



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

**Scientific Committee
Eleventh Regular Session**

**Pohnpei, Federated States of Micronesia
5-13 August 2015**

SUMMARY REPORT

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

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EXECUTIVE SUMMARY

AGENDA ITEM 1 - OPENING OF THE MEETING

Welcome address

1. The Eleventh Regular Session of the Scientific Committee (SC11) was held in Pohnpei, Federated States of Micronesia from 5–13 August 2015. Ludwig Kumoru (Papua New Guinea) chaired the meeting. The Commission Chair Rhea Moss-Christian delivered opening remarks, emphasising the value of science and knowledge and its critical place in decision making for the Commission. The new Executive Director Feleti Teo made a welcoming speech (**Attachment A**). Participants are listed in **Attachment B**.

2. The theme conveners and their assigned themes are:

Data and Statistics theme	L. Kumoru (PNG)
Stock Assessment theme	J. Brodziak (USA) and H. Nishida (Japan)
Management Issues theme	R. Campbell (Australia)
Ecosystem and Bycatch Mitigation theme	J. Annala (NZ) and A. Batibasaga (Fiji)

3. SC11 established five informal small groups (ISG) to facilitate the meeting process. The facilitators for the five ISG were:

ISG-1	Shark Research Plan and tuna stock assessment schedule	J. Larcombe (Australia)
ISG-2	WCPFC Tissue Bank Access Protocols	S. Nicol (SPC)
ISG-3	SC work plan and budget	L. Kumoru (PNG) assisted by R. Campbell (Australia)
ISG-4	Safe release of encircled animals/Guidelines for the survival of sharks from longline and purse seine gear	H. Kiyofuji (Japan)
ISG-5	Changes to longline observer data collection standards for bycatch	K. Bigelow (USA)

Adoption of agenda

4. The SC11 Provisional Agenda SC11-2015-02_rev1 was adopted without change (**Attachment C**).

AGENDA ITEM 2 REVIEW OF FISHERIES

2.1 Overview of Western and Central Pacific Ocean (WCPO) fisheries

5. The provisional total WCPFC Statistical Area tuna catch for 2014 was estimated at 2,860,648 mt, clearly the highest ever at 170,000 mt above the previous record catch in 2013 (2,690,881 mt); this catch represented 83% of the total Pacific Ocean catch of 3,486,124 mt, and 60% of the global tuna catch (the provisional estimate for 2014 is 4,783,629 mt, and when estimates are finalised is expected to be the highest on record mainly due to increased WCPFC Statistical Area catches).

6. The 2014 WCPFC Statistical Area catch of skipjack (1,957,693 mt – 68% of the total catch) was the highest recorded, eclipsing the previous record of catch in 2013 by 115,000 mt (1,842,485 mt). The WCPFC Statistical Area yellowfin catch for 2014 (608,807 mt – 21%) was also the highest recorded (5,000 mt higher than the record catch of 2008 – 603,244 mt) mainly due to increased catches in several longline fisheries. The WCPFC Statistical Area bigeye catch for 2014 (161,299 mt – 6%) was slightly higher than in 2013, but relatively stable compared to the average over the past ten years. The 2014 WCPFC Statistical Area albacore catch (132,849 mt - 5%) was slightly lower than in 2013 and about 15,000 mt lower than the record catch in 2002 at 147,793 mt. The WCPFC Statistical Area albacore catch includes catches of north and south Pacific albacore in the WCPFC Statistical Area, which comprised 76% of the total Pacific Ocean albacore catch of 173,702 mt in 2014. The south Pacific albacore catch in 2014 (83,033 mt) was the fourth highest on record (about 6,000 mt lower than the record catch in 2010 of 88,942 mt).

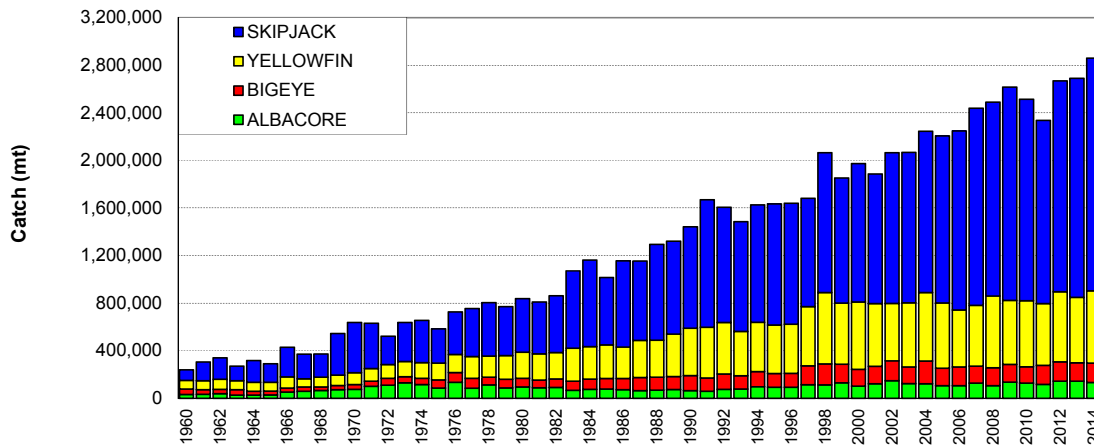


Figure 1. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCPFC Statistical Area.

7. The provisional 2014 purse-seine catch of 2,020,627 mt was the highest catch on record and more than 120,000 mt higher than the previous record in 2013 (1,899,627 mt). The 2014 purse-seine skipjack catch (1,587,018 mt; 79% of total catch) was the highest on record (about 105,000 mt higher than the previous record in 2013) and the main contributor to the total purse seine catch record. The 2014 pole-and-line catch (203,736 mt) was the lowest annual catch since the late-1960s, continuing the trend in declining catches for three decades. The provisional WCPFC Statistical Area longline catch (268,795 mt) for 2014 was slightly above the average for the past five years. The 2014 South Pacific troll albacore catch (2,221 mt) was the lowest since 2010. In line with the prevailing ENSO conditions, fishing activity during 2014 (El Niño-type conditions) expanded into the eastern tropical areas compared to 2013 (La Niña conditions). For the first time in many years, purse seine effort during 2014 in the area to the east of

longitude 160°E was more pronounced than in the area to the west of that longitude (i.e. PNG, FSM and Solomon Islands).

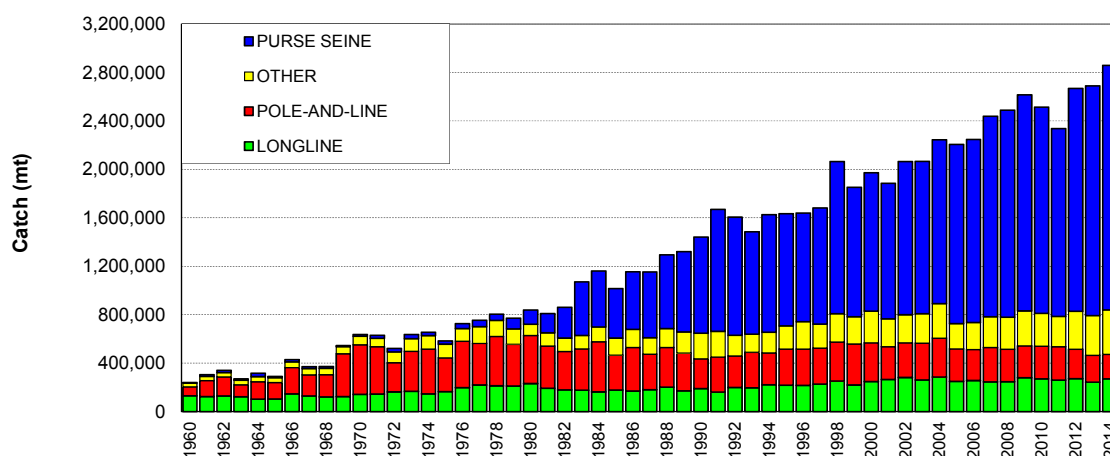


Figure 2. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCPFC Statistical Area, by longline, pole-and-line, purse seine and other gear types

8. SC11 recommends that the WCPFC scientific services provider investigate the possibility of presenting trends in purse seine fishery capacity using additional metrics (e.g. gross tonnage, carrying capacity) that are used in other t-RFMOs.

AGENDA ITEM 3 DATA AND STATISTICS THEME

3.1 Data gaps

3.1.1 Data gaps of the Commission

9. The main data gaps listed in working paper ST11-ST-WP-01 (Scientific data available to the Western and Central Pacific Fisheries Commission) are:

- The non-submission of operational data for several key fleets (Section 2.3);
- The non-submission of number of vessels in the aggregate data for two key fleets (Section 2.4);
- The need for improvement in the submission of catch estimates for the key shark species (Section 2.5) and reporting of discard estimates.

10. SC11 recommends that:

- a. The SC11-ST-WP-01 paper is revised to remove specific reference to the word “compliance” since, while it feeds into the compliance processes of the WCPFC, it is not intended to be the compliance evaluation, *per se*.**
- b. Clarification is sought from TCC11 on whether the significant amount of purse-seine size data provided to the WCPFC through the 100% observer-coverage requirement under the ROP should be considered as satisfying the flag-state scientific purse-seine size data provision.**

- c. The tier scoring system developed by the scientific services provider (SC11-ST-WP-01_rev1) for the evaluation of the provision of scientific data is used in the work of the TCC and the Commission, with the understanding that the respective ratings included in this paper are not necessarily agreed by each WCPFC CCM.

3.1.2 Species composition of purse-seine catches

Review of Project 60 outputs

11. SC11 recommends that:

- a. The WCPFC science/data service provider produce an update to Table 1 in ST-WP-02 annually (until an agreement on methodology can be reached) as it provides a very useful summary of the purse-seine catch estimates derived using the four different methods to ascertain catch composition.
- b. In regards to the implementation of observer spill sampling in the tropical purse seine fishery,
 - i. The WCPFC Secretariat and the WCPFC scientific services provider investigate operational aspects including alternatives for spill sampling on purse seine vessels where the current spill sampling protocol is difficult to implement and report back to SC12.
 - ii. The WCPFC scientific services provider will undertake additional data collection and analyses to evaluate the benefits of spill sampling compared to corrected grab-sampling.

3.2 Regional Observer Programme (ROP)

12. SC11 recommends that:

- a. WCPFC12 notes that a number of CCMs did not achieve the 5% observer coverage of their longline fleets according to the requirements in CMM 2007-01 and this is impacting on the SC's ability to address a number of scientific issues. Coverage of observer data submitted to the WCPFC (that is, Table 5 in SC11-ST-IP-02) be forwarded to TCC11 for consideration.
- b. The WCPFC Scientific services provider include an additional table in future versions of their paper on ROP Data Management (starting with SC12) which compares the coverage of longline observer trips, as provided by CCMs (Table 4 in SC11-ST-IP-02) with the coverage of data submitted for longline observer trips (Table 5 in SC11-ST-IP-02).

Marine pollution data collected by observers

- 13. SC11 agreed that the SC11-ST-IP-05 (Marine pollution originating from purse seine fishing vessel operations in the Western and Central Pacific region, 2004-2014), revised if necessary, should be presented at TCC11 where it is more suited for discussion and consideration.

3.3 Electronic monitoring and electronic reporting

- 14. SC11 noted and supported the recommendations in SC11-ST-WP-04 (Summary Report: First E-Reporting and E-Monitoring Intersessional Working Group Meeting).

3.4 WCPFC-funded Port Coordinators

15. No recommendations were made.

3.5 Fiji's membership of the Northern Committee

16. SC11 recommends that Fiji be admitted as a member of the Northern Committee.

AGENDA ITEM 4 STOCK ASSESSMENT THEME

4.1 WCPO tunas

4.1.1 WCPO bigeye tuna (*Thunnus obesus*)

Progress report on Project 35 (Refinement of bigeye parameters Pacific-wide)

17. SC11 recommends that funding be continued to maintain the Project 35: Bigeye Biology and WCPFC Tuna Tissue Bank, with particular emphasis on WCPO bigeye, yellowfin, and skipjack tunas. SC11 also recommends that the Commission adopt the "WCPFC Tissue Bank Access Protocols" developed within Project 35 and modified by ISG-2 at SC11 (Attachment D).

18. SC11 recommends that funding be provided for the analysis of Project 35 Tissue Bank samples, with a short-term focus on characterizing spatial and temporal variation in the growth of bigeye tuna.

Update of WCPO bigeye stock assessment

19. SC11 requests scientific services provider to evaluate the accuracy of short-term projections for the provision of stock status advice in the years for which there is no assessment via a retrospective analysis.

Pacific-wide bigeye tuna stock assessment

20. After the discussion among the involved CCMs, it was reported that the CCMs needed domestic clearance before finally agreeing to a new arrangement. However, as a way of cooperation in response to the SC's appreciation and request, those CCMs agreed not to require SPC to delete their operational data provided to SPC and the products thereof under the condition that they will not be used in any way until a new agreement is reached with SPC. Those CCMs will discuss the new arrangement intersessionally with SPC based on the draft text for the *Agreement for Provision of Operational-level Data to SPC to Support WCPFC Stock Assessments* shown in **Attachment E**, with the intention of finalizing the arrangement prior to WCPFC12.

21. SC11 appreciated the cooperation and flexibility shown by those CCMs involved and expressed its hope that the new arrangement will be agreed among relevant CCMs promptly so that the SPC's work can be maintained.

22. SC11 recommends that collaborative research on the use of multi-fleet operational-level data for CPUE standardization be continued if the data are available, with particular emphasis on application to WCPO bigeye tuna. SC11 noted that the treatment of spatial variation in CPUE, the

effects of species targeting, the analyses of specific fleets, the effects of environmental variation, the investigation of the performance of alternative standardization models, e.g., random effects and GAMs, and robustness testing through cross-validation were important topics for further consideration.

Provision of scientific information

a. Status and trends

23. SC11 noted that no stock assessment was conducted for WCPO bigeye tuna in 2015. Therefore, the stock status description from SC10 is still current.

24. SC11 noted that the total bigeye catch in 2014 was 161,229 mt, which was a 5% increase over 2013 and a 5% increase over the average for 2010–2013. SC11 also noted that the bigeye catch in 2014 was 48% above the estimated maximum sustainable yield (108,520 mt), although those two numbers are not directly comparable because MSY is calculated based on the historical average recruitment.

25. SC11 also noted the analysis of the sensitivity of the WCPO bigeye tuna stock assessment to the inclusion of EPO data and dynamics within a Pacific-wide model. SC11 concluded that the dynamics of bigeye tuna in the WCPO estimated using the Pacific-wide model are not substantially different from those estimated using the WCPO-only model, especially with respect to the main stock status indicators used by WCPFC. Therefore, SC11 recommends that it is reasonable to continue to provide management recommendations to WCPFC on the basis of WCPO-only regional stock assessment models.

26. SC11 did not consider the Pacific-wide sensitivity analysis to be a new stock assessment for the purpose of formulating management advice.

b. Management advice and implications

27. SC11 noted that no management advice has been provided since SC10. Therefore, the advice from SC10 should be maintained, pending a new assessment or other new information.

4.1.2 WCPO yellowfin tuna (*Thunnus albacares*)

Provision of scientific information

a. Status and trends

28. SC11 noted that no stock assessment was conducted for WCPO yellowfin tuna in 2015. Therefore, the stock status description from SC10 is still current.

29. SC11 noted that the total yellowfin catch in 2014 was the highest ever recorded at 608,807 mt, which was a 10% increase over 2013 and a 9% increase over the average for 2010–2013.

b. Management advice and implications

30. SC11 noted that no management advice has been provided since SC10. Therefore, the advice from SC10 should be maintained, pending a new assessment or other new information.

4.1.3 WCPO skipjack tuna (*Katsuwonus pelamis*)

Provision of scientific information

a. Status and trends

31. SC11 noted that no stock assessment was conducted for WCPO skipjack tuna in 2015. Therefore, the stock status description from SC10 is still current.

32. SC11 noted that the total skipjack catch in 2014 is provisionally estimated to be 1,957,693 mt, which is the highest catch recorded, a 6% increase over 2013 and a 14% increase over the average for 2010–2013.

33. The SC noted that skipjack tuna catch in 2014 was 20% above the estimated MSY (1,618,800 mt) although those two numbers are not directly comparable because MSY is calculated based on the historical average recruitment.

