FT IP-4: **Handbooks for the identification of yellowfin and bigeye tunas in fresh, frozen and fresh but less than ideal condition – (***versions available in English, French, Spanish, Bahasa Indonesia, Japanese, Korean, and Chinese***)** **<<*noted*>>**
   c) SC2 FT IP-5: **Photographic identification guide for billfish, sharks, tuna-like, and non-tuna finfish taken in WCPO pelagic longline fisheries <<DRAFT>>** **<<*noted*>>**

5. Research planning

5.1. Operational Research Plan for 2006 – 07

5.2. Medium Term Research Plan

5.3. Data requirements for observer programmes

6. Administrative matters

6.1. Reporting and timetable

6.2. Other matters

6.3. Close

Appendix II

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

LIST OF ABBREVIATIONS AND ACRONYMS

CPUE	catch per unit of effort
FAD	fish aggregating device
FADIO	fish aggregating devices as instrumented observatories of pelagic ecosystems
FAO	Food and Agriculture Organization of the United Nations
HT	hook timer
IEO	Instituto Español de Oceanografía
IRD	Institute de recherche pour le développement
LCEM	landed catch and effort monitoring
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRIFSF	National Research Institute of Far Seas Fisheries
RFMO	regional fisheries management organization
SPC	Secretariat of the Pacific Community
TDR	temperature and depth recorder
UNCLOS	1982 United Nations Convention on the Law of the Sea
USA	United States of America

Attachment J

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

REPORT OF THE METHODS SPECIALIST WORKING GROUP

INTRODUCTION

1. The Methods Specialist Working Group (ME-SPW) met during the two morning sessions on Tuesday, 8 August. Robert Campbell served as convenor with Nick Davies, Ray Conser and Dale Kolody as rapporteurs.

2. Under the terms of reference for the ME-SWG, the group will coordinate research and make recommendations to the WCPFC Scientific Committee on technical questions related to analytical methods used for fishery management.

3. For this meeting it had as specific tasks to review the research undertaken to address the research issues identified at the first regular session of the Scientific Committee. In particular, this included reviewing the changes and enhancements made to the Multifan-CL (MFCL) models used for assessing the principal target species in the western and central Pacific Ocean (WCPO) (especially yellowfin and bigeye tuna), reviewing research directed at improving the standardization of longline CPUE (in particular, the incorporation of factors to better describe the relationship between catchability and habitat), and reviewing the stock assessment models developed for assessing the status of the swordfish stock in the southwest Pacific.

4. The agenda, including the list of associated papers, is attached as Appendix I to this report.

CHANGES AND ENHANCEMENTS TO THE STOCK ASSESSMENT METHODS USED FOR THE PRINCIPAL TARGET SPECIES

5. A number of outstanding issues regarding yellowfin and bigeye stock assessments were identified by the first Scientific Committee meeting, principally 1) the inconsistency between observed and predicted length composition for particular longline fisheries, 2) the spatial structure of the models, and 3) the parameterization of movement in the yellowfin model. An overview of the analyses completed since the first Scientific Committee meeting to address these issues was presented by Adam Langley and documented in SC2 ME WP-1 (with additional details provided in SC2 ME IP-1, 2, and 3).

Length–weight data

6. A number of issues were identified with respect to the size frequency data sets included in the MFCL models for yellowfin and bigeye. In particular, the conversion factors to determine whole fish weights from processed weights were revised and specific conversion factors were developed for individual fisheries depending on the style of processing (SC2 ME IP-3). For yellowfin, the length–weight relationship included in the model was also revised. Both of these changes resulted in a more consistent observation of the length and weight of fish caught by the main longline fisheries and, in turn, removed the apparent inconsistency between the observed and predicted length compositions from the assessment models.

7. It was noted that a potential for bias in estimates derived from length and weight data collected from commercial vessels may occur due to selective discarding. Japan stated that this may have occurred early in the history of the fishery when catch rates were high, but is unlikely to be prevalent in more recent years. The SWG noted that observer coverage of these catches would be beneficial.

8. It was also noted that data for deriving conversion factors are available from the Japanese fleet and appears to be of consistently good quality. However, data from the domestic fisheries landing fresh chilled catches is more scant. Increasing the quantity and quality of data from this sector of the fishery would be beneficial.

9. Concern was expressed that estimates derived from length–weight data may vary on a temporal-spatial basis. While preliminary results from a current study examining these potential factors suggest they may have limited effect, it was noted that findings of earlier morphometric studies conducted across the Pacific indicated spatial effects on length–weight relationships.

Regional structure

10. The current spatial stratification used in the yellowfin and bigeye assessments was also reviewed. The review explored the potential for developing a seven region spatial structure with a separate region (called region 7) encompassing the western equatorial region incorporating the domestic fisheries of Indonesia and the Philippines. One rationale for partitioning this fishery was the very high uncertainty regarding the catch histories and concern that this was resulting in a more pessimistic status for the broader equatorial region (region 3 in the six-region model).

11. The review of spatial structure explored the variation in trends in longline CPUE (SC2 ME IP-1) and longline size data (SC2 ME IP-2) qualitatively and using a more quantitative approach. This review resulted in a revised regional stratification that restricted the northern boundary of the equatorial region to 10^0N (formerly 20^0N). The final seven-region structure was considered as a sensitivity analysis for both the yellowfin and bigeye assessments. However, difficulties exist in the formulation of a reliable CPUE index from the longline fishery within region 7 for the last 15 year period of the model. This results in a high level of uncertainty in the seven-region assessment models, particularly over the last 20 years. The seven-region model is generally considered to be an improvement with respect to spatial structure although future development of such a model will depend on the development of CPUE indices for both species within region 7.

12. It was clarified that nominal CPUE indices were used in the analyses undertaken to identify homogeneity in CPUE within regions. However, the meeting was informed that the

analysis had also been repeated using standardised CPUE indices and had resulted in no apparent difference to the analysis using nominal indices.

13. Concern was expressed regarding the basis for the location of the boundary between regions 3 and 4. It was explained that Japanese longline data were used to examine spatial heterogeneity in CPUE in the two regions. Also, historical exploitation rates appear to differ between the regions, and this is consistent with the spatial distribution of the yellowfin catch (i.e. the higher catches in the western equatorial region).

14. Size data were also examined to investigate the suitability of the current regional structure. This analysis supported the conclusions of the analysis of the trends in CPUE data that were used to define the regional structure developed for the seven region model.

15. It was noted that the effect of alternative regional structure provided a more optimistic assessment compared to the base line results from the six-region assessment model. However, no reliable CPUE index of abundance is available for region 7 for the last 15–20 years and as such, the model has considerable freedom to account for the substantial increase in catch from the region over this period. This problem will need to be addressed if the seven region model is to have more utility.

Movement parameterisation

16. At the first Scientific Committee meeting, concern was expressed regarding the movement dynamics for yellowfin estimated in the assessment model. A range of different parameterizations of movement were explored to address these concerns (see SC2 ME WP-1). None of these different movement scenarios had any substantial impact on the key biological reference points from the model and on that basis it was decided to persist in the estimation of the movement parameters as undertaken in the 2005 yellowfin assessment.

17. It was noted that yellowfin tuna behaviour and movement between regions is likely to vary, and the results of tagging work in Hawaii suggest low levels of movement in this area. It was also noted that while the six-region model used last year had not incorporated the tagging data from the Hawaiian Islands due to the proximity of these islands to a regional boundary in this model and the consequent influence of this data on the parameterization of movement across this boundary, this data has been included in the seven-region model presented as a sensitivity in this year's assessment.

IMPROVED METHODS TO STANDARDIZE LONGLINE CPUE

18. Keith Bigelow presented results incorporating oceanographic information into CPUE standardizations (SC2 ME WP-2). The vertical distribution in catchability by depth and habitat was estimated from 266 observed longline sets in the central North Pacific Ocean monitored with time-depth recorders (TDRs). Hook depth in each tuna longline set was estimated by two methods: 1) catenary depth formula and 2) interpolation of shallower hooks from the observed depth of the deepest settled hook from TDR monitoring. Observers identified each species and recorded the sequential hook number of capture on the longline segment deployed between two floats. Catchability was analyzed for bigeye tuna (n=2,509) and blue shark (n=1,308). Environmental covariates of ambient temperature, thermocline gradient and climatological oxygen were obtained to model catchability. Generalized linear models (GLMs) were fit to explain the vertical distribution in catchability by depth and habitat.

19. Hook depths based on the catenary formula were substantially deeper (mean=310 m) than observed hook depths (mean=183 m). Similar biases occur when estimating the vertical distribution in catch and corresponding CPUE. The Akaike Information Criterion (AIC) and residual deviance indicated that all GLMs fitted to catch with habitat as explanatory variables were preferred over models using observed depth. The effects of both temperature variables in the GLM imply that bigeye tuna catches are highest at the bottom of the thermocline, while high blue shark catches occur within the thermocline. Future research objectives were presented for a project on assessing the performance of longline catchability models in assessments of Pacific highly migratory species funded by the Pelagic Fisheries Research Program (University of Hawaii).

20. The issue of possible day and night differences in the depth distribution of catchability was raised but the study did not address this issue since only the daytime sets were analysed.

21. It was pointed out that Japanese longline (JLL) data have been the principal source of data used to develop standardized indices of abundance for tuna stock assessment work in all of the world's oceans. Analogous data on hook depth (e.g. from time–depth recorders) are not available for the long time series of available JLL data. Based on this study, however, it may be useful to examine the utility of developing new formulae for estimating hook depth in the JLL standardization models (where it is now used), rather than using deterministic catenary calculations. The inclusion of additional oceanographic features into the model will probably be necessary to make such an approach practical.

METHODS FOR ASSESSING BROADBILL SWORDFISH IN THE SOUTHWEST PACIFIC

Multifan-CL

22. Dale Kolody presented SC2 ME WP-3, which outlines the methodology used for the MFCL assessment of the southwest Pacific swordfish fishery, defined as the region ($0–50^0$S, 140E–175^0W), for the period 1952–2004. This assessment attempts to integrate the available fisheries data on total catch, standardized catch rates, and size composition with biological studies on age, growth, reproductive dynamics and stock structure, to provide a summary of the current stock status, and likely implications of future harvesting.

23. The assessment was disaggregated into five regions primarily based on the operational boundaries of Australian and New Zealand domestic longline fleets, and catch size composition in the northern (tropical and subtropical) and southern (SBT-targeting) fisheries. Ten fleets were defined, with two operating in each of the core areas, one in the northern peripheral zone, and three in the southern periphery. The population was age structured (ages 0–19+ years), sex-aggregated, and iterated in quarterly timesteps (including seasonal migration), with annual recruitment deviations estimated from a Beverton-Holt stock recruitment relationship.

24. The analysis was conducted with a recognition of the fact that stock assessment models are usually sensitive to arbitrary assumptions, and attempted to explicitly admit this problem by placing a heavy emphasis on exploring model uncertainty (as opposed to parameter uncertainty estimated conditional on any specific model being correct), with results from more than 500 model specifications explored. The likelihood-based objective function does not provide a sufficient basis for comparing models in this context, so additional subjective plausibility criteria were defined for model selection. The plausibility criteria include similar terms to the objective function (related to the quality of the fit between model predictions and observations), but also

include additional terms related to numerical performance and agreement with pre-conceived notions of stock dynamics. This process represents an attempt to formally articulate the types of subjective decisions usually considered in model selection, and leads to the conclusion that multiple models (with potentially different management implications) are plausibly consistent with the data.

25. The stock status summary resulting from this analysis (and presented subsequently in the Stock Assessment Specialist Working Group) is based on the maximum posterior density (MPD, or best point estimates) from a subset of 10 models (referred to as the "plausible ensemble"). The paper also lists a series of uncertainties that remain beyond the scope of the analysis (e.g. stock boundary definition, sex dimorphism) and recommendations about how the assessment might be improved in future iterations (e.g. through model refinements, and improved data collection for size, age and sex, improved interpretation of catch rates, plus tagging and genetic studies to improve understanding of migration dynamics). The authors suggest that the most effective means of acting on the uncertain advice that will likely persist for the next few years (at least), might be through the development of feedback decision rule harvest strategies that are robust to the uncertainties identified to the extent possible (management strategy evaluation).

26. The meeting noted that sexually dimorphic growth has been modelled in a recent North Pacific swordfish assessment. In the southwest Pacific, however, the fisheries data have limited associated sex information. Future plans include conducting simulation analyses to examine the effect of ignoring the sexually dimorphic growth in the assessment modelling.

27. The meeting endorsed the systematic manner in which the sensitivity of model results to the uncertainty in the structural assumptions underlying the stock assessment model had been explored in this paper and recommended that a similar approach should be considered for other WCPFC assessments since model uncertainty is likely to be greater than the statistical uncertainty that is now reported.

CASAL

28. Nick Davies presented SC2 ME WP-4, which describes a swordfish population model developed using CASAL, which was fitted to catch per unit of effort (CPUE) and catch-at-length observations collated from all fisheries of the southwest Pacific region. Model runs tested structural assumptions for either a single stock, or one that is spatially disaggregated with options for homogeneous mixing, mixing on shared spawning grounds, or for discrete spawning stocks with foraging site fidelity. Model sensitivity to selected structural and statistical assumptions was tested in terms of model quantities of management interest, such as the current stock status relative to recent historical levels. CASAL model estimates were compared with the equivalent quantities derived from a parallel assessment model developed using MFCL, fitted to the same set of observations, and sharing many of the structural and statistical assumptions.

29. While good fits were made to many of the observations, the CASAL model point estimates of absolute stock size and current status were variable, such that the predicted impact of fishing and levels of depletion from virgin levels are uncertain. Current spawning stock biomass relative to the maximum unfished (virgin) stock size ranged from 37%–77%, and the estimated impact of fishing on spawning biomass ranged from 30%–75% of the unfished population. Predictions of the decline in spawning biomass since 1995 were more consistent with a predicted decline of 5%–51% in spawning biomass since 1995.

30. Model uncertainty is evident in its sensitivity to the structural and statistical assumptions made. When the CPUE data was given more weight relative to the catch-at-length observations, higher levels of depletion were estimated, but when the catch-at-length data was given relatively more weight, lesser levels of depletion were estimated. This example of data conflict is one example of some of the many problems encountered in this assessment. Other sources of uncertainty include: estimation problems, particularly for migration parameters; implausible selectivity parameters that may alias for unrelated processes; and fleet-specific catchability coefficients that are counter intuitive. The full effects of the structural and statistical assumptions have not yet been fully explored in the model given the relatively narrow range of model options investigated. The largest uncertainty in the model related to estimates of absolute abundance, and, hence, the predicted relative fishing impact. There appears to be little information available in the observations from which to infer absolute levels of abundance.

31. The meeting noted that the CASAL model runs to convergence much more quickly than a typically configured MFCL model. Convergence generally occurred within 10 minutes for the single area CASAL models and within 20 minutes for the five-area CASAL models. This has important implications for WCPFC assessments in that runtimes of this order would allow for 1) more fully expressing model uncertainty when providing assessment results, and (2) better expressing statistical uncertainty through the use of modern statistical methods (e.g. Monte Carlo Markhov Chain) in the WCPFC assessments.

32. It was noted by the meeting that CASAL can model sexually disaggregated dynamics (e.g. growth rates) even though the input data are sexually-aggregated. This may be a useful exercise to gain some insight into the importance of collecting sex-specific fisheries data for swordfish.

33. The meeting also saw a need for the development of a standard set of diagnostics to more objectively determine plausible model structure (along the lines suggested in SC2 ME WP-3) for all of the WCPFC assessments.

ISSUES RELEVANT TO THE SCIENTIFIC COMMITTEE RESEARCH PLAN

34. The meeting reviewed the tasks identified by the first Scientific Committee meeting that had relevance to the work plan for ME-SWG. These are listed in Appendix II of this report. It was noted that work had been undertaken since the first meeting of the Scientific Committee addressing most tasks, though it was also noted that further analyses are needed on many of these tasks.

35. Taking into account the work completed over the past year, and the recommendations for additional research stemming from this work, the ME-SWG noted the following tasks which could be addressed in the short term:

a. Continued refinement of stock assessment models. This includes further reduction in the number of parameters to speed up convergence times in order to facilitate investigation of the sensitivity to model assumptions.

b. Exploration of sensitivity to structural assumptions. It was considered that the approach outlined in SC2 ME WP-3 provided a good framework for conducting such analyses. While acknowledging the time constraints on such analyses due to the run-time for the main tuna species, it was suggested that sensitivity analyses could be undertaken using previous assessments, thus allowing considerable more time than if

the analyses had to wait until the latest data for the updated assessments was available. This work would also include the development of better diagnostics to more objectively determine plausible model structure.

c. Given the critical role played by standardised longline CPUE as relative abundance indices in the assessment models, there is a high priority to assess the sensitivity of model outcomes to various hypotheses concerning possible changes in fishing power not adequately accounted for in the standardisations. Analytical methods of defending these series would be preferable, one possibility being a study of the impact of historical variations in bait loss.

d. Investigation of alternative stock status reference points to replace maximum sustainable yield (MSY), for example, elaboration of fishery impact, $B/B_{\text{not-fished}}$, reference points used by other RFMOs, etc.

36. Additional tasks which were raised during the meeting, but which were seen as being best addressed by other SWGs (shown in brackets), were also noted by the ME-SWG:

a. Better determination of possible spatial-temporal differences in the length-weight relationships for the principal target species (ST-SWG).

b. Development of an appropriate index of abundance for region 7 (SA-SWG).

c. Examination of factors that could affect longline fishery selectivity over time, e.g. quantification of changing gear deployment methods and fine-scale spatial patterns (FT-SWG)

37. It was noted that other SWGs can also direct tasks to the Methods SWG. As was the case this year, it was suggested that some of the above tasks may be facilitated via an inter-sessional working group meeting.

38. The ME-SWG also noted the following tasks which should be addressed on a medium-term basis, noting that some of these overlap with tasks also identified as short term:

a. Continued refinement of stock assessment models (incl. models to standardize CPUE)

b. Exploration of sensitivity to model uncertainty

c. Identification of limit and target reference points

d. Further development of the methods used to evaluate potential management strategies (including exploration of uncertainty)

e. Further consideration of how to reflect uncertainty in projections

f. Development of recruitment indices independent of the MFCL model.

g. Development / review of models for evaluation of impacts on ecosystem, and the development of reference points for ecosystem-based management

ADVICE AND RECOMMENDATIONS TO THE SCIENTIFIC COMMITTEE

39. ME-SWG endorsed the enhancements to the stock assessments of yellowfin and bigeye tuna outlined above and noted that these changes had been incorporated into the 2006 stock assessments for these species.

40. Having reviewed the methods used in the southwest Pacific swordfish assessments, and noting the recommendations for further data needs and model development (such as the incorporation of sexual dimorphism), ME-SWG endorsed the present methodological approach and the work completed to date.

41. Finally, ME-SWG recommended that the Scientific Committee take note of the above research tasks and priorities when formulating an overall research plan for the Commission.

Appendix I

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

AGENDA FOR THE METHODS SPECIALIST WORKING GROUP

WCPFC-SC2-2006/ME-SWG AGENDA

1. PRELIMINARIES
- 1.1. Adoption of agenda
- 1.2. Finalization of documents

2. CHANGES AND ENHANCEMENTS TO THE STOCK ASSESSMENT METHODS USED FOR THE PRINCIPAL TARGET SPECIES (REVIEW OF ISSUES IDENTIFIED BY SC1)
- 2.1. Review of information

  WP-1: Langley, A. 2006. "Summary report from yellowfin and bigeye stock assessment workshop"

  IP-1: Langley, A. 2006. "Spatial and temporal trends in yellowfin and bigeye longline CPUE for the Japanese fleet in the WCPO".

  IP-2: Langley, A. 2006. "Spatial and temporal variation in the size composition of the yellowfin and bigeye longline catch in the WCPO".

  IP-3: Langley, A., H. Okamoto, P. Williams, N. Miyabe, K. Bigelow. 2006. "A summary of the data available for the estimation of conversion factors (processed to whole fish weights) for yellowfin and bigeye tuna".
- 2.2. Advice to the Scientific Committee

3. OTHER RESEARCH
- 3.1. Review of information

a. Improved methods to standardize longline CPUE (in particular, the incorporation of factors to better account for changes in catchability over time and physical factors other than SST and oxygen to better describe and account for changes in habitat)

WP-2: Bigelow, K. "Incorporation of other oceanographic factors into CPUE Standardizations".

b. Methods for assessing billfish stocks in the WCPO

WP-3: Kolody, D., R. Campbell, and N. Davies. 2006. "Multifan-CL Stock Assessment for South-West Pacific Broadbill Swordfish 1952-2004"

WP-4: Davies, N., R. Campbell, and D. Kolody. 2006. "CASAL Stock Assessment for South-West Pacific Broadbill Swordfish 1952-2004"

- 3.2. Advice to the Scientific Committee

4. RESEARCH PLANNING

4.1. Medium Term Research Plan
4.2. Operational Research Plan for 2006/07

5. ADMINISTRATIVE MATTERS

5.1. Adoption of report

Appendix II

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

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TASKS IDENTIFIED AT THE FIRST REGULAR SESSION OF THE SCIENTIFIC COMMITTEE FOR THE METHODS SPECIALIST WORKING GROUP

From ANNEX VII: Report of the Methods SWG

48. The ME-SWG noted two tasks for 2006:

a. Physical factors other than SST and oxygen could be incorporated into CPUE standardization algorithms analysis as proxies for habitat (e.g. thermocline structure, horizontal gradients, deep scattering layer); and
b. Examine the sensitivity of the 2005 MFCL assessments for yellowfin tuna and skipjack tuna to alternative movement patterns in the model, and the implications for the quality of fit to the data.

From ANNEX VII: Report of the Stock Assessment SWG

104.

a. Review length-weight conversion factors in those longline fisheries for which weight frequency data were obtained ad used in MFCL analysis;
d. Investigate alternative regional structure for the yellowfin tuna assessment (in light of the high proportion of the catch taken in region 3)
e. Investigate alternative parameterisations of movement in the MFCL assessment models, especially for skipjack.

From Section 7: WCPFC/SC1/2005/Meeting Report

7.13 In reviewing the work program of the ME-SWG, the Scientific Committee noted that the following items of research are the highest priority:

a) Improvements to the longline CPUE standardization (including changes in catchability through time and physical factors for incorporation into the standardization process);
b) Improvements to the recruitment indices used in modelling including development of recruitment indices independent of the model); and
c) Improvements to the spatial parameterisation of the modelling techniques.

Attachment K

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

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REPORT OF THE STATISTICS SPECIALIST WORKING GROUP

INTRODUCTION

1. The Statistics Specialist Working Group (ST-SWG) was held on the afternoons of Monday, 7 August and Friday, 11 August. Kim Duckworth was Convener, Lara Manarangi-Trott, Peter Williams and Nick Davies were appointed rapporteurs.

2. The agenda was adopted as is attached as Appendix I of this report. Discussion of the regional observer programme was brought forward in the agenda so the item on the outcomes of the Ad Hoc Task Group [data] was deferred until Friday afternoon. The list of documents presented is attached in Attachment F of the main report.

OVERVIEW OF GAPS/ISSUES WITH DATA

3. Tim Lawson — from the Secretariat of the Pacific Community (SPC) Oceanic Fisheries Programme (OFP), which manages data on behalf of the Commission — reported on recent developments in regard to filling data gaps, and data gaps remaining. He also reported on the Indonesia and Philippines Data Collection Project (IPDCP), referring to SC2 ST IP-2, "Scientific Data Available to the Western and Central Pacific Fisheries Commission".

4. New data sets that have been provided to the Commission include aggregated catch and effort data covering the Chinese Taipei domestic longline fleet during 2004, and data collected during the 1950s during the Pacific Oceanic Fisheries Investigations (POFI) longline surveys by the United States.

5. While the currently available data for catch and effort, and size composition, are extensive, there are significant gaps and other issues. The most important of those affecting the stock assessment of target tunas include:

   a. Indonesian tuna fisheries: Total catch estimates for the period prior to 1970 are missing; estimates of annual catches have not been stratified by gear type for the period from 1991 onwards; estimates of annual catches of "yellowfin" covering the period from 1970–2003 also include bigeye; neither catch and effort data (operational or aggregated) nor size composition data are available; for the period from 1970–2004, large annual catches have been reported for "unclassified" gear

types with no information on the types of gear included; and the size composition of catches taken by "unclassified" gear types.

b. Japanese coastal longline fleet: There are no operational or aggregated catch and effort data, nor size composition data available.

c. Japanese pole-and-line fleet: No operational or aggregated catch and effort data, nor size composition data, are available for the period prior to 1972.

d. Philippines tuna fisheries: Total catch estimates for the period prior to 1970 are missing; no operational or aggregated catch and effort data are available; only limited size composition and species composition data are available for the period prior to the National Stock Assessment Programme, which commenced in 1997; for the period 1970–2005, significant annual catches have been reported for "unclassified" gear types; information is required regarding the gear types included in "unclassified" and the size composition of catches taken by "unclassified" gear types.

e. Vietnamese tuna fisheries: There are no annual catch estimates, operational or aggregated catch and effort data, nor size composition data currently available, other than reports presented by Vietnamese participating in meetings a few years ago.

f. Historical coverage rates: For several fleets, particularly those of the small Pacific Island countries, better estimates of historical coverage rates of logsheet and unloadings data are required to improve annual catch estimates and aggregated catch and effort data. In this regard, the identification and rescue of historical data is required.

g. Information on vessels covered by annual catch estimates and catch and effort data: For certain fleets, such as those of Belize and Vanuatu, it is suspected that catches by some vessels are also being reported under other flags. Information on the vessels covered by annual catch estimates and aggregated catch and effort data are required to determine whether double-counting or omissions are occurring.

h. Operational catch and effort data: Operational catch and effort data are not available for Japanese fleets outside the exclusive economic zones (EEZs) of Forum Fisheries Agency (FFA) member countries, nor for the distant water longline fleets of Korea and Chinese Taipei.

i. Species composition data for purse seiners: Species composition data collected by observers and port samplers are needed to improve estimates of the catches of yellowfin and bigeye for purse-seine fleets, other than vessels fishing under the United States Treaty and the FSM Arrangement.

6. Data gaps related to the implementation of an ecosystem approach to fisheries include the following:

a. The coverage of catch data for non-target species, including fishes, marine reptiles, marine mammals and seabirds, collected by observers needs to be increased for most longline and purse-seine fleets.

b. Biological data covering non-target species are frequently lacking; the types of data required include length and weight, gender, length and age at maturity, longevity, growth rate, fecundity, habitat use (vertical and horizontal range), and trophic interactions.

c. Other gaps include quality-controlled ocean bathymetry data, especially regarding seamount definitions and locations, oceanographic data products resolving mesoscale features relevant to fisheries, and acoustic data for the validation of models of mid-trophic components of oceanic ecosystems.

7. The data available covering the fisheries of the Philippines has improved, with port sampling data collected by the National Fisheries Research and Development Institute and surveys conducted by the Bureau of Agricultural Statistics, both of which were supported with IPDCP funding during 2005 and 2006. IPDCP activities in Indonesia are not scheduled to commence until funds are available. IPDCP is discussed further under Agenda Item 6 of the agenda of the Second Regular Session of the Scientific Committee.

8. Data relating to other commercial fisheries by gear type other than purse seine and longline were made available as required in paragraph 20 of Conservation and Management Measure 2005-01 to the Scientific Committee and may be discussed by other SWGs.

9. Discussions following the SC2 ST IP-2 included the extent of illegal, unregulated and unreported (IUU) fishing within the western and central Pacific Ocean (WCPO). It was noted that the very nature of IUU fishing is that much of it is not reported or is misreported. Catch certification schemes or statistical documentation schemes, currently under consideration by the WCPFC, were suggested as one approach that in part could address IUU fishing.

REGIONAL OBSERVER PROGRAMME (WCPF CONVENTION, ARTICLE 28)

10. Tim Lawson presented SC2 ST WP–1, "Scientific Aspects of Observer Programmes for Tuna Fisheries in the Western and Central Pacific Ocean". The review is based on information provided by the Bureau of Rural Sciences of Australia, the Ministry of Fisheries of New Zealand, the National Fisheries Research and Development Institute of the Republic of Korea and the Fisheries Agency of Chinese Taipei. Information on the observer programmes of Pacific Island countries and territories that are supported by SPC and FFA, including the observer programmes of the US Treaty and the FSM Arrangement, was provided by SPC. Agencies beyond the region that provided information include the Inter-American Tropical Tuna Commission (IATTC) in regard to the purse-seine observer programme in the Eastern Pacific Ocean conducted under the Agreement on the International Dolphin Conservation Program (AIDCP), and the Institut de recherche pour le développement (IRD) of France and the Instituto Español de Oceanografia (IEO) of Spain in regard to purse-seine observer programmes in the Atlantic Ocean and the Indian Ocean. The scientific aspects of observer programmes that were reviewed include objectives, sampling protocols, sampling design, coverage rates, and the recruitment, training and debriefing of observers.

11. The relationship between observer coverage rates and the reliability of estimates of the catch per unit of effort was discussed. The general form of the relationship is shown in Figure 1.

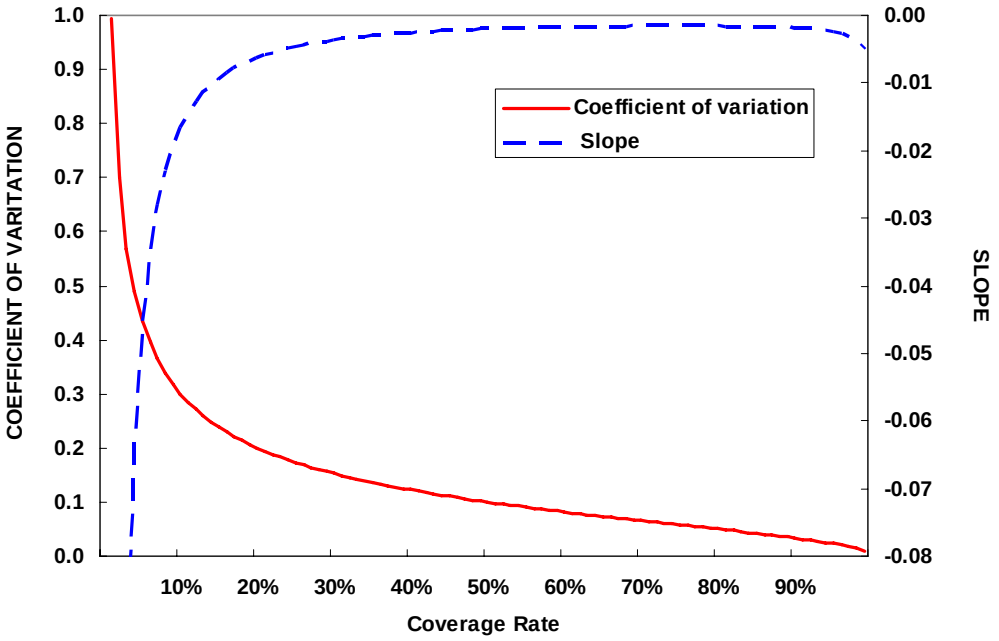

Figure 1. Relationship between the coefficient of variation of estimates of CPUE and the observer coverage rate (see SC2 ST WP–1)

12. While reliable estimates of CPUE for species with extremely low catch rates such as marine reptiles and marine mammals will require almost complete observer coverage, Figure 1 suggests that increases in the coverage rate beyond 20% result in smaller incremental improvements in the coefficient of variation of estimates of CPUE. If financial or other constraints limit the level of observer coverage, then the fact that the reliability of estimates of CPUE improves less rapidly with increasing coverage above 20%, may be an important consideration in determining target coverage rates.

13. The meeting considered the directives from the Commission to the ST-SWG under this agenda item, and using SC2 ST-WP-1 (covering longline and purse seine) as a basis, discussed the following with respect to the Regional Observer Programme:

- Priorities and objectives,
- Coverage levels,
- Process for the implementation of the regional observer programme, and
- Process for development of observer data standards.

14. The ST-SWG noted that SC2 ST-WP-2 was a useful summary of scientific priorities and objectives for current WCPO observer programmes.

15. A small working group was established to assign priorities to each item in the lists of scientific objectives for observer data collection covering longline and purse seine, listed in SC2 ST-WP-1. SC2 FTWG WP-7 was also suggested as a useful source document for the small working group's deliberations.

16. Shelton Harley presented the outcomes of the small working group to the ST-SWG, including separate tables outlining objectives of observer programs for longline and purse-seine fisheries and likely coverage rates. The convenors of the Ecosystem and Bycatch SWG (Peter Ward), Methods SWG (Robert Campbell) and Stock Assessment SWG (Naozumi Miyabe) provided overviews of discussions relevant to the regional observer program that arose during the sessions of their respective SWG. ST-SWG reviewed and revised the table prepared by the small working group. This table, post the editing required to achieve agreement, is attached as Table 1 of Appendix II of this report.

17. In the discussion on priorities, objectives and coverage rates, the ST-SWG noted that:

a. The scientific priorities and objectives of the regional observer programme should address the collection of data needed to assess the impacts of fishing on target and non-target species including species of special interest, provide reliable estimates of catches of target and non-target species and interactions with non-target species, be a source of fisheries data independent of fisher reporting and be adaptable to address specific issues of concern.

b. Consideration should be given to using other types of data collection (e.g. port sampling and VMS) where these can collect information, equivalent to that which can be collected by observers, in a more cost effective manner. Alternative sources of data, including port sampling programs, can sometimes provide similar data to those collected by observer programs. Port sampling data is not as useful as observer data when catches are sorted at sea and there are discards.

c. Two areas that are currently important, and can be determined through observer data collection, are the need to confirm the estimates of the purse seine catch species composition and obtain better indications of the level of interaction with species of special interest.