34. SC11 reviewed information related to identifying changes in the spatial distribution of skipjack (including range contraction) in response to increase in fishing pressure. Project 67 on the impacts of recent catches of skipjack tuna on fisheries on the margins of the WCPFC Convention Area demonstrated no statistical evidence for skipjack range contraction (SA-WP-05). SC11 recommends that WCPFC12 take note of the analyses completed to date and that further work on this issue be undertaken, including:

- more extensive skipjack tagging activities, including in sub-tropical and temperate regions to provide better information on stock connectivity and movement; and
- analysis of operational longline data including skipjack catch to improve the estimation of relative abundance trends by latitude.

b. Management advice and implications

35. SC11 noted that no management advice has been provided since SC10. Therefore, taking note of the current catch status pointed above, the advice from SC10 should be maintained.

4.1.4 South Pacific albacore tuna (*Thunnus alalunga*)

Review of South Pacific albacore tuna stock assessment

36. SC11 recommends that the following be undertaken to support the next south Pacific albacore assessment:

- i. More extensive retrospective analyses examining a longer period of time and including the key management quantities;
- ii. Compare the observed and predicted sample sizes for size composition data as one aspect of a more detailed examination of how size data are modelled and weighted within the stock assessment;
- iii. Collaborate with albacore assessment scientists in other RFMOs and research organizations around data upon which to base a plausible range of values for natural mortality – including consideration of the sensitivity of the assessment results to higher natural mortality for younger ages; and
- iv. Further examination of seasonal selectivity – especially for longline fisheries in southern regions of the assessment.

37. SC11 recommends that the following be undertaken prior to MOW4 and WCPFC-12 to support the Commission consideration of south Pacific albacore:

- i. Update the bio-economic model described in (MI-WP-04); and
- ii. Conduct medium-term projections (2014-2034) under current fishing conditions to determine the predicted impact of these levels on the abundance of albacore vulnerable to the longline fishery.

Provision of scientific information

a. Status and trends

38. There have been significant improvements to the 2015 stock assessment including: improvements to the MULTIFAN-CL modelling framework, a regional disaggregated framework, access to operational data for construction of CPUE indices and regional weights, age-length data to improve growth estimation, and additional tagging data. Further, the regional structure of the model was changed to cover the southern Convention area and be better aligned with the other tuna assessments. This will enable better consideration of the multispecies impacts of management measures. Natural mortality was set at 0.3 in the reference case for consistency with the value used in the assessments performed in other RFMOs.

39. SC11 selected the reference case model as the base case to represent the stock status of south Pacific albacore tuna. To characterize uncertainty SC11 chose all the grid model runs except for those relating to the alternative regional weight hypothesis. This gave a total of 18 model runs and we report the 5%, median and 95% values on the base case estimate in this stock status summary. Details of the base case and axes of uncertainty for the grid are provided in Table SP-ALB1.

Table SP-ALB1: Description of the structural sensitivity grid used to characterize uncertainty in the assessment. The base case option is denoted in bold face.

Name	Description	One-off change model name(s)
Natural mortality	0.25, 0.30 , and 0.40 per year	Low_M and High_M
Length data weighting	Standard weighting or down-weighted	SZ_dwnwht
Steepness	0.65, 0.80 , and 0.95	h_0.65 and h_0.95

40. Time trends in estimated recruitment, spawning biomass, fishing mortality and fishery impacts are shown in Figures SP-ALB 1–5.

41. The estimated maximum sustainable yield (MSY) of 76,800 mt is lower than in the 2012 assessment (2012 MSY = 99,085 mt). Aside from general improvements to the stock assessment this was also influenced by 1) exclusion of catches from outside the southern part of the WCPFC Convention area; and 2) a reduction in the assumed value of natural mortality. Based on the range of MSY estimates (range: 62,260-129,814 mt), current catch is likely at or slightly less than the MSY.

42. Fishing mortality has generally been increasing through time, with F_{current} (2009-12 average) is estimated to be 0.39 times the fishing mortality that will support the MSY. Across the grid $F_{\text{current}}/F_{\text{MSY}}$ ranged from 0.13-0.62. This indicates that overfishing is not occurring, but fishing

mortality on adults is approaching the assumed level of natural mortality (Table SP-ALB2 and Figure SP-ALB5).

43. The fishery impact by sub-tropical longline fisheries has increased continuously since 2000 (Figure SP-ALB6).

44. The latest (2013) estimates of spawning biomass are above both the level that will support the MSY ($SB_{latest}/SB_{MSY} = 2.86$ for the base case and range 1.74—7.03 across the grid) and the adopted LRP of $0.2SB_{F=0}$ ($SB_{latest}/SB_{F=0} = 0.40$ for the base case and range 0.30-0.60 across the grid). It is important to note that SB_{MSY} is lower than the limit reference point ($0.14 SB_{F=0}$) due to the combination of the selectivity of the fisheries and maturity of the species.

45. For the first time SC considered an index of economic conditions in the south Pacific albacore fishery (MI-WP-03). This index, which integrates fish prices, catch rates, and fishing prices, estimates a strong declining trend in economic conditions, reaching an historical low in 2013. While there was a slight recovery in 2014, conditions are still well below the average primarily due to high fishing costs and continued low catch rates. Domestic vessels from some longline fleets have reduced their fishing effort (i.e., tied up for periods of time) in response to these conditions.

Table SP-ALB2: Estimates of management quantities for base case and grid of 18 models (see Table SP-ALB1 for details). For the purpose of this assessment, “current” is the average over the period 2009–2012 and “latest” is 2013.

	Base case	5%	Grid Median	95%
$MSY(mt)$	76,800	62,260	84,980	129,814
C_{latest}/MSY	1.00	0.60	0.91	1.23
$F_{current}/F_{MSY}$	0.39	0.13	0.34	0.62
B_0	711,400	638,465	806,900	1,024,500
$B_{current}$	456,984	365,962	509,653	783,308
SB_0	396,500	368,925	438,700	502,275
SB_{MSY}	57,430	35,762	59,180	90,778
$SB_{F=0}$	408,361	392,358	442,163	486,146
SB_{latest}	164,451	131,456	190,467	272,696
SB_{latest}/SB_{MSY}	2.86	1.74	3.20	7.03
$SB_{latest}/SB_{F=0}$	0.40	0.30	0.44	0.60

Table SP-ALB3: Comparison^a of selected south Pacific albacore tuna reference points from the 2009, 2011, 2012, and 2015 assessments. These represent the value used to provide management advice. Note that the time window for assessment and reference point calculation changes for $F_{current}/F_{MSY}$ and $SB_{latest}/SB_{F=0}$ and that prior to the 2015 assessment, the south Pacific albacore assessments covered the entire south Pacific Ocean rather than the convention area south of the equator used in 2015.

Management quantity	2015	2012 ^b	2011	2009 ^c
$MSY(mt)$	76,800 ¹	99,085	85,130	97,610
$F_{current}/F_{MSY}$	0.39	0.21	0.26	0.25
$SB_{latest}/SB_{F=0}$	0.40	0.58	0.60	0.68

^a 2015 assessment was conducted for WCPF CA and 2011/2012 stock assessment was for the whole South Pacific.

^b The median of the grid was used to provide management advice instead of a single model run

^c Only $SB_{current}$ is available

¹ This is the reference case, not the grid median, as per 2012.

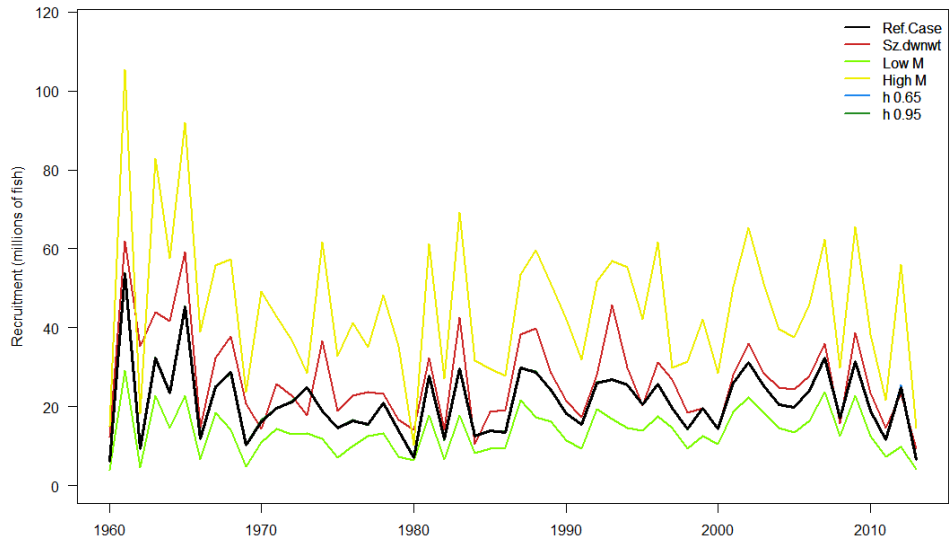


Figure SP-ALB1: Estimated annual recruitment (millions of fish) for the base case model and one-change sensitivity analyses (a subset of runs from the grid). See Table SP-ALB1 for a description of these sensitivity analyses. The model runs with alternative steepness values give the same recruitment estimates.

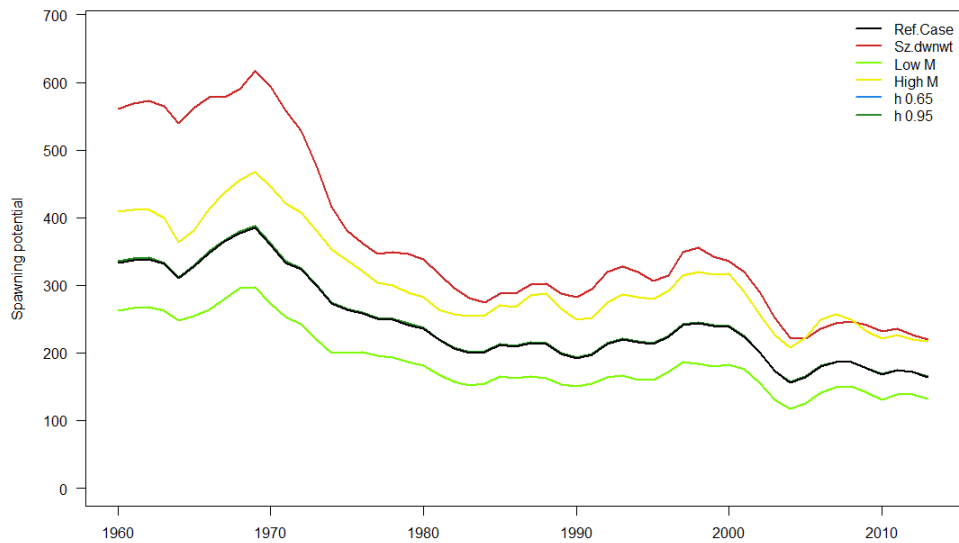


Figure SP-ALB2: Estimated annual average spawning potential for the base case model and one-change sensitivity analyses (a subset of runs from the grid). The model runs with alternative steepness values give the same spawning potential estimates.

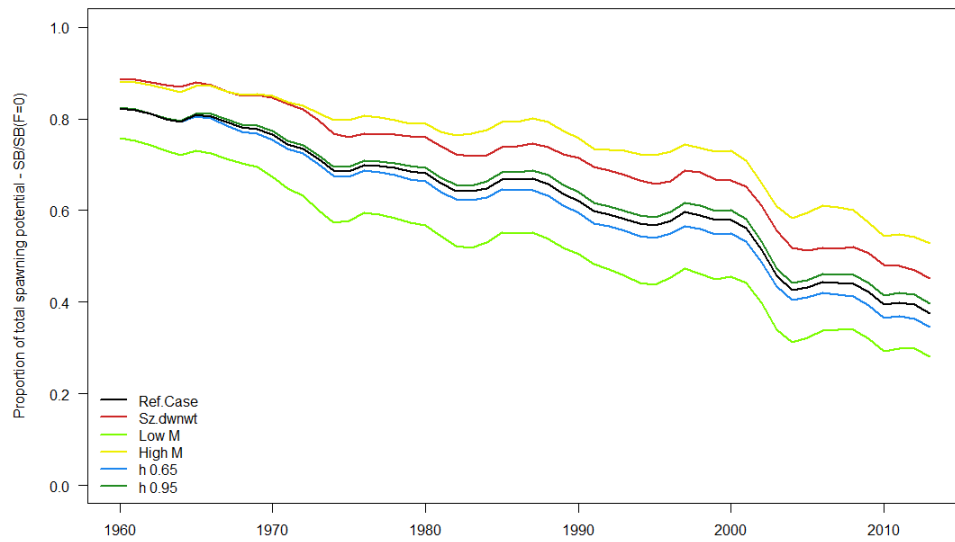


Figure SP-ALB3: Estimated annual average spawning depletion for the base case model and one-change sensitivity analyses (a subset of runs from the grid).

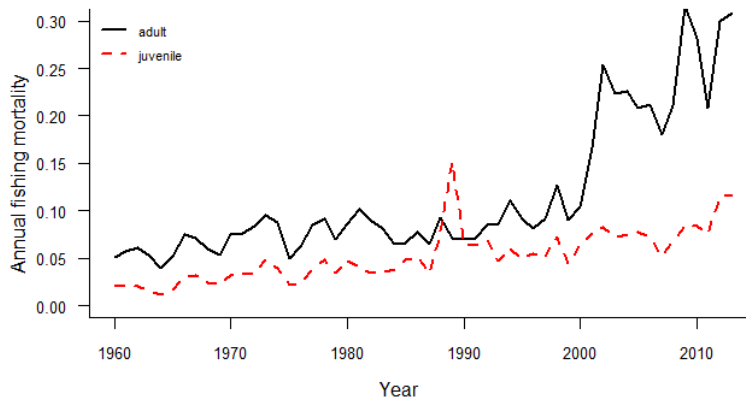


Figure SP-ALB4: Estimated annual average juvenile and adult fishing mortality for the base case model.

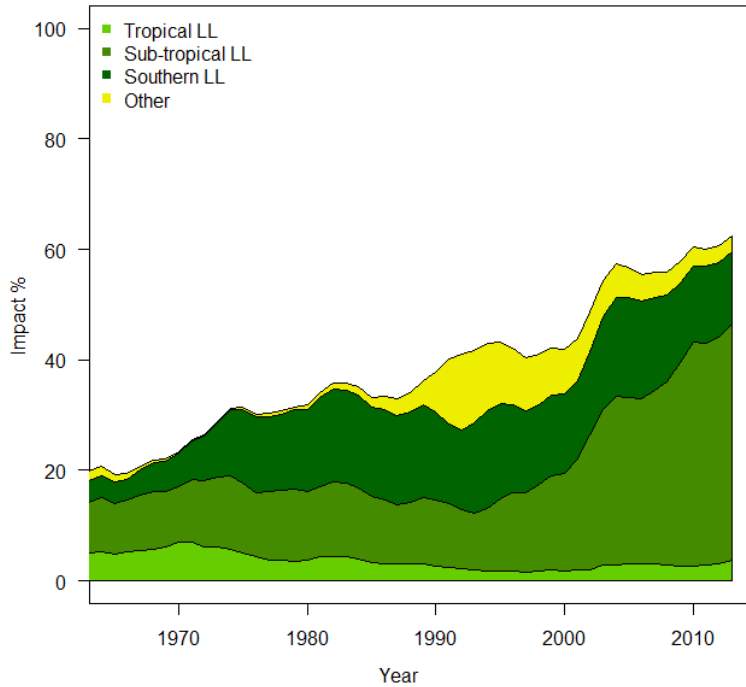


Figure SP-ALB5: Estimates of reduction in spawning potential due to fishing (fishery impact = $1 - SB_t/SB_{t,F=0}$) to different fishery groups for the base case model.