18. In the discussion on coverage rates, the ST-SWG noted that:

a. To obtain reliable estimates of interactions with very rarely encountered species of special interest, close to 100% observer coverage on longline and purse seine fleets is the scientific ideal. However, 100% coverage would be costly.

b. While noting the desirability for higher coverage rates in certain instances to obtain scientifically reliable estimates, the meeting also considered the need for at least a minimum level of coverage if the broad objectives of the regional observer programme are to be achieved. A minimum level of coverage should provide good catch estimates of the frequently caught species and at least ballpark (an order of magnitude) estimates of the catch of rarely caught species. The provision of initial ballpark estimates of rarely caught species would allow more targeted observer programs to be developed later to deal with such issues of specific interest. The present levels of observer coverage on longline fleets in the Convention Area (less than 1% on average across all observer programs in the WCPO) do not achieve these minimum objectives and as such higher levels of observer coverage (e.g. 5%) are required.

c. The most significant gains were made in moving from “no observer coverage” to “some minimum level of observer coverage”.

d. To maximize the utility of observer collected data and information, observer programme coverage will need to be representative across the Convention Area, distribution of fishing effort, seasons, fishing fleets or fleet types. A lower level of coverage distributed well can often provide better information than a higher level of coverage which is distributed poorly.

19. The ST-SWG recommended that five scientific objectives that should be considered in the development of the regional observer program, all of which are high priority:

a. Record the species, fate (retained or discarded) and condition at capture and release (e.g. alive, barely alive, dead, etc.) of the catch of target and non-target species; depredation effects; and interactions with other non-target species including species of special interest (i.e. sharks, marine reptiles, marine mammals and sea birds);

b. Collect data to allow the standardisation of fishing effort, such as gear and vessel attributes, fishing strategies, the depths of longline hooks, FAD use and setting activities of purse seiners, and other factors affecting fishing power;

c. Sample the length and other relevant measurements of target and non-target species;

d. Sample other biological parameters, such as gender, stomach contents, hard parts (e.g., otoliths, first dorsal bone), tissue samples and collect data to determine relationships between length and weight, and processed weight and whole weight;

e. Record information on mitigation measures utilised and their effectiveness.

20. The ST-SWG recommended that the objective of the regional observer programme should initially be to attain a minimum coverage of 5% of fishing effort (longline: total hooks deployed; purse seine: days fished and searched) across all strata to allow identification of specific issues. The distribution of observer effort is to be representative of species of interest, fishing areas, seasons, and fishing fleets (types).

21. The ST-SWG recognized that the initial coverage will not deliver on all possible objectives (e.g. 5% coverage may not be adequate to reliably quantify the incidental catch of sea turtles and seabirds).

22. The ST-SWG recommended that the data collected from initial levels of coverage should be used to further determine the levels of coverage required to address specific issues of concern to the Commission. For example, coverage rates may need to be higher in certain areas or circumstances to obtain reliable estimates of the catch of some species (e.g. seabirds, sea turtles, marine mammals) or species populations that are particularly vulnerable, for fisheries for which information is currently unavailable, and for other specific issues of concern to the Commission.

23. The ST-SWG noted that the regional observer programme could fulfill a role in educating fishers. Particularly in relation to the identification of target and non-target species and also in

relation to best-practice techniques for the use of mitigation measures, for example the correct deployment of tori lines.

24. The work of the ST-SWG in regard to recommendations on regional observer programme objectives, priorities and coverage levels focused on the longline and purse-seine fisheries. The ST-SWG noted that observer programme objectives, priorities and coverage levels for other fisheries within the scope of WCPFC will require further consideration at a later date.

25. Many participants noted that both scientific and compliance objectives need to be considered by the Commission in the development of the regional observer programme.

26. In discussions on the process for the implementation of the regional observer programme it was noted by the Executive Director that the institutional structure for the regional observer programme was still in the process of being developed. It was agreed that consideration by the ST-SWG of the process for the implementation of the regional observer programme should be deferred.

27. In the discussions on the process for the development of observer data standards it was recommended that the Secretariat develop a draft list of fields of data that observers should collect, for consideration at the next meeting of the ST-SWG.

DATA CONFIDENTIALITY, SECURITY, AND DISSEMINATION

28. Kim Duckworth presented an overview of the Summary Record of the Ad Hoc Task Group [data]. Twenty eight people participated in the Ad Hoc Task Group [data] which was held from Monday, 31 July to Friday, 4 August. The group discussed:

- The properties that a good set of rules and procedures for data security and dissemination would have;
- The reasons why data needs to be protected from alteration, loss or unauthorised release;
- A system for classifying the risk associated with each type of data, based on the damage to the credibility or operations of the Commission that would result from an unauthorised disclosure of data;
- General principles for the dissemination of data.
- From these discussions the Ad Hoc Task Group [data] developed a draft set of rules and procedures for access to and dissemination of data compiled by the commission.

The Ad Hoc Task Group [data] also discussed the security of data. The group decided against recommending specific individual measures to protect the security of data, but instead requested that the WCPFC secretariat continue work on its draft Information Security Policy (WCPFC/AHTG [data]/2006/07) using ISO17799 as a basis for its development.

29. The ST-SWG did not comment on the Summary Record of the Ad Hoc Task Group [data].

RECOMMENDATIONS ON 2007 WORK PROGRAMME

30. The ST-SWG:

a. Recommended that the Secretariat develop a draft list of fields of data that observers should collect for longline and purse seine, for consideration at the next meeting of the ST-SWG.

b. Recommended that, with respect to the regional observer programme, the Secretariat commission the drafting of objectives and priorities for data to be collected by observers for fisheries other than purse seine and longline, for consideration of the ST-SWG at its next meeting.

c. Endorsed the recommendation of the Ad Hoc Task Group [data] that the Executive Director, in collaboration with the Chair of the Commission and officers of WCPFC subsidiary bodies, develop a framework for access to non-public domain data by CCMs.

d. Endorsed the recommendation of the Ad Hoc Task Group [data] that the Secretariat further elaborate the draft Information Security Policy (ISP).

e. Recommended that, resources permitting, a study be undertaken to develop a database that clearly defines vessel and gear attributes and operational details that are useful for further studies to standardize fishing effort, estimate fishing power and physical parameters of capacity, and be used in the development of observer programs. The study should also identify and determine best approaches for acquiring these data. The study should have as an initial focus on purse-seine and longline vessel and gear characteristics. (Proposal attached as Appendix III to this report.)

MEMBERSHIP AND PARTNERSHIP AGREEMENTS

31. The ST-SWG did not consider the issue of WCPFC membership in the Coordinating Working Party on Fishery Statistics (CWP) nor a partnership agreement for the WCPFC with the Fishery Resources Monitoring System (FIRMS). It was decided that they were more appropriately considered during Agenda item 6 of the agenda for the Second Regular Session of the Scientific Committee.

32. The ST-SWG adopted this report by consensus.

Appendix I

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
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Manila, Philippines

AGENDA FOR THE STATISTICS SPECIALIST WORKING GROUP

WCPFC-SC2-2006/ST-SWG AGENDA

1. OVERVIEW OF GAPS/ISSUES WITH DATA

a. Summary of 2005/2006 achievements toward filling data gaps

b. Summary of data gaps remaining

c. Indonesia and Philippines catch

- Overview of the IPDCP: achievements and constraints
- Review of data and information available

2. DATA CONFIDENTIALITY, SECURITY, AND DISSEMINATION

a. Rules for access to, and use of, WCPFC data

b. Rules and Procedures to govern the security of data held by the Commission

3. REGIONAL OBSERVER PROGRAMME

a. Priorities and objectives (including species of special interest)

b. Coverage levels (including by method)

c. Process for the development of observer data standards

4. RECOMMENDATIONS ON 2007 WORK PROGRAMME

5. MEMBERSHIP AND PARTNERSHIP AGREEMENTS (IF TIME PERMITS)

a. Membership of the Coordinating Working Party on Fishery Statistics (CWP)

b. Partnership agreement for the Fishery Resources Monitoring System (FIRMS)

Appendix II

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

TABLE USED BY THE ST-SWG IN DEVELOPING ITS RECOMMENDATIONS FOR OBJECTIVES FOR THE REGIONAL OBSERVER PROGRAMME

Table 1. Scientific objectives for WCPFC observer programmes for longline and purse-seine fisheries

Objective for observer programme	Comments
To record the species, fate (retained or discarded) and life status of the **catch** of target and non-target species, interactions with other non-target species, including species of special interest (i.e., sharks, marine reptiles, marine mammals and sea birds)	Important to cover fleets not being covered. Also, idea of higher exploratory coverage on a rotational basis. Knowledge of the habitat of the species may determine the spatial temporal extent of observer coverage required. <u>Longline:</u> Port sampling may be used for both estimating the longline catch and for sampling the species composition of target tunas. <u>Purse seine:</u> Port sampling cannot be effective for estimating purse seine catches sorted at sea and recording discards. Port sampling may be used for some estimates of catch and for sampling the species composition of target tunas.

To collect data to allow the **standardisation of fishing effort**, such as gear and vessel attributes, fishing strategies, the depths of longline hooks, FAD use and setting activities of Purse seiners, and other factors affecting fishing power.	Some data may also be available from logsheets, the Commission vessel record, and port inspections.
To **sample the length** and other relevant measurements of target and non-target species	<u>Longline:</u> Port sampling may be used for target species that are retained on board. <u>Purse seine:</u> Port sampling cannot be effective for estimating catches sorted at sea and discards. When port sampling is at a sufficient level, this objective may become a lower priority. High priority for the collection of biological data for incidental catch (e.g. turtles), but size composition of target species caught in longline are probably of medium priority.
To sample other **biological parameters**, such as gender, stomach contents, hard parts (e.g. otoliths, first dorsal bone), tissue samples and collect data to determine relationships between length and weight, and processed weight and whole weight	Maybe one-off research projects for particular species rather than ongoing collection. Some work may be possible from port sampling
To record information on **mitigation measures** utilized and their effectiveness	May have overlap with TCC requirements

Priority: all scientific objectives of the regional observer program are high priority

Coverage:

- Initially a minimum coverage of 5% of fishing effort (longline: total hooks deployed; Purse seine: days fished and searched) is required across all strata to allow identification of specific issues. The distribution of observer effort is to be representative of species of interest, fishing areas, seasons, and fishing fleets (types).

- The initial coverage will not deliver on all possible objectives (e.g. 5% coverage may not be adequate to reliably quantify the incidental catch of seabirds and sea turtles). Based on the data collected, the level of coverage required to address specific issues will be determined. For example, coverage rates may be higher for species that are caught infrequently, fisheries for which information is currently unavailable, and for other specific issues (e.g. 20%).

Appendix III

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
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PROPOSAL TO DEFINE VESSEL, GEAR AND OPERATIONAL DETAILS TO SUPPORT THE SCIENTIFIC COMMITTEE NEEDS

Justification

1. Details of vessel, gear and operational modes are needed for a range of analytical purposes including studies to assess changes in fishing power, fleet capacity and to facilitate effort standardization studies. The collection of a comprehensive list of technical details will promote the Scientific Committee abilities to:

a) characterize regional fisheries,

b) better determine fleet-specific targeting,

c) estimate effective fishing effort, and

d) investigate the influence of FAD design and use on levels of catch and bycatch.

2. The WCPFC Record of Fishing Vessels is not adequate for this purpose because it only covers vessels fishing beyond national jurisdictions and because the information collected does not include most of the information needed for scientific purposes. The FFA Vessel Register is inadequate for a number of reasons having to do with verification, updating and content.

3. The collection of these data will allow meaningful analyses to proceed on capacity estimation, differential catch rates of target and bycatch species by different fleets or between FAD types (moored, drifting, natural, artificial, different artificial designs, use of light, chumming, etc.)

4. The definition of data that should be collected will allow evaluation of what may be the best way to obtain these data, such as through:

a) license applications,

b) vessel registries,

c) targeted in-port inspections,

d) port sampling programs,

e) observer programs, and

f) some other means not yet developed.

Study proposal

To review the scientific needs of the Scientific Committee and Commission in relation to vessel, gear and operational data from WCPO fisheries in comparison to what has been collected by observer programmes, license agreements, what is/will be collected under provisions of WCPF Convention Annex IV and other sources.

To review and collate written information on vessel, gear and operational details useful for effort standardization and the points listed in 1a–1d above.

To recommend a list of vessel, gear and operational details useful for these purposes and recommend how these data may best be collected.

To recommend how these data can be regularly updated and verified to remain useful for the purposes of the Scientific Committee.

(Future work) Project proposal

Results of this study will be useful in the later development of a Commission programme to collect, verify and maintain these data, perhaps through submission of licensed vessel details by CCMs.

Attachment L

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
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REPORT OF THE STOCK ASSESSMENT SPECIALIST WORKING GROUP

INTRODUCTION

1. The meeting of the Stock Assessment Specialist Working Group (SA-SWG) took place from 8–9 August 2006 at the Dusit Hotel Nikko in Makati City, Philippines. Naozumi Miyabe (Japan) and Gerard DiNardo (USA) served as convenors of the meeting, with Keith Bigelow, Dale Kolody, Chris Reed, Shelton Harley, Ray Conser, Adam Langley and David Kirby serving as rapporteurs.

2. A provisional agenda was circulated for review prior to the meeting, and adopted as attached as Appendix I to this report. Seven working papers were presented to the SA-SWG, including assessments on bigeye tuna, yellowfin tuna, South Pacific albacore and southwest Pacific striped marlin and South Pacific swordfish. The yellowfin, bigeye and South Pacific albacore tuna working papers represent updated assessments, while those for southwest Pacific swordfish and southwest Pacific striped marlin represent new assessments. While no skipjack tuna assessment was undertaken in 2006 (as recommended at the first regular session of the Scientific Committee), an analysis was conducted to determine the utility of temporal closures of the western and central Pacific Ocean (WCPO) purse-seine fishery in the previously adopted WCPFC conservation and management measure for bigeye and yellowfin tuna.

3. Overviews of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) activities of relevance to the assessment of the northern stocks were presented to the SA-SWG. These included North Pacific albacore tuna, North Pacific bluefin tuna and North Pacific striped marlin.

4. The SA-SWG also discussed and identified short- to long-term research items to advance stock assessments and these items are included in the emerging WCPFC research plan (see Agenda Item 9 — Future work programme). It should be noted that many of the research items identified by the SA-SWG are consistent with those identified by the other Specialist Working Groups, and is expected given the objective of a stock assessment — the integration of diverse datasets to produce a comprehensive and reliable results.

5. On the basis of the presentation of relevant stock assessment working papers and the discussions of the SA-SWG, stock status descriptions were developed for bigeye tuna, yellowfin tuna, South Pacific albacore, southwest Pacific striped marlin and southwest Pacific swordfish. Summaries of each working paper, including relevant status descriptions and SA-SWG

discussions, and proposed short- to long-term research items follow. A complete listing of documents presented to the SA-SWG is included in Attachment F of the main report.

YELLOWFIN TUNA STOCK ASSESSMENT

Summary of SC2 SA WP-1

6. Adam Langley presented the paper SC2 SA WP-1: Stock assessment of yellowfin tuna in the WCPO, including an analysis of management options. The 2006 stock assessment for yellowfin tuna in the WCPO was implemented in MULTIFAN-CL (MFCL). The yellowfin tuna model is age- and spatially structured (28 age-classes, 6–7 regions) and the catch, effort, size composition and tagging data used in the model are classified into 19 fisheries and quarterly time periods from 1952 through 2005. The following substantive changes were introduced this year:

a. Length–weight and processed-whole weight conversion factors were reviewed and revised, resulting in an improved agreement between predicted and observed size frequency data for some key fisheries;

b. The non-decreasing constraint on selectivity was removed for some of the principal longline fisheries;

c. Only general linear model (GLM)-standardized CPUE series and a single (fixed) natural mortality vector were included this year;

d. A seven-region spatial structure was explored in one model (as a consequence of a separate analysis of spatial homogeneity of CPUE and catch size composition, Fig. Y1);

e. The data have been updated to include 2004 longline, Philippines and Indonesia fisheries data plus, 2005 purse-seine data.

7. Three sensitivity trials were defined. Two six-region scenarios were defined, which differed only in the relative weighting of the catch-at-size samples in the objective function (LOWSAMP and HIGHSAMP). The third scenario (7REGION) involved a new spatial structure, in which a seventh region was defined to partition the Indonesian and Philippines fisheries from the other regions (catch-at-size was down-weighted in the manner of LOWSAMP). The HIGHSAMP scenario was the most similar to the base case defined last year (GLM-MFIX). This year, LOWSAMP was adopted as the base case, because it allowed a better fit to the principle CPUE series (at the expense of a decreased fit to the size data). The seven-region model was considered to be less reliable than the six-region model because there is no reliable abundance index post-1985 for the new region at this time.

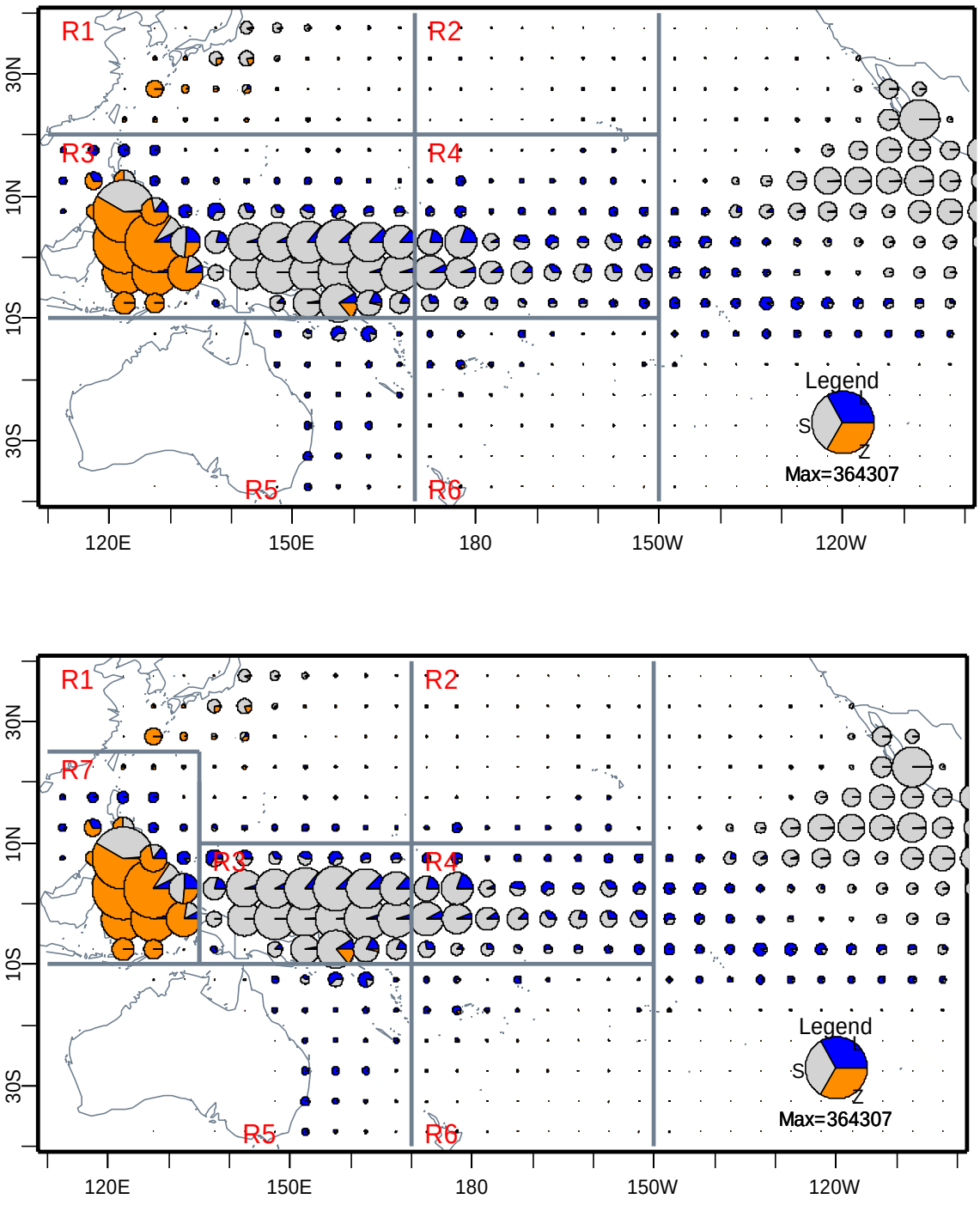

Figure Y1. Distribution of cumulative yellowfin tuna catch during 1990–2003 by five-degree squares of latitude and longitude and fishing gear; blue (L) = longline, grey (S) = purse seine, and dark orange (Z) = other. The top panel has the six-region structure superimposed, while the bottom panel illustrates the exploratory seven-region structure.

8. From the three scenarios, biomass is estimated to have declined to 0.51–0.60 of unfished levels, with exploitation rates rising steeply in the last decade. The dominant equatorial regions were the most heavily impacted by fishing (particularly the purse seine and Indonesia/Philippines fleets), while the peripheral sub-tropical regions were not estimated to be highly depleted. The main reference points from the stock assessment indicate that over fishing is probably occurring ($F_{current} \geq F_{MSY}$) while biomass is probably above that capable of producing MSY. Biomass is predicted to decline further if current levels of recruitment and current (2001–2004 average) fishing mortality are maintained.

Discussion

Uncertainty in catch history

9. The implications of the uncertain catch statistics from the Indonesian and Philippines on the assessment uncertainty was questioned. This issue has been formally addressed with alternative assessment scenarios in past years, such that the results were intuitively consistent with expectations; that is, if catches are underestimated (overestimated), the stock status is more pessimistic (optimistic) than current estimates suggest.

Between-year variability in assessment inferences

10. There were mixed opinions as to whether the model inferences were stable between consecutive assessments, and there was concern that the manner of presentation makes it difficult to judge whether the year to year differences which are observed result from alterations to the assessment model specifications or the addition of new data (or revisions to historical data). It was noted that changes could result from both sources, but past retrospective analyses suggest that annual updates to the data are generally less important than updates to the model assumptions. Given pragmatic time constraints, it was recognized that the models are always based on the best available methods even if this causes differences in the base case model between years. There was some concern that consistency between years would be a desirable outcome in order to meet management concerns. However, it was also noted that the changes made to this year's assessment resulted from recommendations arising at the first meeting of the Scientific Committee. It was also suggested that effort should be spent identifying which factors are likely to have the greatest influence on the assessment, and these factors should be prioritized for sensitivity trials and the representation of assessment uncertainty. High priorities mentioned included the standardization and interpretation of CPUE series as relative abundance indices, and uncertainty in Indonesian and Philippines catch data and absence of Vietnamese catch and effort information.

Discrepancy between model and prior perceptions of biomass distribution

11. It was noted that the model predictions of biomass from the Coral Sea (region 5) for recent years were almost as large as the estimates for the western equatorial Pacific (region 3), despite the fact that catch removals in region 3 are far greater than region 5. This observation was explained by consideration of the longer-term trends in regional levels of biomass and exploitation rates. Historically, region 5 is estimated to include 24% of the level of longline exploitable biomass within region 3, as determined from a spatially weighted analysis of longline CPUE data. A major portion of the catch in area 3 occurs in the purse-seine fishery, and since there is no equivalent fishery in area 5, there is limited information with which the model can quantify the relative abundance of the juvenile component of the stock in this region. The

similarity in current biomass in the two regions reflects the fact that the fishing impact in area 3 is estimated to be much higher than area 5, such that the area 3 abundance would be expected to be substantially higher in an unfished state. While these explanations may help to understand the result, it was also recognized that the relative effective area calculations for CPUE weightings might need to be refined for the Coral Sea.

Stock description for yellowfin tuna

12. On the basis of the assessment, the SA-SWG developed the following stock status description for yellowfin tuna.

Key attributes

13. Yellowfin tuna are fast growing, mature at about two years of age and are highly fecund. Yellowfin can grow to 180 cm in length and weigh over 100 kg when they are about six years of age or older. The majority of the catch is taken from the equatorial region where they are harvested with a range of gear types, predominantly purse seine and longline. Catches of yellowfin tuna represent the second largest component (approximately 20–25% since 1990) of the total annual catch of the four main target tuna species in the WCPO. For stock assessment purposes, yellowfin tuna are assumed to constitute a single stock in the WCPO.

Trends: catch and effort

14. Longline fisheries developed in the early 1950s, with yellowfin tuna being the principal target species. A major change took place after the mid-1970s, though, with the increased targeting of bigeye tuna. Large-scale industrial purse-seine fisheries developed in the early 1980s, principally targeting skipjack tuna but also taking large catches of yellowfin tuna (Fig. Y2). This development, together with increased catches by Indonesia and the Philippines, resulted in the yellowfin catches in the WCPO doubling from 200,000 to 400,000 mt between 1980 and 1990. Over the past decade, 40–60% of the total yellowfin catch each year has come from the purse-seine fishery.

15. Since 1980, there have been large increases in the total catch of yellowfin with the development of the purse-seine fishery. This has included a considerable catch of juvenile yellowfin associated with the fish aggregating device (FAD) fishery. In recent years, catches in the purse-seine fishery overall have declined from the record catch taken in 1998 but recovered somewhat in 2005. The catches of juvenile yellowfin in the Philippine and Indonesian domestic fisheries have also increased significantly since 1990, with these increases continuing to 2004, although the magnitude of these catches is not well determined.

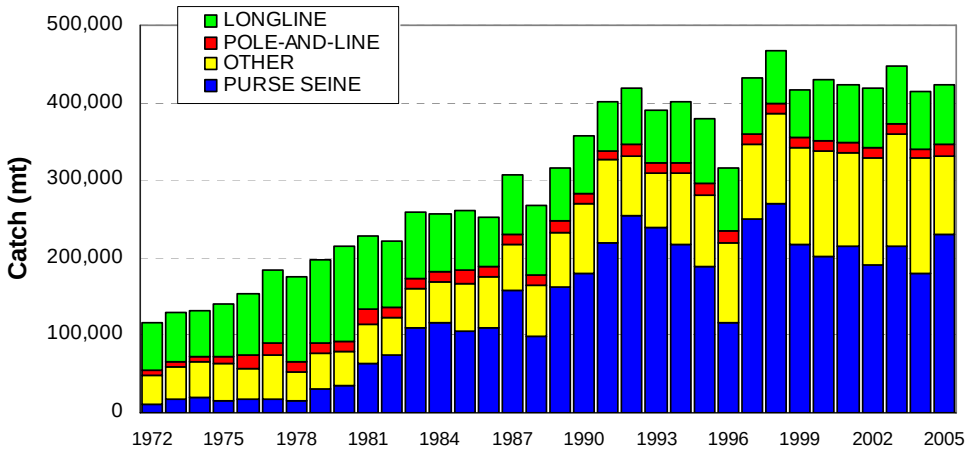

Figure Y2. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the Convention Area, by longline, pole-and-line, purse seine and other gear types

16. The total 2005 Convention Area yellowfin tuna catch was 423,468 mt. The purse-seine catch (231,241 mt), accounting for 54% of the total Convention Area yellowfin catch, was the highest for this fishery in seven years. In recent years, the yellowfin longline catch has ranged 61,000–80,000 mt, which is well below catches taken in the late 1970s to early 1980s (90,000–120,000 mt), presumably related to changes in targeting practices by some of the large fleets and the gradual reduction in the number of distant-water vessels. The Convention Area longline catch for 2005 was 76,521 mt (18% of the total Convention Area yellowfin catch).

17. The CPUE indices derived from the Japanese longline fleet represent the principal index of longline exploitable biomass in each of the model regions. Time-series of nominal catch rates for the Japanese longline fleet display high inter-annual variability and regional differences, with an overall decline since the early 1950s in the equatorial WCPO but more variable trends and smaller declines in more temperate regions. The GLM based index displays similar (if sometimes smaller) trends to the nominal catch rates (Fig. Y3) from the late 1970s to the 1990s. Note the absence of a standardized CPUE since the late 1980s in region 7 of the seven-region model.

Size of fish caught

18. The domestic surface fisheries of the Philippines and Indonesia take large quantities of small yellowfin in the range 20–50 cm (Fig. Y4). In the purse-seine fishery, smaller yellowfin are caught in log and FAD sets than in unassociated sets. A major portion of the purse-seine catch in weight is adult (>100 cm) yellowfin tuna, to the extent that the purse-seine catch of adult yellowfin tuna is usually higher than the longline catch. Inter-annual variability in the size of yellowfin taken exists in all fisheries. Note the strong mode of large (130–150cm) yellowfin from (purse-seine) unassociated-sets in 2002, which corresponds to the good catches experienced in the extreme east of the tropical WCPO (Fig. Y1).

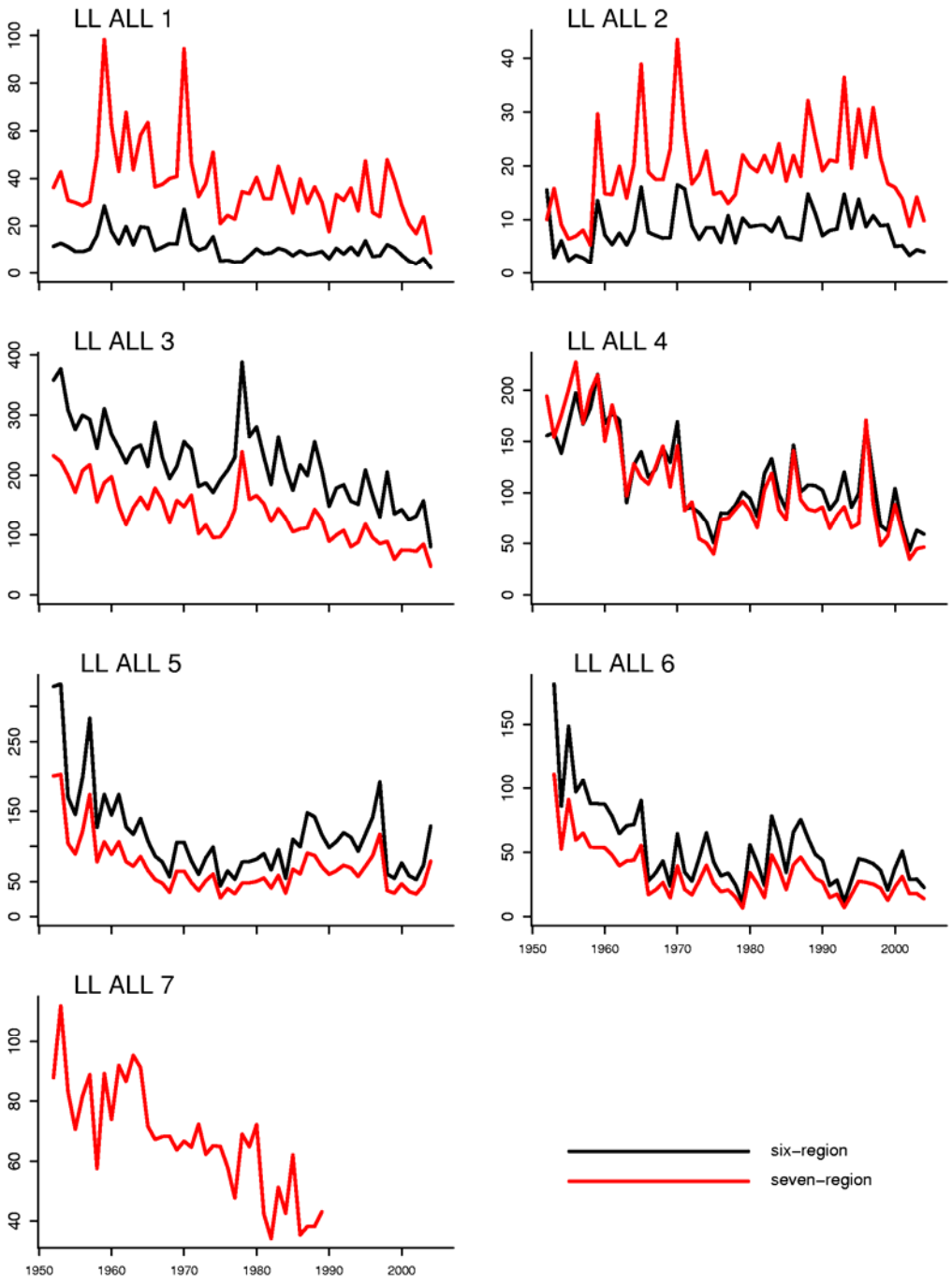

Figure Y3. Catch-per-unit-of effort (CPUE) for the principle longline fisheries standardized using the GLM method, for the two different spatial structures (six- and seven-region models). Series are scaled into relative abundance indices by the respective regional scalars. Areas correspond to Figure Y1.