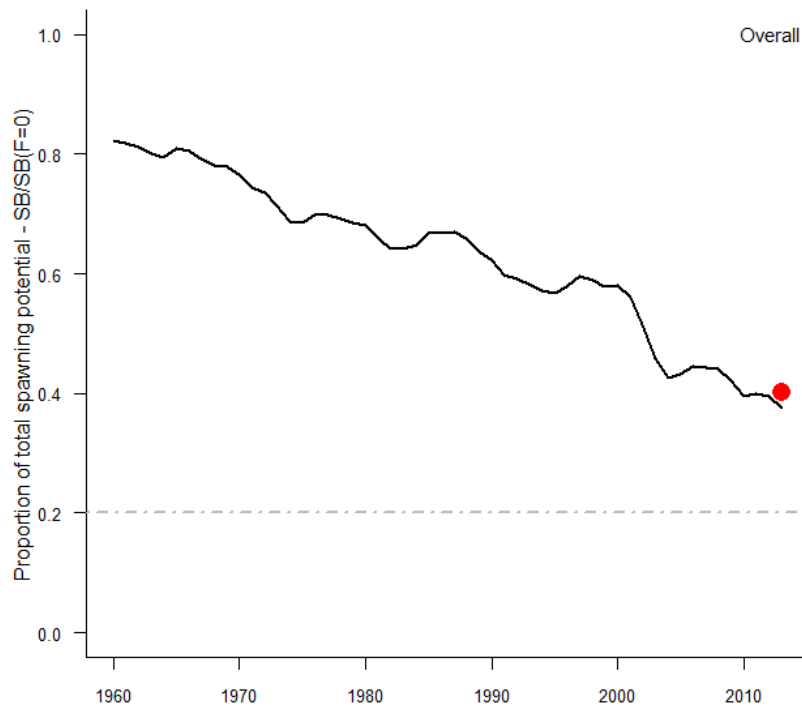


Figure SP-ALB6: Ratio of exploited to unexploited spawning potential, $SB_{latest}/SB_{F=0}$, for the reference case. The current WCPFC limit reference point of $20\%SB_{F=0}$ is provided for reference as the grey dashed line and the red circle represents the level of spawning potential depletion based on the agreed method of calculating $SB_{F=0}$ over the last ten years of the model (excluding the last year).

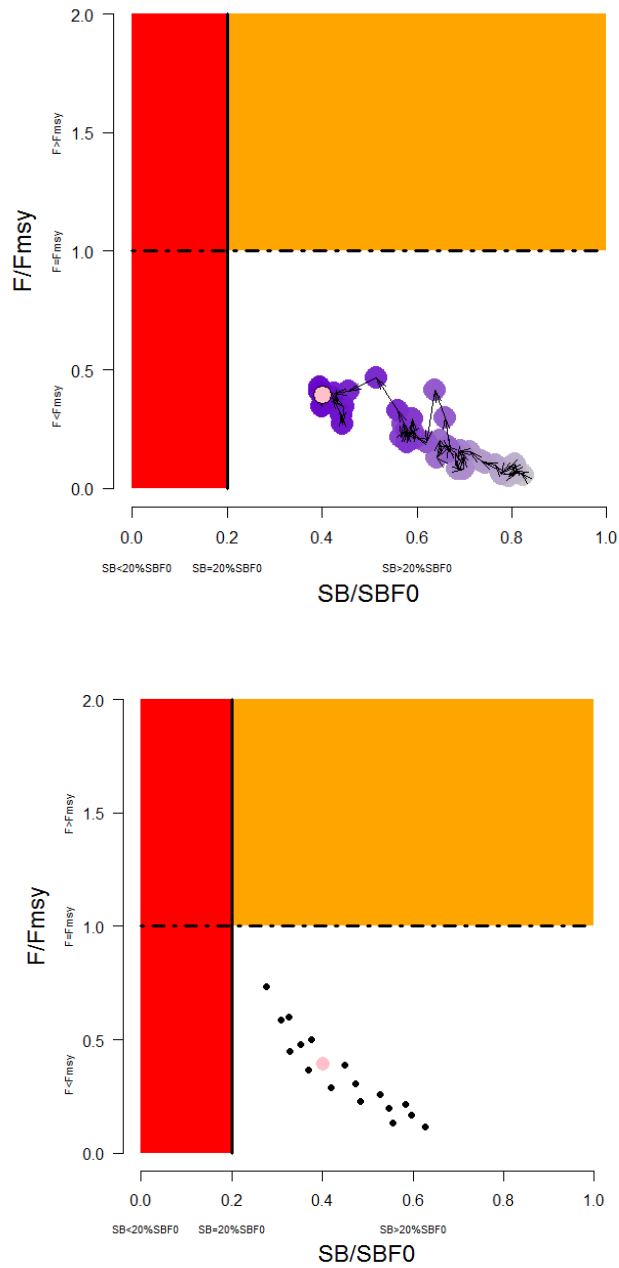


Figure SP-ALB7: Temporal trend for the base case model (top) and terminal condition for the base case and other sensitivity runs (bottom) in stock status relative to $SB_{F=0}$ (x-axis) and F_{MSY} (y-axis). The red zone represents spawning potential levels lower than the agreed LRP which is marked with the solid black line ($0.2SB_{F=0}$). The orange region is for fishing mortality greater than F_{MSY} ($F=F_{MSY}$; marked with the black dashed line). The pink circle (top panel) is $SB_{2012}/SB_{F=0}$ (where $SB_{F=0}$ was the average over the period 2002-2011). The bottom panel includes the base case (pink circle) and 18 models from the grid.

b. Management advice and implications

46. The South Pacific albacore spawning stock is currently above both the level that will support the MSY and the adopted spawning biomass limit reference point, and overfishing is not occurring (F less than F_{msy}).

47. While overfishing is not occurring, further increases in effort will yield little or no increase in long-term catches and result in further reduced catch rates.

48. Decline in abundance of albacore is a key driver in the reduced economic conditions experienced by many PICT domestic longline fleets. Further, reductions in prices are also impacting some distant water fleets.

49. For several years, SC has noted that any increases in catch or effort in sub-tropical longline fisheries are likely to lead to declines in catch rates in some regions (10oS-30oS), especially for longline catches of adult albacore, with associated impacts on vessel profitability.

50. Despite the fact that the stock is not overfished and overfishing is not occurring, SC11 reiterates the advice of SC10 recommending that longline fishing mortality and longline catch be reduced to avoid further decline in the vulnerable biomass so that economically viable catch rates can be maintained.

4.2 Northern stocks

4.2.1 – 4.2.3 North Pacific albacore (*Thunnus alalunga*), North Pacific bluefin tuna (*Thunnus orientalis*) and North Pacific swordfish (*Xiphias gladius*)

Provision of scientific information

a. Status and trends

51. SC11 noted that no stock assessments were conducted for these species in 2015. Therefore, the stock status descriptions from SC10 are still current.

b. Management advice and implications

52. SC11 noted that no management advice has been provided since SC10. Therefore, the advice from SC10 should be maintained, pending a new assessment or other new information.

4.3 WCPO sharks

4.3.1 – 4.3.3. Oceanic whitetip shark (*Carcharhinus longimanus*), Silky shark (*Carcharhinus falciformis*) and South Pacific blue shark (*Prionace glauca*)

Provision of scientific information

a. Status and trends

53. SC11 noted that no stock assessments were conducted for these shark species in 2015. Therefore, the stock status descriptions from SC8 and SC9 are still current for oceanic whitetip shark and silky shark, respectively.

54. SC11 noted that no stock assessment has been conducted for South Pacific blue shark.

b. Management advice and implications

55. SC11 noted that no management advice has been provided since SC8 and SC9 for oceanic whitetip shark and silky shark, respectively. Therefore, previous advice should be maintained, pending a new assessment or other new information.

56. SC11 noted that no management advice has been provided for South Pacific blue shark.

4.3.4 North Pacific blue shark (*Prionace glauca*)

Evaluation of North Pacific blue shark as a northern stock

57. SC11 noted that ISC provided a bibliography of studies undertaken on North Pacific blue sharks. SC11 also noted that it is important for ISC, in collaboration with SPC, to continue to work to provide information regarding the stock distribution north and south of 20°N in order to enable the SC to provide a recommendation to the Commission about whether this should be considered a northern stock.

Provision of scientific information

a. Status and trends

58. SC11 noted that no stock assessment was conducted for North Pacific blue shark in 2015. Therefore, the stock status description from SC10 is still current.

b. Management advice and implications

59. SC11 noted that no management advice has been provided since SC10. Therefore, the advice from SC10 should be maintained, pending a new assessment or other new information.

4.3.5 North Pacific shortfin mako (*Isurus oxyrinchus*)

Provision of scientific information

a. Status and trends

60. SC11 noted that ISC provided the following conclusions on the stock status of North Pacific shortfin mako shark:

“Shortfin mako is a data poor species. Recognizing that information on important fisheries is missing, the untested validity of indicators for determining stock status, and conflicts in the available data, stock status (overfishing and overfished) could not be determined. Managers should consider the undetermined stock status of shortfin mako shark in the North Pacific when developing and implementing management measures.

The ISC SHARKWG reviewed a suite of information to determine the stock status of shortfin mako shark in the North Pacific. Of the three indices considered to have the greatest value in providing stock status information, abundance trends in two of the series appear to be stable or increasing, while the abundance trend in the third series appears to be declining.”

b. Management advice and implications

61. SC11 recommends that the Commission consider the undetermined stock status of shortfin mako shark in the North Pacific when developing and implementing management measures.

62. SC11 noted the following conservation advice from ISC:

“It is recommended that data for missing fleets be developed for use in the next stock assessment scheduled for 2018 and that available catch and CPUE data be monitored for changes in trends. It is further recommended that data collection programs be implemented or improved to provide species-specific shark catch data for fisheries in the North Pacific.”

63. SC11 noted that the quality of fisheries data for shortfin mako shark, varied for the fleets in the indicator analysis. SC11 recommends that changes in fishing practices of all fleets fishing in the WCPO be documented through time and noted that this information would be important for assessing fishery impacts on all species including shortfin mako shark.

4.4 WCPO billfishes

4.4.1 South Pacific swordfish (*Xiphias gladius*)

Provision of scientific information

a. Status and trends

64. SC11 noted that no stock assessment was conducted for South Pacific swordfish in 2015. Therefore, the stock status description from SC9 is still current.

b. Management advice and implications

65. SC11 noted that no management advice had been provided since SC10. Therefore, the advice from SC9 should be maintained.

4.4.2 Southwest Pacific striped marlin (*Kajikia audax*)

Provision of scientific information

a. Status and trends

66. SC11 noted that no stock assessment was conducted for southwest Pacific striped marlin in 2015. Therefore, the stock status description from SC8 is still current.

b. Management advice and implications

67. SC11 noted that no management advice had been provided since SC10. Therefore, the advice from SC8 should be maintained.

4.4.3 North Pacific striped marlin (*Kajikia audax*)

Provision of scientific information

a. *Status and trends*

68. SC11 noted the stock status and conclusions for North Pacific striped marlin provided by ISC in SC11-SA-WP-10:

*“Estimates of population biomass of the Western and Central North Pacific (WCNPO) striped marlin stock (*Kajikia audax*) exhibit a long-term decline (Table S1 and Figure S2). Population biomass (age-1 and older) averaged roughly 20,513 mt, or 46% of unfished biomass during 1975-1979, the first 5 years of the assessment time frame, and declined to 6,819 mt, or 15% of unfished biomass in 2013. Spawning stock biomass is estimated to be 1,094 mt in 2013 (39% of SSBMSY, the spawning stock biomass to produce MSY, Figure S3). Fishing mortality on the stock (average F on ages 3 and older) is currently high (Figure S4) and averaged roughly $F = 0.94$ during 2010-2012, or 49% above F_{MSY} . The predicted value of the spawning potential ratio (SPR, the predicted spawning output at current F as a fraction of unfished spawning output) is currently $SPR_{2010-2012} = 12\%$ which is 33% below the level of SPR required to produce MSY. Recruitment averaged about 308 thousand recruits during 1994-2011, which was 25% below the 1975-2013 average. No target or limit reference points have been established for the WCNPO striped marlin stock under the auspices of the WCPFC.*

The WCNPO striped marlin stock is expected to be highly productive due to its rapid growth and high resilience to reductions in spawning potential. The status of the stock is highly dependent on the magnitude of recruitment, which has been below its long-term average since 2007, with the exception of 2010 (Table S1). Changes in recent size composition data in comparison to the previous assessment resulted in changes in fishery selectivity estimates and also affected recruitment estimates. This, in turn, affected the scaling of biomass and fishing mortality to reference levels (Figure S6).

When the status of striped marlin is evaluated relative to MSY-based reference points, the 2013 spawning stock biomass is 61% below SSBMSY (2819 t) and the 2010-2012 fishing mortality exceeds F_{MSY} by 49% (Figures S3, S4, and S5). Therefore, overfishing is occurring relative to MSY-based reference points and the WCNPO striped marlin stock is overfished.”

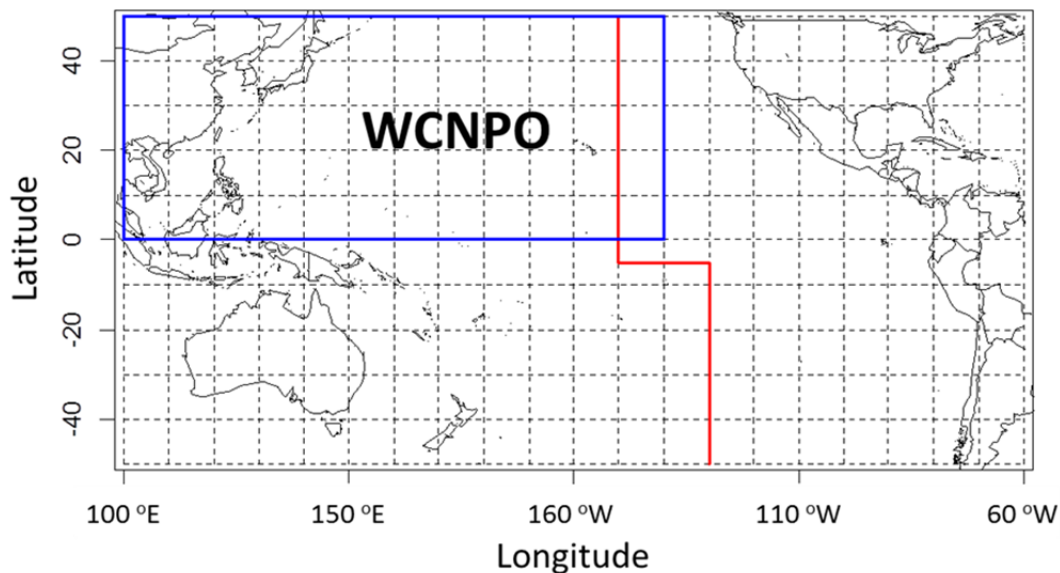


Figure S1: Stock boundary for the stock assessment update of Western and Central North Pacific Ocean striped marlin (WCNPO) as indicated by the blue lines. Red lines indicate the WCPFC convention area.

Table S1: Reported annual values of catch (mt) and posterior mean values of exploitable biomass (B, mt), relative biomass (B/B_{MSY}), harvest rate (percent of exploitable biomass), relative harvest rate (H/H_{MSY}), and probability of annual harvest rate exceeding H_{MSY} for the EPO swordfish stock.

Year	2007	2008	2009	2010	2011	2012	2013	Mean ¹	Min ¹	Max ¹
Reported Catch	3084	3503	2468	2852	3125	3521	2984	5822	2468	10594
Population Biomass	6915	6773	6409	5156	7823	7349	6819	12758	5156	28440
Spawning Stock Biomass	1192	1171	970	984	873	1013	1094	2025	815	6946
Relative Spawning Biomass	0.42	0.42	0.34	0.35	0.31	0.36	0.39	0.75	0.29	2.46
Recruitment (age 0)	240	242	63	496	155	224	352	410	63	1369
Fishing Mortality	0.82	0.99	0.80	0.96	0.89	0.97	0.76	0.95	0.47	1.54
Relative Fishing Mortality	1.29	1.57	1.27	1.51	1.41	1.53	1.20	1.50	0.74	2.44
Exploitation Rate	45%	52%	39%	55%	40%	48%	44%	48%	32%	65%
Spawning Potential Ratio	15%	12%	16%	13%	12%	12%	14%	13%	7%	24%

¹During 1975-2013

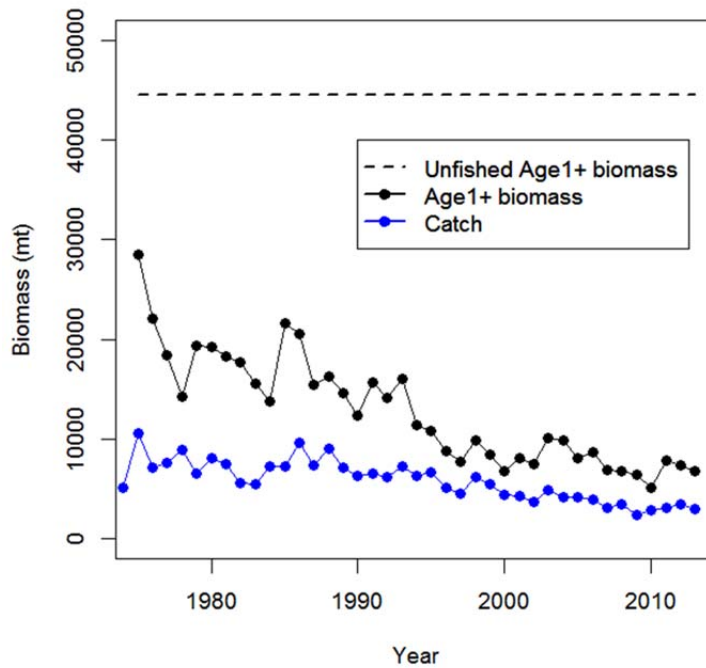


Figure S2. Trend in population biomass and reported catch biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2013.