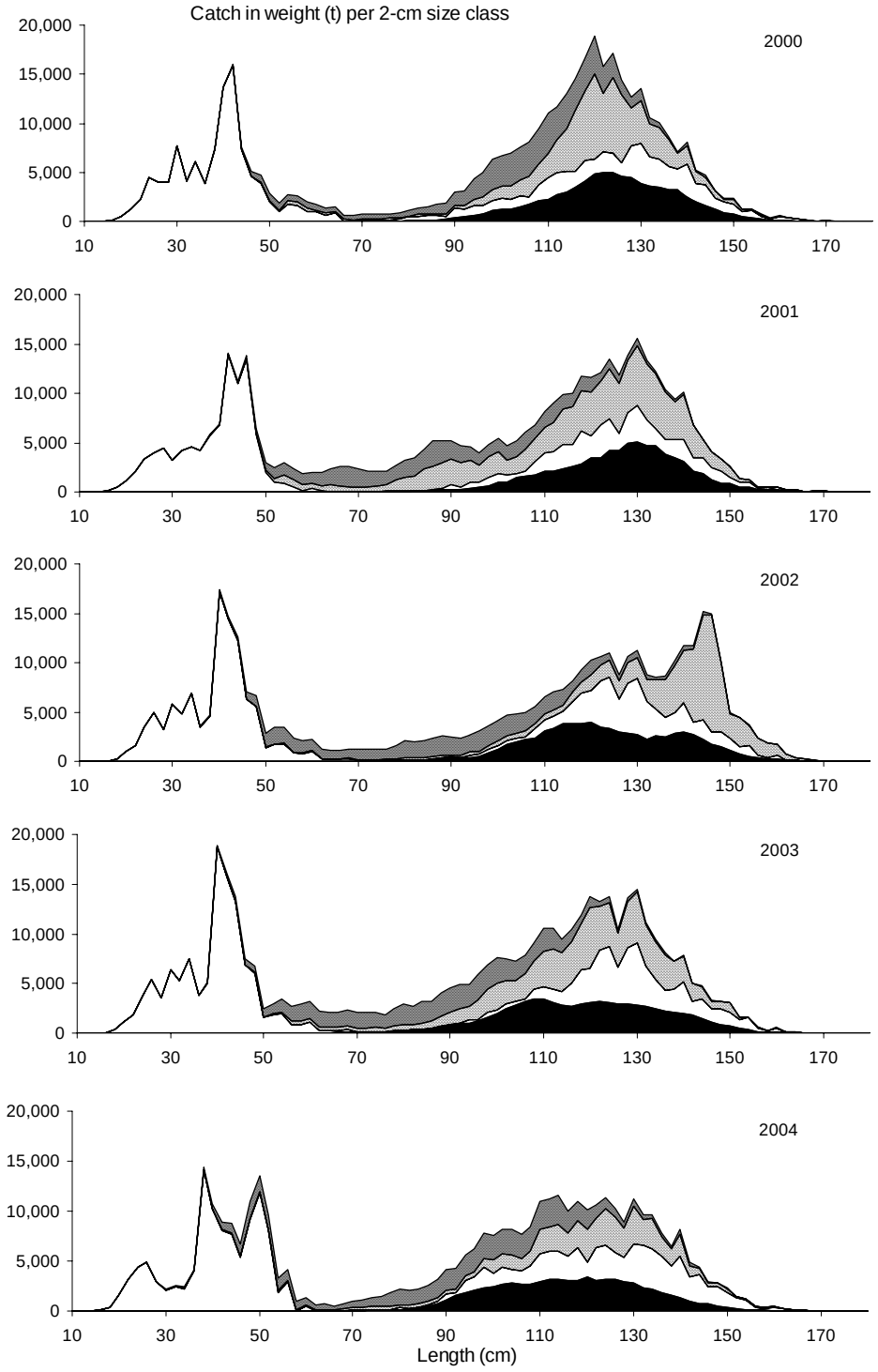

Figure Y4. Annual catches of yellowfin tuna in the WCPO by size and gear type, 2000–2004. (Black = longline; white = Phil-Indo fisheries; stipple = purse-seine associated; hatching = purse-seine unassociated; Phil–Indo data carried over from 2002 –2003).

Stock assessment of yellowfin tuna

Recruitment

19. Initial recruitment was relatively high, declining to a lower level during the 1960s and early 1970s (Fig. Y5). Recruitment subsequently increased to higher levels beginning in the late 1970s. Recruitment remained relatively high during the 1980s with a decline in recruitment since the early 1990s, such that average recruitment over the last 15 years is comparable to the long-term mean for the stock. The causes of the apparent temporal changes in recruitment levels are not known. The relative trends in recruitment were similar for the three models, while the absolute numbers for LOWSAMP appeared to be somewhat lower than the other two models.

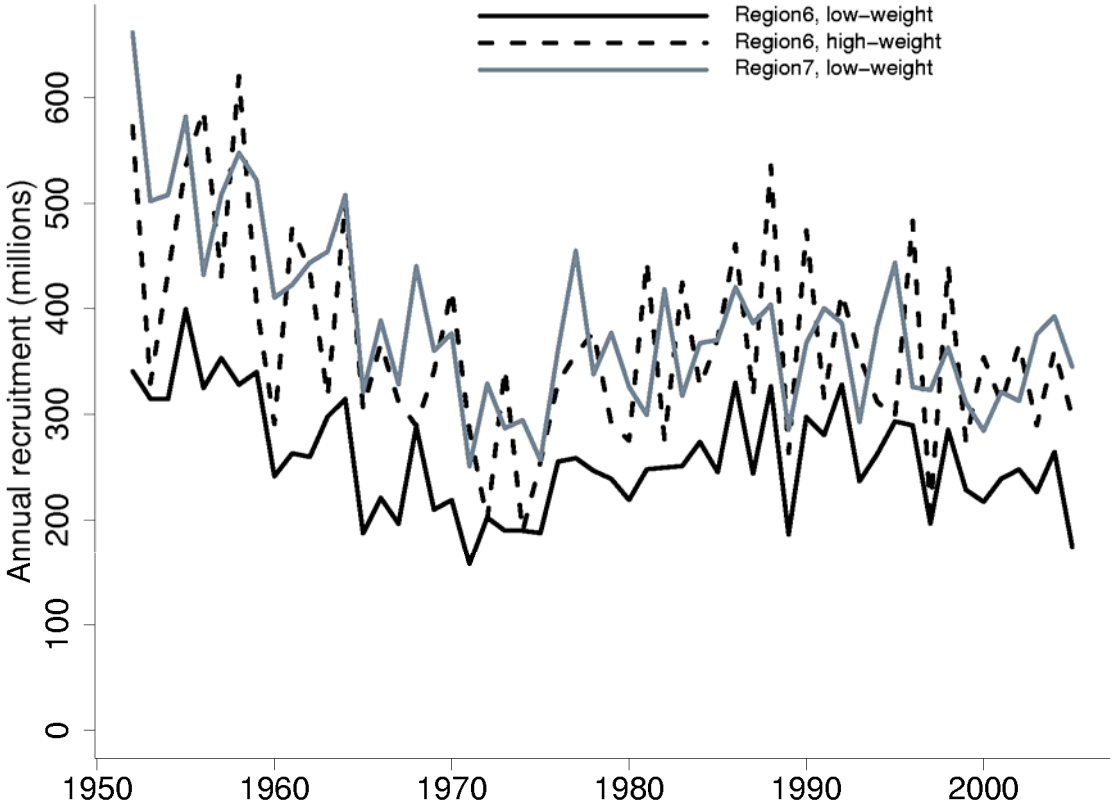

Figure Y5. Estimated annual recruitment for the WCPO obtained from the three different model options.

Biomass

20. The general trends in overall annual average biomass showed many similarities across the different model options, although there was considerable difference in the absolute biomass estimates (Fig. Y6). Estimates of the current level of depletion of yellowfin in the WCPO indicate that the current biomass is 51–61% of the level estimated to have occurred in the absence of

fishing. Depletion varies among regions, with high levels of depletion estimated for the equatorial regions; biomass in region 3 is estimated to be at 30% of the unfished level.

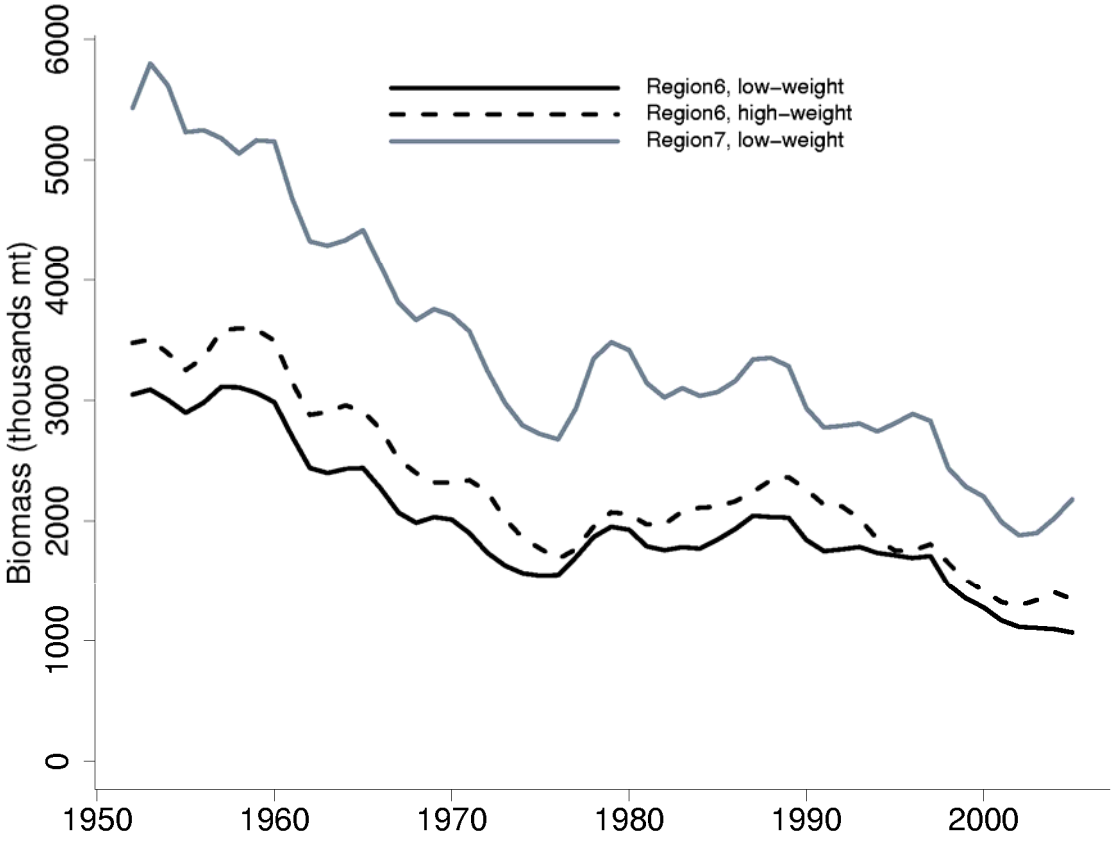

Figure Y6. Estimated annual average total biomass (thousand mt) for the WCPO obtained from the three different model options.

Fishing mortality

21. Trends in estimated fishing mortality rates are shown in Figure Y7. Fishing mortality for both juveniles and adults is estimated to have increased continuously since the beginning of industrial tuna fishing, with significantly more rapid increases since the early 1990s. Fishing mortality is poorly determined for the last few years included in the model. These increases are attributable to increased catches in purse seine fisheries and catches of juveniles in particular in the domestic Indonesian and Philippine fisheries, together with the declines in overall biomass over the past decade. Fishery impact analysis shows that the highest impacts on the yellowfin stock occur in tropical regions 3 and 4 (Fig. Y8), and to a lesser extent the northern region 1 (which has a low level of biomass relative to the equatorial regions). The longline fishery has relatively low impact on the stock, but the surface fisheries, particularly the Indonesian and Philippines domestic fisheries and the purse-seine fisheries, have a high impact.

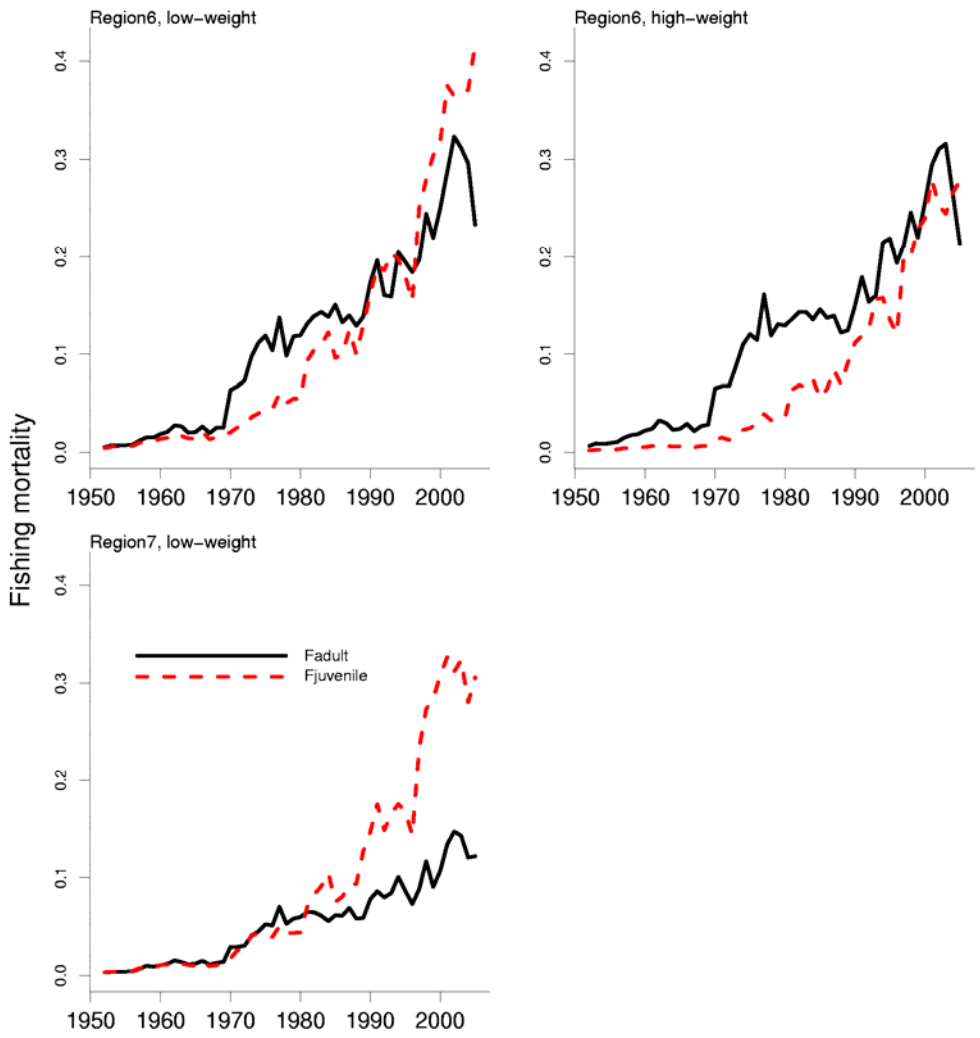

Figure Y7. Estimated annual average juvenile and adult fishing mortality for the WCPO obtained from the three separate model options. Note that the 2005 estimate is influenced by incomplete data.

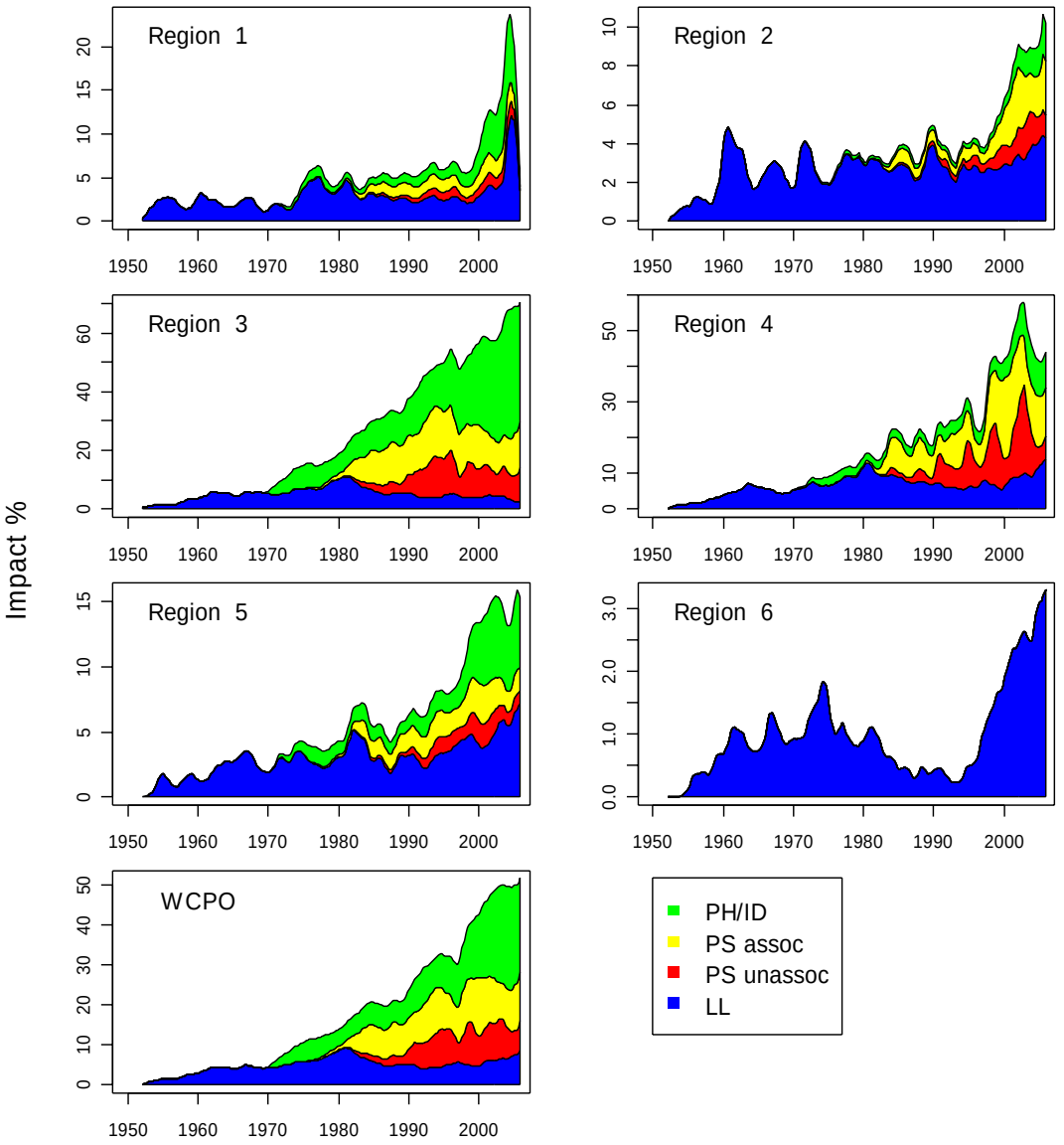

Figure Y8. Estimates of the fishery impact (fishery impact: 1 - $B_0 / B_{0,t}$) by region and for the WCPO attributed to various fishery groups. LL: all longline fisheries; PH/ID: Philippines and Indonesian domestic fisheries; PS assoc: purse-seine associated sets; PS unassociated: purse-seine unassociated sets.

Stock status for yellowfin tuna

22. The 2006 assessment results were reviewed and confirmed as consistent with the 2005 assessment, although the point estimates of some reference points were slightly more optimistic in this assessment (Table Y1). The assessment using the six-region model indicates that overfishing is occurring in the WCPO ($F_{current}/F_{MSY} \geq 1$, with 73% probability) and has been since 2002, but the stock is not yet in an overfished state ($B_{current}/B_{MSY} >1$, with 95% probability) (Table Y1; Figs. Y11 and Y12). The trajectory of these stock status reference points (Fig. Y10) indicates

that the stock has been declining rapidly in recent years, and fishing mortality at current levels will probably move the yellowfin stock into an overfished state.

23. An alternative model structure using seven regions was explored but considered to be work in progress. The utility of the seven-region model depends on the future provision of better catch and effort data from some of the key longline fisheries operating in the western equatorial region in order to develop a better index of abundance in this area.

24. The greatest impact from the fishery is in the equatorial region, while the temperate regions are estimated to be only lightly exploited. Furthermore, the attribution of depletion to various fisheries or groups of fisheries indicates that the Indonesian/Philippines domestic fishery has the greatest impact, particularly in the western equatorial region (Fig. Y8), and is also estimated to impact the other regions, to some extent, through fish movement (although the movement rates out of region 3 are not estimated to be very large). The purse-seine fishery has a lesser, but still substantial effect, particularly in the equatorial regions.

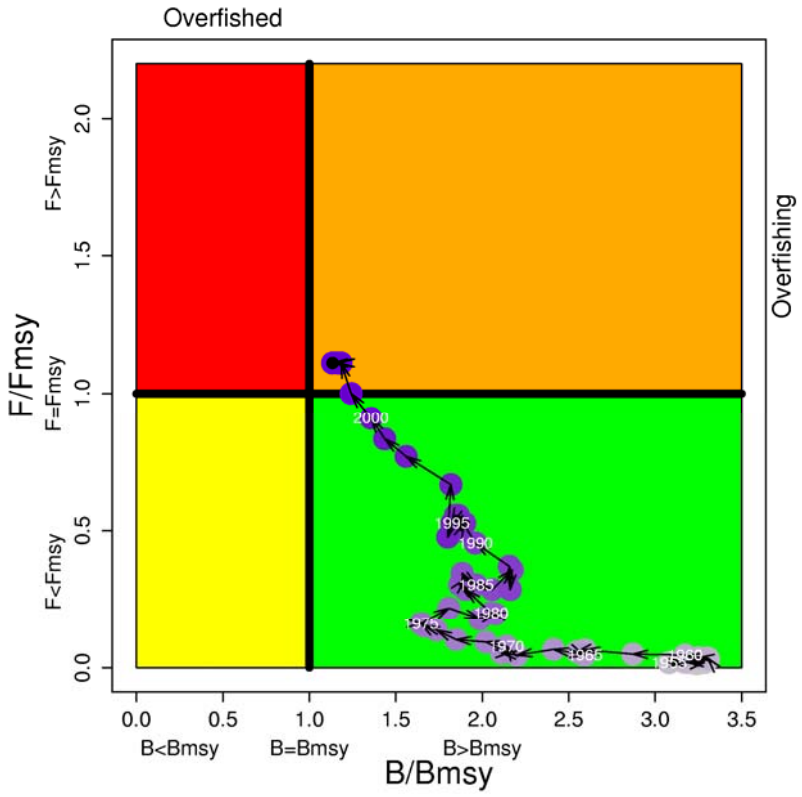

Figure Y10. Bivariate trajectory of biomass, $B_{current}/\widetilde{B}_{MSY}$ and fishing mortality, $F_{current}/F_{MSY}$ reference points corresponding to the base case LOWSAMP (six-region) model.

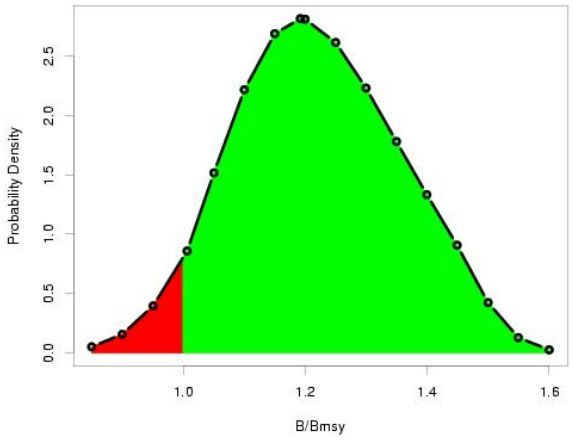

Figure Y11. Likelihood profile for $B_{current}/\widetilde{B}_{MSY}$ from the LOWSAMP (six-region) model.

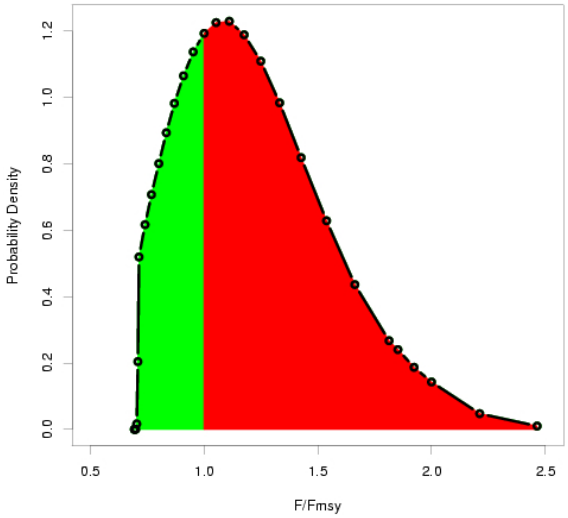

Figure Y12. Likelihood profile for $F_{current}/F_{MSY}$ from the LOWSAMP (six-region) model.

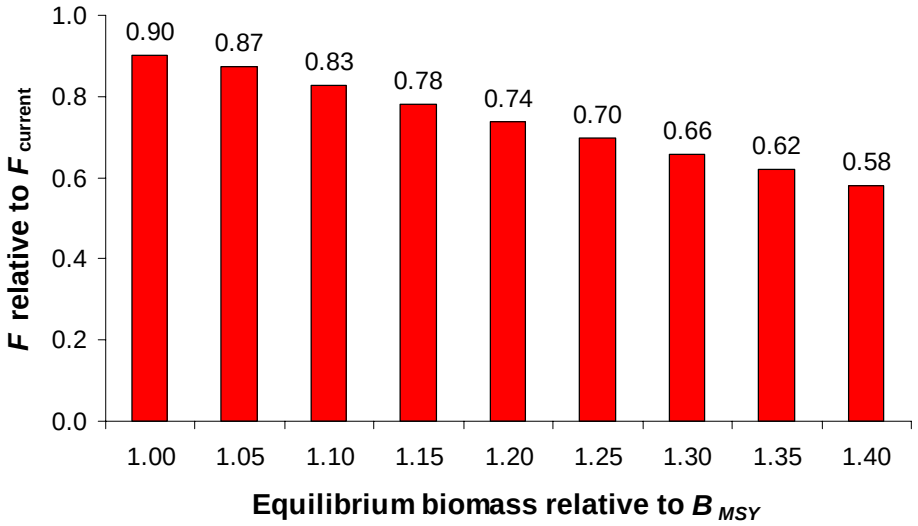

Figure Y13. Estimates of the equilibrium level of fishing mortality (relative to current levels) required to sustain biomass at the indicated levels (relative to B_{MSY}) based on the LOWSAMP (six-region) model.

Table Y1. Estimates of reference points from the 2006 and 2005 yellowfin tuna stock assessments. 2006 base case results (LOWSAMP) and range to HIGHSAMP model were given. Models included in the 2005 assessment summary are explained in the 2005 report

Management Quantity	2006 Assessment	2005 Assessment
Most Recent Catch	423,468 mt (2005)	413,201 mt (2004)
MSY	Base case: 329,680 mt Range: 329,680 ~ 330,040 mt	Base case: 262,400 mt Range: 209,320 ~ 313,400 mt
$Y_{Fcurrent}$/MSY	Base case: 1.0 Range: 1.0 ~ 1.0	Base case: 0.98 Range: 0.66 ~ 1.0
$B_{current}/B_{current,\ F=0}$	Base case: 0.51 Range: 0.51 ~ 0.56	Base case: 0.40 Range: 0.33 ~ 0.52
$F_{current}/F_{MSY}$	Base case: 1.11 Range: 1.00 ~ 1.11	Base case: 1.22 Range: 1.0 ~ 2.33
$B_{current}/B_{MSY}$	Base case: 1.17 Range: 1.17 ~ 1.27	Base case: 1.32 Range: 0.88 ~ 1.55

Management recommendations

25. In order to maintain the yellowfin stock at a level capable of producing the maximum sustainable yield, the Scientific Committee recommended a 10% reduction in fishing mortality from the average levels for 2001–2004. If the Commission wishes to maintain equilibrium average biomass at levels above B_{MSY}, further reductions would be required. The various levels of fishing mortality reduction required to maintain the biomass at specified levels above B_{MSY} (relative to the average levels for 2001–2004) are given in Figure Y13. For example, a 26%

reduction would be required to maintain biomass at a level 20% above that which will produce MSY. As noted in 2005, fishing impacts in the western equatorial WCPO have been increasing over recent years and more urgent management actions may be required for this area.

26. Stock projections for 2006–2010, which attempt to simulate the conservation and management measures adopted at the second regular session of the Commission, indicate that the point estimate of B_t/B_{MSY} remains above 1.0 throughout the projection period, although the biomass is still predicted to decline. However, the increasing uncertainty in the future projections (e.g. distribution of effort, recruitment variability) results in a greater probability (29%) of the biomass declining below B_{MSY} by the end of the projection period (Fig. Y14). The projections indicate a strong shift in the spatial distribution of biomass, with continued depletion occurring in the equatorial regions.

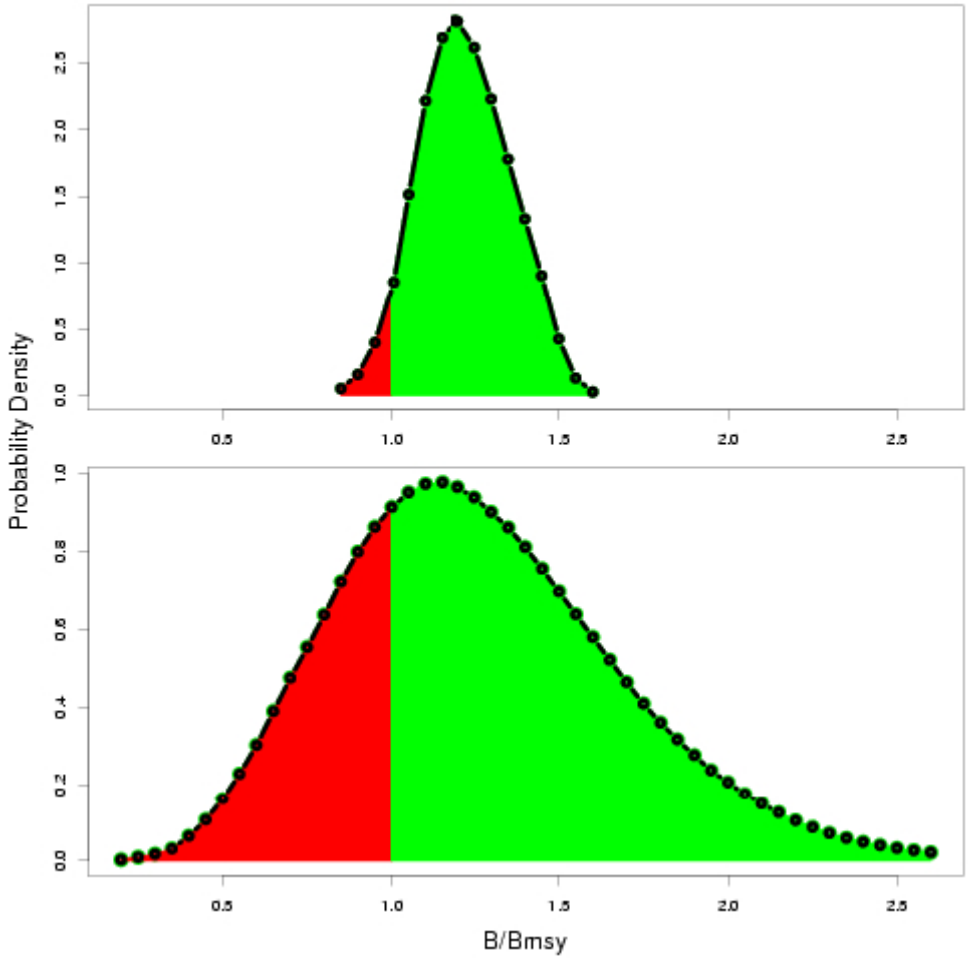

Figure Y14. Profile likelihood for $B_{final} / \widetilde{B}_{MSY}$, i.e., the biomass ratio for the final year (5) of the projection (lower panel). The $B_{current} / \widetilde{B}_{MSY}$ profile likelihood based on 2001−2004 average *F*-at-age is shown on the same scale in the upper panel for comparison. The probability that $B_{current} / \widetilde{B}_{MSY} < 1$ is approximately 4.9%; the probability that $B_{final} / \widetilde{B}_{MSY} < 1$ is approximately 29%.

BIGEYE TUNA STOCK ASSESSMENT

Summary of working paper SC2 SA WP-2

27. John Hampton presented SC2 SA WP-2; the MULTIFAN-CL based stock assessment of bigeye tuna in the WCPO. The 2006 assessment was implemented in MULTIFAN-CL. The bigeye tuna model is age (40 age-classes) and spatially structured (6 regions) and the catch, effort, size composition and tagging data used in the model are classified by 20 fisheries and quarterly time periods from 1952 through 2005.

28. The catch, size and tagging data used in the assessment were the same as those used last year, with the exception that additional recent fishery data (2004 for longline, 2004 for Philippines and Indonesia, 2005 for purse seine) were included. It should be noted that 2005 data are not complete for some fisheries. The estimation of standardised effort for the main longline fisheries used the GLM approach similar to the 2005 assessment, with a minor refinement to the method for scaling indices of abundance among regions. Other refinements to the conversion of length to weight and processed weight to whole weight were included in the assessment.

29. The sensitivity of the assessment model to the relative weighting applied to size–frequency data was investigated through changing the effective sample size applied to the size–frequency data. The impact of a key structural assumption in the model was investigated through a reconfiguration of the spatial stratification of the model with the inclusion of an additional region (seven-region model).

In summary, the sensitivity analyses carried out were:

LOWSAMP	Six-region spatial stratification, general linear model standardised effort for "main" longline fisheries, *M*-at-age assumed at fixed levels, lower effective sample size applied to the length and weight frequency samples.
HIGHSAMP	Six-region spatial stratification, general linear model standardised effort for "main" longline fisheries, *M*-at-age assumed at fixed levels, higher effective sample size applied to the length and weight frequency samples. This analysis approximates the base-case model run (GLM-MFIX) from the 2005 assessment. The only significant difference is the parameterisation of the selectivity functions for the principal longline fisheries — allowing a decline in the selectivity for the oldest age classes.
7REGION	Seven-region spatial stratification, general linear model standardised effort for "main" longline fisheries, *M*-at-age assumed at fixed levels, lower effective sample size applied to the length and weight frequency samples.

The main conclusions of the current assessment are as follows:

30. Recruitment in all analyses is estimated to have increased since about 1980. This result was very similar to that for the 2005 assessment. However, while the seven-region model exhibits a comparable temporal trend in recruitment, the recent increase in recruitment is less pronounced as the recruitment in region 3 represents a smaller proportion of the total recruitment. The overall magnitude of recruitment is considerably higher for the seven-region model than for the six-region model.

31. For the three analyses, total biomass for the WCPO is estimated to have declined to about half of its initial level by about 1970 and has been fairly stable or subject to slight decline since then. Adult biomass has declined by about 20% over the last decade.

32. The biomass trends in the model are strongly driven by the time-series of catch and GLM standardised effort from the principal longline fisheries. For some of the main longline fisheries, there is an apparent inconsistency between the trends in the size–frequency data and the trends in longline catch and effort (i.e. the two types of data are providing inconsistent information about the relative level of fishing mortality in the region). The LOWSAMP model was adopted as the base case because it was considered that the catch and effort data are more informative than the size–frequency data in the estimation of trends in fishing mortality. However, further research is required to explore the relationship between longline CPUE and bigeye abundance and the methodology applied to standardise the longline CPUE data, particularly to account for temporal trends in fishing efficiency. The latter issue was examined by way of a sensitivity analysis in the 2005 assessment and shown to be highly influential in the conclusions of the assessment.

33. Fishing mortality for adult and juvenile bigeye tuna is estimated to have increased continuously since the beginning of industrial tuna fishing. For the two models with lower effective sample sizes (LOWSAMP and 7REGION), fishing mortality on adult bigeye is relatively comparable to that for juvenile bigeye, whereas, the HIGHSAMP model predicts a higher level of exploitation on the adult component of the stock.

34. The ratios $B_t / B_{t,F=0}$ provide a time-series index of population depletion by the fisheries. Overall, depletion is estimated to have been rapid, particularly since the mid-1980s. Even though the estimated total biomass has remained fairly stable since 1970, it appears to have been sustained only by above average recruitment. If recruitment were to return to the average level estimated in this assessment, biomass decline would be rapid, as suggested by the stock projections. The current level of biomass is 28% of the unexploited level ($B_{current} \big/ B_{current,F=0}$ = 0.28) for the six-region models and 44% for the seven-region model. Depletion is more extreme for some individual model regions, notably region 3 (recent $B_t \big/ B_{t,F=0}$ ratios around 0.20 in the base-case model) and region 4 ($B_t \big/ B_{t,F=0}$ = 0.25). Other regions are less depleted, with recent $B_t \big/ B_{t,F=0}$ ratios of around 0.4 or greater.

35. The attribution of depletion to various fisheries or groups of fisheries indicates that the longline fishery has the greatest impact throughout the model domain. The purse seine and Philippines/Indonesian domestic fisheries also have substantial impact in region 3 and to a lesser extent in region 4.

36. The reference points that predict the status of the stock under equilibrium conditions are $\widetilde{B}_{F_{current}} \big/ \widetilde{B}_{MSY}$ and $S\widetilde{B}_{F_{current}} \big/ S\widetilde{B}_{MSY}$. For the six-region models, these ratios are 0.79 and 0.68, respectively, indicating that the long-term average biomass would fall below that capable of producing MSY at 2001–2004 average fishing mortality. For all analyses undertaken in this assessment, current biomass exceeds the biomass yielding MSY ($B_{current} \big/ \widetilde{B}_{MSY}$ > 1.0) with a high probability (i.e. the bigeye stock in the WCPO is not in an overfished state due to above average recruitment). However, biomass levels in recent years have been declining under

increasing levels of fishing mortality, and the probability of the stock becoming overfished is increasing over time.

37. The estimate of $F_{current} / \widetilde{F}_{MSY}$ reveals that overfishing of bigeye is occurring in the WCPO with high probability. While the stock is not yet in an overfished state ($B_{current} / \widetilde{B}_{MSY} > 1$), further biomass decline is likely to occur at 2001–2004 levels of fishing mortality at long-term average levels of recruitment.

38. Stock projections for 2006–2015 — that attempt to simulate the conservation and management measures adopted at the second regular session of the Commission — indicate that $B_t / \widetilde{B}_{MSYfinal}$ falls below 1.0 under long-term average recruitment with high probability but remains above 1.0 if 1995–2004 average recruitment is assumed to continue throughout the projection period. The projections based on long-term average recruitment indicate a strong shift in the spatial distribution of biomass with continued depletion occurring in the equatorial regions due to constant high longline catches.

39. At the request of the Commission, various levels of purse seine effort reduction (which could be implemented by time closures) were investigated using stock projections. The projections indicated that, under assumed long-term average recruitment and maintenance of non-purse seine fisheries at 2004 catch/effort levels, a purse seine effort reduction (closure) of 75% would be required to maintain biomass above $\widetilde{B}_{MSYfinal}$ for the 10-year projection period.

40. The seven-region model provides a more optimistic assessment of the status of the stock than the base-case model, although the probability of $F_{current} / \widetilde{F}_{MSY} > 1$ (overfishing) is still significant (49%). However, because of the lack of a reliable index of abundance since the late-1980s and weak data generally for the additional region (western tropical Pacific incorporating Philippines and Indonesia), we do not have sufficient confidence in the seven-region model to use it as the main management advisory model at this time. Subject to further model testing and the incorporation of improved data from the western tropical region, it may be possible in the future to adopt the seven-region model structure for the assessment.

Discussion

41. The discussion focused on sources of uncertainty in the assessment, migration between the WCPO and eastern Pacific Ocean (EPO) components of the population, tagging programmes and management actions.

42. It was noted that the EPO had predicted lower levels of recruitment at lower stock levels than the WCPO. It was indicated that the Inter-American Tropical Tuna Commission (IATTC) EPO assessment was more conservative and there were less informative priors in the WCPO assessment where a high SRR steepness was estimated.

43. The assessment is only applicable to the WCPO and does not consider potential migration between the WCPO and EPO. There is substantial effort by the fleets of China and Chinese Taipei at the eastern boundary of the WCPO (150°W) but there is no consideration of mixing. It was indicated that the boundary at 150°W is not well defined, but mixing obviously does occur. A pan-Pacific assessment has been conducted (SC2 SA IP-1), which may be a good approach to understand the overall stock dynamics. However, several aspects are questionable

such as an entire Pacific SRR, thus there are good reasons to maintain separate WCPO and EPO assessments. It was noted that the entire Pacific assessment has similar stock status outcomes as the WPCO assessment. The need for a large scale tagging program was re-iterated from last years recommendations to reduce the uncertainty in such issues as the migration dynamics between the WCPO and EPO and between other regions especially in heavily exploited tropical areas.

44. It was noted that the seven-region model structure was preliminary and further work should consider the development of a longline CPUE index from the Chinese Taipei fishery.

45. The 2006 assessment did not include scenarios that involved progressive increases in fishing power. The SA-SWG recognized that those scenarios resulted in more pessimistic conclusions on the status of bigeye and yellowfin when these scenarios were explored in 2005. The SA-SWG encouraged the Oceanic Fisheries Programme (OFP) of the Secretariat of the Pacific Community (SPC) to consider fishing power scenarios in future stock assessments.

46. The estimate of $F_{current} / \widetilde{F}_{MSY}$ indicates that overfishing of bigeye is occurring in the WCPO with high probability and that reductions in fishing mortality would be necessary to fish at F_{MSY}. There was discussion on what reductions may be appropriate, by fishery sector (e.g. purse seine juvenile catches compared to longline adult catches) or closed areas (e.g. in-zone, high-seas). It was clarified that guidance was provided to the Commission on the overall objective of maintaining the biomass at levels capable of producing MSY; however, the Scientific Committee is not the forum to discuss options or make recommendations on ways to reduce fishing mortality.

Stock description for bigeye tuna

47. On the basis of the assessment, the SA-SWG developed the following stock status description for bigeye tuna.

Key attributes

48. Bigeye tuna are a relatively slow growing tuna that mature at approximately three to four years of age. Bigeye are known to grow to about 200 cm and up to 180 kg when eight years or older. These and other characteristics make them less resilient to exploitation than skipjack and yellowfin tunas. They have a wide distribution between 40°N and 40°S (Figure B1) and vertically between surface and 500 m deep (occasionally to 1,000 m) due to their tolerance of low oxygen levels and low temperatures. Their distribution is continuous across the Pacific (Figure B1). However, it has been noted that there are areas of lower catch separating the principal fishing areas to the eastern (east of about 165°W–170°W) and the more western regions of the Pacific. It was also noted that though little information is available on mixing rates, the limited tag returns available suggest low mixing rates between the eastern and western Pacific. In consideration of this information, a Pacific-wide assessment has been conducted collaboratively by the SPC OFP and IATTC in addition to separate assessments for the areas of authority of the IATTC (by the IATTC) and the Convention Area (by the SPC OFP). Large fish are caught mainly by longline, and these longline-caught bigeye are the most valuable among the tropical tunas. Juvenile fish tend to form mixed schools with skipjack and yellowfin, which results in catches by the surface fishery, mostly in association with floating objects. Natural mortality is estimated to be relatively low compared with other tropical species.

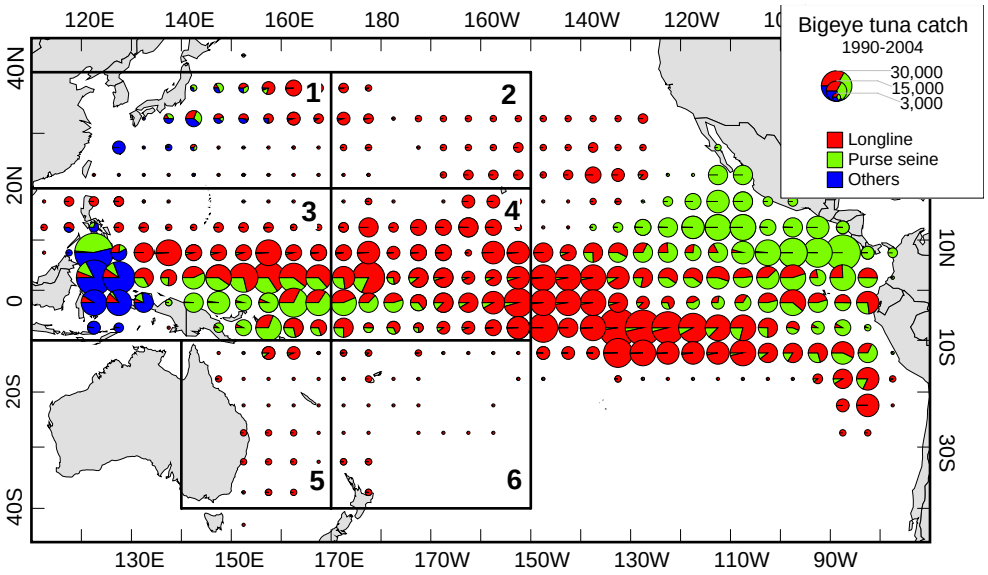

Figure B1. Distribution of bigeye tuna catch, 1990–2004. The six-region spatial stratification used in stock assessment for the Convention Area is shown.

49. The majority of the Convention Area catch is taken in equatorial areas, both by purse seine and longline, but with some longline catch in sub-tropical areas (e.g. east of Japan and off the east coast of Australia). In the equatorial areas, much of the longline catch is taken in the central Pacific, continuous with the important traditional bigeye longline area in the eastern Pacific.

50. High catches are also presumed to be taken in the domestic fisheries of Philippines and Indonesia. These catches, along with small catches by pole-and-line vessels operating in various parts of the WCPO, have approached 20,000 mt in recent years and exceeded 30,000 mt in 2005. The statistical basis for the catch estimates in Philippines and Indonesia is weak; however, the best available catch estimates have been included in the assessment in the interests of providing the best possible coverage of bigeye tuna catches in the WCPO.

Trends: catch and CPUE

51. The Convention Area longline bigeye catches over the past four years have been the highest on record and the Convention Area purse-seine bigeye catch for 2005 was estimated to be 41,502 mt, a clear record for this fishery (Fig. B2). The Convention Area pole-and-line fishery has generally accounted for between 2,000 and 4,000 mt of bigeye catch annually over the past decade, and the "other" category, representing various gears in the Philippine, Indonesian and Japanese domestic fisheries, has accounted for about 12,000–15,000 mt in recent years, expanding to about 25,000 mt in 2005. It is noted that the apparent increase in purse seine and "other" catches in 2005 is due to estimates from Indonesian fisheries that incorporate new information on the species composition of these catches. These new estimates were not received in time to be incorporated into the bigeye assessment for 2006. Direct comparison of the 2005 catch with previous years is therefore not appropriate.

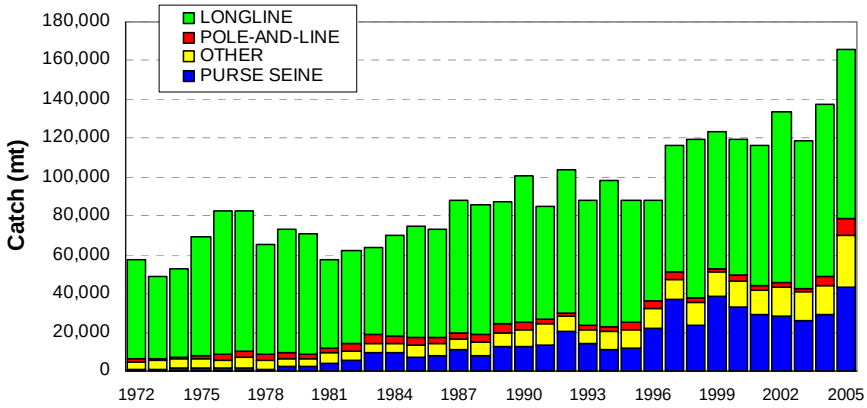

Figure B2. Convention Area bigeye tuna catch by gear. The apparent increase in purse seine and "other" catches in 2005 is due to estimates from Indonesian fisheries that incorporate new information on the species composition of these catches. These new estimates were not received in time to be incorporated into the bigeye assessment for 2006. Direct comparison of the 2005 catch with previous years is therefore not appropriate.

52. Time-series of CPUE for all fisheries are presented in Figure B3. For the principal longline fisheries (LL ALL 1–6), effective (or standardised) effort was derived using generalized linear models (GLM). Effort data units for purse-seine fisheries are defined as days fishing and/or searching, allocated to set types based on the proportion of total sets attributed to a specified set type (associated or unassociated sets) in logbook data.

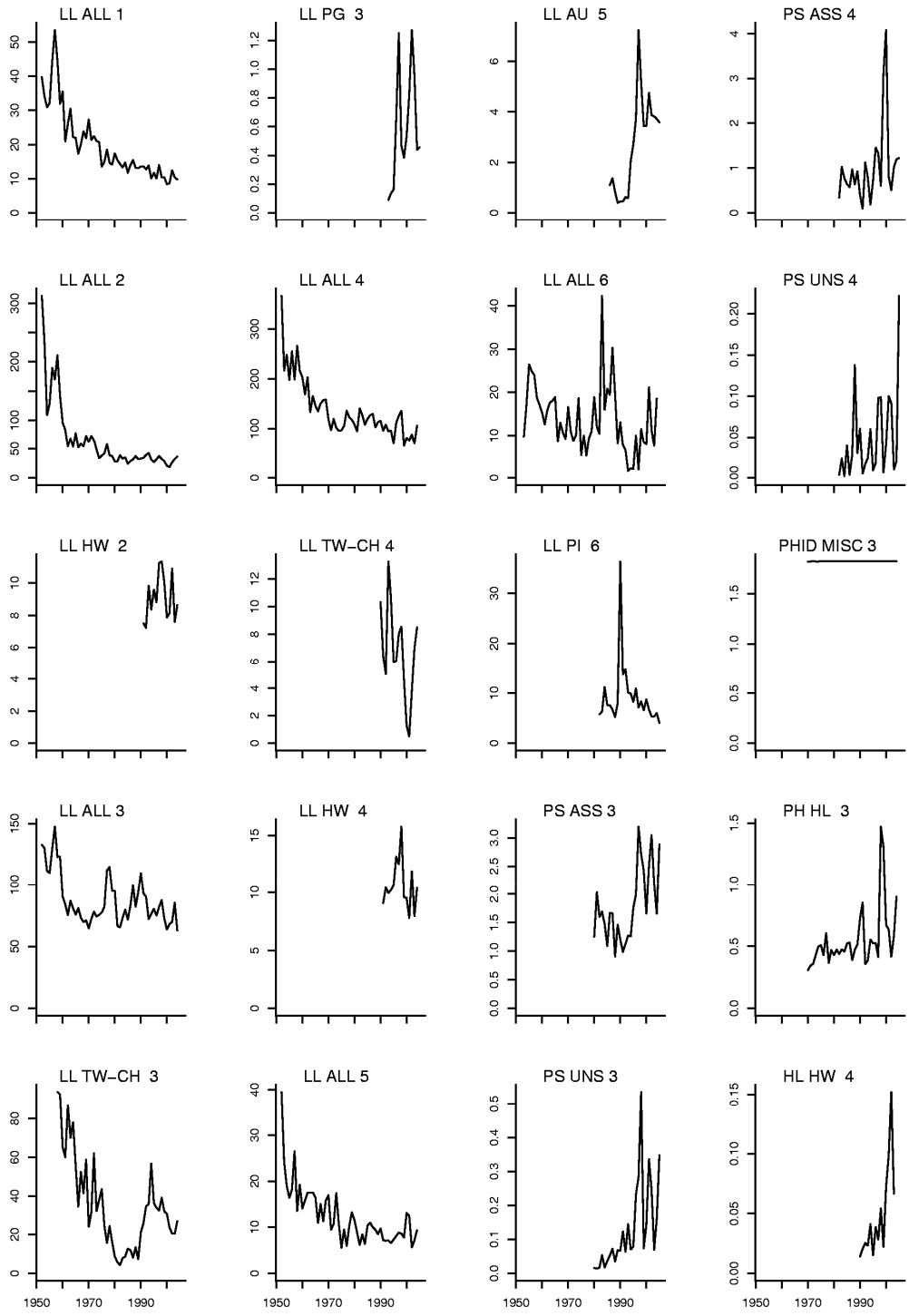

Figure B3. Catch-per-unit-of effort (CPUE) by fishery. Units are catch number per GLM-standardised effort (fisheries LL ALL 1–LL ALL 6), catch number per 100 nominal hooks (LL HW, CH/TW LL, LL PI, LL PG) and catch (mt) per day fished/searched (all PS fisheries). Note that CPUE for PH RN, PH HL and ID are arbitrary and not based on data.

Size of fish caught

53. Annual catch-at-size by major fisheries is shown in Fig. B4. Large bigeye are very rarely taken in the WCPO purse-seine fishery and only a relatively small amount come from the handline fishery in the Philippines. Bigeye sampled in the longline fishery are predominantly adult fish with a mean size of ~130 cm fork length (FL; range 80–160 cm FL), while the domestic surface fisheries of the Philippines and Indonesia take small bigeye in the range 20–60 cm. Associated sets account for nearly all the bigeye catch in the Convention Area purse-seine fishery with considerable variation in the sizes from year to year.

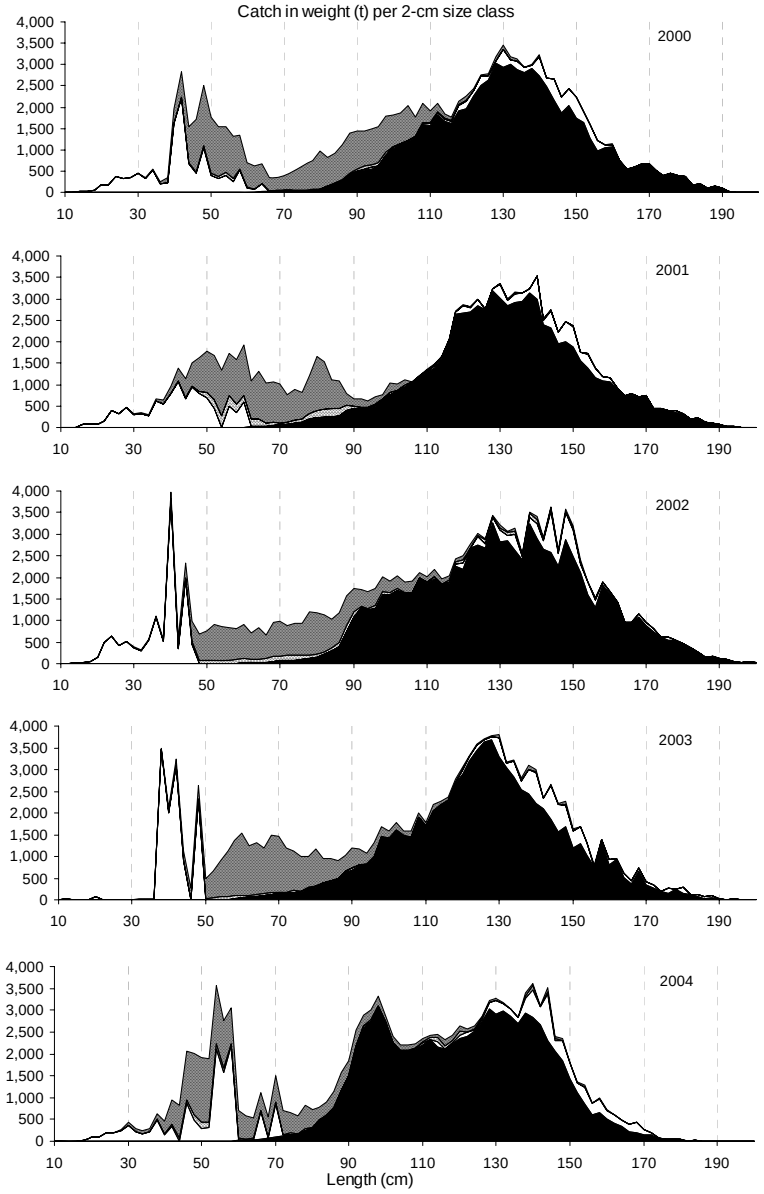

Figure B4. Annual catches of bigeye tuna in the WCPO by size and gear type, 2000–2004. (Black–longline; white–Phil-Indo fisheries; stiple–purse seine associated; hatching–purse seine unassociated, Phil–Indo data carried over from 2002 to 2003).

Recruitment

54. The LOWSAMP (base case) recruitment estimates for each region and the entire WCPO are shown in Fig. B5. For the aggregated estimates, there is a decreasing trend to about 1970 and an increasing trend thereafter. This pattern is similar to that estimated in last year's assessment. There are sharp initial declines in recruitment in several regions (1, 2, 4), which are the model's response to the rapid declines in CPUE in these regions. The post-1970 increase in WCPO recruitment is due primarily to an increasing trend in the estimates for region 3 and, to a lesser extent, region 4. This trend, and its correspondence with increasing juvenile catch in the same region, has been noted in previous WCPO bigeye assessments.

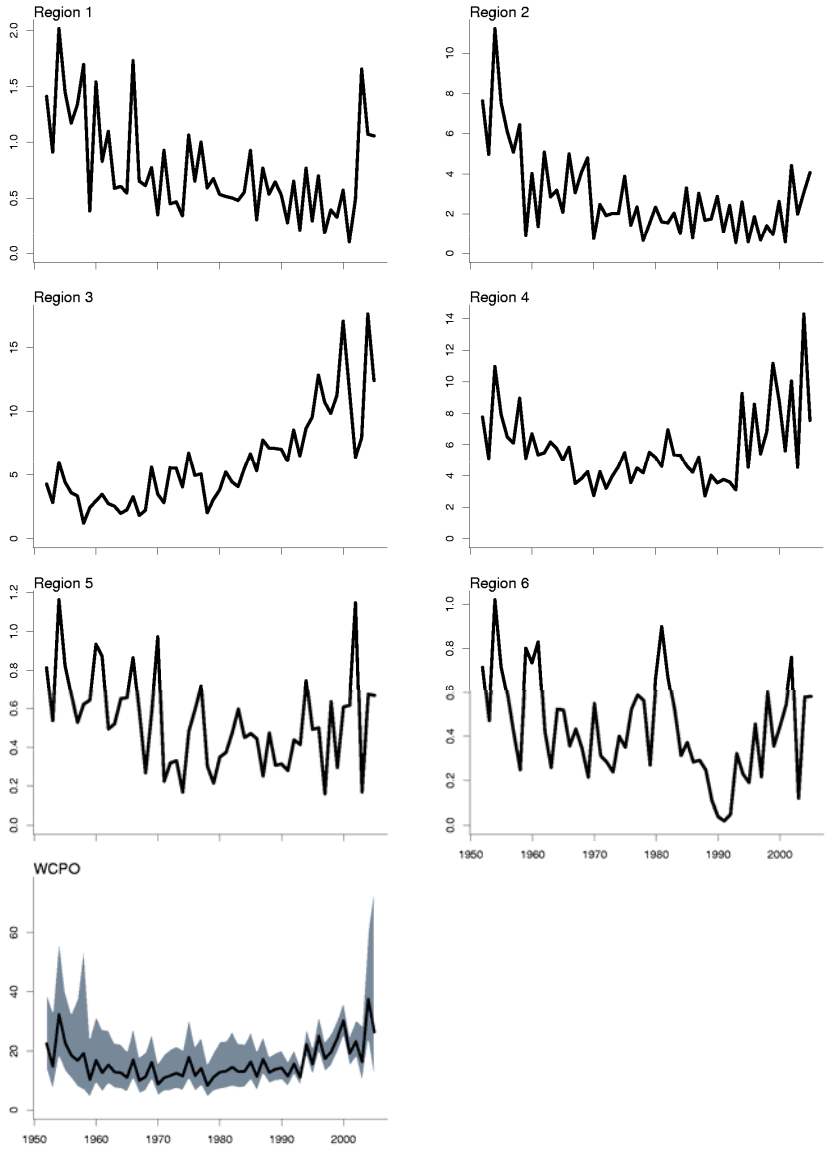

Figure B5. Estimated annual recruitment (millions) by region and for the WCPO (six-region LOWSAMP model). The shaded area for the WCPO indicates the approximate 95% confidence intervals.

Biomass

55. Estimated biomass time-series for each region and for the WCPO are shown in Figure B6 for the base-case analysis. Convention Area estimates of current biomass are largely comprised of fish in regions 3 and 4. Biomass declines during the 1950s and 1960s in all regions. In region 3, biomass recovers during the 1970s and 1980s before entering a sharp decline beginning in the mid-1990s. Overall, biomass is estimated to have declined, during the 1950s and early 1960s, to be stable during the 1970s and 1980s and to decline since the 1990s.

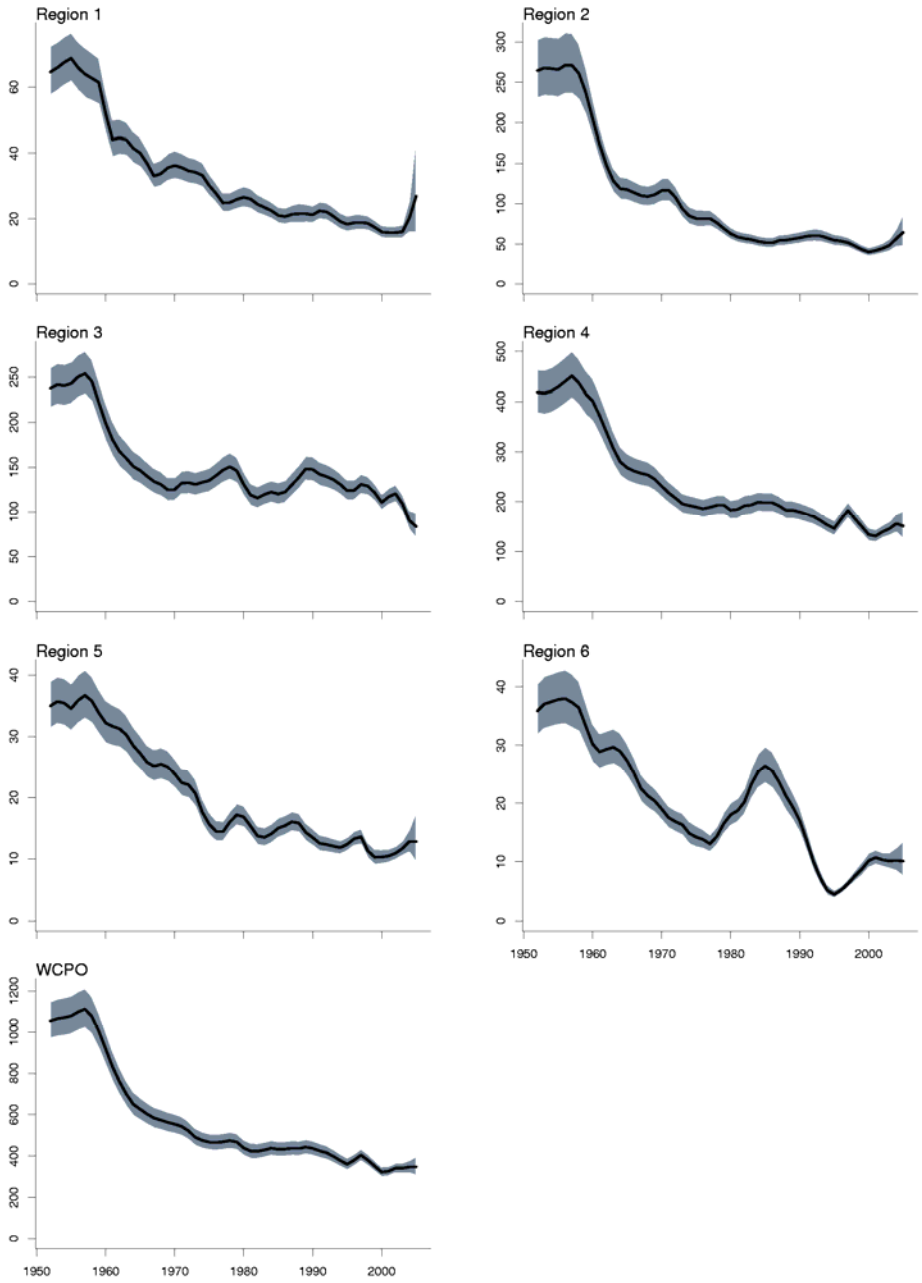

Figure B6. Estimated annual average total biomass (thousand mt) by region and for the WCPO (six-region LOWSAMP model). The shaded areas indicate the approximate 95% confidence intervals.

Fishing mortality

56. Average fishing mortality rates for juvenile and adult age-classes increase strongly throughout the time series, particularly for the two six-region models (Fig. B7). For the two models with lower effective sample sizes (LOWSAMP and 7REGION), fishing mortality on adult bigeye is relatively comparable to that for juvenile bigeye, whereas, the HIGHSAMP model predicts a higher level of exploitation on the adult component of the stock.

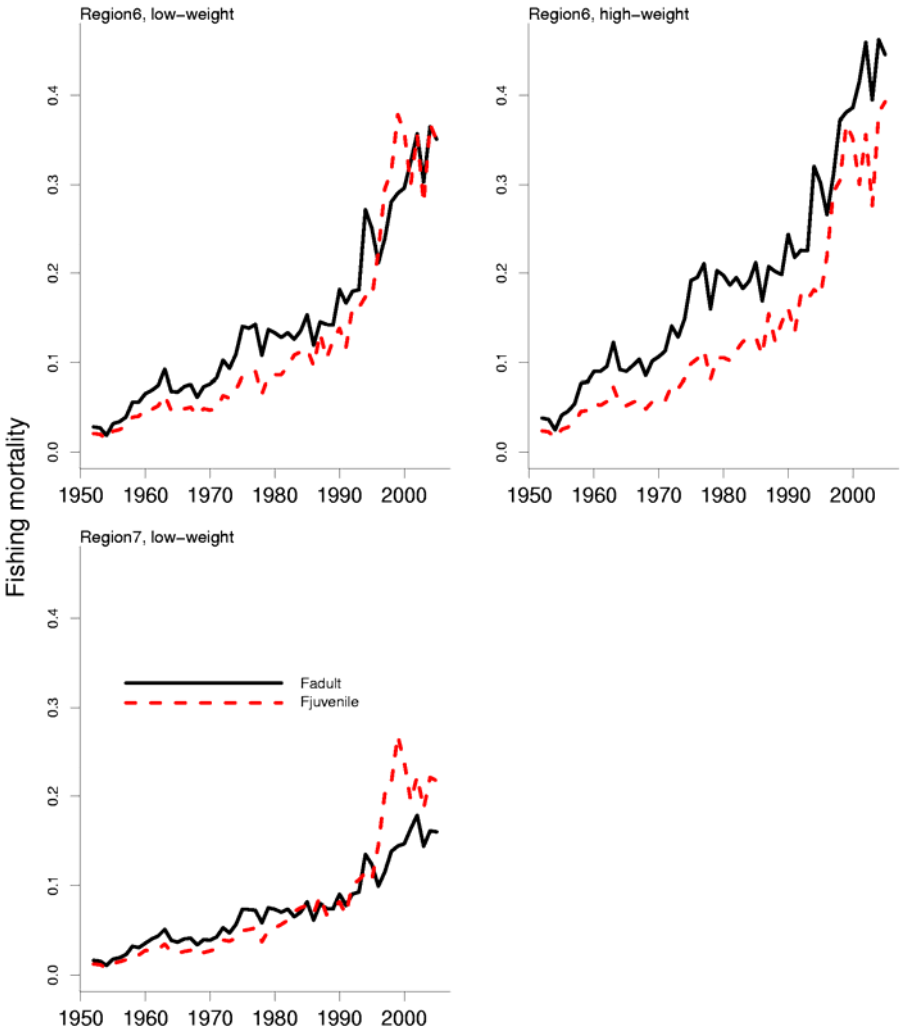

Figure B7. Estimated annual average juvenile and adult fishing mortality for the WCPO obtained from the separate analyses.