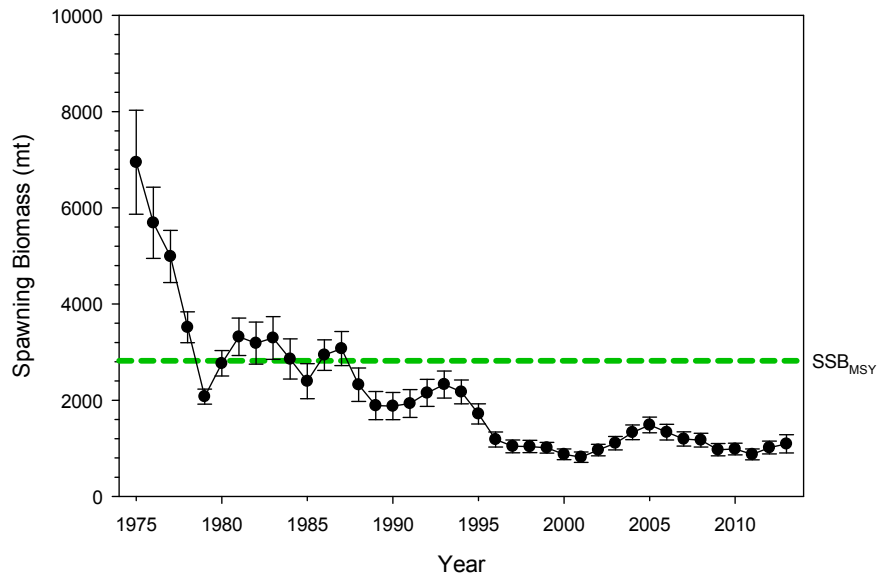


Figure S3. Trends in estimates of spawning biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2013 along with 80% confidence intervals.

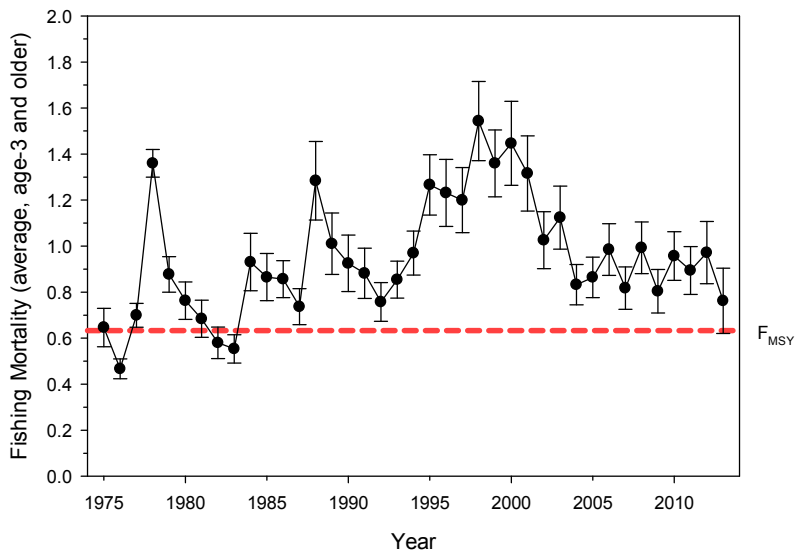


Figure S4. Trends in estimates of fishing mortality of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2013 along with 80% confidence intervals.

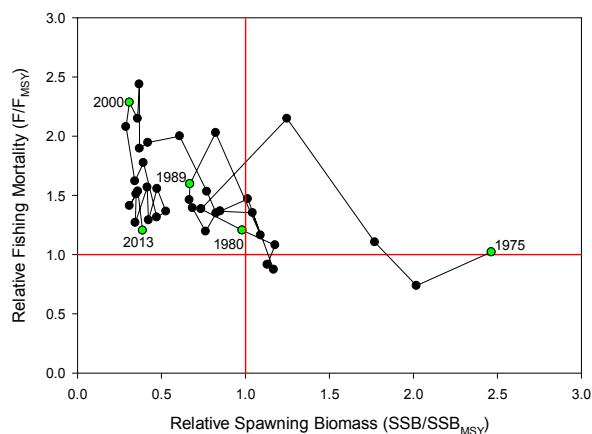


Figure S5. Kobe plot of the trends in estimates of relative fishing mortality and relative spawning biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2013.

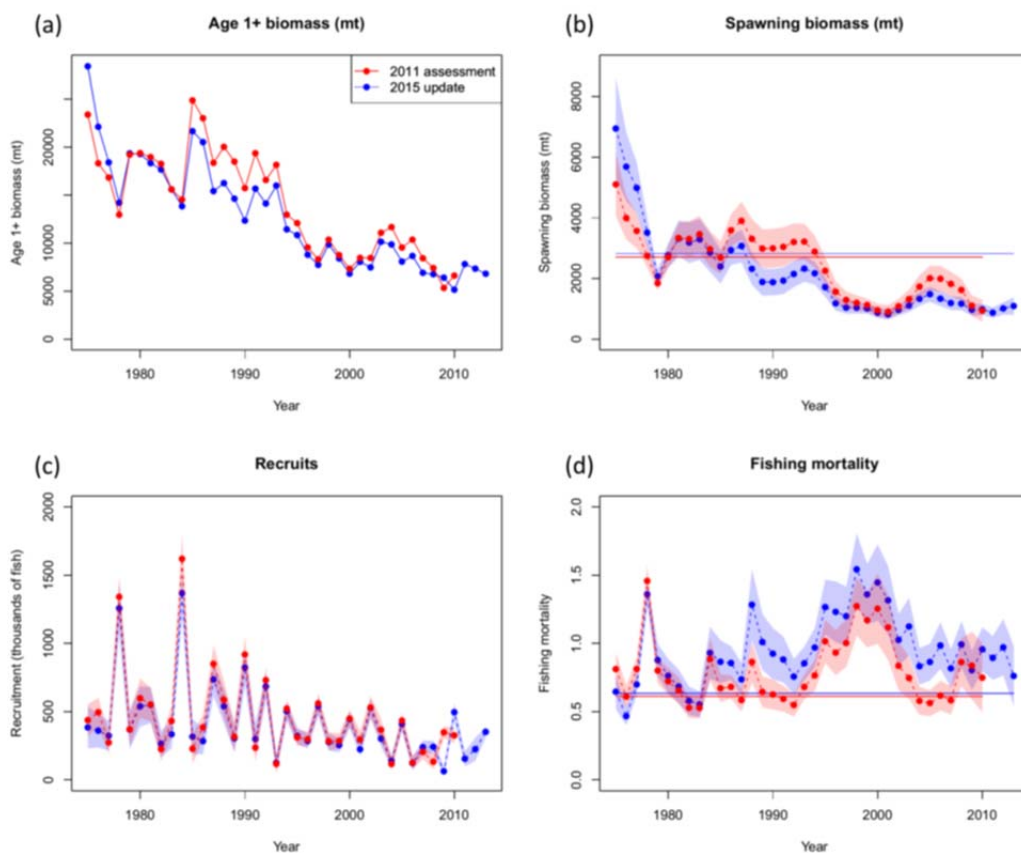


Figure S6. Comparison of time series of total biomass (age 1 and older) (a), spawning biomass (b), age-0 recruitment (c), and instantaneous fishing mortality (year-1) (d) for the WCNPO striped marlin between the 2011 stock assessment (red) and the 2015 update (blue). The solid line with circles represents the maximum likelihood estimates for each quantity and the shadowed area represents the 95% asymptotic intervals of the estimates (± 1.96 standard deviations). The solid horizontal lines indicated the MSY-based reference points for 2011 (red) and 2015 (blue).

b. Management advice and implications

69. SC11 noted the following conservation advice from ISC.

“The stock has been in an overfished condition since 1977, with the exception of 1982 and 1983, and fishing appears to be impeding rebuilding especially if recent low recruitment levels persist.

Projection results show that fishing at FMSY could lead to median spawning biomass increases of 25%, 55%, and 95% from 2015 to 2020 under the recent recruitment, medium-term recruitment, and stock recruitment-curve scenarios.

Fishing at a constant catch of 2,850 t could lead to potential increases in spawning biomass of 19% to over 191% by 2020, depending upon the recruitment scenario.

In comparison, fishing at the 2010-2012 fishing mortality rate, which is 49% above FMSY, could lead to changes in spawning stock biomass of -18% to +18% by 2020, while fishing at the average 2001-2003 fishing mortality rate ($F_{2001-2003}=1.15$), which is 82% above FMSY, could lead to spawning stock biomass decreases of -32% to -9% by 2020, depending upon the recruitment scenario.”

70. SC11 expressed concerns about the updated stock status of WCNPO striped marlin, noting that the stock was overfished (SSB_{2013} at 61% below SSB_{MSY}) and that overfishing was occurring ($F_{2010-2012}$ exceeds F_{MSY} by 49%). Although a LRP for billfish species has not been adopted by the WCPFC, SC11 noted that $SSB_{current}/SSB_{current,F=0} = 0.12$ and is below the LRP adopted for tunas. SC11 also noted that projections indicate that $Prob(SSB_{2020} > SSB_{2015}) < 50\%$ for all constant catch scenarios over 2,850 mt (under the three recruitment hypotheses modelled), which means that in order to allow the spawning biomass to rebuild then catches need to be reduced to less than 2,850mt.

71. SC11 recommends that the Commission develop a rebuilding plan for North Pacific striped marlin with subsequent revision of CMM 2010-01 in order to improve stock status.

4.4.4 Pacific blue marlin (*Makaira nigricans*)

Provision of scientific information

a. Status and trends

72. SC11 noted that no stock assessment was conducted for Pacific blue marlin in 2015. Therefore, the stock status description from SC9 is still current.

b. Management advice and implications

73. SC11 noted that no management advice had been provided since SC9. Therefore, the advice from SC9 should be maintained, pending a new assessment or other new information.

4.5 Independent review of stock assessments

74. SC11 recommends that the Secretariat develops a proposal to establish a formal process and its cost implication to independently review stock assessments. This proposal will be presented to SC12.

AGENDA ITEM 5 MANAGEMENT ISSUES THEME

5.1 Limit reference points for the WCPFC

5.1.1 Implications of alternative levels of acceptable risk

75. Noting that SC10 had considered levels of risk associated with breaching the LRP within the range 5-20%, that the identification of acceptable risk is a management issue, SC11 reaffirmed the recommendation made by SC10 that WCPFC12 identify the level of acceptable risk which should be applied to breaching a LRP for the key target species, noting that the UN Fish Stocks Agreement states that the risk of exceeding LRPs should be very low.

5.1.2 Identifying appropriate LRPs for elasmobranchs within the WCPFC

76. SC11 noted the work undertaken in support of identifying appropriate LRPs for elasmobranchs within the WCPFC, in particular the report of the Pacific shark life history Expert Panel Workshop (SC11-EB-IP-13) and that other work necessary to identify and support the development of LRPs for sharks has been included in the updated shark research plan. SC11 recommends that the WCPFC12 continues to support this work.

5.2 Development of target reference points (TRPs) and harvest control rules (HCRs) for the WCPFC

5.2.1 Development of WCPFC harvest strategies

77. SC11 considered the draft work-plan (SC11-MI-WP-01) provided by Australia to progress the harvest strategy approach, which is required under CMM 2014-06. SC11 strongly supported the initiative by Australia to develop this plan. SC11 recommends that Australia continue to develop this work-plan, noting the comments provided by SC11, and in consultation with other CCMs intersessionally, and that the updated plan be presented to TCC11 and WCPFC12, including an estimation of budget and resources required.

5.2.2 Skipjack tuna target reference point

78. SC11 considered the scientific aspects of the draft CMM on a target reference point for WCPO skipjack tuna (SC11-MI-WP-02) provided by PNA. SC11 recommends that PNA take into consideration comments provided by SC11 in further developing this draft CMM.

5.2.3 South Pacific albacore tuna target reference point

79. SC11 reviewed information related to the identification of an appropriate TRP for south Pacific albacore tuna, noting in particular a decline in the economic performance of this fishery (SC11-MI-WP-03) and the consequences for the stock and the fishery of a range of candidate target reference points (SC11-MI-WP-04). SC11 noted these analyses and recommended that the latter be

updated based on the 2015 stock assessment of south Pacific albacore tuna and presented to both MOW4 and WCPFC12 for consideration of TRPs.

5.3 Implementation of CMM 2014-01

5.3.1 Evaluation of impacts of the purse-seine fishery

80. SC11 reviewed information related to tropical tunas (SC11-GN-WP-01). Noting the longline bigeye catch and the total number of FAD sets in 2014 was still higher than in 2010 (taken as a reference year for the current CMM), and the number of FAD sets was 5% above the mean total number for the 2005-2014 period, SC11 recommends the need for additional or alternative targeted measures to reduce the fishing mortality on bigeye tuna, as seen as appropriate by the Commission.

81. SC11 also reviewed evaluation of CMM-2013-01 (SC11-WCPFC11-03). Noting revised tropical tuna measure adopted at WCPFC 11 (CMM-2014-01) is slightly different from the assumption used in the analysis, SC11 requests the Science Service Provider consider the implementation of updated projections, including evaluation of the potential impact of CMM 2014-01, for the consideration of tropical tuna measures at WCPFC12.

Skipjack tuna purse-seine associated and unassociated set effort

82. Noting the request in paragraph 584 of the SC10 report, SC11 reviewed working paper SC11-MI-WP-05 which analysed the relative impact of associated and unassociated set types on skipjack tuna stock status. Results indicated that skipjack stock status is relatively insensitive to the proportions of associated or unassociated sets of purse seine effort, with slight benefits to stock status with a higher proportion of unassociated sets. In addition, SC11 noted that the analyses had assumed a linear relationship between CPUE and stock abundance (potentially unrealistic in purse seine fisheries) and had not taken account of effort creep in purse-seine effort, for both associated and unassociated sets. SC11 also noted that a decrease in days searching and an increase of days in transit in logbooks might partially explain the increased CPUE observed. SC11 recommends that WCPFC12 take note of this paper and that further analyses be undertaken taking into account the issues identified above.

Productivity changes within the tropical WCPO purse-seine fishery

83. SC11 reviewed information related to changes in catchability within the tropical WCPO purse seine fishery (SC11-MI-WP-06) and noted that results based on several sources indicate significant increases in catchability over the past 20 years (e.g. a 3-5% average annual increase (2005-2011) in purse-seine vessel efficiency based on the 2014 skipjack stock assessment). SC11 noted these analyses, and recognized the need for further analyses and additional information to help identify the causes of these increases, and recommends that WCPFC12 takes note of this paper.

Purse-seine catches of bigeye tuna

84. SC11 reviewed information related to understanding bigeye tuna interactions in the purse seine fishery through characterisation of catches in space and between sets with the aim of identifying management options that reduce impacts on bigeye with minimal losses to the purse seine fishery (SC11-MI-WP-07). SC11 noted that while bigeye tuna catches are common in both the central and western Pacific, around one-third of the purse-seine catch of bigeye is taken by a small component (~10%) of the fleet. SC11 recommends that further research on the various issues

identified by the paper be undertaken, for example time of the purse seine sets relative to nautical dawn and the effects on species composition, and that WCPFC12 takes note of this paper.

5.3.2 WCPFC FAD Management Options Intersessional Working Group

85. No recommendations were made.

5.3.3 Yellowfin tuna catch limit

86. SC11 reviewed working paper SC11-MI-WP-09 which analysed the relative impact of associated and unassociated set types on yellowfin tuna stock status. SC11 advises WCPFC12 that based on the results of the analyses described in this paper yellowfin tuna stock status in the WCPO is relatively insensitive to whether purse seine effort is comprised of mainly associated sets or unassociated sets and these results are consistent with working paper SC10-MI-WP-05. SC11 also noted that a slightly better stock status (higher spawning biomass) for yellowfin tuna and slightly lower average catch of yellowfin tuna occurred when purse seine effort compositions favoured unassociated sets. SC11 recommends that WCPFC12 take note of these conclusions and that further analyses be undertaken taking into account alternative relationships between CPUE and abundance.

5.3.4 Other issues related to CMM 2014-01

87. SC11 reviewed analyses undertaken to estimate potential tropical purse seine fleet sizes given existing effort limits and candidate target stock levels (WCPFC-SC11-2015/MI-WP-10). SC11 noted that these analyses are an important contribution to the development of a purse seine capacity management scheme for the WCPFC and supported further work to identify patterns of participation by full-time and part-time vessels within the fishery, the need to relate both participation and effort creep to vessel characteristics, and the expansion of similar analyses to the longline fleets. SC11 recommends that WCPFC12 take note of these preliminary analyses and requests the Commission identify any specific analyses which may assist the Commission's consideration of fleet capacity.

AGENDA ITEM 6 ECOSYSTEM AND BYCATCH MITIGATION THEME

6.1 Ecosystem effects of fishing

Spatial Ecosystem and Population Dynamics Model (SEAPODYM)

88. SC11 recommends that:

- a. the Commission/WCPFC12 acknowledge the funding received from ISSF for an external review of the SEAPODYM project and further notes the outcomes from that review will assist the Commission in evaluating potential applications and future directions.
- b. the Commission/WCPFC12 provide guidance to the SC on whether they would like the SC to move forward with the further development of ecosystem indicators for possible incorporation in the MOW process, building on the work of other international fisheries bodies, e.g. ISC and ICAAT.

6.2 Sharks

6.2.1 Review of potential mitigation measures to reduce fishing-related mortality on silky and oceanic whitetip sharks

89. SC11 recommends that the Commission:

- a. Consider the Monte Carlo analysis of longline shark mitigation methods (e.g. hook type, leader material, non-deployment of shallow hooks, and a prohibition on shark lines) presented in SC11-EB-WP-02, in order to inform WCPFC12's further consideration of revising shark CMMs to incorporate shark mitigation requirements that reduce catch rates and at-vessel mortality.**
- b. Note the Monte Carlo simulations run presented in EB-WP-02, which showed that given the model assumptions, banning wire trace and shark lines would further reduce fishing mortality of oceanic whitetip and silky sharks by longline compared to the current choice between the two mitigation measures.**
- c. Note that the Monte Carlo mitigation model and its inputs can be improved through an increase in available observer data and more studies on post-release survival rates for key shark species.**
- d. Request that the Monte Carlo simulation work be expanded to a) account for flag-state choice between prohibition of shark lines and/or of wire leader with respect to CMM 2014-05, b) additional modeling of combinations of available mitigation options, and c) inclusion of purse seine fisheries to assess the effects on fishing mortality of sharks when effort on FAD sets was re-distributed to unassociated sets.**
- e. Request that CCMs quantify and describe longline gear configuration inputs and provide these to SPC to inform the Monte Carlo simulation work.**

6.2.2 Review of conservation and management measures for sharks

a. *CMM 2010-07 (CMM for Sharks)*

90. SC11 recommends that the Commission:

- a) SC11 was able to review the ratio of fin weight to shark carcass weight from one study (SC11-EB-IP-03). This study demonstrated that shark fin weight data suffered from some serious limitations, potential biases and errors. SC11 was unable to confirm the validity of using a 5% fin to carcass ratio in CMM 2010-07 and forwards these concerns to TCC, noting that an evaluation of the 5% ratio is not currently possible due to insufficient information for all but one of the major fleets implementing these ratios.**
- b) Notes that according to the most recent information provided by SPC, finning still occurs in the Convention Area.**
- c) Notes that information which can be used to evaluate the effectiveness of the WCPFC ban on shark finning (CMM 2010-07) is currently very limited.**

- d) **Encourages CCMs to gather and submit information on the implementation of CMM 2010-07, including data on fin to carcass ratios where CCMs apply that approach, to the Secretariat, in their AR-Part 2 reports or other formats, in order to support future evaluation.**

b. *CMM 2011-04 (CMM for oceanic whitetip shark)*

91. No recommendations were made.

c. *CMM 2012-04 (CMM for protection of whale sharks from purse seine fishing operations)*

92. **SC11 recommends that WCPFC12 adopt the guidelines for safe release of encircled animals including whale sharks as contained in the ISG-4 report (Attachment F) and recommends that TCC11 provide any additional considerations for the Commission's decision.**

d. *CMM 2013-08 (CMM for silky sharks)*

93. **SC11 recommends that the Commission notes that the SC endorses the post-release mortality study being proposed by USA and other similar studies proposed under the WCPFC Shark Research Plan.**

e. *CMM 2014-05 (CMM for sharks)*

94. **After considering the shark management plans submitted by Japan and Chinese Taipei - in accordance with paragraph 2 of CMM 2014-05, review by SC11 was made difficult due to the lack of guidance on what should be incorporated into the shark management plans, what is considered a target fishery, and how the review should be performed. SC11 recommends that the Commission:**

- a) **Consider development of a list of minimum requirements that such a plan should include, guidelines to evaluate such a plan, and the definition of a target shark fishery for future review by SC, TCC and the Commission;**
- b) **Notes the need for plans to contain species specific information and a rationale for how catch, effort or capacity limits are derived, amongst other minimum requirements.**

f. *Safe release guidelines*

95. *Development of new guidelines for the survival of sharks (other than whale sharks) to be released from longline and purse seine gear was not finalized by ISG-4 and is retained in draft form for future discussion by SC (Attachment G). It was noted that further information is necessary to advance the development of these guidelines.*

6.2.3 Shark Research Plan (SRP)

Indicators for key shark species

96. **Recognizing that the analysis on north Pacific blue shark and north Pacific shortfin mako shark did not cover some data used in the ISC analysis on these stocks, SC11 recommends that the Commission:**

- a) Notes the results of analysis described in paper EB-WP-04 are useful for prioritizing the stock assessment of the various shark stocks.
- b) Take note of the following recommendations from the SC:
 - Increase observer monitoring (at least to CMM requirements) in order to:
 - Support to develop stock assessments
 - Monitor the impact of CMMs
 - Reconcile differences in logbook and observer reporting
 - Develop a stock assessment schedule
 - Develop catch histories for unassessed stocks
 - Collect information on post release mortality rates, especially for silky, oceanic whitetip and whale sharks
 - Develop a time series of whale shark interactions and mortalities.
 - Repeat the indicator analysis in 2-3 years.
- c) Requests that SPC be tasked with reviewing available information on mobulid species (mantas and devil rays) and their interactions with fisheries managed by the WCPFC and prepare a paper for SC12 for consideration of these species for designation as WCPFC key sharks.
- d) Notes that there are limitations imposed on shark analyses due to low levels of observer coverage and lack of representativeness in the observer data.

Shark Research Plan 2016-2020 and stock assessment schedule

97. SC11 adopts the Shark Research Plan and Stock Assessment Schedule (Attachment H) and recommends that WCPFC12 endorses it.

Changes to longline observer data collection standards for bycatch

98. SC11 endorses the outcomes of ISG-5 as amended in Attachment I, and forwards them to TCC11 for technical consideration.

6.3 Seabirds

Risk of seabird bycatch

99. There was no consensus on the recommendations presented in the SC11-EB-WP-09; two different views were expressed:

- A minority view was provided by Japan for the report: A number of CCMs considered that the information contained in SC11-EB-WP-09 (The overlap of threatened seabirds with reported bycatch areas between 25° and 30°S in the WCPFC Area) was not conclusive to necessitate the expansion of the area of application of CMM 2012-07 further north from 30°S. Thus, they did not support a recommendation for the Commission to consider moving the mitigation measure boundary.
- A majority view was provided by FFA members for the report: that the Commission note potential interactions of threatened seabird species with longline fisheries between 25-30°S. In order to reduce the probability of seabird interactions, that the Commission considers extending seabird mitigation within CMM 2012-07 to encompass 26°S-30°S within the WCPFC-CA or

alternatively to 25°S-30°S but pertaining to only to the high seas (within 25°-30°S) within the WCPFC-CA.

100. SC11 recommends that the Commission take note of SC11-EB-WP-09 (The overlap of threatened seabirds with reported bycatch areas between 25° and 30° South in the WCPFC area).

6.4 Sea turtles

101. SC11 noted that when more detailed information regarding the organization of the project is available, CCMs are requested to consider if:

- a) they are interested in contributing data to ABNJ Tuna Project sea turtle bycatch mitigation project; and
- b) they are interested in participating in the workshops proposed for this project.

6.5 Bycatch mitigation for other species

102. SC11 requests that SPC, with help from ABNJ Tuna Project:

- **develop a process to populate the template; and**
- **provide the first BDEP template (for 2013-2015) to SC12 for review with ROP data subject to the WCPFC data rules.**

AGENDA ITEM 7 OTHER RESEARCH PROJECTS

7.1 West Pacific East Asia Project

103. A new GEF-funded project (Sustainable Management of Highly Migratory Fish Stocks in the West Pacific and East Asian Seas) was introduced, including the development process, key activities, budget scope, and key outcomes from the previous projects (SC11-RP-WPEA-01).

7.2 Pacific Tuna Tagging Project

104. A steering committee meeting was held during SC11 and the steering committee summary report (SC11-RP-PTTP-01) was made available to SC11 participants.

7.3 GEF ABNJ Shark and BMIS project

105. A brief overview of progress with the ABNJ (Common Oceans) Tuna Project activities was presented, including i) shark data improvement and harmonization; ii) shark stock assessment and management; and iii) global bycatch management and information.

AGENDA ITEM 8 COOPERATION WITH OTHER ORGANISATIONS

106. The Secretariat paper SC11-GN-IP-01 was presented. There are two new arrangements for 1) the GEF-funded WPEA project and 2) the FAO's GEF-funded ABNJ Tuna Project.

AGENDA ITEM 9 SPECIAL REQUIREMENTS OF DEVELOPING STATES AND PARTICIPATING TERRITORIES

107. There was a brief description on how the JTF fund was distributed in 2015, the fourth year of the second phase of the JTF Project. The Secretariat informed plenary that the 2016 JTF funding would be announced during TCC, and urged participants to be ready for the call for next year's funding, which would likely have a closing date of 31 December 2015.

AGENDA ITEM 10 FUTURE WORK PROGRAM AND BUDGET

Development of the 2016 Work Programme and budget, and projection of 2017-2018 provisional Work Programme and indicative budget

108. SC11 adopted the SC work programme and budget as shown in Table 1.

Table 1: List of SC work programme titles and budget for 2016, and indicative budget for 2017–2018, which require funding from the Commission's core budget (budget in USD and priority 1 = low, 3 = high).

Project	Essential	Priority	2016		2017		2018	
			Core	Other	Core	Other	Core	Other
SPC Oceanic Fisheries Programme Budget	x		1,031,200	400,000	1,031,200	400,000	1,031,200	400,000
Project 14. West Pacific East Asia (WPEA) Project	x		25,000	693,400	25,000	693,400	25,000	
Project 35. Refinement of bigeye tuna parameters		3	50,000					
Project 42. Pacific-wide tagging project		3	10,000	570,000	10,000		10,000	
Project 57. Limit reference points (LRPs) Develop proposed limit reference points for elasmobranchs (requires scope of work to progress)		3	25,000					
Project 67 – Review of impacts of recent high catches of skipjack on fisheries on the margins of the WCPFC Convention Area		2	40,000		40,000			
Project 60: Further paired sampling and unloading data comparisons. - Budget would cover at-sea data collection (2nd observer), associated travel, some analytical support. \$50,000 in each of 2016 and 2017.		2	50,000		50,000			
New Projects identified by SC11								
Maintenance and enhancement of the WCPFC Tissue Bank		3	80,000		80,000		80,000	
Review of Shark Length-weight conversion factor for all key shark species		1	10,000					

Project	Essential	Priority	2016		2017		2018	
			Core	Other	Core	Other	Core	Other
Sharks Monte Carlo mitigation analysis for purse seine, and extension of longline analysis		3	25,000					
EU funded projects that require 20% matching funds								
Technical support for the MOW4/HSW1 Project 63. Harvest control rules Project 66. Target reference points (TBC, max. EU contribution: 100,000 euro)	x		190,000	110,000	160,000			
Purse seine bigeye catch mitigation analysis. - Co-funding for expected EU contribution of Euro 200,000 (USD220,000) total.	x		25,000	110,000	25,000	110,000		
New mitigation trials or project for juvenile bigeye and yellowfin by purse seine (TBC, max. EU contribution: 400,000 euro)		3	44,000	440,000	44,000			
Post release of sharks and rays from longline and purse seine vessels (TBC, max. EU contribution: 400,000 euro)		3	44,000	440,000	44,000			
New projects Identified by SC10 as High Priority but not funded								
Further development of methods and analysis to account for changes in targeting practices on the catch of non-target species in particular shark species (alternative funding to be identified)		1	-					
Unobligated (Contingency) Budget related with any science-related projects requested by the Commission with no budget allocation			83,000		83,000		83,000	
TOTAL BUDGET			1,732,200		1,592,200		1,229,200	

AGENDA ITEM 11 ADMINISTRATIVE MATTERS

Election of Officers of the Scientific Committee

109. A. Batibasaga (Fiji) was nominated and accepted by SC11 as the SC Vice-Chair.

11.3 Next meeting

110. Indonesia confirmed to host SC12 in Bali, Indonesia, scheduled to take place from 3-11 August 2016.

AGENDA ITEM 12 OTHER MATTERS

111. There was no discussion against this agenda item.

**AGENDA ITEM 13 ADOPTION OF THE SUMMARY REPORT OF THE ELEVENTH
REGULAR SESSION OF THE SCIENTIFIC COMMITTEE**

112. According to the Rule 33 of the Commission’s Rules of Procedure, the following procedure for the development of SC11 Summary Report was agreed by the SC11 plenary.

Due by	Activity
18 August	Theme convenors receive SC11 draft report for review from the Secretariat
24 August	The Secretariat posts the provisional Executive Summary on SC11 website
24 August	The Secretariat receives theme convenors’ comment
28 August	The Secretariat distributes draft summary report to all CCMs and Observers by email
2 October	The Secretariat receives comments from CCMs and Observers

AGENDA ITEM 14 CLOSE OF MEETING

113. Fiji stated that they would volunteer to host the 2016 Commission meeting.

114. The SC Chair closed the meeting at 3:10pm on 13 August 2015.

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

**Scientific Committee
Eleventh Regular Session**

**Pohnpei, Federated States of Micronesia
5–13 August 2015**

SUMMARY REPORT

AGENDA ITEM 1 - OPENING OF THE MEETING

1.1 Welcome address

1. The Eleventh Regular Session of the Scientific Committee (SC11) was held in Pohnpei, Federated States of Micronesia from 5–13 August 2015. The meeting was opened by the Chair of the Scientific Committee Ludwig Kumoru (Papua New Guinea), welcoming delegations of the WCPFC Members, Cooperating Non-members and Participating Territories (CCMs) and Observers. A. Batibasaga (Fiji) led a prayer.

2. Opening remarks were presented by the Commission Chair Rhea Moss-Christian. She emphasised the value of science and knowledge and its critical place in decision making for the Commission. She noted that all participants must make a contribution and play a part in moving the Commission forward. She also acknowledged SPC's continued excellent support for the Commission.

3. The new Executive Director Feleti Teo made remarks which emphasised strong communication, community engagement by the Commission, and early consultations with stakeholders (**Attachment A**).