57. Fishery impact ($1 - B_t / B_{0t}$) analysis shows that the highest impacts on the bigeye stock occur in the tropical regions 3 and 4 (Fig. B8). In contrast with yellowfin tuna, the longline fishery has a significant impact on the bigeye tuna population in all model regions; it is the most significant component of overall fishery impact in all regions with the exception of region 3 and is responsible for about half of the WCPO impact on total biomass and two-thirds of the impact on adult biomass in recent years. In region 3, the purse seine fisheries and the Indonesian and

Philippines domestic fisheries also have high impact on both total and adult biomass. In region 4, purse seine impacts are significant.

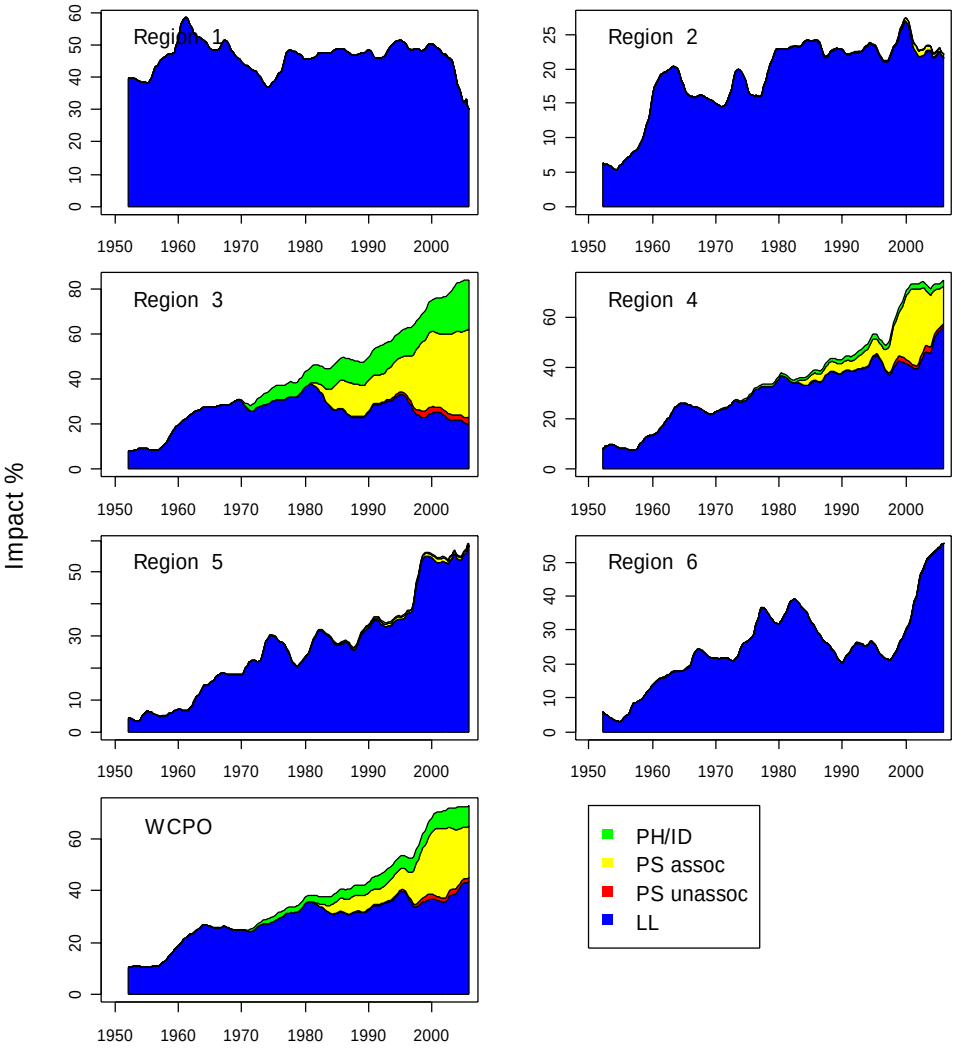

Figure B8. Estimates of reduction in total biomass due to fishing (fishery impact = 1-$B_t/B_{0,t}$) by region and for the WCPO attributed to various fishery groups (six-region LOWSAMP model). LL = all longline fisheries; PH/ID = Philippines and Indonesian domestic fisheries; PS assoc = purse seine log and FAD sets; PS unassoc = purse seine school sets.

Stock status for bigeye tuna

58. The 2006 assessment results were reviewed and confirmed as consistent with the 2005 assessment, although the point estimates of some reference points were slightly more pessimistic in this assessment (Table B1). The assessment using the 6 region model indicates that there is a high probability that overfishing of bigeye is occurring in the WCPO ($F_{current}/F_{MSY} \geq 1$) since 1997. While the stock is not yet in an overfished state ($B_{current} \big/ \widetilde{B}_{MSY} > 1$; Table B1; Figs. B9 and B10) further biomass decline is likely to occur at 2001–2004 levels of fishing mortality at long-term average levels of recruitment. The trajectory of these stock status reference points indicates

that the stock has been declining rapidly in recent years, and fishing mortality at current (2001–2004) levels will probably move the bigeye stock into an overfished state (Fig. B10).

Table B1. Estimates of reference points based on the 2006 and 2005 bigeye tuna stock assessments. 2006 base case results (LOWSAMP) and range of other two models were given. Models included in the 2005 assessment summary are explained in the 2005 report.

Management Quantity	2006 Assessment	2005 Assessment
Most Recent Catch	165,501 mt (2005)	125,940 mt (2004)
MSY under the most recent decadal average recruitment	110,000 ~ 120,000 mt	93,300 mt
MSY	64,600 ~ 91,400 mt	66,000 ~ 76,000 mt
$\mathbf{Y_{Fcurrent}/MSY}$	Base case: 0.96 Range: 0.94 ~ 0.99	Base case: 0.98 Range: 0.90 ~ 1.00
$\mathbf{B_{current}/B_{current,F=0}}$	Base case: 0.29 Range: 0.24 ~ 0.44	Base case: 0.33 Range: 0.31 ~ 0.51
$\mathbf{F_{current}/F_{MSY}}$	Base case: 1.32 Range: 0.87 ~ 1.48	Base case: 1.23 Range: 0.90 ~ 1.45
$\mathbf{B_{current}/B_{MSY}}$	Base case: 1.27 Range: 1.27 ~ 1.59	Base case: 1.25 Range: 1.06 ~ 1.48

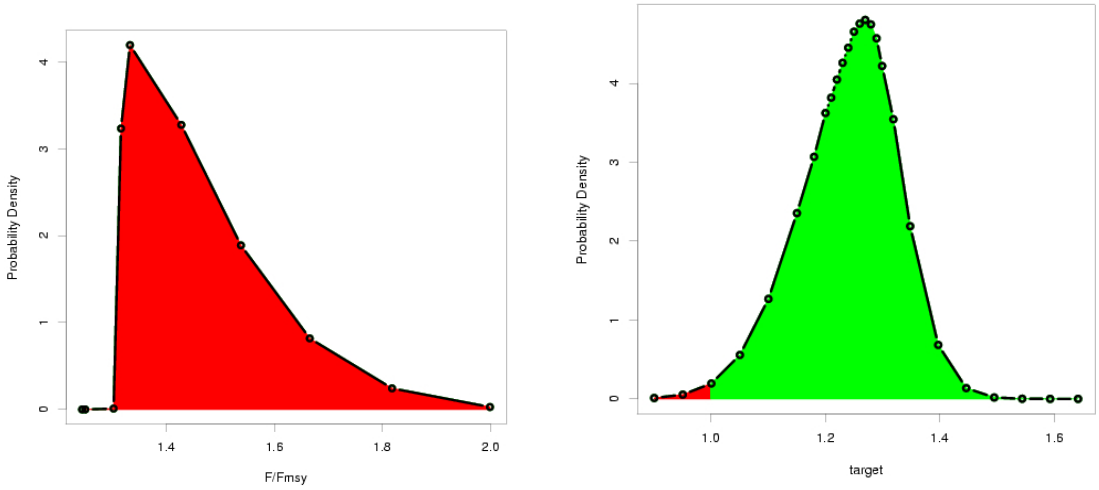

Figure B9. Probability distribution of $F_{current}/\widetilde{F}_{MSY}$ based on the likelihood profile method for the six-region LOWSAMP model. The probability of overfishing is occurring (i.e. the probability of $F_{current}/\widetilde{F}_{MSY} > 1$ is 100% (left panel). The probability of $B_{current}/\widetilde{B}_{MSY} < 1$ is approximately 0.8% (right panel).

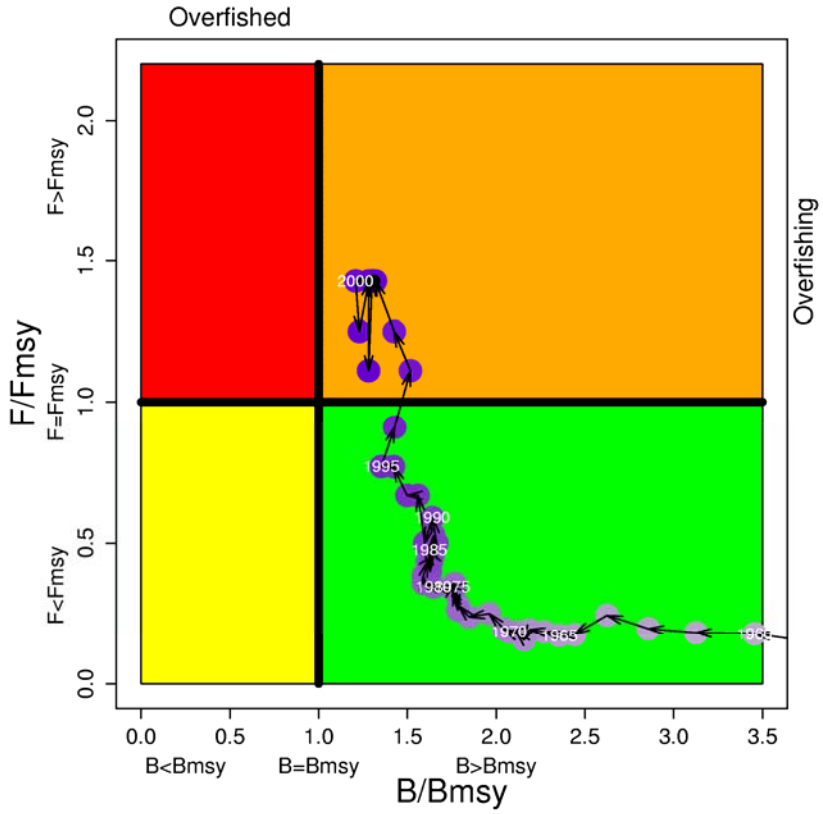

Figure B10. Temporal trend in annual stock status, relative to B_{MSY} (x-axis) and F_{MSY} (y-axis) reference points, for the model period (1952–2005). The colour of the points is graduated from mauve (1952) to dark purple (2005) and the points are labelled at five-year intervals.

59. An alternative model structure using seven regions was explored but considered to be work in progress. The utility of the seven-region model depends on the future provision of better catch and effort data from some of the key longline fisheries operating in the western equatorial region in order to develop a better index of abundance in this area.

60. The greatest impact from the fishery is in the equatorial region, while the temperate regions are estimated to be moderately exploited. Furthermore, the attribution of depletion to various fisheries or groups of fisheries indicates that the longline fishery has the greatest impact. The purse seine fishery operating on associated sets has a lesser, but still substantial effect, particularly in the equatorial regions.

Management recommendations

61. In order to maintain the bigeye stock at a level capable of producing the maximum sustainable yield the Scientific Committee recommends a 25% reduction in fishing mortality from the average levels for 2001–2004. If the Commission wishes to maintain equilibrium average biomass at levels above B_{MSY}, further reductions would be required. The various levels of fishing mortality reduction required to maintain the biomass at specified levels above B_{MSY} (relative to the average levels for 2001–2004) are given in Figure B11. For example, a 39% reduction would be required to maintain biomass at a level 20% above that which will produce the maximum sustainable yield. Fishing impacts in the equatorial WCPO have been increasing over recent years and more urgent management actions may be required for this area.

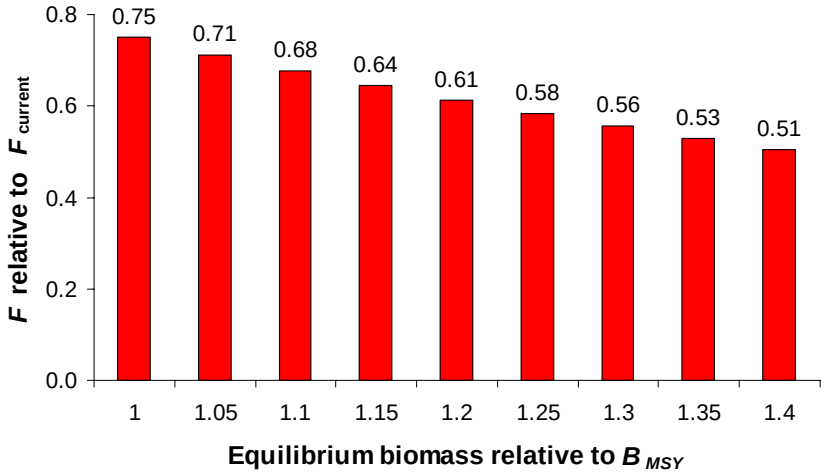

Figure B11. Estimates of the equilibrium level of fishing mortality (relative to current levels) required to sustain biomass at the indicated levels (relative to B_{MSY}) based on the LOWSAMP (six-region) model.

62. Stock projections for 2006–2015, which attempt to simulate the conservation and management measures adopted at the second regular session of the Commission, indicate that the point estimate of B_t/B_{MSY} declines below 1.0 during the projection period (Fig. B12). The increasing uncertainty in the future projections (e.g. distribution of effort, recruitment variability) results in a greater probability (86%) of the biomass being below B_{MSY} by the end of the projection period (Fig. B13). The projections indicate a strong shift in the spatial distribution of biomass, with continued depletion occurring in the equatorial regions.

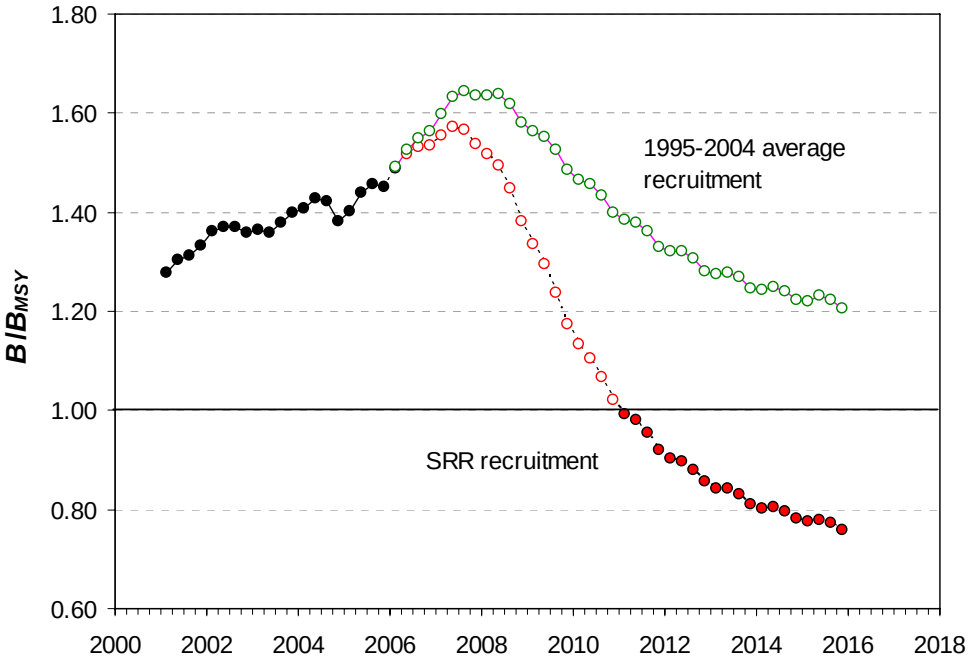

Figure B12. Projected ratio of $B_t \big/ \widetilde{B}_{MSYfinal}$ where $\widetilde{B}_{MSYfinal}$ is computed based on the average *F*-at-age in the final year (10) of the projection. Projections using the estimated SRR and the average recruitment in 1995–2004 to predict recruitment in the projection period are shown for comparison.

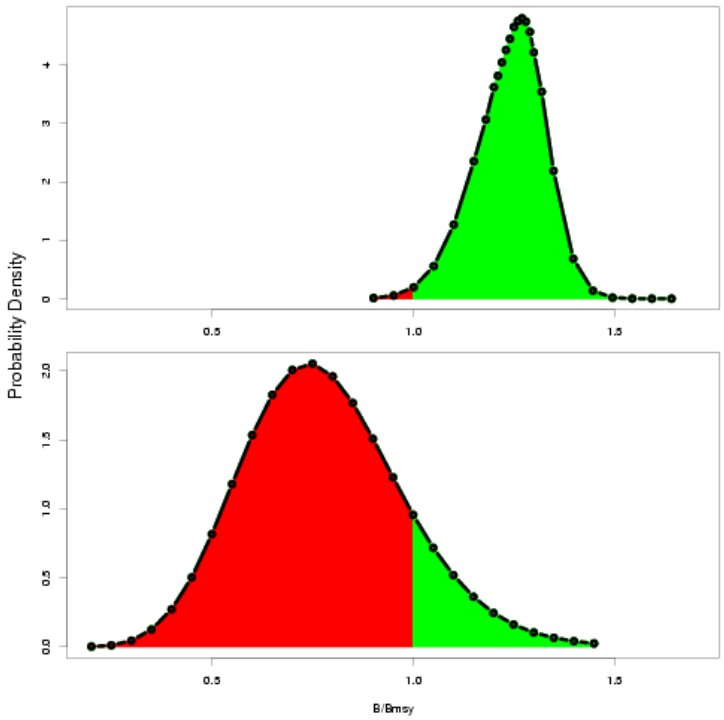

Figure B13. Comparison of the probability distribution of B/B_{MSY} for the current period (top panel) and for a 10-year projection period (bottom panel).

63. An alternative projection was undertaken under a scenario that assumes recruitment to be consistent with recent levels, which have been well above the long-term average. Under this scenario, the stock was projected to remain above the B_{MSY} level throughout the projection period of 2006–2015. However, overfishing would still be occurring under this scenario. There is no robust information available concerning future recruitment levels. However, most CCMs considered that continuation of relatively high recruitment over the long-term was less likely than a return to the long-term average.

YELLOWFIN AND BIGEYE: FURTHER CONSIDERATIONS

The Scientific Committee reviewed the data collected on "other commercial fisheries" (SC2 ST IP-4) and noted the need for more specific information concerning the needs of the Commission with regard to formulating advice on specific management measures for these fisheries. The SA-SWG also agreed that the Executive Director should liaise with the Scientific Service Providers to formulate some technical guidance to the Commission on the subject of purse seine closures (paragraph 11 of the Conservation and Management Measure-2005-01).

SKIPJACK TUNA STOCK ASSESSMENT

Summary of working paper SC2 SA WP-5

64. There was no stock assessment undertaken for skipjack in 2006. The latest stock assessment for skipjack tuna is presented in SC1 SA WP-4.

65. John Hampton presented SC2 SA WP-5 which examined the utility of temporal closures of the WCPO purse-seine fishery in the previously adopted WCPFC conservation and management measure for bigeye and yellowfin tuna. This research was conducted in response to a directive of the second meeting of the Commission as detailed in Attachment D of the summary record of the second regular session of the Commission (paragraph 11), that is:

> In order to achieve the overall reduction in catch and effort required for bigeye and yellowfin tuna, in accordance with advice and recommendations received from the Scientific Committee, the Executive Director shall work with CCMs during 2006 to develop a proposal for consideration at the Third Session of the Commission that is consistent with the IATTC arrangements that allow for a system of temporary purse seine closures.

66. The paper examined purse seine data for 1996–2005 to determine on an empirical basis whether closures in certain months would be more effective than others. Effectiveness is judged by how well a closure in a particular month would satisfy two objectives: 1) to maximize the percentage reduction in yellowfin and bigeye catch; and 2) to minimize the reduction in skipjack catch.

67. The results of the analysis are summarized in Table S1. The percentage reductions in skipjack and yellowfin + bigeye catches that would have been achieved by closures in each month are shown in the first two substantive columns of the table. In the next two columns, the reductions are ranked, with the month resulting in the smallest skipjack catch reduction having the highest rank (1) for the skipjack objective, and the month resulting in the largest yellowfin + bigeye catch reduction having the highest rank for that objective. For skipjack, January, December and August have the highest ranks (smallest catch reductions) while for yellowfin +

bigeye, September, November and October have the highest ranks (largest catch reductions). The skipjack and yellowfin + bigeye ranks were integrated by combining the two outcomes using several example weighting schemes. These are only examples, but the idea is that the outcomes should be weighted in such a way to reflect our relative priorities for the two objectives (see caption to Table S1). For example, if we weight both objectives equally, the months of September to December (composite ranks 1–4) would have performed best for purse-seine closures based on the historical data. On the other hand, the months of March to May would have performed worst in terms of simultaneously satisfying both objectives (and this is also true for the other weighting schemes in Table S1).

68. While there is no guarantee that future variation in catch by month would follow the past, the approach outlined above might nevertheless be useful for assisting in the design of purse-seine closures. A more detailed analysis would examine the inter-annual variation in catch composition and potentially consider the effect of set type, if appropriate to any particular management proposal.

69. Note that the data were aggregated over the entire area of the fishery for this analysis. It would be relatively straightforward to stratify the analysis spatially in order to assess the efficacy of closures in particular sub-areas of the fishery. There are apparent temporal and spatial differences in the catch composition that may enable a more directed management action that achieves a better outcome for the overall fishery.

Table S1. Percentage catch reductions assuming that various monthly closures had been applied over the period 1996–2005. The rankings for skipjack (SKJ) are numbered 1–12 from the lowest to highest percentage reductions. The rankings for yellowfin plus bigeye (YFT+BET) are numbered 1–12 from the highest to lowest percentage reductions. Composite catch reduction indices, *CRI*, are derived by subtracting SKJ from YFT+BET weighted catch reductions: $CRI = \left(C_{y+b} w_{y+b} - C_s w_s\right) / \left(w_{y+b} + w_s\right)$, and ordering from highest to lowest. The highest ranks (1 being the highest), which are highlighted for each set of weightings, are months with low SKJ catch reduction and high YFT+BET catch reduction.

Closure month	% Catch reductions		Rank		Composite rank					
	SKJ	YFT+ BET	SKJ	YFT + BET	$w_{y+b} = 50$ $w_s = 50$		$w_{y+b} = 25$ $w_s = 75$		$w_{y+b} = 75$ $w_s = 25$	
					CRI	Rank	*CRI*	Rank	CRI	Rank
1	7.7	8.5	1	7	0.83	5	-3.64	3	4.46	6
2	8.0	7.7	6	8	-0.30	8	-4.06	8	3.76	8
3	9.4	6.4	11	12	-2.95	12	-5.43	11	2.48	12
4	9.1	6.7	10	11	-2.39	10	-5.16	10	2.76	11
5	9.6	7.0	12	10	-2.62	11	-5.44	12	2.82	10
6	7.9	7.3	4	9	-0.62	9	-4.10	9	3.48	9
7	7.9	8.7	5	5	0.82	6	-3.74	4	4.56	5
8	7.9	8.6	3	6	0.70	7	-3.76	5	4.46	6
9	8.0	10.4	7	1	2.34	1	-3.44	1	5.77	1
10	8.5	9.5	9	3	0.99	4	-3.99	7	4.98	4
11	8.4	9.9	8	2	1.51	3	-3.80	6	5.31	2
12	7.8	9.4	2	4	1.69	2	-3.46	2	5.14	3

Discussion

70. The need for additional analysis using different spatial and temporal specification was noted by the Federated States of Micronesia with closures on high seas areas being one suggested analyses that should be undertaken. Dr Hampton agreed that other analyses could be undertaken, although the need for clear guidance from the Commission to the science provider in terms of exactly what analyses should be conducted was required.

71. The provision of additional information, for example, total catch reductions as opposed to percentage reductions was requested by Chinese Taipei. Dr Hampton noted that this could be derived based on the figures provided in the table and catch data.

72. The likelihood that the higher composition of yellowfin and bigeye tuna in the catch in the period September to December was a result of a greater proportion of sets on unassociated yellowfin tuna schools being made at this time of year was noted by the USA and New Zealand. The inclusion of school sets on yellowfin could lead to incorrect conclusions regarding closures given that larger yellowfin are taken in school sets. Dr Hampton noted the importance of the implementation of the observer programme in assessing catch from different set types.

73. It was noted that this particular application did not separate juvenile and adult yellowfin tuna taken in purse seine fisheries and that the paper was not meant to provide support for any particular closure regime; rather it was an example of the types of analysis with regard to closures that could be done using historical data. The Convenors noted their support for this observation.

74. Some CCMs felt that analysis of closures on high seas areas might also be worth pursuing as purse-seine effort in waters under national jurisdictions are already limited by Commission measures, but there is no limit on purse-seine effort in the high seas.

Recommendation

75. The SA-SWG felt that there was a need for clarification by the Commission of the objectives used for the analysis and that further work is therefore required before these results are used as a basis for decision making by the Commission.

SOUTH PACIFIC ALBACORE STOCK ASSESSMENT

Summary of working paper SC2 SA WP-3

76. Adam Langley presented SC2 SA WP-3, which summarizes key conclusions of the 2005 South Pacific albacore stock assessment that have direct relevance to the Pacific Island (PI) domestic longline fisheries. The paper highlighted the inappropriateness of MSY-based reference points for the management of this fishery. The PI domestic longline fleets principally catch large (older) albacore. Fishing at levels of effort associated with the MSY reference point (F_{MSY}) would require an increase above current fishing levels, resulting in a decline in the age composition of the population. The net affect of a decline in average age composition would be a reduction in catch rates associated with the PI domestic longline fleets. Fishing mortality would need to be set substantially lower than F_{MSY} to ensure albacore catch rates of the PI longline fleet at economically sustainable levels.

77. The paper also compared recent trends in longline catch rates with variation in oceanographic conditions, principally to explain the low catch rates attained by the PI longline

fleets in 2003 and, for some domestic fleets, over a more prolonged period. Catch rates of albacore are strongly linked to oceanographic conditions as indexed by seasonal fluctuations in sea surface temperature and inter-annual variation in prevailing sea temperatures.

78. For some domestic longline fleets, local-scale depletions of albacore have been observed in areas where fishing effort is highly concentrated. This occurs when the diffusion of fish into an area is less than the extraction by the fishery. Many of the domestic fleets have a relatively limited range of operation. Consequently, for these domestic fisheries, management measures that limit catch/effort to levels that will maintain economically viable catch rates may be appropriate.

Discussion

79. It was noted that in the short term, vulnerable biomass was predicted to decline further (even in the absence of fishing), but increase over the long term due to an increasing trend in the long-term average recruitment. However, as was noted in the paper, the projections are a theoretical exercise to illustrate the types of effects that could occur, and strong caution was given to any interpretation of the outcomes in a real sense. For example, no detailed analysis of recent data was used to determine the likely levels of future fishing effort for the various fleets (e.g. the longline fleet from Chinese Taipei).

80. It was also noted that the most influential abundance series in the current assessment is the longline fishery for Chinese Taipei. While this series was not standardized in the current assessment, comparisons in the past had shown very little difference between standardized and unstandardized indices. Notwithstanding this, two recent issues 1) the change in the dynamics of the Chinese Taipei fleet towards targeting bigeye tuna, and 2) the increased awareness of the importance of oceanographic influences on albacore catch rates, suggest that standardized analyses should be considered in future assessments. Further while the current assessment relied heavily of the Chinese Taipei CPUE series, it may be possible to use CPUE from some Pacific Island fisheries in the future.

81. Given the current "health" of the stock in MSY-related terms, economic factors were recognized as likely being important for management. It was noted that while consideration of economic issues was important, it was unlikely that sufficient expertise in economic issues was available to the Scientific Committee. If the Scientific Committee was to consider economic factors, it would be important to expand the 'membership' of the Scientific Committee to include researchers with expertise in this area.

82. There was discussion about what is meant by the phrase "local depletion". Further, was it a phenomenon that occurred only within zones or could it occur anywhere? It was recognized that local depletion essentially relates to a phenomena whereby catch removed from a region is not replaced immediately by diffusion of fish from other regions. So to a greater or lesser extent there is likely always a local depletion effect, but its magnitude will depend on the level of fishing mortality in a region relative to the rate of mixing of the stock.

Summary of working paper SC2 SA WP-4

83. Adam Langley presented SC2 SA WP-4, which updates the 2005 assessment (SC1 SA WP-3) and investigates the sensitivity of key biological parameters included in the stock assessment model. The 2005 assessment included fishery data through 2003; the updated assessment includes fishery data through 2005. To allow for direct comparisons, the model structure used in current assessment is the same as that used in the previous assessment. The

sensitivity analysis facilitates a prioritization of further research directed at improving the available estimates.

84. For the range of sensitivity scenarios examined, and with the inclusion of the 2004 and 2005 fishery data, the updated assessment is consistent with the finding of the previous assessment. This result strengthens the conclusion that there is no concern regarding the biological sustainability of the stock at the current level and age-specific pattern of exploitation; that is, current biomass levels are well above the biomass-based reference points and exploitation rates are low relative to the F_{MSY} level.

85. Nevertheless, the comparison with the previous years' assessment reveals that there is a high degree of uncertainty regarding our estimate of natural mortality, and limited information in the model data to reliably calculate this parameter. As a priority, further research should focus on attempting to refine current estimates of natural mortality.

86. A number of other key observations emerge from the current assessment. First, while there is no concern about the biological sustainability of the stock, the level of biomass vulnerable to the Pacific Islands domestic longline fisheries has declined over the last decade. The model attributes the decline to an increase in the overall impact of the total fishery on this component of the stock, and to a substantial reduction in the level of recruitment over the last decade. The latter effect will continue to impact on the longline fisheries as the lower levels of recruitment promulgate into the longline vulnerable biomass over the next five years.

Discussion

87. It was noted that the analysis presented was simply an update of last year's assessment model using two extra years of data and an examination of the impact of uncertainty in key biological parameters. While these sensitivity analyses did not alter the perceived stock status in a qualitative sense (e.g. to a state where the stock was overfished or overfishing was occurring), there were substantial quantitative differences in estimated stock status.

88. In considering the estimated biomass trends, participants were reminded of the conclusions from the more comprehensive analyses undertaken in 2005. In particular the conclusions that the historical trends are probably less reliable than those in the more recent period (e.g. the model predictions that biomass at the start was lower than the intermediate period).

89. There is a high degree of uncertainty surrounding estimates of M for South Pacific albacore and additional research studies are required to provide accurate estimates. It was noted by the SWG that current tag recapture data will not provide useful estimates due to low recapture rates. An age, growth and maturity study currently underway may provide some information on M, but will not provide a definitive answer.

90. It was noted that while the current model considers only a single area, spatial structure is incorporated implicitly in the model through seasonal and gear specific catchability. While spatially disaggregated models could be used in the future it is likely that strong assumptions about movement rates will be needed.

91. There was discussion on the utility of tagging albacore tuna with conventional and archival tags to try and reduce the uncertainties in biomass. It was noted that tagging albacore is difficult as the large albacore are hard to catch and tag without high levels of tag related

mortality. Further while the small albacore are easier to tag, very large numbers would need to be tagged to ensure sufficient recoveries due to the long lag (and cumulative natural mortality) between the time the fish are vulnerable to the troll fishery and then the longline fishery around the Pacific Islands.

Stock status for South Pacific albacore

92. A full stock assessment was not undertaken for South Pacific albacore in 2006, but the 2005 assessment was updated using new data for 2004 and 2005. The key conclusions were similar to those of the 2003 and 2005 assessments; that is, that overfishing is not occurring ($F_{current}/F_{MSY}$ <1) and the stock is not in an overfished state ($B_{current}/B_{MSY}$ >1). Overall, fishery impacts on the total biomass are low (10%), although considerably higher impacts occur for the portion of the population vulnerable to longline. The model estimates recent recruitment is below average and, consequently, the portion of the population vulnerable to longline is predicted to decline further in the next two to three years. The assessment conclusions were relatively insensitive to a range of different assumptions regarding the key biological parameters included in the model, although the analysis highlighted the need to refine some of these key parameters.