4. The following CCMs attended SC11: American Samoa, Australia, China, Cook Islands, European Union (EU), Federated States of Micronesia (FSM), Fiji, French Polynesia, Indonesia, Japan, Kiribati, Korea, Marshall Islands, Nauru, New Zealand, Palau, Papua New Guinea (PNG), Philippines, Samoa, Solomon Islands, Chinese Taipei, Tonga, Tuvalu, United States of America (USA), Vanuatu, and Vietnam.

5. Observers from the following inter-governmental organizations attended SC11: The Agreement on the Conservation of Albatrosses and Petrels (ACAP), Pacific Islands Forum Fisheries Agency (FFA), Inter-American Tropical Tuna Commission (IATTC), Parties to the Nauru Agreement (PNA), and Secretariat of the Pacific Community (SPC).

6. Observers from the following non-governmental organizations attended SC11: Birdlife International, Conservation International, Greenpeace, International Pole and Line Foundation, International Seafood Sustainability Foundation (ISSF), Pew Charitable Trusts, Sustainable Fisheries Partnership (SFP), University of the South Pacific (USP), and World Wildlife Fund (WWF).

7. The list of participants is appended as **Attachment B**.

1.2 Meeting arrangements

8. The SC Chair outlined procedural matters including the meeting schedule, social functions and administrative arrangements, schedule for other meetings in the margins, theme conveners and theme session arrangements. Theme conveners were:

Data and Statistics theme	L. Kumoru (PNG)
Stock Assessment theme	J. Brodziak (USA) and H. Nishida (Japan)
Management Issues theme	R. Campbell (Australia)
Ecosystem and Bycatch Mitigation theme	J. Annala (NZ) and A. Batibasaga (Fiji)

9. SC11 established five informal small groups (ISG) to facilitate the meeting process. The facilitators for the five ISG were:

ISG-1	Shark Research Plan and tuna stock assessment schedule	J. Larcombe (Australia)
ISG-2	WCPFC Tissue Bank Access Protocols	S. Nicol (SPC)
ISG-3	SC work plan and budget	L. Kumoru (PNG) assisted by R. Campbell (Australia)
ISG-4	Safe release of encircled animals/Guidelines for the survival of sharks from longline and purse seine gear	H. Kiyofuji (Japan)
ISG-5	Changes to longline observer data collection standards for bycatch	K. Bigelow (USA)

1.3 Issues arising from the Commission

10. The WCPFC Science Manager introduced working paper SC11-GN-WP-03, which outlines key issues arising from SC10 and WCPFC11. It was noted that most of the issues would be covered by SC11.

11. EU queried why an SC10 recommendation to the Commission about fin to carcass ratios for sharks was not listed. The Science Manager responded that while it had been reported to the Commission, no discussion and decision was made at the Commission in December 2014.

1.4 Adoption of agenda

12. The SC11 Provisional Agenda SC11-2015-02_rev1 was adopted without change (**Attachment C**).

1.5 Reporting arrangements

13. WCPFC Executive Director explained that it had been agreed at the Heads of Delegation Meeting that recommendations and decision points will be adopted during the session and the summary report will be formally adopted after the session. This change is designed to bring the report adoption process into line with other meetings of the Commission and it will relieve the burden on theme conveners. Theme conveners will be producing recommendations, including stock status in the case of the Stock Assessment theme.

14. EU sought clarification around the adoption of the recommendations taking place during the theme sessions, and suggested delaying their adoption to the end in case of a situation where the group might want to come back to a recommendation in light of information which might come out of other

theme sessions; EU further clarified the proposal was to avoid SC having its hands tied in case of inconsistency and noted that the SC should avoid being in a position of presenting inconsistencies to TCC and the Commission which expect and rely on robust scientific advice.

15. Others expressed their views that an adoption process would take place once, decisions would be deferred to the last moment where there was no consensus, or the SC Chair could rule when exceptional circumstances exist. The SC Chair noted that at the end of each theme session, SC would adopt those recommendations which can be agreed to. Under exceptional or special circumstances, where there are inconsistencies in recommendations, any decisions can be adopted on the last day, or the adopted recommendations could be re-opened if there is inconsistency. The EU was satisfied with this approach.

1.6 Intersessional activities of the Scientific Committee

16. The WCPFC Science Manager introduced working paper SC11-GN-WP-04, a brief summary of science-related key intersessional activities the Secretariat and SC has conducted during the last 12 months. These activities included preparing and posting the adopted version of the SC10 report, outlining the work of the scientific services provider (SPC-OFP), participation and presentations at TCC10, MOW3 and WCPFC11 in 2014, and SPC's technical assistance to the work of the Commission. It was noted that SPC also participated with the Secretariat in the data review and catch estimation workshops of the Global Environment Facility (GEF) funded West Pacific East Asia (WPEA) Project held in the participating countries (Indonesia, Philippines and Vietnam), conducted the Pacific Tuna Tagging Programme (PTTP), including the PTTP Steering Committee Meeting during SC11.

AGENDA ITEM 2 REVIEW OF FISHERIES

2.1 Overview of Western and Central Pacific Ocean (WCPO) fisheries

17. P. Williams (SPC-OFP) and P. Maru (FFA Secretariat) presented SC11-GN-WP-01, an overview of tuna fisheries in the western and central Pacific Ocean for 2014, including economic conditions.

18. The provisional total WCPFC Statistical Area tuna catch for 2014 was estimated at 2,860,648 mt, clearly the highest ever at 170,000 mt above the previous record catch in 2013 (2,690,881 mt); this catch represented 83% of the total Pacific Ocean catch of 3,486,124 mt, and 60% of the global tuna catch (the provisional estimate for 2014 is 4,783,629 mt, and when estimates are finalised is expected to be the highest on record mainly due to increased WCPFC Statistical Area catches).

19. The 2014 WCPFC Statistical Area catch of skipjack (1,957,693 mt – 68% of the total catch) was the highest recorded, eclipsing the previous record of catch in 2013 by 115,000 mt (1,842,485 mt). The WCPFC Statistical Area yellowfin catch for 2014 (608,807 mt – 21%) was also the highest recorded (5,000 mt higher than the record catch of 2008 – 603,244 mt) mainly due to increased catches in several longline fisheries. The WCPFC Statistical Area bigeye catch for 2014 (161,299 mt – 6%) was slightly higher than in 2013, but relatively stable compared to the average over the past ten years. The 2014 WCPFC Statistical Area albacore catch (132,849 mt - 5%) was slightly lower than in 2013 and about 15,000 mt lower than the record catch in 2002 at 147,793 mt. The WCPFC Statistical Area albacore catch includes catches of north and south Pacific albacore in the WCPFC Statistical Area, which comprised 76% of the total Pacific Ocean albacore catch of 173,702 mt in 2014. The south Pacific albacore catch in 2014 (83,033 mt) was the fourth highest on record (about 6,000 mt lower than the record catch in 2010 of 88,942 mt).

20. The provisional 2014 purse-seine catch of 2,020,627 mt was the highest catch on record and more than 120,000 mt higher than the previous record in 2013 (1,899,627 mt). The 2014 purse-seine skipjack catch (1,587,018 mt; 79% of total catch) was the highest on record (about 105,000 mt higher than the previous record in 2013) and the main contributor to the total purse seine catch record. This exceptional catch could be due to a strong year-class in conjunction with environmental conditions resulting in a prolonged period where skipjack tuna were more available to the gear. The 2014 purse-seine catch estimate for yellowfin tuna (362,049 mt) was the third highest on record but at only 18% of the total catch, continuing the recent trend of a diminishing contribution in the overall catch. The provisional catch estimate for bigeye tuna for 2014 (67,367 mt) was the sixth highest on record and will be refined as further observer data for 2014 have been received and processed. The total number of purse seine vessels was relatively stable over the period 1990-2006 (in the range of around 180-220 vessels), but over the last seven years, the number of vessels has gradually increased, attaining a record level of 303 vessels in 2013, with 302 vessels listed for 2014.

21. In line with the prevailing ENSO conditions, fishing activity during 2014 (El Niño-type conditions) expanded into the eastern tropical areas compared to 2013 (La Niña conditions). For the first time in many years, purse seine effort during 2014 in the area to the east of longitude 160°E was more pronounced than in the area to the west of that longitude (i.e. PNG, FSM and Solomon Islands). With the ENSO forecast for late 2015 predicting more pronounced El Niño conditions, the recent increased purse seine activity in the eastern tropical areas should therefore be maintained.

22. The 2014 pole-and-line catch (203,736 mt) was the lowest annual catch since the late-1960s, continuing the trend in declining catches for three decades. Japanese distant-water and offshore fleets (100,347 mt in 2014), and the Indonesian fleets (102,093 mt in 2014), account for nearly all of the WCPFC Statistical Area pole-and-line catch (99% in 2014).

23. The provisional WCPFC Statistical Area longline catch (268,795 mt) for 2014 was slightly above the average for the past five years. The WCPFC Statistical Area albacore longline catch (91,414 mt – 34%) for 2014 was the lowest for three years, 12,000 mt. lower than the record of 103,466 mt attained in 2010. The provisional bigeye catch (73,898 mt – 27%) for 2014 was higher than in 2013 but still amongst the lowest catches since 1996. In contrast, the yellowfin catch for 2014 (101,552 mt – 38%) was the highest for more than ten years, with increased catches by a number of fleets.

24. The 2014 South Pacific troll albacore catch (2,221 mt) was the lowest since 2010. The New Zealand troll fleet (153 vessels catching 1,937 mt in 2014) and the United States troll fleet (6 vessels catching 263 mt in 2014) typically account for most of the albacore troll catch.

25. Economic conditions in the tuna fisheries of the WCPFC Statistical Area during 2014 were mixed compared with 2013. US dollar (USD) prices for canning lightmeat raw materials (skipjack and yellowfin) saw a year on year decline in 2014 of around 30% across major markets while prices for whitemeat raw materials increased by 10% to 20%. In contrast USD prices for longline sashimi products in 2014 were little changed from 2013.

26. The total value of the tuna catch in the WCPFC Statistical Area declined year on year by around \$810 million to be \$5.8 billion in 2014. This decline was driven by the decline in the value of purse seine catch which, in turn, was driven by the decline in prices received by the purse seine fleet.

27. Prices in the major markets for WCPO skipjack were lower in 2014 compared with 2013, underpinned by a mix of factors including persistently high raw material inventories due to generally good fishing conditions and, lower demand at the end markets. The Bangkok benchmark (4.0 – 7.5 lbs) and Yaizu prices were lower by similar margins, down 30 and 26% respectively. Similar trends occurred

in other markets with Thai Customs import and General Santos prices lower by 30%, the Japan markets (in USD terms) - Japan selected ports and Japan Customs imports - declined by 25% each while the Ecuador prices declined by 28%.

28. Yellowfin prices on canning markets were mostly down but at varying magnitudes; the Bangkok market price (20lbs+, c&f) down 20%, Thai import prices declined 21%, Yaizu down 2% (in USD terms) and General Santos (20lbs+, fob) down 30%. Bangkok yellowfin prices averaged \$2,123/mt in 2014 compared to \$2,638 in 2013.

29. Albacore prices experienced improvements during 2014 across markets; the Bangkok benchmark (10kg and up) increased 15% (following a 28% drop the previous year), Thai frozen imports 14% (-29%), Japan selected ports fresh (ex-vessel) 12% (-27%) and US imports fresh free alongside ship (f.a.s.) 19% (-12%).

30. The Yaizu price of pole and line caught skipjack in waters off Japan averaged \$3,056/Mt in 2014, an increase of 26% compared to 2013. The Yaizu price of pole and line caught skipjack in waters south of Japan, however, by 6% to \$2,243/mt. Overall, the pole and line price at Yaizu in 2014 averaged \$2,356/Mt as against an average of \$2,402 in 2013, representing a small decline of 2%.

31. The USD prices on the main markets for longline caught sashimi products (yellowfin and bigeye) in Japan showed marginal to moderate changes during 2014. The prices in 2014 for the Japan fresh yellowfin imports from all sources averaged \$9.45/Kg, broadly comparable to 2013. The Yaizu port 2014 longline caught yellowfin fresh/frozen prices increased by 4% to \$6.48/Kg. Similar trends occurred on US markets with the US fresh yellowfin import prices averaging \$9.64 in 2014, the same as in 2013.

32. The Japan market prices for fresh bigeye imports from all sources weakened slightly by 2% to \$9.47/Kg while Japan selected ports frozen prices rose by 2% to \$9.03/Kg. In the US market the fresh bigeye import price in 2014 broadly maintained its 2013 level with a slight decline of 2%.

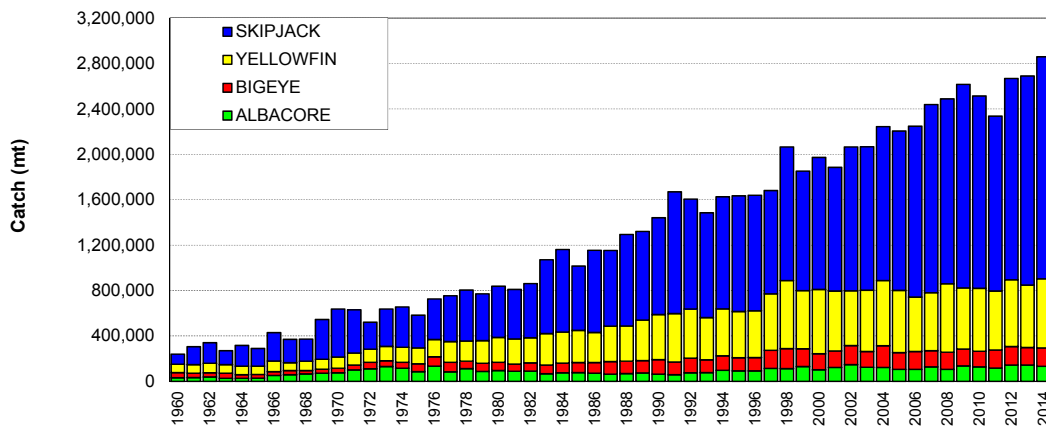


Figure 1. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCPFC Statistical Area.

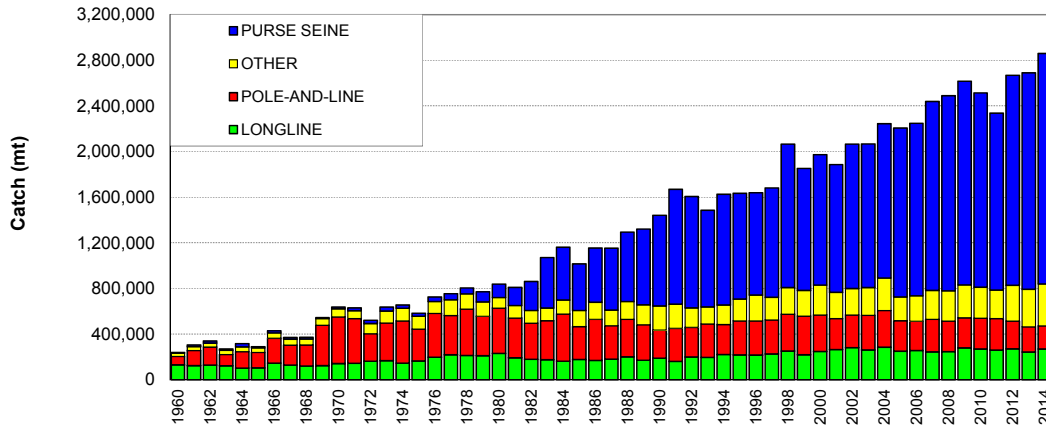


Figure 2. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCPFC Statistical Area, by longline, pole-and-line, purse seine and other gear types

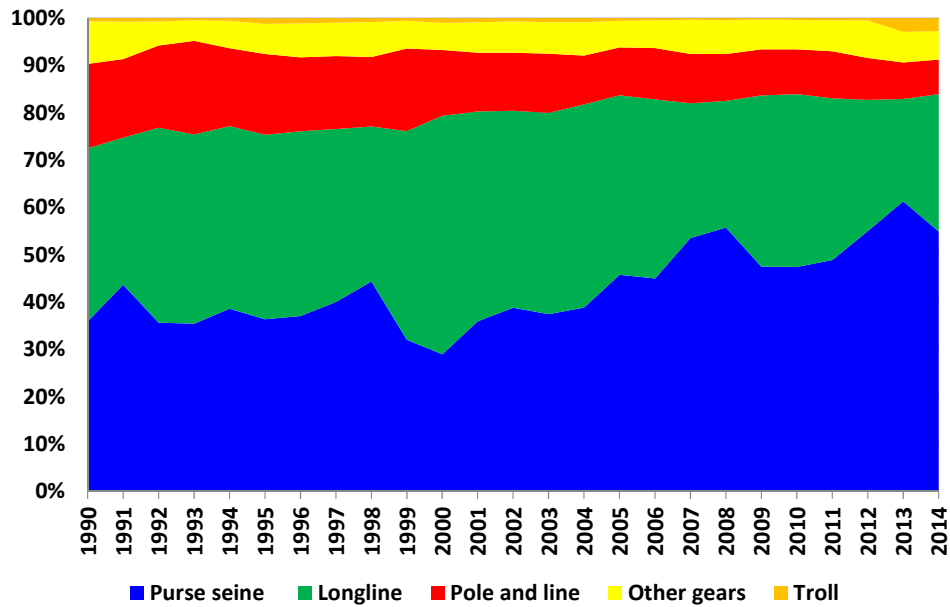


Figure 3. Relative share of gear type in the estimated delivered values of WCPFC Statistical Area catch, 1990–2014.

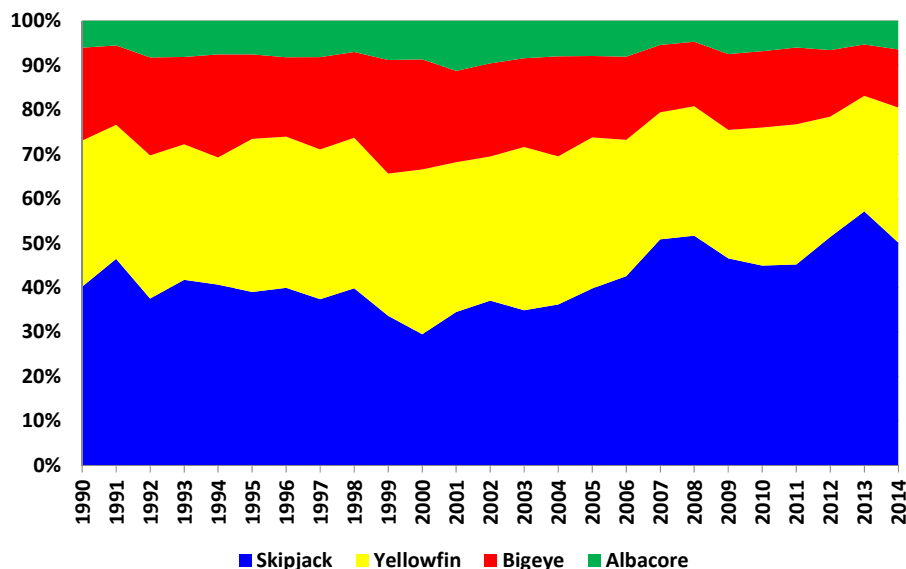


Figure 4. Relative share of species type in the estimated delivered values of WCPFC Statistical Area catch, 1990–2014.

Discussion

33. FFA members noted the record catches in the purse-seine fisheries, particularly skipjack and yellowfin. These trends suggest a continuing increase in the number and efficiency of purse-seine vessels. These CCMs noted that provisional 2014 data shows that longline vessel number appears to have decreased but longline catch remains steady or slightly increased, and suggested effort creep may be a contributing factor; a focus on capacity management may therefore not be necessary. FFA members supported directing future work towards alternative management efforts, technical controls and limits on catches and suggested further investigation of the data. These CCMs observed that the record high catches of skipjack and yellowfin did not translate into improved economic benefits in the skipjack fishery; SC11-GN-WP-01 showed that the economic conditions in 2014 deteriorated in comparison to 2013, a decline driven by the decrease in the value of purse seine catch. In turn, this was driven by the decline in prices received by the purse-seine fleet; the high skipjack catch led to an oversupply and crash in price. FFA members asked the authors if they could provide examples of direct evidence of supply influencing price or price crash, recognising variability. The CCMs were also concerned about the increased catch of bigeye and suggest the SC identify the reasons driving the increase, and provide advice to WCPFC12 including tightening the tropical tuna CMM.

34. FFA members further noted the update trends on the influence of environmental conditions and oceanography on the availability of tuna, observing that the El Nino event in 2014 and this year will further concentrate fishing activities to the eastern side of the WCPO. These CCMs sought SC advice on future predictions, whether this is likely to be a permanent trend or a phase of the ENSO cycle and what implications the trends might have on advice provided to Commission.

35. Japan observed that the 2 million tonne skipjack catch was high compared to the estimated MSY of 1.6 million tonnes. Japanese coastal small scale fishermen were observing low catch rates in the coastal areas of Japan and their concern was likely to rise with this news. It was time for the Commission and the SC to raise concerns about the catch level which is not sustainable. Secondly, purse-seine vessels were separated as distant water and domestic but Japan would appreciate further information distinguishing the

number of operating purse seine vessels by country. Thirdly, Japan was concerned about effort increase and the fast increase in associated sets and noted that effort creep is an important issue for SC. Catch and effort levels for associated sets are not decreasing as the Commission intended when they introduced the tropical tuna measure. Regarding the free school or FAD associated sets in Figure 9, Japan noted the recent increase in Japanese sets designated as ‘others’. Japan found an error in its data and has submitted a corrected version, reiterating that the set type is little changed in the last couple of years.

36. Korea queried the data used in Figure 8, page 5 in SC11-GN-WP-01, which showed US catch on a par with the Korean purse-seine fleet over past 4 years although effort in Korean purse-seine was clearly lower than the US’s effort. Korea thought there may have been problems in reporting, suggesting the explanation could be found in the number of vessels and that the catch rate of Korean vessels should be 1.4 times higher to be on par. Secondly, page 4 footnote 3 noted there was an additional 40 vessels in the category less than 200 GRT and queried whether these are new vessels or updated information. SPC responded that information in that footnote has been provided in the past and is excluded from that particular graph; it was not new information. Those vessels were not an integral part of the tropical fleet.

37. PNA members shared others’ concerns about the increases in catches and were encouraged by indicators such as reductions in effort in the core areas of the tropical longline fishery, reductions in purse-seine effort and in the number of FAD sets. These CCMs stated that the catch increases showed that the longline bigeye catch limits, the purse-seine effort limits and the FAD closure need to be tightened in an integrated package of improvements to CMM 2014-01.

38. Nauru pointed out the importance of this paper and noted that PNA members had observed problems arising from inaccurate use of some purse-seine data in the paper. These CCMs requested that a table be attached to future versions of this paper including best estimates of vessel numbers, effort and catch for this fishery and referred to SC11-ST-IP-04 which provided information on the purse-seine fishery in PNA waters and the effectiveness of the PNA VDS in managing purse-seine fishing in PNA waters.

39. China noted the purse-seine catch last year was substantially higher than the previous year and that the precautionary approach required SC make a more precautionary estimate of the skipjack stock. This CCM suggested that SC propose a fishing capacity limitation for the purse-seine fishery to maintain sustainable utilization of skipjack. A second concern of this CCM was the catch of bigeye tuna by purse-seiners, amounting to more than 67,000 mt, which this CCM considered was not sustainable for the bigeye tuna fishery.

40. USA queried the apparently high CPUE in the longline fishery in 2014. Referring to page 55, graph A7 ‘Estimates of longline effort and bigeye catch and bigeye CPUE for the core area of the tropical WCPFC longline fishery’, this CCM noted that 2014 was an anomalously high year. USA asked whether the numbers could be disaggregated into the four distant water fleets and the coastal fleet to see if a high CPUE average existed. In response, P. Williams reported that for a number of fleets that trend has occurred. Agenda item 5.3 of the Management Issue theme would examine the issue in more detail.

41. EU welcomed the presentation on capacity trends in the WCPO in other metrics than number of vessels and called for additional work in the future, including other metrics (e.g. GT or preferably carrying capacity) used in other RFMOs, as GRT has become an obsolete metric. Observing that both catches and prices seem to be increasing in average over a period of several years, this CCM referenced Figure 25 ‘Skipjack prices, Bangkok and Yaizu monthly and 12 month moving average’ and asked if SPC had conducted any analysis on links between the evolution in catches and evolution in prices.

42. P. Maru noted that C. Reid will provide a comprehensive response on that question.

43. Chinese Taipei noted the high purse-seine catches in El Nino years and observed that the oversupply of skipjack would impact on economic benefit. This CCM echoed China's suggestion that in future the Commission might set a limit on purse-seine vessels in the area.

Recommendations

44. SC11 recommends that the WCPFC Scientific Services Provider investigate the possibility of presenting trends in purse seine fishery capacity using additional metrics (e.g. Gross Tonnage, carrying capacity) that are used in other t-RFMOs.

2.2 Overview of Eastern Pacific Ocean (EPO) fisheries

45. K. Schaefer presented SC11-GN-WP-02, a summary of the IATTC fishery and assessment of the major stocks of tuna exploited in the eastern Pacific Ocean. The fishing capacity of the purse-seine fleet fishing in the EPO increased rapidly during 1995 to 2005, but has been fairly steady since about 2006, at about 200,000 cubic meters of well volume. The reported nominal longline effort has fluctuated between about 300 and 100 million hooks set annually over the past thirty years. Since the highest peak in 2002-2003 of about 300 million hooks there was a distinct decline to about 100 million hooks, but in recent years has increased to about 200 million hooks. Total tuna catches increased starting in 1996, peaked in 2003, and in 2014 were close to the average of the past fifteen years.

46. Yellowfin tuna catches have remained fairly stable since the mid-1980s, except for a peak in 2001 through 2003, followed by a substantial decline in 2006 through 2008, a slight increase in 2009 and 2010, and again a decline in 2011 through 2013. The 2014 catch on dolphin associated schools was greater than the past three years, but less than 2009 and 2010. The catches of yellowfin in unassociated schools in 2014 remained low, similar to the previous eight years. The current stock assessment method being used for yellowfin is Stock Synthesis 3. Since 2004 recruitment has been relatively low, though not quite as low as it was during 1979 through 1981. Recent estimates indicate that the yellowfin spawning biomass in the EPO is overexploited ($S < S_{msy}$), but that overfishing is not taking place ($F < F_{msy}$). The current status of the stock is considerably more pessimistic if a stock recruitment relationship is assumed, if a higher value is assumed for the average size of the older fish, and if lower rates of natural mortality are assumed for adults.

47. The status of the skipjack stock has been evaluated using eight different data and model based indicators. The purse-seine catch has been significantly increasing since 1994, and in 2014 was similar to the other peak years over the past decade, and near the upper reference level. Following a large peak in 1999, the catch per days fished on floating objects has generally fluctuated between an average level and the upper reference level. The value for 2014 was similar to that of 2013, and below the upper reference level. Except for 2010, the biomass and recruitment, have been relatively high over the past decade including for 2014, and the exploitation rate has remained relatively high during this same period. There is uncertainty about the status of skipjack tuna in the EPO, and there may be differences in the status of the stock among regions. However, there is no evidence that indicates a credible risk to the skipjack stock(s).

48. There have been substantial historical changes in the bigeye fishery in the EPO. Beginning in 1994 purse-seine catches increased substantially from targeting tunas associated with drifting FADs in the equatorial EPO. The estimated 2014 total bigeye catch of 60,000 tons by purse seine vessels was similar to the average of the past decade. The estimated 2014 bigeye longline catch of 35,000 tons was comparable to that of the past six years. The current stock assessment method being used for bigeye is Stock Synthesis 3. A full assessment was conducted in 2012, which included some major changes in

methodology to the previous full assessment done in 2010. The assessment for 2014 was similar to that for 2013, except for the inclusion of updated and new data. Recruitment estimates have been variable since 1975. There were very high peaks in recruitment indices corresponding with the major El Nino events in 1983 and 1998. Recruitment indices over the past six years have been close to the average value. Recent estimates indicate that the bigeye spawning biomass in the EPO is not overexploited ($S > S_{msy}$), and that overfishing is not taking place ($F < F_{msy}$). The current status of the stock is considerably more pessimistic if a stock recruitment relationship is assumed, if a higher value is assumed for the average size of the older fish, and if lower rates of natural mortality are assumed for adults.

49. A tuna conservation resolution (C-13-01) was adopted by the IATTC in 2013, for the three-year period (2014-2016). This includes an EPO wide closure for purse-seine (>182 mt) fishing of 62 days in each of those years, along with a 30-day closure of a core offshore FAD fishing area. There is a special provision for class 4 vessels (182-272 mt) which permits 30 days of fishing during the EPO closure provided an observer is aboard. For longline vessels (>24 m) the resolution includes fixed bigeye catch limits for China, Japan, Korea, and Chinese Taipei, and other CPCs not to exceed 500 t or their respective catches in 2001, whichever is greater. Additionally, a Pacific bluefin tuna conservation resolution (C-14-06) was adopted by the IATTC in 2014, for the two year period (2015-2016). This includes a catch limit of 6,600 metric tons of total commercial catches during 2015 and 2016. An additional 600 metric tons can be taken by US flag commercial vessels in 2015 and 2016 combined.

Discussion

50. FFA members noted the collaborative work of the scientists and the exchange of tuna fishery and ecosystem information between WCPFC and IATTC in conducting the Pacific-wide bigeye stock assessment. These CCMs observed that such an exchange is important to improve understanding of the state of potentially shared tuna stocks and developing effective management arrangements for each Convention area and the overlap area. FFA members observed that IATTC and WCPFC use different stock assessment methodologies and different approaches and reference points to determine stock status which is confusing and does not help managers understand the biological state of shared tuna stocks. These CCMs reiterated comments from last year, noting that SC11-GN-WP-02 provides the IATTC candidate limit and target reference points being proposed for yellowfin and bigeye in the EPO. IATTC proposed target reference points for these two species are SBMSY and FMSY and the proposed limit reference points which correspond to a 50% reduction in recruitment from its average unexploited level based on a relatively conservative steepness value of 0.75. These CCMs are concerned with such proposals considering guidelines for the application of precautionary reference points as set out in the UNFSA Appendix II – in particular paragraph 2 relative to limit and target reference points and sought clarification from IATTC on the basis of these reference points, in particular the limit reference point which relates to potentially very low stock biomass levels.

51. K. Schaefer acknowledged the concerns of some countries about the different approaches taken by IATTC and WCPFC, noting there was a philosophical difference regarding what the TRPs should be. In IATTC, the TRP relates to the Convention and managing the fishery at MSY – in the absence of any evidence towards a spawn recruitment function they ought to use a steepness of one. Regarding the LRPs proposed by IATTC (which have not been adopted) they are initial or interim LRPs which are going to be further explored and evaluated over the next 1-2 years. However, IATTC stock assessment scientists believe they are a reasonable stating point.

52. Japan commented that the approach taken by IATTC is not un-precautionary from a perspective of avoiding a recruitment decline given that IATTC's interim LRP is set at a biomass which is expected to produce 50% of normal recruitment assuming a rather strong stock recruitment relationship, which is actually not detected.

53. USA stated that the IATTC LRPs were more liberal than anything the USA would consider domestically or for WCPFC tuna stocks. This CCM queried the techniques' robustness and whether IATTC documentation demonstrated compliance with the rule which came in on 1 January 2013 requiring 5% observer coverage on longline vessels greater than 20 metres. This CCM further queried whether the IATTC plenary adopted the proposed 20% coverage level at its recent meeting.

54. In response, K. Schaefer referred the USA to the IATTC website, but commented that it was not possible to determine from those reports what the country observer level coverage was, although that is supposed to be reported. He acknowledged that it is widely understood that 5% is inadequate and pointed to Hawaii with a minimum of 20%. A proposal for 20% was not adopted at the recent IATTC meeting in Ecuador.

55. Marshall Islands noted the differences between LRPs for the two organisations which would need to be looked at in future and expressed thanks to ISSF for its workshop report (SC11-MI-IP-01) which included a comparative analysis of LRPs by different tuna RFMOs.

56. The EU noted its support for the introduction of TRPs and LRPs but commented that it is not enough without also testing the robustness of the reference points. EU has supported work this year in ICCAT, IOTC and IATTC to push forward this analysis, with the expectation it will contribute to the adoption of such reference points in the future and a more comprehensive harvest strategy.