Management recommendations

93. The key management implications are unchanged from the 2005 assessment. Current catch levels from the South Pacific albacore stock appear to be sustainable and yield analyses suggest increases in fishing mortality and yields are possible. However, given the age-specific mortality of the longline fleets, any significant increase in effort would reduce CPUE to low levels with only moderate increases in yields. CPUE reductions may be more severe in areas of locally concentrated fishing effort.

SOUTHWEST SWORDFISH STOCK ASSESSMENT

Summary of working paper SC2 SA WP-7

94. Dale Kolody presented an overview of assessment approaches applied to southwest Pacific swordfish (*Xiphias gladius*) with a primary emphasis on comparing results from the MFCL and CASAL models (SC2 SA WP-7). The two approaches are described in detail in SC2 ME WP-3 and SC2 ME WP-4, respectively. The assessment integrates the available fisheries data on total catch, catch rates, and size composition with biological studies on age, growth, reproductive dynamics and stock structure, to provide a summary of the current stock status.

95. The inferences in most fisheries stock assessment models are sensitive to the subjective assumptions that are required to formulate tractable estimators, and one can generally be more confident in results that are robust to alternative plausible assumptions. In recognition of this fact, two assessment packages were used for the swordfish stock assessment – MFCL and CASAL. Both packages are flexible, generic modelling tools that have rich and overlapping feature sets. Different spatial structures were explored, including single area and five-area models (including single stock with homogenous mixing among areas, and five stocks with shared spawning grounds but discrete foraging areas). Additional assumptions related to process and observation variances, and structural constraints among fleets and areas were also tested. In total, several hundred MFCL models were fit, compared with a handful of CASAL models.

96. Assuming that the catch data are reliable, the strongest signals for estimating the impact of the fishery on the swordfish population relate to the declining catch rates in the core areas of

the fishery, and the declining sizes in the Australian fishery. The majority of models examined fit the main data reasonably well. To some extent, the models can interpret the gross features of these data either as a direct impact of the fishery, or via trends in recruitment that are largely independent of the fishery (generally increasing recruitment through the 1970–1980s, and declining in the 1990s). Most models examined suggest that both mechanisms are occurring, with the relative importance of the two driven by sensitivity to the structural and statistical assumptions of the models, and not easily distinguished by the available data.

Stock description for southwest swordfish

97. On the basis of the assessment, the SA-SWG developed the following stock status description for swordfish in the southwest Pacific Ocean.

98. At this time, it is not possible to conclude that either MFCL or CASAL is preferable tools for conducting the swordfish assessment. CASAL was used to explore the structural assumption for spatial disaggregation with foraging site fidelity. However, the MFCL assessment had the benefit of an extensive exploration of model uncertainty and its results are the principal basis for the stock status summary herein.

Stock structure

99. The stock assessment assumes a unit stock in the area of the Southwest Pacific Ocean bounded by 0–50^{0}S latitude and 140^{0}E–175^{0}W longitude (Fig. SW1). There is genetic evidence suggesting that northern and southern populations have limited mixing in the western Pacific Ocean, however, the definition of western and eastern bounds is more arbitrary, and partly reflects a convenient partitioning based on fleet characteristics. In particular, the fisheries to the east of 175^{0}W are dominated by Korean and Taiwanese fleets, and the data available for catch rate standardization are not as detailed as for the Australian and New Zealand fleets in the southwest Pacific.

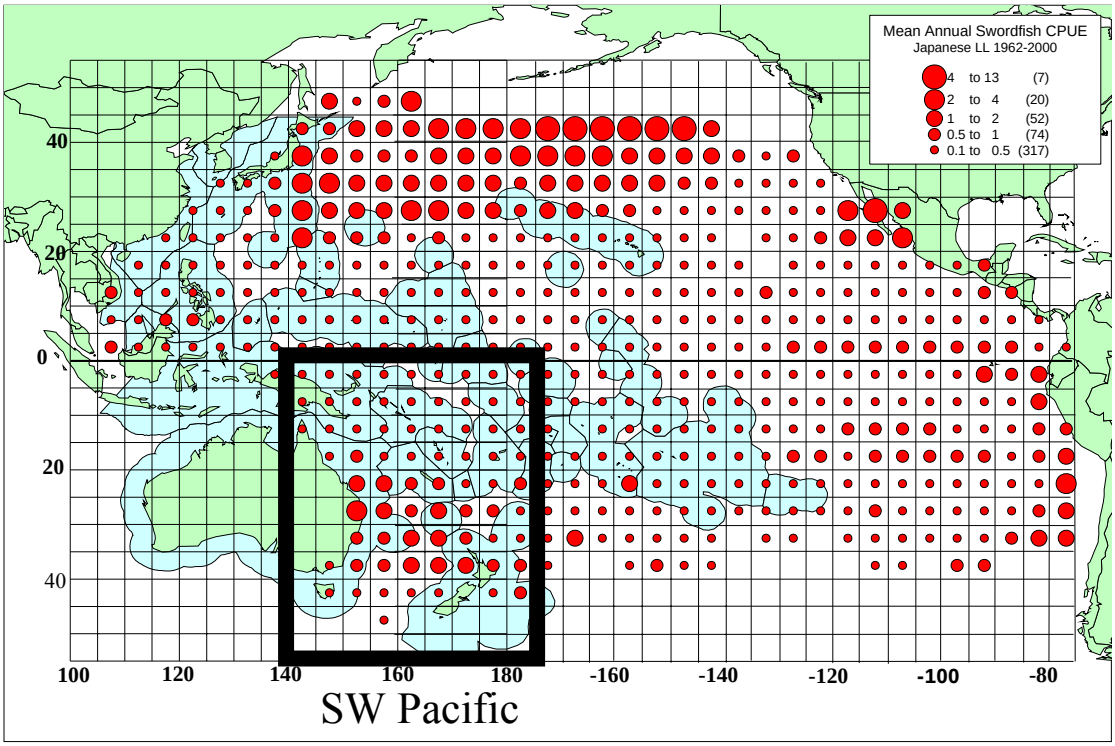

Figure SW1. Rectangle outlines the operational definition of the southwest Pacific swordfish stock for assessment purposes. The red circles indicate mean CPUE observed in the Japanese longline fishery 1962–2000.

The nominal CPUE trends in this south-central region have been increasing in recent years, and this suggests that either the population dynamics in this region are substantially different from the southwest, or catchability might be changing for the south-central fleets.

Catch, effort and size of fish caught

100. The stock assessment covers the southwest Pacific Ocean (0–50^{0}S, 140^{0}E–175^{0}W) for the period 1952–2004. Swordfish have been exploited in this region primarily as by-catch in the Japanese longline tuna fisheries since the 1950s (Figs. SW2 and SW3). Total catches and catch rates remained fairly consistent from about 1970–1996, after which the Japanese fleets were no longer able to access Australian and New Zealand fishing zones, and catches from this fleet have declined steadily since then. Australian and New Zealand catches increased dramatically in the mid-1990s, such that total annual catches in 1997–2004 were roughly double the levels in the preceding period. Pacific Island, Korean, and Taiwanese catches also increased during this period, but remain a small proportion of the total. In the mid-1990s, the Australian fleet gradually expanded offshore with some of the fleet specifically targeting swordfish. Declining catch rates (Fig. SW4) and declining sizes (Fig. SW5) in core areas of the fishery since 1997 have raised concerns about the biological and economic sustainability of the fishery.

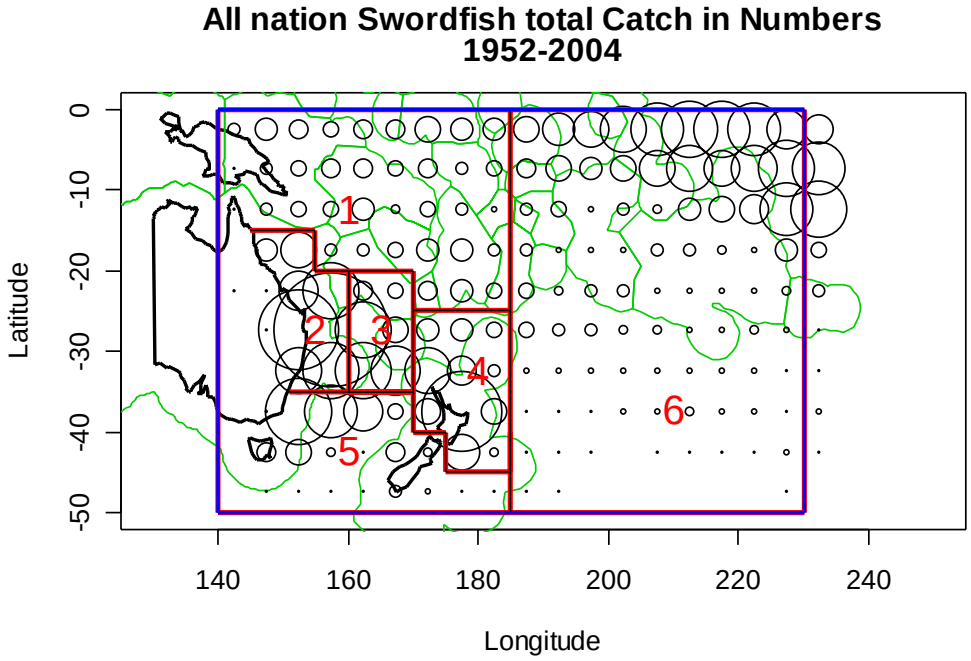

Figure SW2. Spatial considerations in the development of the southwest Pacific swordfish assessment. Regions 1–5 correspond to the core assessment area, where the best understanding of the fisheries data and biology occur. Region 6 was initially defined for sensitivity trials but was not used in the assessment. The area of the circles represents the relative catch (numbers) in each 5 X 5 degree square summed over 1952–2004.

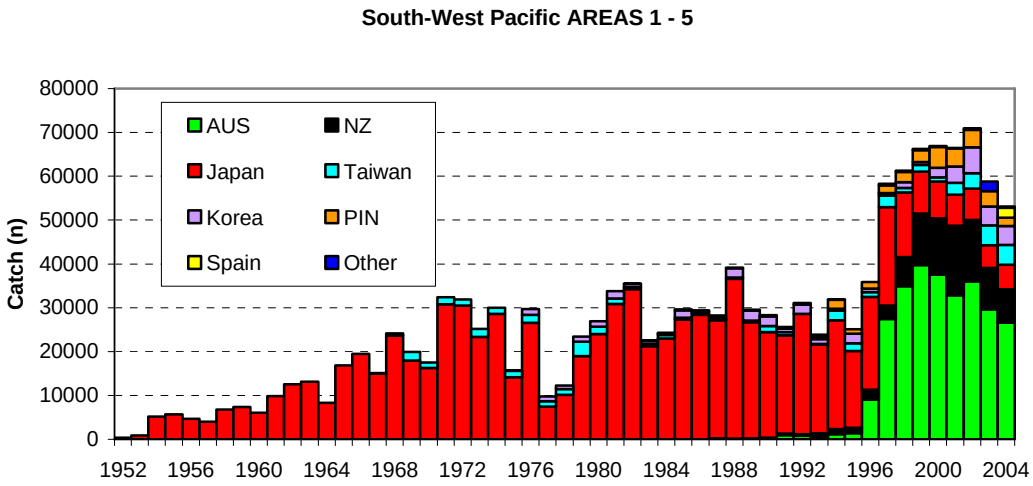

Figure SW3. Total swordfish catch history in the southwest Pacific (areas are defined in Fig. SW2).

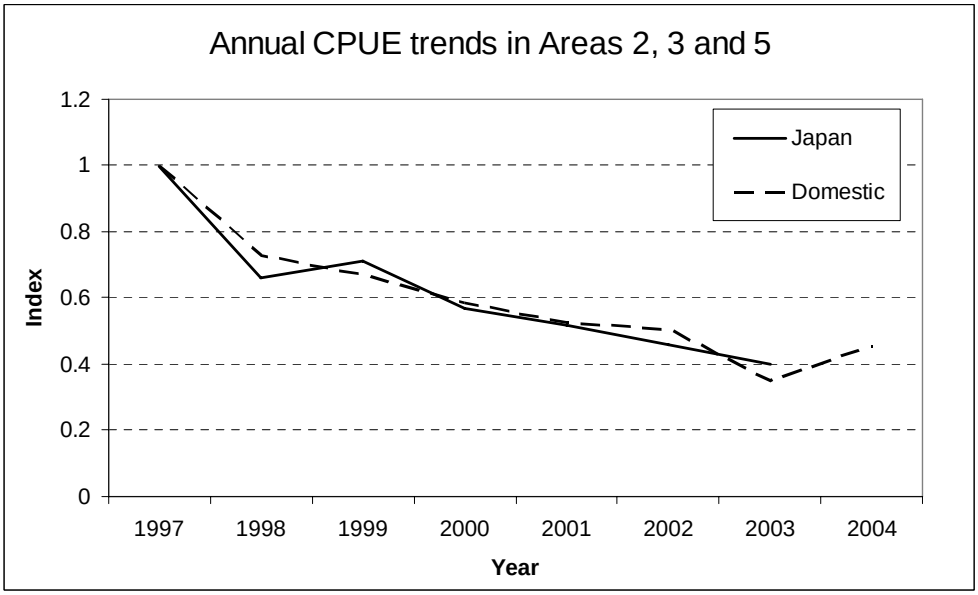

Figure SW4. Comparison of the annual standardized catch rates of the Japanese and Australian domestic fleets in the regions where operations overlap in the southwest Pacific (areas are defined in Fig. SW2).

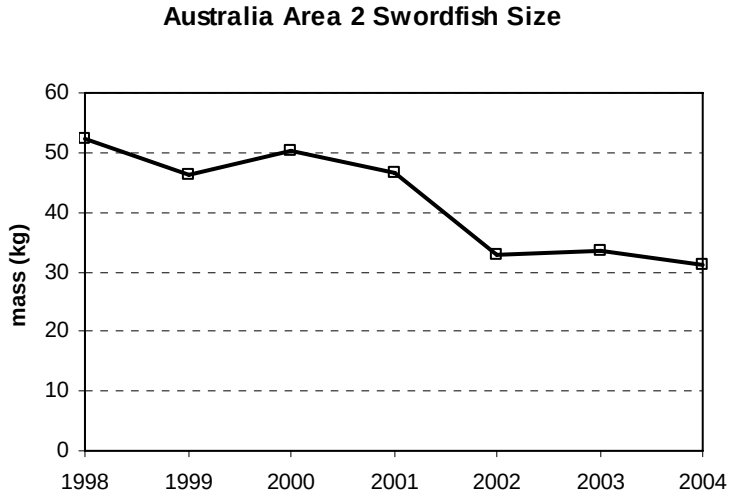

Figure SW5. Declining size (trunked mass) trend in the core Australian swordfish fishery (areas are defined in Fig. SW2).

Stock status for southwest swordfish

101. The status summary represents a synthesis of the Bayesian maximum posterior density (MPD, or best point estimate) results from a subset of 10 models (the most plausible ensemble), selected from several hundred results (Fig. SW6). In the following conclusions, the estimates represent the median (and range) of the MPD results from the plausible model ensemble, such that if one of the models at the extreme end of the range were actually a perfect unbiased estimator, there would be a 50% chance of the true value being more extreme than the uncertainty bound indicates:

1) Relative total stock biomass (TSB) estimates for recent years are the most reliable reference points because they are the most closely linked to the highest quality data, and are reasonably robust to the alternative model assumptions explored. The MPD results from the plausible model ensemble indicate:

    - TSB(2004)/TSB(1995) median = 0.70, range = (0.56–0.74)

2) All of the Spawning Stock Biomass (SSB – roughly corresponding to age 10+ fish) reference points are much more uncertain than TSB because SSB represents a small portion of the catch, and may be badly biased by natural mortality assumptions, and the model aggregation of sex-specific characteristics of growth, mortality and migration. Furthermore, the southern range of the stock seems to consist predominantly of mature females, but this region is poorly sampled by the fishery and it is difficult to relate abundance in this southern part of the population to the core population.

    - SSB(2004)/SSB(1995) = 0.75 (0.51–0.86)

3) The ratio of current biomass over the estimated biomass that would have been observed in the absence of fishing (NF) provides a measure of the fishery impact on the population that might be more meaningful than the biomass ratio at two points in time if the

population experiences non-stationary production dynamics (which these assessments tend to suggest).

- TSB(2004)/TSBNF(2004) = 0.59 (0.31–0.69)
- SSB(2004)/SSBNF(2004) = 0.49 (0.15–0.65)

4) The data are not sufficient to estimate a stock recruitment relationship reliably, and most or all models explored suggest some form of non-stationary (or at least highly variable) recruitment dynamics. This seriously undermines the usefulness of the MSY-related reference points. However, in so far as these reference points have been calculated, the majority of MPD estimates from the plausible model ensemble suggest that biomass (total and spawning) are probably above levels that would sustain MSY and fishing mortality is probably below F(MSY).

- TSB(2004)/TSB(MSY) = 1.7 (0.87–3.0)
- SSB(2004)/SSB(MSY) = 3.4 (0.75–6.4)
- F(2004)/F(MSY) = 0.70 (0.33–2.2)

5) The apparent optimism of the MSY-related reference points is countered by the stock projections (assuming constant future recruitment according to the estimated stock recruitment relationships, and constant effort at 2004 levels), which suggest biomass declines over the short term (Fig. SW7):

- TSB(2009)/TSB(2004) = 0.88 (0.78–1.00)
- SSB(2009)/SSB(2004) = 0.84 (0.71–0.86)

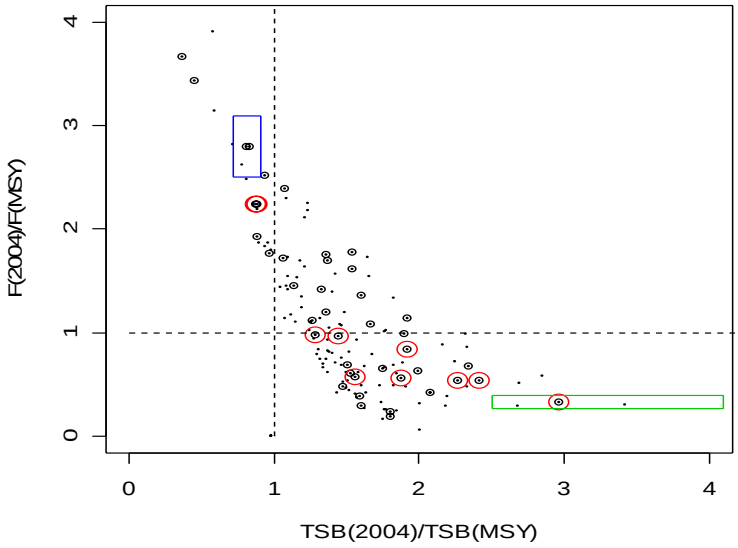

Figure SW6. Stock status summary plot. Points indicate the estimates corresponding to the MFCL models examined. Large (red) circles indicate the most plausible model ensemble used for stock status determination. Example model 1 (vertical blue) and 2 (horizontal green) are indicated by the large rectangles which encompass the two-dimensional 95% confidence limits (without the correlation).

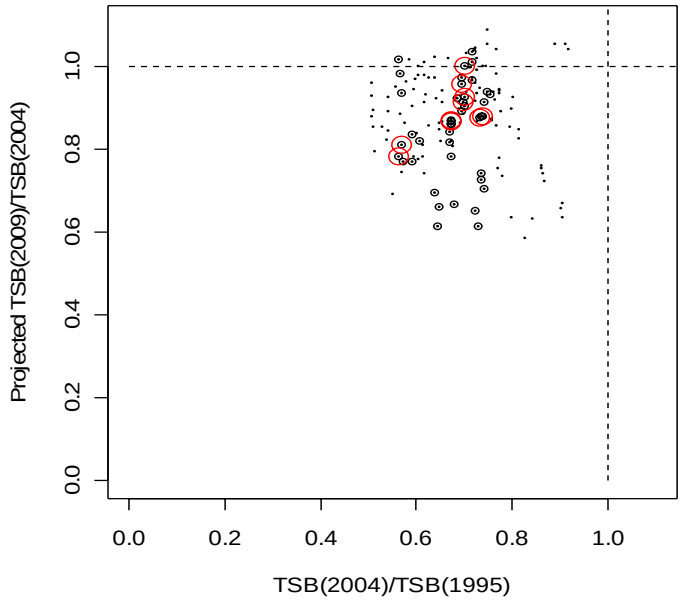

Figure SW7. Summary of recent biomass trends and short term deterministic projections (with 2004 effort) in relation to model uncertainty. Points indicate the estimates corresponding to MFCL models examined. Large (red) circles indicate the most plausible model ensemble used for stock status determination.

102. Despite the emphasis on model uncertainty in the assessment, there remain a number of assumptions which probably influence the conclusions and remain largely beyond the scope of the current assessment, including: 1) catchability of the fleets may be changing in ways that cannot be reliably estimated through the catch rate standardization methods employed, 2) the link between the operational definition of the southwest Pacific stock area and the broader Pacific (and possibly Indian) Ocean is unclear, and 3) all of the models examined ignore sex-specific population characteristics (natural mortality, growth and migration), which may contribute to potential biases in estimators. These assumptions should be further investigated and sex-specific population characteristics should also be provided in the future assessment.

Discussion

103. The assessment used data through 2004. It was noted that New Zealand and Australian catches declined in 2005 while catches by the European Union (EU)-Spain increased significantly. While it is not likely that post-2004 fishery developments would alter significantly the conclusions and advice from the assessment, this should be examined when the 2005 data become available.

104. The southwest swordfish assessment used an innovative process to quantify model uncertainty through the application of two different models (MFCL and CASAL) and through extensive MFCL sensitivity analyses coupled with well-defined acceptance criteria. This was encouraging particularly since model uncertainty is generally greater than the statistical uncertainty presented in WCPFC assessments. It was suggested that this well-structured southwest swordfish process would be beneficial for all WCPFC assessments.

105. While the southwest swordfish process nicely characterized model uncertainty, it was suggested that the statistical uncertainty could be added to the model uncertainty to better characterize the full range of uncertainty (i.e. by adding two-dimensional error bars to the collection of points within the "banana" region displayed in Fig. SW6).

106. 1995 was used as the reference year for some of the reference points presented (e.g. ratio of 2004 biomass to 1995 biomass). Significant fisheries took place for several years prior to 1995 but data quality for those years was not as good. Further, Japanese longline CPUE indices for 1995 and these earlier years were more or less constant, and there is limited size sampling data, such that there is not much direct evidence for fishery impact prior to 1995,

107. A recent southeast Pacific swordfish assessment (IATTC) indicated four stocks in the Pacific Ocean. This highlights the need to more fully consider stock structure and other biological uncertainty in future assessment work. It was noted the New Zealand and Australia are planning archival tagging work aimed at addressing the stock structure question.

Management Recommendations

108. Given:

1) the present uncertainty in the assessments about current stock status and the need to be precautionary in light of this uncertainty,

2) that the assessments indicate the possibility that overfishing may presently be occurring, and

3) that projections predict further declines in biomass over the next five years given effort levels remaining at 2004 levels,

it is recommended that, at a minimum, there should be no further increase in fishing mortality on swordfish, particularly in the western region of the southwest Pacific.

STRIPED MARLIN STOCK ASSESSMENT

Summary of working paper SC2 SA WP-6

109. Don Bromhead presented a stock assessment for striped marlin in the southwestern Pacific Ocean (SC2 SA WP-6). This region is considered to support a relatively discrete stock of striped marlin and the spatial scale of assessment was considered appropriate for management purposes. The fishery in this region is dominated by distant water and domestic longline fleets, although important recreational fisheries also exist in the region, particularly in Australia and New Zealand. Relatively high catches of striped marlin were taken during the 1950s and early 1960s, with a peak of about 12,000 mt in 1954. Since the mid-1960s, catches from the southwest Pacific Ocean have fluctuated between approximately 2,000 mt and 4,000 mt with a trend towards lower catches in more recent years. Historically, the Japanese longline fleet has accounted for most of the catch from the fishery and catch and effort data and size data from this fleet represent a key input to the stock assessment.

110. The stock assessment was undertaken using MFCL and included catch, effort, and size data for 1950–2003. A total of 12 longline and 2 recreational fisheries were included in the model within a single model spatial structure. The catch and effort from the Japanese longline fisheries provide the key index of longline exploitable biomass, with the effort data standardized using a GLM approach to attempt to account for changes in catchability that may have occurred over the history of the fishery (e.g. deeper setting of longline gear). Catch and effort data from the Japanese fleet reveals a strong decline in CPUE during the early period (first 15 years) of the fishery.

111. The biological parameters included in the model were sourced from the available literature. However, it is recognized that there is a high level of uncertainty regarding natural mortality, growth and age of maturity. Sensitivity analyses were undertaken for some of these key parameters.

112. The assessment indicates that biomass declined sharply during the 1950s and 1960s and continued to decline, at a lower rate until the mid-1980s. Biomass levels were relatively stable in the subsequent years. These trends are consistent with the trend in CPUE from the main longline fishery. The initial decline in biomass is partly attributable to a corresponding decline in recruitment through this period. The temporal trends in biomass and recruitment — high/low recruitment corresponding to high/low levels of adult biomass — resulted in a low estimate of steepness for the relationship between spawning biomass and recruitment (SRR). The resulting SRR is highly influential in defining the key MSY-based reference points for the stock.

113. There are a number of inconsistencies identified in the model diagnostics, in particular a lack of fit to the size data from some fisheries. This indicates some deficiencies in the current model structure and/or the key biological parameters included in the model. There remains considerable uncertainty regarding some of the key inputs to the model and further refinement of

the assessment will be dependent on an increased understanding of the biology of the species and CPUE trends from the key longline fisheries.

114. The current assessment should be considered preliminary as there remains a great deal of uncertainty regarding the key parameters in the models. Nevertheless, some tentative conclusions are available from the results of the assessment. While the current stock status is uncertain, principally due to uncertainty regarding the assumed value for natural mortality and the estimated SRR, current levels of catch are comparable to the range of MSY estimates obtained from the various sensitivity analyses. On this basis, there appears to be no potential to substantially increase the current level of yield from the stock. The fishery has supported catches at about the MSY level for the last 20 years (average annual catch 1984–2003 of 2,400 mt) at a relatively constant level of fishing effort. Consequently, there is no indication that current exploitation rates are having a deleterious impact on the productivity of the stock.

Discussion

115. During subsequent discussion a number of suggestions for how the model could be progressed and improved were raised.

116. First, given that the New Zealand recreational fishery typically catches a larger mean size of marlin than most of the longline fisheries, it was suggested that longline selectivity in the model should be allowed to decline at larger sizes, or else spatial structure should be included in the model. It was also noted that a problem arises on specifying selectivity as age-based rather than length based, given that age classes have a broad range of lengths.

117. Second, given uncertainty over the current use of New Zealand recreational data, it was suggested that the model be re-run, excluding that data set, to assess its impact on the assessment conclusions. However, it was also noted that the current model places little weighting on the New Zealand data, so its influence is likely to be very small.

118. Third, it was suggested that the drop in the size of Japanese longline caught marlin in the mid-1980s might have resulted from a change in processing, and that further investigation into the form of weight data supplied over time (fillet versus trunked weights) might be worth undertaking.

119. It was also noted that the very steep biomass decline in the 1950s and 1960s in region 2 is very different to trends observed for other large pelagic fisheries in that region. The reasons for this have not yet been investigated to any extent but should be followed up. The decline in biomass is explained by the model as a decline in recruitment, leading to a strong stock-recruitment relationship. The inclusion of recently acquired size data for the early years might allow more accurate estimation of recruitment in the early years of the model for future assessments. This, along with further research into CPUE standardizations (in particular to account for occurrence of or changes in targeting over time) and age-growth and reproductive studies, were identified as the key research priorities. There was some concern expressed over the use of hooks-between-floats data as a proxy for depth of setting, given uncertainty in the consistency of how that data has been recorded over time.

120. Of further note, there will be an investigation into striped marlin stock structure through satellite tagging undertaken in the North Pacific in the near future.

Management Recommendations

121. Several of the plausible model scenarios investigated indicate that current levels of fishing mortality may approximate or exceed the reference level (F_{MSY}) and current biomass levels may approximate or be below the biomass based reference point ($S\widetilde{B}_{MSY}$). On this basis, it is recommended that there should be no increase in fishing mortality (fishing effort) on striped marlin in the southwestern Pacific. This recommendation applies particularly to the area encompassing the Coral Sea and the Tasman Sea (sub-area 2 and the western part of sub-area 3) as these fisheries account for most of the striped marlin catch in the southwest Pacific.

NORTHERN STOCKS

122. Gary Sakagawa (ISC Chair) presented an overview of ISC activities of relevance to the assessment of the northern stocks documented in (SC2 GN IP-4). These related specifically to the status of assessment undertaken for North Pacific albacore tuna, Pacific bluefin, and striped marlin in the North Pacific and the corresponding conclusions and management recommendations based on these assessments.

123. A summary of each of these assessments was presented by Ray Conser (North Pacific albacore), Naozumi Miyabe (Pacific bluefin), and Gerard DiNardo (striped marlin).

Report of the ISC North Pacific Albacore Working Group

124. Ray Conser presented the report of the ISC North Pacific Albacore Working Group (ALB-WG). The report provided an overview of the North Pacific albacore fisheries, biological research, and stock assessment studies with emphasis on the activities and progress made by the working group since the first ISC meeting.

125. The ALB-WG met at the NMFS Southwest Fisheries Center, La Jolla CA, USA during 28 November–2 December 2005. The primary focus of the meeting was to outline preparations for conducting the 2006 North Pacific albacore assessment. The meeting also considered appropriate reference points for North Pacific albacore; choice of modelling platforms for the 2006 assessment; research studies needed to improve knowledge of albacore biology; and the process to update fisheries data. A total of 20 participants from Canada, Chinese Taipei, Japan, USA, and IATTC attended the meeting. Fourteen working documents were tabled. A full report of the meeting is available on the ISC website (http://isc.ac.affrc.go.jp/). A task group, appointed by the WG, subsequently met at the Department of Fisheries and Oceans Marine Biological Station, Nanaimo, BC, Canada during 13–17 July 2006 to further preparations for the 2006 assessment.

Among the key decisions that resulted from these deliberations were:

1) The length of the stock assessment time series will be expanded to include years prior to 1975 (the starting year in previous assessments).

2) A standardized index of abundance from the Chinese Taipei longline fishery will be incorporated into the assessment for the first time.

3) As in the past, the VPA-2Box model will be used for the 2006 stock assessment. In addition, the Stock Synthesis 2 model will be applied in a parallel fashion providing results that can be directly compared to the VPA-2Box results.

126. Data preparations and preliminary analyses are now well underway for the next WG meeting — November 2006 in Shimizu, Japan — where the next stock assessment will be conducted. The results of this assessment will be provided to the third session of the Scientific Committee in 2007.

Discussion

127. A general comment was made concerning the presentation of scientific information from the ISC to the Scientific Committee as stipulated in the MOU between the WCPFC and the ISC and in the text of the resolution relating to North Pacific albacore from the second Commission meeting (paragraph 5, Conservation and Management Measure-2005-03). It was considered that these terms had not been met as a detailed assessment had not been presented to the second Scientific Committee meeting. ISC responded that no assessment for North Pacific albacore had been undertaken in 2006 and the results of the most recent (2004) North Pacific albacore assessment were provided to the first Scientific Committee meeting in 2005 (as an information paper). The current report (SC2 GN IP-4) documents the key conclusions from that assessment and, in the absence of a new assessment, this remains the best available information and the conclusions and subsequent management advice remains valid. ISC also noted that it was not practical to present all the results of the assessment and supporting analyses to the Scientific Committee as this would be very time consuming. The convenor noted that this was an issue for further discussion at the plenary session.

128. The recent meeting of the ISC Albacore Working Group (November 2005) reviewed catch and effort data from the Chinese Taipei distant water longline fleet and considered this fishery may provide a CPUE index for inclusion in the next assessment. Chinese Taipei questioned this conclusion given the small proportion of the total catch taken by this fleet. In response, it was noted that this fishery has a broad spatial coverage and, particularly for such a migratory species, it was not necessary for the index to be derived from fishing activity throughout the entire range of the species. The resulting index would be further reviewed in the framework of the new stock assessment model (November 2006).

Report of the ISC Pacific Bluefin Tuna Working Group

129. The ISC Pacific Bluefin Tuna Working Group (PBF-WG) meeting was held in Shimizu, Shizuoka, Japan from 16–20 January 2006. This was the fourth meeting of this working group since its inception in 2000. Dr Ziro Suzuki (Japan) chaired the meeting. Scientists from Chinese Taipei, Japan, USA, and IATTC participated. Nineteen working documents and three information papers were provided to the meeting.

130. The annual Pacific bluefin catch fluctuated between 8,000 mt and 34,000 mt with the recent (2001–2005) level being 16,000–22,000 mt. The annual Japanese catch has been the largest, but varying between 9,000 mt and 24,000 mt during the past 10 years. The largest portion of this catch is taken by purse seine, followed by troll and longline. Various other fisheries, including small-scale fisheries, also took a certain amount of the catch. The catch from Mexico is the second highest, showing a large fluctuation between 0 and 9,000 mt in recent years. Chinese Taipei's small longliners have been fishing this species, and their catch began increasing about 10 years ago. The catch level has been between 1,000 mt and 3,100 mt. Similar to the Japanese

coastal longliners, the small Chinese Taipei longliners are catching adult fish in spawning aggregations. Korea and USA took smaller catches by purse seine.

131. Biological studies, such as on growth, length–weight relationship, natural mortality rates of young fish, ageing, analysis of archival tag data and maturity, were presented and reviewed by the group.

132. Nine standardized and unstandardized CPUE information were provided for various fishery components. Indices from Japanese coastal longliners, the Japanese purse-seine fishery in the Pacific, and the Chinese Taipei longline fishery were newly made available. In general, these fisheries data indicated that catching medium to large fish showed that fishing took place in certain spaciotemporal strata, and that the size of fish tended to fluctuate from year to year. The group discussed which series were likely to best represent changes in population abundance and considered the criteria that could be used to identify preferable indices to be used in the assessment.

133. The base case assessment was conducted using the ADAPT VPA framework as in the past. It utilized six CPUE indices for tuning. The program used in the study was also developed to handle the discontinuous CPUE series and to give confidence intervals on the point estimates through bootstrap simulation. The analysis was conducted with data for 1952–2004. The results showed that the total biomass exhibited decadal changes from the level of 60,000 mt to the level of 160,000 mt. The SSB trend was roughly similar with that of total biomass. The fishing mortalities of ages 0 and 1 in 1990s were higher than those in 1980s. The current fishing mortalities for fish older than age five were estimated to have increased. Recruitment overfishing does not seem to have occurred.

134. Examination of the results revealed that there were patterns in the CPUE residuals, which indicated the failure of the model fit to the Japanese longline or the early EPO purse seine indices. As a reason for this, possible changes in targeting in the longline fishery were discussed.

135. A test run of the fully-integrated, length/age-structured model (SS2) was also conducted to evaluate its potential use in future assessments. The results from SS2 showed slower growth than the currently used growth and stock estimates are different from the VPA runs, particularly in the early to middle period of the time series. Due to the data limitation, there were high degrees of uncertainty for the earlier period in catch-at-age data and CPUEs. During the meeting, a sensitivity VPA run was conducted using an alternative catch at age matrix, adjusted for slower growth rate. This sensitivity run gave a quite different result from the base case. Biomass of the early to middle of the time frame was estimated to be much higher than the base case, although the recent biomass was similar to the base case. Fishing mortality in early years was lower than the base case analysis. However, the fit to CPUE data did not appear to have improved. These substantial differences demonstrated the quite large sensitivities with respect to the growth rate assumption.

136. Even with these difficulties, however, the results from the two model runs converged for recent years and could serve to draw some general conclusions. Stock biomass has a local peak in the late 1970s and the late 1990s, with a decline after the second peak. Based on the base case run, recruitment in recent decades indicated large fluctuations and 2001 recruitment estimate was the highest. This recruitment would maintain biomass above the current level by 2010 based on the future projection. However, if the fishing mortality increases by 20%, the spawning biomass will decline below the current biomass.

137. Based on these results and taking into account the uncertainties encountered with the analyses, the PBF-WG recommended that the fishing mortality should not be increased further, largely because recruitment in recent years is poorly estimated. The Group recommended the careful monitoring of the stock in the future.

138. At the end of this meeting, a series of research recommendations were developed, and a high priority was given to the validation of growth, particularly for the older ages of this species. Other recommendations included: improvement of natural mortality estimates, maturity ogive and seasonal length–weight relationships by area. Further development and improvement of integrated model application was also stressed. Two items are worth noting.

- Because Pacific bluefin tuna form a single stock in the Pacific Ocean, data should be collected throughout the Pacific Ocean.

- Catch data for Pacific bluefin tuna are not part of the current WCPFC data exchange requirement, but the ISC noted that bluefin tuna data should be added to that requirement.

139. The ISC Plenary, held from 23–27 March 2006, in La Jolla, discussed the current stock assessment provided by the PBF-WG. Noting the uncertainty in the assessments, the ISC Plenary agreed with the working group recommendation that as a precautionary measure, bluefin tuna fishing mortality not be increased above recent levels.

140. The next PBFWG assessment meeting will be scheduled in 2007 with a data preparation meeting prior to the assessment meeting.

Discussion

141. Purse-seine fisheries catching Pacific bluefin operate on both sides of the Pacific. The Japanese purse-seine fishery in the Japan Sea catches mainly small fish, while small and large fish are caught by the Japanese purse-seine fishery operating in the western Pacific from July–August. The purse-seine fishery in the eastern Pacific principally catches small fish.

142. The potential impact of the recent development of the Mexican purse-seine fishery was raised. It was considered that this fishery may have a substantial impact on recent (2001 and 2002) age classes in population and this may reduce the future abundance of bluefin in the Japanese longline fishery.

143. Pacific bluefin is not currently included on the list of species whose catch is reported to WCPFC and limited information is available on catch from some fisheries. The list of species needs to be amended to include Pacific bluefin.

144. Japan noted the importance of understanding recruitment dynamics of Pacific bluefin and has developed a research proposal to undertake this work. In future, such a project could be expanded to provide routine monitoring of trends in recruitment.

Report of the ISC Marlin Working Group

145. Gerard DiNardo presented the report of the ISC Marlin Working Group (MAR-WG). The report provided an overview of the working group goals and objectives, current assessment and research activities, as well as future plans.

146. The MAR-WG conducted a preliminary striped marlin stock assessment in early 2006 and is scheduled to complete the final assessment in 2007. The MAR-WG, with support from the ISC Plenary, will conduct a Pacific-wide blue marlin stock assessment in 2008. The MAR-WG is currently engaged in gathering support and identifying collaborators to participant in a Pacific-wide blue marlin stock assessment.

Discussion

147. Limited information is available regarding the location of spawning for marlin species, particularly striped marlin. It was noted that considerable size data are being collected from the Hawaiian and Japanese longline fisheries and the Mexican sport fishery.

148. A general comment was made with respect to the reporting of the stock status of the northern stocks relative to relevant biological references points (BPRs), including those specified in the Convention (MSY-based). In response, it was noted that no formal reference points had been established by the ISC, although there has been consideration of a wide range of reference points by the Albacore Working Group. However, there is a need further develop appropriate references points in conjunction with fisheries managers, incorporating consideration of suitable levels of risk and consideration of other management objectives.

149. Gary Sakagawa provided a general summary of the current recommendations for management of the northern stocks and future activities of the ISC (as documented in SC2 GN IP-4). It was noted that the key conclusions for North Pacific albacore remain unchanged and the management measures introduced by both WCPFC and IATTC are consistent with the ISC recommendations. For Pacific bluefin tuna, recent recruitment is estimated to have been at a high level. However, there is a high level of uncertainty in the estimates, so ISC recommended that there be no increase in fishing mortality. A similar recommendation was made for the northern striped marlin stock as an interim measure, until the results are available from the final stock assessment in 2007. Over the next few years, work will be undertaken to develop an assessment for both swordfish and blue marlin (Pacific-wide).

Appendix I

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

AGENDA FOR THE STOCK ASSESSMENT SPECIALIST WORKING GROUP

WCPFC-SC2-2006/SA-SWG AGENDA

Co-convenors: Gerald Dinard and Naozumi Miyabe

1. Preliminaries

1.1. Adoption of agenda

1.2. Finalization of documents

2. Selection of Rapporteurs

3. Stock Assessment

3.1. Bigeye and Yellowfin Assessments

SA WP–1: Hampton, J., Langley, A., Kleiber, P. *Stock assessment of yellowfin tuna in the western and central Pacific Ocean, including an analysis of management options. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia. NOAA Fisheries, Honolulu, Hawaii.*

SA WP–2: Hampton, J., A. Langley, A., and P. Kleiber. *Stock assessment of bigeye tuna in the western and central Pacific Ocean, including an analysis of management options. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia. NOAA Fisheries, Honolulu, Hawaii.*

SA IP–1: Hampton, J., and M. Maunder. *An update of Pacific-wide assessment of bigeye tuna with comparisons with eastern Pacific assessment results. Document SAR-7-07c.ii. IATTC Working Group to Review Stock Assessments, 7th meeting, La Jolla, California (USA), 15-19 May 2006.*

SA IP–2: Sheng-ping Wang, Chi-lu Sun, N. Miyabe, Su-Zan Yeh, Nan-Jay Su, and Yi-Jay Chang. *Stock assessment of BET in the western and central Pacific Ocean using an age-structured production model.*

Discussion and Conclusions

3.2. South Pacific Albacore Assessment

SA WP–3: Langley, A.D. *The South Pacific albacore fishery: a summary of the status of the stock and fishery management issues of relevance to Pacific Island countries and*

territories. Technical Report 37. Noumea, New Caledonia: Secretariat of the Pacific Community.

SA WP–4: Langley, A., and J. Hampton. *An update of the stock assessment for South Pacific albacore tuna, including an investigation of the sensitivity to key biological parameters included in the model. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.*

Discussion and Conclusions

3.3. Potential Impact on Skipjack Catches by Purse Seine Fishery Resulted from Management Measures for Bigeye and Yellowfin

SA WP–5: Langley, A., and J. Hampton. *Potential impact on catches of skipjack by the WCPO purse-seine fishery of various WCPFC conservation and management measures considered for bigeye and yellowfin. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia.*

Discussion and Conclusions

3.4. Striped Marlin Assessment

SA WP–6: Langley, A., B. Molony, D. Bromhead, K. Yokawa, and B Wise. *Stock assessment of striped marlin (Tetrapturus audax) in the southwest Pacific Ocean. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia. 2Bureau of Resource Sciences, Canberra, Australia. Japan National Research Institute of Far Seas Fisheries, Shimizu, Japan.*

Discussion and Conclusions

3.5. Swordfish Assessment

SA WP–7: Kolody, D., N. Davies, and R. Campbell. *SW Pacific Swordfish Stock Status Summary from multiple assessment models. CSIRO. Division of Marine Research, Hobart, Australia. National Institute of Water and Atmospheric Research, Whangarei, New Zealand.*

Discussion and Conclusions

4. Responses to the Commission's Requests

4.1. Bigeye and yellowfin tuna Assessments: "Identify levels of fishing effort to ensure that the bigeye and yellowfin stocks will remain at an agreed level above B_{MSY}"

4.2. South Pacific albacore: "Develop a stock assessment for South Pacific albacore for consideration of reviewing last years decision on no increase of fishing"

4.3. Southwest Pacific swordfish: "Provide additional advice on the status of swordfish stocks"

4.4. Purse seine closure: "In order to achieve the overall reduction in catch and effort required for bigeye and yellowfin, develop a proposal for consideration at the third regular session of the Commission for a system of temporary purse-seine closure"

5. Research Planning

5.1. Short- and Medium Term Research Plan

5.2. Work Plan for 2006/07

6. Administrative Matters

6.1. Terms of Reference

6.2. Other matters

7. Adoption of Report

Attachment M

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

SEA TURTLES DATA COLLECTION AND RESEARCH PROGRAMME

The research programme should acknowledge the huge breadth of biological research being undertaken by the worldwide turtle research community, and should focus the Commission's activities to support objectives for which it has particular expertise, resources, and responsibility.

Objective: Identification of areas of spatial and temporal importance to fishery interactions and population impacts on sea turtles, so that the Commission can target time area strata of major importance for bycatch mitigation measures and other actions.

An illustrative example of achieving this objective would be the much clearer picture now available on seabird distribution in relation to fishing effort. This has allowed some Commission members to efficiently target management measures in specific regions. The research programme should support the following activities directed towards defining sea turtle stock distributions and vulnerability to fishing gear.

1. Activity: A More Comprehensive Fishery Observer Programme

    a. Coverage: To adequately characterize statistically rare events, up to 100% observer coverage can be required. But bearing in mind the practicalities involved, the programme should:

        i. Initially be spatially and temporally representative of each fishery operating in the Convention Area.

        ii. Given diminishing benefits of greater coverage (SC2 ST WP-1), the programme should aim to observe 20% of the fishing effort over a two-year period. As a practical matter, however, a sudden increase to this level (from the current level of 0.5%) is unlikely to occur. Therefore, an initial minimum of 5% of the fishing effort be observed. When areas of greater importance are found, the observer programme may be restructured to optimize coverage in these areas.

    b. Data collection

        i. The SPC observer manual, reporting forms, and standards should be used as a model, and should be cross–checked with the corresponding Hawaiian and other manuals and standards to ensure all the necessary turtle data collection details are included, and,

where relevant, data on other species potentially affected by new mitigation measures. Some of these programmes have focused intensely on the requirements for sea turtle bycatch management. (This activity will be addressed through the Statistics Specialist Working Group recommendation on observer data, Statistics Specialist Working Group report, para. 29 (a)).

ii. Programme priorities should be clearly specified and as should the way in which observation time is directed towards sea turtle observation versus other objectives. Other activities can effectively prevent effective bycatch observation, so this documentation is essential for interpreting the effective observer coverage, including historical coverage.

iii. Observer data should be submitted to the Commission for centralized collection and analysis.

2. Activity: Tagging and Telemetry

a. Tagging should be widely expanded to include conventional styles of tagging (e.g. flipper tagging, pit tagging) by trained fishers and observers (see Fishers Education) to provide information on post-release survival and movements.

b. Satellite and archival telemetry should be encouraged in order to achieve broader coverage than is sometimes achieved by the very active turtle telemetry research community. The Commission should encourage and support further effort of this community by making trained observers available for satellite/archival tagging on fishing vessels. Researchers should be encouraged and supported to broaden the habitats and regions where turtles are tagged.

c. Information from tagging should be provided to the Commission, and shared with the South Pacific Regional Environment Programme (SPREP).

3. Activity: Documenting Other Sources/Areas of Population Impact

a. Turtle nesting beach habitats should be comprehensively surveyed, monitored, and evaluated for the opportunity to undertake activities supporting population recovery.

b. Comprehensive information and investigation of impacts on turtle populations from sources outside the fisheries jurisdiction of the Commission should be requested from members. Information on overall anthropogenic mortality and other sources of mortality is just as essential as information on other vital rates (e.g. age and growth) for assessing the dynamics and status of the populations and for choosing effective management strategies.

Objective: Reduce the capture and injury of sea turtles in fishing gear

The Ecosystem and Bycatch Specialist Working Group provided a good review of recent progress as well as a recommended approach for research on gear improvements and for incremental, flexible implementation of management measures.

1. Activity: Improved mitigation measures

Scientific experiments should be undertaken to test a range of mitigation techniques in order to determine appropriate mitigation measures for a particular fishery or area. Research should also continue to be focused on the development and implementation of improved mitigation measures and turtle handling and release methods.

2. Activity: Industry Education

   a. CCMs should be responsible for providing training to fishers in sea turtle identification, handling and release, including provision of a manual on sea turtles (which would include information on mitigation, identification, handling and release). This may facilitate fishers assisting in data collection.

   b. Self-reporting (logbook reporting) of turtle identification and release condition (e.g. alive, dead, how hooked, gear remaining on turtles).

   c. Tagging of sea turtles by trained fishermen prior to release.

   d. The Commission should make available existing educational material that member nations could use to provide information to their fishers on how to reduce captures and mortality of sea turtles.

3. Activity: Development and Sharing of Improved Release Methods

   New methods for releasing sea turtles caught on circle hooks are needed and are under development. Observers' and fishermen's recent experiences with circle hooks indicate greater difficulty in releasing turtles caught with circle hooks than with more traditional J and tuna hook types. Programmes in the USA and Latin America are experimenting with new methods. The programme should monitor and potentially adopt these newly developed methods as appropriate.

4. Activity: Expand the existing initiatives to investigate turtle mortality from FAD entanglement.

   This is an area of concern that should be evaluated for its priority and for potential management measures.

Attachment N

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

FULL RECORD OF DISCUSSION AROUND MEASURES TO MITIGATE AGAINST CAPTURE OF JUVENILE BIGEYE AND YELLOWFIN TUNA BY PURSE SEINE

Information addressing Agenda Item 5 — bycatch mitigation of juvenile bigeye and yellowfin tuna (JBYT) — was presented by David Itano who served as Chair for this session and led the discussion on this topic. An informal information paper had been circulated to provide basic information and to stimulate discussion on recommendations that might arise from the Scientific Committee regarding the reduction of JBYT fishing mortality. The Chair for this session drew attention to two documents from PrepCon and the first Scientific Committee meeting, which are of relevance to this session in relation to the management of bigeye and yellowfin catch and in particular, the fishing mortality of JBYT taken in association with floating objects[1].

It was noted by the meeting that the directive from the Commission to the Scientific Committee was specific to the evaluation of mitigation measures for JBYT taken around FADs[2]. The directive, from the Commission's Conservation and Management Measure-2005-01 states:

> *Beginning in 2006, the Scientific Committee and the Technical and Compliance Committee shall undertake to explore and evaluate mitigation measures for juvenile bigeye and yellowfin taken around FADs, in cooperation with other RFMOs, and present the results annually to the Commission. This work shall continue on an annual basis.*

Discussion focused initially on various options to reduce the catch of JBYT identified in the information paper. The Chair noted the paper was a comprehensive list of all the potential ways to reduce JBYT fishing mortality that, including various scenarios of catch and effort reduction, research on acoustic selectivity and aggregative behaviour of JBYT on FADs, and input controls to fishing gear and practices.

Differing views over the appropriateness of development and consideration of mitigation options related to catch and effort reduction, such as time–area closures or FAD specific effort reduction were expressed by the meeting. Some CCMs suggested that the Scientific Committee should only be concerned with JBYT mitigation that can be addressed in a research-based environment, such as studies related to selectivity, targeting and tuna behaviour. Other viewpoints were tabled supporting the investigation of certain effort

[1] WCPFC/PrepCon/WP.24
SC1/FT WP-4

[2] Defined as any human-made device, or natural floating object, whether anchored or not, which is capable of aggregating fish.

reduction scenarios that could be analysed within a scientific and statistical environment. The Chair supported this compromise position, noting that several working papers had already been submitted to the Standing Committee on Tuna and Billfish (SCTB) and the first session of the Scientific Committee. These papers addressing JBYT catch and mitigation issues, included papers examining spatial and temporal abundance of bigeye in purse-seine fisheries, modeling scenarios examining resource trade-offs between floating-object, and unassociated fishing modes.

There were specific requests to the WCPFC Secretariat as to which areas of mitigation the Scientific Committee should concentrate their discussions and recommendations. The WCPFC Secretariat advised that the Scientific Committee should remain open and flexible in regards to which areas of research the Scientific Committee could consider when developing studies to address JBYT fishing mortality.

Some CCMs supported the importance of having accurate spatial and temporal data on catches of JBYT available to the Scientific Committee to facilitate the evaluation of mitigation measures and development of research priorities. The Chair sought clarification as to the ability of the Scientific Committee to collate information on catches of catches of JBYT taken in association with FADs. The Oceanic Fisheries Programme (OFP) of the Secretariat of the Pacific Community (SPC) advised that their group could provide these data if directed by a detailed information request. It was suggested that catch and effort data for JBYT in five-degree square areas encompassing MULTIFAN CL areas 3 and 4 of the 6-area model would suffice. The Chair advised that due to limitations in time during plenary, a more thorough experimental design to examine specific management options would have to be developed after the second session of the Scientific Committee.

The reduction of effort by FAD-directed purse-seine effort was proposed by a CCM as an effective mitigation measure to reduce JBYT catch. It was recognized that directed management of fisheries considered to be primarily responsible for JBYT fishing mortality was an efficient way to proceed. However, the Chair noted that implementation of specific management options was the responsibility of the Commission rather than the Scientific Committee whose role was to support the science behind management decisions.

There was discussion from CCMs as to the relative importance of acquiring data and managing fisheries of the Philippines and Indonesia versus the importance of regulating JBYT fishing mortality from high seas zones. It was noted that an over-riding and common feature of JBYT catch from both the Philippines, Indonesia and high seas fisheries was the use of FADs. There was substantial discussion of what basic information on FADs and JBYT catch is needed from both high seas and coastal states. It was noted that the Scientific Committee and WCPFC would benefit from examining the experience and actions of other regional fisheries management organizations (RFMOs) in regulating FADs and JBYT in their respective areas. CCMs noted that examination of seasonal and area closures in the Gulf of Guinea by the International Commission for the Conservation of Atlantic Tunas (ICCAT) may be particularly useful.

There was general comment on the importance of FADs to purse-seine fleets for some CCMs, and there was a question as to whether the Commission was seeking guidance on research needs in relation to FADs and reducing catches of JBYT. The Chair noted that some research on acoustic selectivity and behaviour of FAD-associated tuna and other species was available, but that additional research was required. Reference was made to the tagging project recently initiated by SPC and the National Fisheries Agency of Papua New Guinea and its importance in providing valuable information on the impact of FADs on the behaviour of associated tuna species. A recently initiated Pacific Islands Forum Fisheries Agency (FFA) study to review FAD use by fleet and the management of FAD-based purse-seine effort will assist in clarifying these issues.

The Chair noted that data inputs necessary to design experiments and allow evaluation of management options based on gear design and operational aspects can be collected by well designed observer and port sampling programmes. The need to increase and improve the quality and level of monitoring of WCPO fisheries was noted.

Discussion followed to develop specific recommendations in response to the Commission's request to evaluate mitigation measures for JBYT taken around FADs. The following recommendations were developed by the meeting and adopted by consensus.

RECOMMENDATIONS TO THE COMMISSION

1. The Commission’s Science Service Provider should review spatio-temporal aspects of catches of JBYT caught in association with FADs and refine analyses of potential management options that the Commission might adopt in order to reduce such catches, including cooperation with other RFMOs to identify appropriate mitigation measures.

2. CCMs should continue research into acoustic selectivity to avoid juvenile bigeye and yellowfin as well as research into the vertical distribution and residence time of JBYT on FADs.

3. CCMs should ensure that relevant information (relevant to mitigation based on gear and operational modes) is being collected through observer programmes and port sampling and submitted to the Commission in order to assess the impacts of FADs and other technological aspects on catches of JBYT.

Attachment O

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

REPORT OF THE THIRD MEETING OF THE STEERING COMMITTEE OF THE INDONESIA AND PHILIPPINES DATA COLLECTION PROJECT

The third meeting of the Indonesia and Philippines Data Collection Steering Committee was held on 4 and 8 August 2006, in Manila, Philippines, during the second regular session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. The meeting was attended by participants from Indonesia (Dyah Retnowati, Wudianto) and the Philippines (Winifredo Amandy, Noel Barut, Elaine Garvilles, Estella de Ocampo, Romeo Recide, Cynthia Vallesteros); donor CCMs including Chinese Taipei (Chung-Hai Kwoh), New Zealand (Kim Duckworth) and the United States of America (Ray Clarke, Robert Skillman); the Chair of the Scientific Committee (Dae-Yeon Moon); the Western and Central Pacific Fisheries Commission (WCPFC) Secretariat (Andrew Wright, SungKwon Soh); and the Secretariat of the Pacific Community Oceanic Fisheries Programme (Tim Lawson, Peter Williams). Kim Duckworth also attended as Chair of the Statistics Specialist Working Group of the Scientific Committee. Participants from Japan (Yuji Uozumi) and the Food and Agriculture Organization of the United Nations (Sachiko Tsuji) also attended.

Appointment of Chair and rapporteur

Tim Lawson was elected Chair of the Steering Committee. Tim Lawson and Peter Williams were appointed rapporteurs.

Adoption of agenda

The agenda presented in Appendix I was adopted.

Status of financial contributions

Actual and anticipated contributions and expenditures are presented in Appendix II. $140,000 have been received from Chinese Taipei, New Zealand and the United States, and $131,047 have been used for activities in the Philippines during 2005 and 2006, in accordance with the decision made at the first meeting of the Steering Committee, which was held on 21 April 2004 in Bali, Indonesia, during PrepCon VI.

The current balance of Indonesia and Philippines Data Collection Project (IPDCP) funds is $8,953. It is anticipated that a contribution of $40,000 from France will be transferred to the

Commission during 2006. However, the anticipated balance of $48,953 will not be sufficient to fund activities in Indonesia, for which $147,651 have been budgeted. IPDCP activities in Indonesia will consist primarily of port sampling; however, in contrast to the Philippines, where a port sampling programme already existed, a port sampling programme will need to be established in eastern Indonesia. It is therefore important that the full two years' funding be available before commencing activities in Indonesia. In this regard, an additional $98,687 are required.

Romeo Recide and Noel Barut reported that funding by the Government of the Philippines for port sampling and surveys in 2007 is unlikely to be at the level of the combined funding by the Philippines government and the IPDCP during 2005 and 2006. Therefore, while the Philippines government is expected to provide some funding, it almost certainly will not be sufficient to maintain port sampling and surveys at the 2005–2006 level.

Andrew Wright, Executive Director of the WCPFC, advised that the Global Environment Facility (GEF) had expressed interest in funding a project in Indonesia, the Philippines and Vietnam. It was noted that anecdotal evidence suggests that catches of pelagic tunas in Vietnam had increased to about 40,000 tonnes in recent years, yet no annual catch estimates, catch and effort data or size data were available. The objectives of the project would be to 1) establish or improve the collection of tuna fishery data, and 2) promote good governance with regard to the management of tuna fisheries. Funding of $1 million may be available for a project of a duration of three to five years; however, if successful, it is anticipated that 18–24 months may be required to develop the project.

The Steering Committee recommended that the Executive Director continue to liaise with GEF, Indonesia, the Philippines and Vietnam to develop a data collection and governance project for those countries.

Noting that GEF funding, if forthcoming, would not be available for 18–24 months, the Steering Committee recommended that CCMs continue to be invited to contribute, as soon as possible, an additional $100,000 to implement port sampling in Indonesia in 2007–2008.

Concern was expressed with respect to the continuity of the collection of data in Indonesia, the Philippines and Vietnam, given that catches from this area represent about 30% of the catch in the Convention Area and that the lack of data has been a primary source of uncertainty in assessments of the stocks of tuna. In this regard, it was recommended that the Commission consider funding data collection in this area through its core budget.

Review of IPDCP activities in the Philippines

Romeo Recide and Noel Barut reported on activities conducted by the Bureau of Agricultural Statistics (BAS) and the National Fisheries Research and Development Institute (NFRDI) respectively.

At the second meeting of the Steering Committee in December 2005, it was reported that NFRDI hired 16 enumerators with IPDCP funds, who conducted sampling in 14 ports during 2005, and two encoders to enter the port sampling data. This level of sampling has continued during 2006, although sampling in Region 9 (Zamboanga) ceased in July, due to the uncertainty of the renewal of the contracts of samplers, which is based on the level of funding by the national government.

The Assistant National Tuna Coordinator (ANTC), Elaine Garvilles, was hired in early 2005 and has successfully managed the IPDCP activities implemented by NFRDI. In 2006, she further

discussed the establishment of a catch and effort logsheet system with the National Tuna Industry Council, and it is expected that the system will be implemented on purse seiners in 2007. Data collected since the beginning of the port sampling programme in 1997, but which had not been forwarded to NFRDI headquarters, have now been compiled, under Elaine Garvilles' supervision, although data from some regions are still missing or need to be converted to the current database format.

BAS has continued the level of Commercial and Municipal Fisheries Surveys that was achieved during 2005, when 32 Contractual Data Collectors (CDCs) and three Contractual Data Processors (CDPs) were hired. However, a delay in the disbursement of funds in early 2006 meant that surveys did not commence until March.

The meeting considered the need for an external review of the port sampling and surveys, and a meeting to review IPDCP activities in the Philippines at the conclusion of the initial two years of the project at the end of 2006. It was agreed that the funds allocated to the external review and the meeting in the project budget would be better used for continuing the port sampling and surveys in case, as expected, insufficient funds are available from the Philippines government for 2007. Instead of a meeting to review the initial two years of the project, a review document will be prepared and circulated for comment by email. It was also agreed that it would be appropriate for NFRDI to allocate funds (about $600) originally budgeted for supplies to the hiring of samplers.

It was also agreed that the visit by Peter Williams to the Philippines in late 2006, which was originally proposed to provide programming support for the tuna fisheries database system at NFRDI, would be used to develop statistical procedures to incorporate the port sampling data compiled by NFRDI into the annual catch estimates produced by BAS. It would be appropriate for this visit to take place in early 2007, after BAS has estimated catches during 2006.

Plans for IPDCP activities in Indonesia

It was reported that Craig Proctor of the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Hobart, Australia, and Budi Nugraha of the Research Centre for Capture Fisheries in Jakarta, Indonesia have nearly completed their review of the tuna fisheries and the current statistical system in eastern Indonesia. They visited Jayapura, Sorong and Biak in Papua in September 2005, and Bitung, Ternate, Kendari and Bone in 2006.

The meeting discussed whether a workshop to consider recommendations from the review conducted by Craig Proctor and Budi Nugraha and to plan the implementation of port sampling and an observer programme should be held, in spite of the fact that funding for port sampling is not yet available. It was agreed that the meeting should be held, given that it would be useful to consider the recommendations of the review and that the report of the meeting would be a useful document in regard to the development of the GEF proposal. It was decided that the workshop would be held from 27–28 November 2006 and that all interested parties (e.g. government, industry and universities) should be invited to attend.

It was noted that a longline observer programme funded by the United States of America and implemented by the World Wildlife Fund was being conducted in Indonesia. The meeting agreed that representatives of the WWF project should be invited to participate in the workshop.

Other matters

There were no other matters.

Appendix I

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

AGENDA

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1. Appointment of Chair and rapporteur
2. Adoption of the agenda
3. Status of financial contributions
4. Review of IPDCP activities in the Philippines
5. Plans for IPDCP activities in Indonesia
6. Other matters

Appendix II

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

CONTRIBUTIONS AND EXPENDITURES

DATE	ITEM	CURRENCY	AMOUNT	RATE	DEBIT	CREDIT	BALANCE
					USD	USD	USD
2004	Chinese Taipei					20,000	20,000
2004	United States					60,000	80,000
Nov 2004	Philippines -- Year 1 -- SPC	XPF	290,990	91.10	3,194		76,806
Dec 2004	Philippines -- Year 1 -- NFRDI	PHP	1860000	56	33,131		43,674
Dec 2004	Philippines -- Year 1 -- BAS	PHP	1,337,200	56.13	23,823		19,851
Jan 2005	Philippines -- Year 1 -- BAS	PHP	162800	55	2,958		16,893
Nov 2005	Philippines -- Year 1 -- SPC	PHP	192,800	55.43	3,478		13,414
Dec 2005	New Zealand					60,000	73,414
Dec 2005	Philippines -- Year 2 -- NFRDI	PHP	1,700,000	55.43	30,669		42,745
Dec 2005	Philippines -- Year 2 -- BAS	PHP	1260000	55	22,731		20,014
2006	Philippines -- Year 2 -- SPC	PHP	613,086	55.43	11,061		8,953
2006	France					40,000	48,953
	Indonesia -- Year 1	IDR	672,009,000	9,114	73,734		(24,780)
	Indonesia -- Year 2	IDR	673,678,324	9,114	73,917		(98,697)

Attachment P

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

STRATEGIC RESEARCH PLAN 2007–2011

INTRODUCTION

The Convention and the Commission

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC) was established by the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (the Convention). The objective of the Convention is to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean.

The Commission is tasked with developing and adopting specific measures to promote these objectives, as detailed in Articles 5 and 6 of the Convention. Fundamental duties of the Commission necessary to promote conservation, sustainability and optimal utilization that are supported by science-based information include:

- assessing the impact of fishing on marine resources and the western and central Pacific Ocean (WCPO) ecosystem;
- protecting biodiversity and promoting ecosystem based approaches to management;
- minimizing waste, pollution and impacts on both target and non-target or associated or dependent species (NTADs);
- preventing or eliminating overfishing and excess fishing capacity;
- promoting the collection, compilation and dissemination of complete and accurate fisheries data and information from national and international research programmes.

To implement and enforce these goals, the Commission is required to utilize the best scientific evidence available. This evidence must be incorporated into a fishery management regime consistent with the principles of the precautionary approach and in consideration of target species, NTADs, environmental factors and habitats of special concern.

The Scientific Committee

Article 11 of the Convention establishes a Scientific Committee, the functions of which are described in Article 12. They include reviewing the results of research, analysis and status assessments of target stocks or NTADs in the Convention Area and to assist development and assess information resulting from a regional observer programme[1].

The Convention requires that the Scientific Committee recommend a research plan to the Commission[2]. The Strategic Research Plan[3] described here has been prepared in response to this requirement. The Plan will be complemented by rolling work plans, reviewed and amended annually as appropriate by the Scientific Committee.

This Strategic Research Plan is intended to serve an initial period of five years from 2007. As there will be an ongoing need for an adaptive research plan to support the Scientific Committee's objective of providing the best available scientific advice, the Plan will be periodically reviewed to ensure it remains responsive to the Commission's needs.

RESEARCH PRIORITIES

The Commission has four overall research and data collection priorities:

- collection and validation of data from the fishery
- monitoring and assessment of stocks
- monitoring and assessment of the ecosystem
- evaluation of management options

Collection, compilation and verification of data from the fishery

Data from the fishery are required to monitor catch and effort, and are an essential input to stock assessment. Increases in data quality and coverage will enable more accurate estimates of catches and are key to reducing uncertainty in stock assessments. Data are also required for tracking fleet dynamics and monitoring changes in the fisheries. A critical role of the Scientific Committee is to promote the collection and compilation of all necessary data and to assist in increasing data accuracy and coverage. Research activities include:

- estimating total fishing effort, catches and related mortalities of target and non-target species, stratified, as appropriate, by area, time, species or stock, size, sex and other characteristics;

[1] Including work undertaken by scientific experts engaged by the Commission under Article 13, and for the observer programme, in conjunction with the Technical and Compliance Committee.

[2] Article 12(2)(a)

[3] for the period 2006 to 2011

- monitoring the accuracy and coverage of operational-level catch and effort data, aggregated catch and effort data, and size composition data compiled by the Commission, and developing programmes to improve accuracy and coverage and to address data gaps that are identified;

- developing programmes for the collection and compilation of related fisheries data, such as gear and vessel attributes, and other information, that can be used to standardise fishing effort and estimate fishing capacity and effective fishing effort;

- rescuing historical fisheries and related data;

- developing draft standards for the collection of operational catch and effort data, port sampling data, observer data and other types of data, as required, including minimum standards for data collection forms;

- developing sampling designs, including sampling protocols, for the collection of data through observer and port sampling programmes; and

- developing programmes to assist Members and Cooperating Non-members in meeting data-related Convention obligations.

Monitoring and assessment of stocks

Stock assessment and modelling are the primary scientific tools used to estimate the condition of fish stocks and to evaluate the efficacy of conservation measures. Structural uncertainty in stock assessment derives, in part, from inaccurate or incomplete data from the fishery, mistaken assumptions about underlying biological processes, and lack of understanding of fishing vessels operations. Addressing uncertainties in stock assessment is a useful guide to assigning priorities to components of scientific the programme.

Stock assessment and modelling

Research activities directly supporting stock assessments include:

- Routine application of existing methods;

- Characterisation of statistical and structural uncertainty in stock assessments;

- Improvement of existing methods and development of new methods;

- Refinement of biological reference points for use in stock status determination;

- Use of simulation models to evaluate the sensitivity of stock assessment tools to violation of specific assumptions about biological processes (e. g. the dependency of natural mortality on age); and

- Improvement of data inputs to stock assessment models, in particular analyses to standardise fishing effort or catch-per-unit-effort to provide reliable indices of abundance.

Biological studies

Understanding of key biological processes and the identification and definition of regional variability in these processes in an area as large as the WCPO is required to underpin stock assessments of target species and selected NTADs. Enhanced understanding of these processes will reduce "structural" uncertainty and possible bias in stock assessments. Required studies include:

- age and growth of pre- and post-recruit segments of the population;
- reproductive parameters and capacity;
- length, weight and sex composition in response to environmental and anthropomorphic factors;
- characterisation of stock structure;
- movement and migration;
- behaviour and habitat utilisation;
- recruitment variability and the environmental influences thereon; and
- tagging studies.

Tagging is an important tool for biological and behavioural studies of fish and has special importance in the assessment highly migratory fish stocks (HMS). Stock assessments for other types of fish (e. g. small pelagic and demersal species), benefit greatly from "fishery independent" survey data, which provide information on population size independent of data from the commercial fishery. Such survey data can potentially reduce the bias and uncertainty in the stock assessments. Unfortunately, routine scientific survey methods are not applicable to HMS because of the large geographical scales and resultant costs. Tagging studies on all scales are the closest approximation to fishery independent data currently available to support WCPFC management activities. Tagging studies provide information on rates and direction of movement, mortality, habitat utilization, aggregation and vulnerability, all of which are directly used in the stock assessments. Tagging activities include:

- mass tagging with conventional tags to determine large-scale population movement and mortality rates;
- specialized deployment of data storage tags, both conventional archival tags and pop-up satellite tags, to better define horizontal and vertical habitat preferences;
- deployment of other types of electronic tags to determines small-scale movements in relation to natural features and floating objects, such as fish aggregating devices; and
- implementation of comprehensive tag recovery procedures, and studies (e.g. tag seeding) to estimate the rates of reporting of recaptured tags.

Monitoring and assessment of the ecosystem

The ecosystem approach to fisheries requires managers to consider more than the impact of the fishery on single target stocks. Additional considerations include assessing the impact of environmental variability on target stocks, and assessing the impact of the fishery on other species including prey, competitors, species caught in association with the target species (NTAD or non-target, associated and dependent species), and on habitat. Research activities include:

- undertaking regular ecological risk assessments (using Productivity-Susceptibility Analysis or other approaches), to identify priorities for enhanced monitoring, biological research, stock assessment and management intervention;

- establishing ecosystem indicators to monitor the effects of fishing, other anthropogenic effects and natural variability on ecosystem structure, function and biodiversity;

- identifying habitats of special concern, and the fishery impacts, other anthropogenic impacts and the effects of environmental variability thereon;

- estimating maximum aggregate yield of all species that can be safely removed from the ecosystem without disrupting ecosystem structure and function;

- identifying oceanographic features, processes and fishing practices that influence the distribution and abundance of fish stocks and their vulnerability to fishing gear;

- investigating trophic relationships (food webs, aggregation, maturity, spawning, ecological modelling, predator/prey relationships, depredation, etc.);

- synthesising data and ideas across disciplines into ecosystem-based models; and

- conducting bycatch mitigation research.

Evaluation of management options

The impacts of potential management measures on target stocks, NTADs and the ecosystem as a whole (including socioeconomic impacts) should be considered by the Commission where possible before the implementation of such measures. In particular, insights into the robustness and effectiveness of management measures in achieving the objectives of the Commission, and the associated trade-offs across these objectives, under uncertainty in our current understanding of population and ecosystem dynamics can be obtained from computer simulations. Such simulations may range in complexity from simple projections or equilibrium yield analyses incorporated into single species stock assessment models to complex multi-species management strategy evaluation (MSE) models, in which the stock, fleet and ecosystem dynamics, fishing impacts, data collection, stock assessment, management response and management implementation are modelled as a single integrated system. The research required to develop an MSE framework for the WCPO convention area includes:

- Development of an appropriately structured multi-species operational model that incorporates, inter alia, the effects of oceanographic variability;

- Development of behavioural models of fleet dynamics, including bio-economic models which integrate resource and fleet dynamics;

- Quantification of management objectives and the development of biological and economic performance indicators against which the achievement of management objectives can be assessed;

- Development of candidate feedback decision-rules for updating management measures in response to assessment outcomes;

- Characterisation of uncertainty in the evaluation of management measures;

- Development of computer software, or adaptation of existing software, to integrate the above models with modules simulating data generation, assessment, management response and implementation.

IMPLEMENTATION AND REVIEW

Monitoring the implementation of this Strategic Research Plan will be the responsibility of the Chair of the Scientific Committee in collaboration with the Executive Director. Members of the Commission, including Cooperating Non-members, participating territories, observers, scientific experts and the Secretariat will share responsibility for implementation of the Plan. Opportunities to take responsibility for activities supporting implementation of components of the Plan will be considered at each meeting of the Scientific Committee.

At each regular session of the Scientific Committee each Specialist Working Group (SWG: Statistics, Fishing Technology, Methods, Biology, Stock Assessment and Ecosystems and Bycatch) will review the elements of the Plan relevant to their respective terms of reference and will develop operational work programmes consistent with the Plan. Coordination of the review and work programme development will rest with the Chair of the Scientific Committee in consultation with convenors of the SWGs, the manager of the science provider and the Executive Director.

Opportunities to involve individuals and institutions from developing countries and territories should be a strong feature of the implementation of the Plan. Promoting such involvement should be aimed at both utilising available expertise from developing countries and territories, and at providing important opportunities for building scientific and technical capacity within those countries and territories.

Full implementation of the Strategic Research Plan will probably be beyond the means of the Commission's core budget. Extra-budgetary funds from voluntary contributions of Members and other sources will be required. Nevertheless, adoption of the Plan by the Scientific Committee and subsequent strong support from the Commission is a prerequisite to securing the necessary extra-budgetary funds.

An independent external review of the Plan will take place every five years. The Scientific Committee will be responsible for preparing the terms of reference for the review. The Scientific Committee will present the report of the review to the next regular session of the Commission.

RELATIONS WITH OTHER ORGANISATIONS

Article 22 of the Convention provides that the Commission will consult, cooperate and collaborate with other relevant organizations, particularly those with related objectives and which can contribute to the attainment of the objective of the Convention. In relation to this Plan, relationships with the following institutions are of particularly significance.

Technical and Compliance Committee

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that the Technical and Compliance Committee is consulted on any element of the Plan directly relevant to the functions of the Technical and Compliance Committee.

The Executive Director will provide the Technical and Compliance Committee with copies of reports of the Scientific Committee relating to implementation and review of the Plan.

This commitment will be reflected in the memorandum of understanding (MOU) developed between the Scientific Committee and the Technical and Compliance Committee.

International Committee for Scientific Research on Tuna and Tuna-like Species in the North Pacific

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that the International Committee for Scientific Research on Tuna and Tuna-like Species in the North Pacific (ISC) is informed of relevant elements of the Plan that may have a bearing on the research conducted by the ISC.

This commitment, together with a commitment to collaboration, consultation and coordination, is reflected in the Memorandum of Understanding developed between the Commission and the ISC.

The ISC will be invited to participate in each regular session of the Scientific Committee.

Inter-American Tropical Tuna Commission

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that the Director of the Inter-American Tropical Tuna Commission (IATTC) is informed of any element of the Plan directly relevant to the functions of IATTC.

This commitment, together with a commitment to collaboration, consultation and coordination, is reflected in the Memorandum of Understanding between the Commission and the IATTC. The MOU provides for collaboration with respect to the collection and sharing of data and information, subject to data sharing protocols of each organisation, the development and implementation of joint research initiatives and the harmonisation of conservation and management measures.

The IATTC will be invited to participate in each regular session of the Scientific Committee.

Secretariat of the Pacific Community – Oceanic Fisheries Programme

As the provider of scientific services, provided for under Article 14 of the Convention, the Secretariat of the Pacific Community – Oceanic Fisheries Programme (SPC-OFP), will have a pivotal role in the Scientific Committee's monitoring, review and periodic refinement of the Plan.

SPC-OFP is a standing member of the Scientific Committee and, as scientific expert to the Commission has the capacity to report directly to the Commission n science matters.

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that SPC-OFP is consulted a regular intervals between regular sessions of the Scientific Committee on progress with implementation of the Plan. An MOU between the Commission and SPC-OFP reflects these arrangements.

Indian Ocean Tuna Commission

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that the Director of the Indian Ocean Tuna Commission (IOTC) is informed of any element of the Plan directly relevant to the functions of the IOTC. Strong similarities exist between the fisheries and fishery management concerns and objectives of each regional fisheries management organization (RFMO). Implementation of research plans by both organizations will benefit from open and transparent communication in many areas, including research related to purse seine and longline fisheries, data collection and verification, illegal, unregulated and unreported (IUU) fleets, capacity and vessel registries. The geographic areas of concern to each party overlap in Southeast Asia, further reinforcing the need for collaboration. Tuna tagging programmes are active within both Commission areas, which will test the ability of both organizations to organize a single, coherent tag recovery and reward system in cooperation with coastal states and distant-water fishing nations. Due to the fact that frozen tagged tuna will move between ocean basins for processing, some formal link and communication bridge between RFMOs and their research plans would be desirable.

Food and Agriculture Organization

The Commission's Rules of Procedures provide for the participation of FAO in the meetings of the Commission and its subsidiary bodies. In relation to the Scientific Committee and this Research Plan potential areas for collaboration include the Coordinating Working Party on Fishery Statistics (CWP, www.cwpnet.org) and the Fishery Resources Monitoring System (FIRMS) which is part of the FAO Fisheries Global Information System (FIGIS, a network of integrated fisheries information). FIRMS draws together a unified partnership of international organizations, regional fishery bodies and, in the future, national scientific institutes, collaborating within formal agreement to report and share information on fisheries resources. For effective fisheries information management, FIRMS also participates in the development and promotion of agreed standards.

Attachment Q

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

RULES OF PROCEDURE FOR THE WCPFC SCIENTIFIC COMMITTEE

APPLICATION AND INTERPRETATION

Rule I

1. These Rules shall apply to the Scientific Committee or bodies recommended for establishment by the Committee and endorsed by the Commission (hereinafter referred to as "Working Group").

2. Where these Rules are silent on an issue, the Committee and Working Group shall apply the Rules of the Procedure of the Commission to the extent practicable with a view to ensuring its deliberations and proceedings are conducted in a practical and non-bureaucratic manner in order to facilitate the discharge by the Committee or Working Group of its responsibilities under the Convention.

REGULAR SESSIONS

Rule II

1. The Committee shall hold one regular annual session unless otherwise decided by the Commission. The regular annual session of the Committee shall be held at least two calendar months prior to the regular annual session of the Commission unless otherwise decided by the Commission.[1]

2. The Committee shall recommend, to the extent practicable, before the conclusion of its regular annual session, the dates, venue and duration of its next regular annual session. Upon approval by the Commission, the Executive Director shall notify Members, each territory referred to in Article 43 of the Convention, Cooperating Non Members (CNMs), and observers of the dates and venue of the next regular annual session of the Committee at least ninety (90) days before the opening of its regular annual session.

3. Unless otherwise agreed by the Committee, all meetings of the Committee shall be held at the headquarters of the Commission.

AGENDA FOR REGULAR SESSIONS

[1] When scheduling the regular annual sessions of the Committees established by the Commission, and such other subsidiary bodies or Working Groups established by the Commission, due consideration will be made so that these meeting are not held concurrently.

Rule III

1. The Convenor shall draw up a provisional agenda for the regular annual session of the Committee, in consultation with the Executive Director and the Chair of the Commission.

2. The provisional agenda shall be based on the functions of the Committee as described in the Convention, requests from the Commission, and, where applicable, the adopted work programs of the Committee.

3. The Convenor shall circulate the provisional agenda to all Members, territories referred to in Article 43 of the Convention, CNMs, and observers at least sixty (60) days before the opening of the regular annual session of the Committee. Members, territories referred to in Article 43 of the Convention, and CNMs may at any time suggest additional agenda items which shall be made at least fifteen (15) days before the opening of the regular session of the Committee. The Committee may agree to make additional changes to the provisional agenda at its regular annual session.

4. Where the Committee is required to meet in a special session decided by the Commission, the Convenor shall circulate the provisional agenda at least thirty (30) days before the date at which the meeting is to be held.

ELECTION OF CONVENOR AND VICE-CONVENOR

Rule IV

1. The Committee shall elect a Convenor and a Vice-Convenor from among its Members or territories referred to in article 43 of the Convention. The Convenor and Vice-Convenor shall assume office at the end of the next regular annual session of the Commission and shall remain in office until their successors are elected and assume office. The Convenor and Vice Convenor shall serve a two-year term and may be reelected for one additional consecutive two-year term.

2. In the absence of the Convenor, the Vice-Convenor shall assume all duties and responsibilities of the Convenor.

3. The Convenor and Vice-Convenor shall be elected by consensus. If the Convenor and, where applicable, the Vice-Convenor cannot be elected by consensus, they shall be elected by a simple majority vote of Members of the Committee present and voting. Voting shall be by secret ballot. Once the Convenor is elected, voting, where applicable, for the Vice-Convenor shall take place immediately using the same procedure. If in the first ballot, no candidate obtains the necessary majority of the votes cast, a second ballot restricted to the two candidates obtaining the largest number of votes shall be taken. If in the second ballot the votes are equally divided, balloting shall be continued until one candidate secures the necessary majority of the votes cast.

REPLACEMENT OF THE CONVENOR OR VICE-CONVENOR

Rule V

1. If the Convenor or Vice-Convenor is unable to carry out his or her functions or ceases to be a representative of a Member or territory referred to in article 43 of the Convention, or if a Member of which the Convenor or the Vice-Convenor, as the case may be, ceases to be a Member of the Commission, he or she shall cease to hold office and a new Convenor or Vice-Convenor shall be elected for the unexpired term. A person so elected may stand for re-

election on expiry of that term and may subsequently serve for a maximum of two consecutive terms in accordance with Rule 4 of these Rules of Procedure.

2. Where necessary, the Executive Director may coordinate nominations and elections for a new Convenor or Vice-Convenor electronically.

FUNCTIONS OF THE CONVENOR

Rule VI

1. The powers and duties of the Convenor or Vice-Convenor, when acting as the Convenor, shall be to:

- determine, distribute, and solicit comments on the draft agenda at least sixty (60) days in advance of each meeting;
- declare the opening and closing of and preside at meetings;
- direct discussions and rule on points of order, subject to the right of any representative to request that any ruling of the Convenor be submitted to the meeting for decision;
- strive for consensus, and if efforts to achieve consensus fail, report majority and minority views;
- transmit the summary report of each meeting to the Commission, each Member, each territory referred to in article 43 of the Convention, each CNM, and others concerned, as appropriate;
- make such decisions and give such directions as will ensure, especially in the interval between meetings, that the business of the Committee, is carried out efficiently and in accordance with its decisions and directives from the Commission; and
- make a presentation to the Commission and other subsidiary bodies, as appropriate, on the work and recommendations of the Committee.

REPRESENTATION

Rule VII

1. Each Member of the Commission and each territory referred to in article 43 of the Convention, shall be entitled to appoint one representative to each session of the Scientific Committee. Such representative may be accompanied by other experts and advisers. Such representatives shall have appropriate technical qualifications or relevant experience.

2. Each CNM shall be invited to participate in the work of the annual regular sessions of the Scientific Committee.

3. Each Member of the Commission, territory referred to in article 43 of the Convention, CNM, or observer, shall submit the names of its representatives and advisers to the Convenor of the Committee no later than twenty-four (24) hours after the opening of the session in such standard form as the Secretariat may develop.

OBSERVERS

Rule VIII

1. States, inter-governmental organizations, and non-governmental organizations who have been admitted as observers to the Commission under Rule 36 of the Rules of Procedure of the Commission may participate as observers in the Committee and Working Group.

2. Observer States and inter-governmental organizations may participate in the deliberations of the Committee and Working Group but shall not be entitled to participate in the taking of decisions. Such observers may submit papers to the meetings of the Committee and Working Group and may make written statements during the sessions of the Committee. Such papers and statements shall be distributed by the Secretariat to members of the Committee and Working Group. Papers contributed by observer States and inter-governmental organizations may, subject to Rule 9, form part of the official documentation of the meeting of the Committee, or as the case may be, Working Group.

3. A non-governmental organization may contribute papers and may make written statements within the scope of its activities which are relevant to the work of the Committee, or as the case may be, Working Group subject to the approval of the Convenor. Papers contributed by a non-governmental organization may be distributed by the Secretariat to members of the Committee and Working Group. Such papers may, subject to Rule 9, form part of the official documentation of the meeting of the Committee or, as the case may be, Working Group. If such papers are not considered part of the official documentation of the meeting of the Committee or, as the case may be, Working Group, they shall be recorded as a contribution from the non-governmental organization concerned for that particular meeting of the Committee or Working Group. A non-governmental organization may make an oral statement on matters within the scope of its activities upon the invitation of the Convenor but shall not be entitled to participate in the taking of decisions.

CONDUCT OF MEETINGS

Rule IX

1. The meetings of the Committee and Working Group will be conducted in a way that promotes the effective functioning of the Committee and Working Group, and to ensure that the Committee discharges its responsibilities under the Convention. To this end, the Committee and Working Group will conduct its meetings in a way that promotes the exchange of information.

2. The Committee may where appropriate develop guidelines for the conduct of its meetings. Such guidelines may relate, among other things, to:

a) Numbering of information and working papers submitted for the meeting by the Secretariat, members, territories referred to in Article 43 of the Convention, CNMs, and observer States and inter-governmental organizations;
b) Treatment of documents submitted by non-governmental organizations; and
c) Treatment of information that may be deemed to be confidential, in accordance with the Commission’s Information Security Policy.

TECHNICAL CONTACT

Rule X

1. Each Member of the Committee, territory referred to in article 43 of the Convention, and CNM shall notify the Executive Director of the person or persons who shall be the Technical Contact for the Committee or Working Group for the purposes of communications between the Secretariat and the Member, territory referred to in article 43 of the Convention, or CNM.

2. Each Technical Contact, who may also be the representative referred to under Rule 7 of these Rules of Procedure shall have primary responsibility for correspondence on technical matters, including meeting all requirements for timely submission of complete and accurate

data on behalf of the Member, territory referred to in article 43, or CNM in relation to the subsidiary body concerned.

3. Observers shall also notify the Executive Director of the person or persons who shall be the Technical Contact for the Committee or Working Group.

4. Official WCPFC contacts will be copied on all communications, if requested by the Member, territory referred to in article 43 of the Convention, CNM, or observer.

INVITED EXPERTS

Rule XI

1. The Committee and, if the case may be, Working Group, may invite other organizations or individuals with technical experts in matters related to the work of the Committee or Working Group to participate in its meetings. The Convenor, in consultation with the Secretariat, shall circulate the names of the organization or individuals to the Committee or Working Group at least [60] days before the meeting. If no objections are received within 45 days prior to the meeting, the Convenor shall issue invitations to organizations or individuals concerned.

2. Invited experts shall be allowed to participate in the deliberations of the Committee, or if the case may be, Working Group but may not take part in the taking of decisions.

3. In the case where the Committee is required to meet in a special session decided by the Commission, the Convenor shall circulate the names of the organization or individuals to the Committee or Working Group at least [30] days before the meeting. If no objections are received within 20 days prior to the meeting, the Convenor shall issue invitations to the organizations or individuals concerned.

WORKING GROUPS

Rule XII

1. The Committee may recommend to the Commission the establishment of a Working Group in accordance with Article 11(6) and Article 14(3) of the Convention as it deems necessary for exercise of its functions. Where the Committee recommends the establishment of a Working Group, that Working Group shall report its findings and conclusions to the Committee which made the recommendation for its establishment.

2. The terms of establishment of a Working Group may include its terms of reference and reporting schedule. A Working Group may conduct intersessional meetings through electronic communications.

3. A Working Group may be comprised of nominated representatives of Members, each territory referred to in article 43 of the Convention, CNMs, and other observers referred to in Rule 36 of the Rules of Procedure of the Commission with expertise in matters related to the work of the Working Group, which have been invited to participate in the work of the Working Group concerned in accordance with these Rules of Procedure.

4. Experts invited pursuant to Rule 11 of these Rules of Procedure, may also be invited to participate in the deliberations or work of a Working Group.

5. In order to minimize costs, the Working Group shall, as far as practicable, meet in conjunction with the Committee for which its work is related. If a meeting of a Working

Group is held separately from the Committee for which its work is related, the budget of the Commission shall include the costs necessary to support the travel and subsistence for one representative from each developing State Party and, where appropriate, territory and possession, to the meeting in accordance with Regulation 3.5 of the Financial Regulations of the Commission.

FACILITATOR OF WORKING GROUPS

Rule XIII

1. Each Working Group shall elect by consensus a Facilitator(s) with appropriate expertise and knowledge from amongst representatives of Members, territories referred to in Article 43 of the Convention, CNMs, or an invited expert pursuant to Rule 11 of these Rules of Procedure.

2. The functions and duties of the Facilitator(s) of a Working Group shall be to:
   a) coordinate work assignments;
   b) coordinate communications;
   c) organize meetings, including advanced preparation of agendas;
   d) schedule the list of presenters, as appropriate;
   e) appoint rapporteurs;
   f) ensure that assignments are completed as required;
   g) make such decisions and give such directions as will ensure, especially in the interval between meetings, that the business of the Working Group, is carried out efficiently and in accordance with its decisions and directives from the Commission;
   h) ensure its findings and conclusions are reported to the Committee which made the recommendation for its establishment; and
   i) develop multi-year work plans, as appropriate.

3. The Facilitator(s) shall facilitate discussions so to ensure that participants with differing views get an opportunity to be heard. The Facilitator(s) shall use his or her best endeavours to ensure the report of findings and conclusions of the Working Group is agreed by consensus. If every effort to achieve consensus has failed, the report shall indicate the majority views and may include the differing views of the representatives of the Members, territories referred to in Article 43 of the Convention, and CNMs on all or any part of the report.

4. The Facilitator(s) shall report to the Commission, or, where appropriate, to the Committee on the status of the work of the Working Group. Upon completion of its work, the Facilitator(s) shall provide a final report to the Commission, or where appropriate, the relevant Committee on the work and findings of the Working Group.

5. The Facilitator(s) shall serve for the duration of the work of the Working Group or for up to two-years from the date of first election, which ever comes first. The Facilitator(s) shall be eligible for re-election.

INFORMAL CONTACT GROUPS AND DRAFTING COMMITTEES

Rule XIV

The Committee may establish during its regular session, small informal contact groups, drafting committees, and such other small working groups for the purpose of advancing specific issues during the session of the Committee. Such groups designated during the

session of a meeting of the Committee shall not be deemed to be subsidiary bodies of the Commission.

REPORTS OF MEETINGS OF THE COMMITTEE

Rule XV

The Committee shall prepare a summary report of its findings, conclusions, advice and recommendations for the record and for distribution to the Commission and others concerned, as appropriate. The Committee shall make every effort to adopt its reports by consensus. If every effort to achieve consensus has failed, the report shall indicate the majority and minority views and may include the differing views of the representatives of the Members, territories referred to in Article 43, and CNMs on all or any part of the report.

Attachment R

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

INDEPENDENT REVIEW OF THE SCIENCE STRUCTURE AND FUNCTION OF THE COMMISSION

INFORMATION PACKAGE

Introduction

The Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (the Convention) entered into force in June 2004, creating one of the first regional fisheries management organizations to be established since the 1995 adoption of the United Nations Fish Stocks Agreement (the Agreement).

The objective of the Convention is to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the Agreement. For this purpose, the Convention establishes a Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC). A small Commission Secretariat is based at Kolonia, Pohnpei State, Federated States of Micronesia.

The Convention applies to all species of highly migratory fish stocks (defined as all fish stocks of the species listed in Annex I of UNCLOS occurring in the Convention Area and such other species of fish as the Commission may determine) within the Convention Area, except sauries. Conservation and management measures under the Convention are to be applied throughout the range of the stocks, or to specific areas within the Convention Area, as determined by the Commission. The Commission currently has 25 Members and two Cooperating Non-Members. The three Pacific Overseas Territories of France and Tokelau are Participating Territories within the Commission. Additional information concerning the Commission, including copies of recent decisions, is available from www.wcpfc.int
The Inaugural Session of the Commission in December 2004 adopted the Final Report of Working Group II which was concerned with science structure and functions of the Commission. Among other matters, the report recommended:

- a provisional science structure for the Commission for a transitional period (expected to last some three to five years and representing the period between the Convention coming into force and a fully functioning Commission);
- that, during this period, the structure and functions of the science secretariat be flexible and adaptable; and
- an independent review of the transitional structure and function be carried out two years after entry into force of the Convention, or earlier if required, to determine the effectiveness of the science structure and to recommend changes as appropriate.

These terms of reference have been prepared to solicit expressions of interest from suitably qualified and experienced individuals, institutions or firms to undertake the independent review. The expression of interest (EOI) should include a timetable for delivery of the consultancy outcomes and an estimate of the costs involved in undertaking the consultancy.

Objective

Using Articles 10 to 15 of the Convention as a basis, undertake, in consultation with interested Members, Cooperating Non-Members, and Participating Territories, a review of the science structure and science functions of the Commission.

Scope and Tasks

The review will cover all subsidiary bodies associated with the provision of scientific advice to the Commission.

The assignment will address, among other matters, the following questions in relation to scientific data functions and science functions of the Commission.

1) Scientific data functions

<u>During the transitional period</u>

- Have the respective roles and responsibilities of the Commission's data submission and data management arrangements been adequately defined and specifically, are there any gaps, overlaps, or areas of ambiguity?
- Are the Commission's rules and policies (or standards and specifications where they exist) regarding the security and confidentiality of data, including physical and electronic protection from unauthorised access, adequate?
- Has the Commission's data management performance been satisfactory in its provision of data custodianship services, and specifically have all of the Commission's rules and policies (or standards and specifications where they exist) for data compilation, processing, safekeeping and dissemination, been achieved?
- Are adequate resources available for both data stewardship and data custodianship services of the Commission?

<u>Following the transitional period</u>

What would be the advantages and disadvantages of each of the following options for the provision of data custodianship services to the Commission:

- Provision from within the Secretariat,
- Provision by a regional fisheries management organisation outside the Commission,
- Provision by an agency within the government of a member or participating territory,
- Provision by a private agency,
- Provision by the Oceanic Fisheries Programme (OFP) of the Secretariat of the Pacific Community (SPC).

2) Science functions

<u>Contracted research</u>

- Has contracted research been carried out to suitable standards?
- Have cost-effective outcomes been obtained from the contract research?
- Is there adequate communication between the research contractor, science manager and Scientific Committee?
- Are alternative cost-effective research options available?
- Is the research contracting process transparent?

- Are the contactors free of conflicts of interests?

Secretariat and the Scientific Committee

- Is the Secretariat adequately resourced to deal with the scientific matters (including data submission and data base contract management) of the Commission?
- Is the Scientific Committee functioning to meet the needs of the Commission? (e.g. is the best available information made available to the Commission, and its subsidiary bodies including the Northern Committee?)
- Following a review of the terms of reference of the specialist working groups, and the review the function of each Specialist Working Group (SWG), determine whether all or any SWGs should continue to exist? If so, is there any other function (SWG) necessary to reply to the requests of the Commission (e.g. economics)?
- Are other cooperative arrangements required?
- Is engagement with Members, including Pacific Island States and Participating Territories, adequate and balanced?

Outputs

1. Reviewer participates in 2007 ISC meeting.
2. Initial feedback to the third regular session of the Scientific Committee.
3. Final Report for the fourth regular session of the Scientific Committee. Due date: July 2008.
4. Final Report for the fifth regular session of the Commission. Due date: September 2008.

Reviewer Attributes

The reviewer(s) will be able to demonstrate:

- broad knowledge of marine science, fisheries biology, oceanography, socio-economics and data management;
- detailed knowledge of oceanic pelagic fisheries, preferably with an emphasis on highly migratory species;
- detailed understanding of the role and functions of regional fisheries management organisations particularly those primarily concerned with highly migratory species;
- expert knowledge in one or more of the following fields: fisheries stock assessment, fisheries statistics, fisheries biology and ecology;
- international standing in the field of fisheries research, preferably involving tuna; expertise in conflict resolution in group processes; and
- extensive experience in the formulation of scientific advice for fisheries management purposes.

Indicative Schedule

Task	**Timeframe 2006/2008**
Finalize reviewer attributes, process and TOR	SC2, August 2006
Advertise opportunity/call for EOI	1st quarter 2007
Close of EOI	30 April 2007
Select reviewer(s) (E-panel: Chair of SC, Chair of Commission and the ED)	31 May 2007
Formal and opportunistic consultations with full range of stakeholders	June 2007 to August 2008
Reviewer participates in the 2007 Annual meeting of the ISC (wrt	June/July 2007

advice provided to NC and SC)	
Reviewer participates in SC3	August 2007
Reviewer participates in Comm4	December 2007
Draft Report	1 June 2008
SC4	August 2008
Final Report	August 2008
Submission to Comm5 (together with comments from relevant stakeholders: NC, ISC, SPC-OFP and WCPFC Secretariat)	December 2008

Expressions of Interest

The consultancy will commence as soon as possible after the selection of the winning bid. Suitably qualified individuals, institutions or firms are invited to submit bids to undertake the assignment described above. Bids should include:

- a capability statement detailing qualifications and relevant experience for individual team members and/or the agency bidding for the consultancy;
- a work plan, with milestones and budget for the consultancy; and
- contact details for individuals who can comment on previous work by the bidder that is relevant to this consultancy.

The approximate budget for this assignment is US$ 80,000. In assessing the merits of all bids, cost efficiency and cost effectiveness will be important considerations in determining the preferred bidder.

Request for additional information relating to this consultancy and submissions of EOI should be submitted by close of business on Friday, 30 April 2007 to:

The Executive Director
Western and Central Pacific Fisheries Commission
PO Box 2356
Kolonia
Pohnpei State
Federated States of Micronesia
Phone: (691) 320 1992
Fax: (691) 320 1108
Email: wcpfc@mail.fm
Web: www.wcpfc.int

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Attachment S

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Second Regular Session

7–18 August 2006
Manila, Philippines

GUIDANCE ON THE SUBMISSION OF PAPERS TO THE THIRD REGULAR SESSION OF THE SCIENTIFIC COMMITTEE IN 2007

Submission of papers to WCPFC-SC3 in 2007

All papers for the Scientific Committee (SC) should address specific requests from the Commission or issues highlighted in the SC's work programme. Papers should contain specific advice to the SC for its consideration.

Based on 13–24 August 2007 being the dates for the meeting, the procedure for submission of papers will be as follows:

- **National Reports** must be submitted to the WCPFC Secretariat 30 days in advance of the start of WCPFC-SC 3 (**13 July 2007**) (Annual Report to the Commission Part 1) A two to three paragraph abstract should accompany the submission of the National Report.

- **Paper titles and a preliminary abstract** should be submitted to SWG conveners and the Chair of the Scientific Committee (Dr Dae Yeon Moon) by **6 July 2007** (five weeks in advance of the start of WCPFC-SC-3). SWG convenors in consultation with the Scientific Committee Chair would have the final say on which SWG will consider each paper, which papers are presented (i.e. Working Papers), and which are simply provided for information (Information Papers). Document numbers will be allocated at this time.

- **All papers (including an abstract that specifically addresses the agenda item under consideration)** must be submitted to the WCPFC Secretariat in electronic form by **25 July 2007** (18 days in advance of the start of WCPFC-SC-3) (and copied to relevant SWG convenors for planning purposes) to allow papers to be available on the website two weeks before the commencement of SC-3. The official version of the paper will be that published on the Commission website. Papers not received by this date will not be presented at SC-3, but may still be made available as Information Papers.

- **Papers** that are not available in the advance of the meeting (i.e. not on the website prior to the meeting) will not be discussed at the meeting.

All participants will be responsible for downloading papers and printing them out, should that be desired. Hardcopies of papers will not be provided. Electronic versions of papers will be available at the meeting.