2.3 Annual Report – Part 1 from Members, Cooperating Non-Members, and Participating Territories

57. China, Japan, Kiribati, Korea, PNG, Philippines, Samoa, Solomon Islands briefly presented important changes in their fisheries over the past year from their Annual Reports Part 1.2

58. Japan noted that many of its coastal communities experienced the record low skipjack catch in coastal fisheries last year and the situation has not improved much this year. This continues to be a big problem for the country.

59. Kiribati thanked the Secretariat, FFA and SPC for assistance with its timely annual reporting submission. This has been an issue for Kiribati in past years due to limited capacity. The situation has progressively improved and Kiribati looked forward to continued support with reporting.

60. Korea noted improvements in data collection from its tuna fishing fleet. The interval of logbook submission by fishers shortened this year from monthly to weekly and an E-reporting system is under development. Korea observed that E-reporting needs to be standardized in the format under development by the Commission.

61. Philippines reported ongoing initiatives such as a national stock assessment program and observer program, catch documentation and validation, the implementation of a Vessel Monitoring System and other collaborative activities supporting Philippines' efforts towards improving tuna data collection. Philippines passed Republic Act 10654 known as the Philippine Fisheries Code of 1998 and in 2015 Philippines approved and implemented Fisheries Administrative Order No. 245-3 (FAO 245-3) on the Regulations and Implementing Guidelines on Group Tuna Purse Seine Operations in High Seas Pocket Number 1 as a Special Management Area. This is supported by other FAO initiatives such as the National

² CCM Annual Reports Part 1 for 2014 can be found on the WCPFC website on the SC11 meeting page: <https://www.wcpfc.int/meetings/11th-regular-session-scientific-committee>.

Tuna FAD Management Policy (FAO No. 244), FAO 236-4: Extension of FAO 236 series of 2010 and other FAOs.

62. 203 vessels were active in PNG waters in 2014. PNG is introducing electronic reporting systems, has implemented an annual port sampling program, an observer program which covers vessels based out of PNG and foreign vessels fishing PNG waters. This observer program aims to improve observer coverage on all vessels. PNG is striving towards building its fishing industry. Fishing licenses are linked to onshore investment. At full capacity PNG is looking to processing all fish caught in PNG waters, back in PNG.

63. Samoa's albacore catch for 2014 was an estimated 808 mt, the lowest recorded catch in the past five years, indicating challenges faced by the domestic fleet. Samoa expressed interest and concern regarding the albacore stock assessment to be discussed at SC11.

64. Vietnam noted it was the first time it has collected data in its own territory and thanked WCPFC for funding support.

Discussion

65. FFA members were encouraged by improvements in the timely submission of Annual Reports Part 1 which allowed time for CCMs to consider the information provided well in advance of SC. These CCMs noted the relationship between the Annual Reports Part 1 and 2 and the Part 1 information that is reported against in Part 2. However there is a mismatch in their submission dates. In addition, these CCMs noted that the Compliance Monitoring Scheme involves a comprehensive process of data collection and analysis by the Secretariat, including the amount information in the Annual Reports. These CCMs asked for consideration of the feasibility of national agencies to submit Part 1 reports earlier in the year, perhaps at the end of May following the Scientific Data and annual catch estimates submissions in April. This would complement the development of annual catch estimates, provide CCMs sufficient time to review these reports, and provide the Secretariat with more time to manage CMS-related tasks. At the very least the SC could consider aligning the submission date for Part 1 to coincide with Part 2.

66. The SC Chair noted this request and queried CCMs on whether they could submit Annual Reports Part 1 by May 30 each year. A number of CCMs observed that they would find it difficult to meet a 30 May deadline, with USA noting that having submission dates for Annual Reports Part 1 and 2 more in sync could be considered, but the Annual Report Part 1 deadline should not be set too far in advance of Annual Report Part 2.

67. The WCPFC Compliance Manager asked that CCMs consider the issue in the context of the annual reporting process and data submission - there are advantages for the compliance process if the submission date could be moved forward and would spread the Secretariat's workload.

68. The SC Chair noted that SC would come back to the issue to try and agree a date between May 30 and July 1.

2.4 Reports from regional fisheries bodies and other organizations

69. While not presented, it was noted that papers from non-government organisations Pew Charitable Trusts and WWF could be found on the WCPFC SC11 meeting website.

AGENDA ITEM 3 DATA AND STATISTICS THEME

3.1 Data gaps

3.1.1 Data gaps of the Commission

70. P. Williams (SPC-OFP) presented SC11-ST-WP-01 on scientific data available to the Western and Central Pacific Fisheries Commission including a review of the tier scoring system for scientific data submission which has been developed for evaluating compliance with the provision of scientific data to the Commission. SC11 was asked to review the system and provide comments or recommendations, if any, to the Commission (Paragraph 478, WCPFC11 Report). He also presented recent development in WPEA Phase 2 project taking place in Indonesia, Philippines and Vietnam and main data gaps for these two CCMs and one cooperating non-member.

71. With regard to 2014 scientific data submissions, three CCMs with fleets active in the WCPFC Convention Area had not provided 2014 annual catch estimates by deadline of the 30th April 2015; two of these CCMs have now provided their estimates. Estimates for the key shark species (which is in accordance with the change in the requirements to include the key shark species catches) continue to improve but remain, with the provision of discard estimates, as the major data gap.

72. In general, the timeliness of the provision of aggregate catch/effort data continues to improve with nearly all CCMs providing data by the deadline of 30th April 2015. The quality of aggregate data provided is also improving with a reduction in the number of notes assigned to the aggregate data in recent years.

73. Operational catch and effort data for the Korean longline and purse seine (2014) and the China longline fleets (2014) were made available for the first time, and were by far the most significant developments in resolving data gaps over the past year.

74. The main data gaps listed in working paper ST-WP-01 are:

- The non-submission of operational data for several key fleets (Section 2.3);
- The non-submission of number of vessels in the aggregate data for two key fleets (Section 2.4);
- The need for improvement in the submission of catch estimates for the key shark species (Section 2.5) and reporting of discard estimates.

75. The review of gaps in 2014 scientific data provisions includes the assignment of a tier-scoring evaluation level, as recommended by WCPFC11.

76. The second phase of the Western Pacific East Asia Oceanic Fisheries Management Project (WPEA OFM) which provides support to the Philippines, Indonesia and Vietnam to, inter alia, improve monitoring and data management of their domestic fisheries, has now commenced. There remains significant work to improve the coverage, quality and submission of logsheet, port sampling and observer data, and the reliability of annual catch estimates for certain gears. For Indonesia, the main data gaps continue to be the lack of aggregate catch/effort data and the uncertainty of the estimates for their small-scale tuna fisheries. For the Philippines, the main data gap is the reliability of the historical estimates for their small-scale artisanal hook-and-line fisheries. For Vietnam, the main data gap is the complete lack of historical annual catch estimates prior to 2000, and the need to improve the coverage of logbook data.

Discussion

77. FFA members were supportive of ongoing efforts to develop and strengthen data collection programmes in the Philippines, Indonesia and Vietnam, in particular the collection of operational level catch and effort data through the WPEA project. These CCMs noted that neither Vietnam nor Indonesia has yet to provide or authorise the release of their operational and aggregate level data to the Commission. Understanding and addressing uncertainties in these western Pacific fisheries is important to the scientific work of the Commission. FFA members strongly urged these CCMs to address this as a matter of priority.

78. Indonesia noted that it still faced substantial problems with the observer program's coverage levels and continues to look for ways to improve, including arranging for a logbook owners workshop and introducing a logbook regulation. WPEA project's assistance was acknowledged.

79. EU opined that the tiered scoring system is an outstanding improvement in visually presenting compliance with data submission requirements, showing the level of data provision and, over the long term, allowing parties to assess and monitor improvements in compliance with data provisions and improving the work of the TCC. This CCM queried why it was considered to have not provided size data when this data was provided by observers (the EU does not receive the data from the observers, it goes directly to SPC). This CCM supported the use of longline operational data to support future work of the Commission and also supported the work being done with the Philippines and hoped this would continue in the future.

80. EU opined that the tiered scoring system is an outstanding improvement in presenting (including visually) compliance with data submission requirements, showing the level of data provision and, over the long term, allowing parties to assess and monitor trends in compliance with data provisions and improving the work of the TCC. This CCM queried why it was considered to have not provided size data when this data was provided by observers (the EU does not receive the data from the observers, it goes directly to SPC). This CCM supported the conclusion of a new agreement between SPC and relevant CCMs that would allow the continuation of the use of longline operational data provided under confidentiality agreement for the BET assessment, to support future work of the Commission and also supported the work being done with the Philippines and hoped this would continue in the future.

81. A lengthy discussion took place relating to whether the working paper presented was compliance-related or a data gaps paper. Regarding operational data, Japan stated that it complies with data provision rules and objected to receiving a score of 'non-compliant'. Japan pointed out that it was concluded that the dynamics of bigeye tuna in the WCPO estimated using the Pacific-wide model with operational data are not substantially different from those estimated using the WCPO-only model with aggregated data, which verifies there is no basis for argument that non-provision of operational data gives an adverse effect on the conservation and management of resources. It also pointed out that the paper referred to non-required data such as aggregated catch and effort data for the Pacific Ocean east of the eastern boundary of the WCPFC Statistical Area and requested to delete references to those data in order to prevent confusion. Japan asked for clarification about whether it had provided operational data distinguishing between the high seas and EEZ and sought clarification on the data gap related to provision of data for the entire Pacific Ocean.

82. In response, P. Williams confirmed that Japan had provided catch estimates by EEZ and high seas and this was acknowledged in this paper. He explained that the Table 3 data gap note for Japan purse-seine data related to the requirement to provide aggregated catch and effort data for areas outside the Convention area. When there are assessments for certain species which have stock boundaries covering the south Pacific Ocean, e.g., for South Pacific albacore, the assessments require data for what SPC

understands to be the stock area and noted that in Data to be Provided to the Commission there is a specific note about South Pacific albacore, swordfish and striped marlin and requires that the data is provided for those species.

83. The WCPFC Compliance Manager noted that the tiered scoring system originated as a recommendation from TCC last year to WCPFC11. She explained that for the last couple of years TCC has spent considerable time discussing the matter of distinguishing between small data gaps that do not have a major impact on the scientific work of the Commission and large data gap that constrain the Commission's scientific work. The WCPFC11 decision (paragraph 478, WCPFC11 Summary Report) that the tiered system would be adopted, on the understanding that the TCC and SC would continue to review and refine, if necessary.

84. Philippines stated that it submits its observer program data directly to SPC. Philippines it achieves 100% coverage in HSP1 but coverage in their domestic fisheries still lacks some data. Reforms are being undertaken and the number of landing areas for the national stock assessment program has expanded – 254 landing sites had been established out of the 500 planned. Domestic observer coverage has expanded too, it previously operated only during the FAD closure period and it now includes the EEZ.

85. Chinese Taipei asked SPC about the data provided by their country used for stock assessments. Chinese Taipei stated that its domestic legal constraints meant it cannot provide operational level data but would provide operation level data as required by CMM 2014-01 in 2018 and that it also cooperates with SPC with the provision of data for stock assessments. Chinese Taipei asked SPC to confirm that it had provided observer data for 2014. P. Williams responded that Chinese Taipei is compliant regarding the provision of size data.

86. USA observed that it had been critical in the past about the processing of observer data, but noted that processing had been better in recent years. Table 4 in ST-IP-02 is a CCM declaration of observer coverage within fisheries. Alternatively, Table 5 illustrates data that CCMs actually submit to WCPFC and SPC. Table 5, at least, should be submitted to TCC for evaluation.

87. Vietnam reported that under the WPEA project's Phase 2 it has plans to improve this data sampling. There are significant constraints regarding coverage due to its large number of fishing boats. On logbook data collection, Vietnam hopes to improve on the poor quality of its logbooks, and it, which may then be submitted for stock assessment purposes.

88. Korea stated that it has submitted catch-up data for 2014, submitted data distinguishing between EEZ and high seas for 2012 and 2013. Korea plans to make historical operational catch and effort data available for stock assessments, when ready.

89. EU reminded the group that the purpose of the discussion was to evaluate whether the approach proposed by the SPC and Secretariat will enhance the work of TCC and Commission; whether the proposed amendments are required to improve it or if it will fulfil the task as it is. EU opined that it is a significant improvement, although this CCM didn't agree with some of the scores – this could be discussed at TCC – but the EU supported the tool itself.

90. Australia stated it made a useful contribution from a scientific perspective and commented that SC has previously made it clear that the non-provision of operational level data impacts on the scientific work of the Commission. Japan did not support the comment noting that it was concluded that the

dynamics of bigeye tuna in the WCPO estimated using the Pacific-wide model with operational data are not substantially different from those estimated using the WCPO-only model.

91. FFA members were encouraged by the submission of operational data to the Commission by China and Korea, and looked forward to continued progress, including the provision of historical data. Several CCMs are yet to provide historical operational data, and FFA members encouraged efforts to resolve this.

92. FFA members thanked SPC for developing and presenting the evaluation scores on provision of scientific data, noting that it is a useful indicator and helps identify where improvements can be made. FFA members encouraged the CCMs identified as Tier I and II to use the tables to address their data provision requirements. These members congratulated Korea for providing operational level data for its longline and purse-seine fleets for 2014, achieving full data submission.

93. A number of CCMs expressed the desire to evaluate whether the document could be used as a tool for evaluating data gaps, and leave compliance assessments to TCC. The US and Japan suggested removing the references to ‘compliance’ out of the paper in future versions. P. Williams commented that, in future, SPC will ensure that the evaluation does not infer compliance in this paper, since the compliance aspect of the paper is TCC’s responsibility.

94. SC agreed to revise the document to remove the word ‘compliance’. Japan supported the suggestion, and requested that the footnote say that Japan is compliant with the operational data provision. The SC Chair said this issue would be revisited later in the meeting.

95. In a later session, P. Williams announced that the paper had been reissued without mention of the word ‘compliance’ and was available for participants.

Recommendations

96. SC11 recommends that:

- a. **The SC11-ST-WP-01 paper is revised to remove specific reference to the word “compliance” since, while it feeds into the compliance processes of the WCPFC, it is not intended to be the compliance evaluation, *per se*.**
- b. **Clarification is sought from TCC11 on whether the significant amount of purse-seine size data provided to the WCPFC through the 100% observer-coverage requirement under the ROP should be considered as satisfying the flag-state scientific purse-seine size data provision.**
- c. **The tier scoring system developed by SPC (SC11-ST-WP-01_rev1) for the evaluation of the provision of scientific data is used in the work of the TCC and the Commission, with the understanding that the respective ratings included in this paper are not necessarily agreed by each WCPFC CCM.**

3.1.2 Species composition of purse-seine catches

a. *Review of Project 60 outputs*

97. J. Hampton (SPC) presented SC11-ST-WP-02, on annual estimates of purse seine catches by species based on alternative data sources and a review of current purse-seine catch estimation issues and future plans. This paper responds to two requests from SC10 (para 100, SC10 Report) regarding the estimation of purse seine catch by species. Purse seine catches by species were estimated using four methods – uncorrected logsheets (Method 1), preserving the logsheet estimate of skipjack catch and using

observer grab sampling data to determine the catches of yellowfin and bigeye tuna (Method 2), the current method based on estimation of the three species using observer grab sampling data corrected for selectivity bias (Method 3) and the current method but using uncorrected grab sampling data (Method 4). The greatest impact on the species catch estimates has resulted from no longer assuming, as was done pre-2008, that the logsheet-declared skipjack catches are accurate. Using observer-based grab sampling as the basis for disaggregating the catch into the three species, the overall bigeye catch is increased by 252%, the skipjack catch reduced by 13% and the yellowfin catch increased by 36%. By contrast, the correction of the grab sampling data for selectivity bias resulted in relatively small incremental changes – a reduction of overall bigeye catch by 7%, and increase in skipjack catch of 3% and a reduction in yellowfin catch of 7%. The two main questions that need further consideration are: (i) is spill sampling the method of choice for observer-based catch sampling and (ii) are corrected grab samples a reasonable proxy for spill samples? On the basis of the limited trials so far carried out, whereby the different sampling protocols have been compared to accurate species catches obtained at unloading, it is concluded that spill sampling is likely to consistently provide the most accurate estimates of species composition, and presumably size composition as well. It is therefore the current method of choice, although further such comparisons would be useful. On the basis of the paired sampling trips conducted thus far, it was found that for all data combined, the corrected grab samples provide species composition estimates for skipjack and yellowfin within 2% of the spill-sample-based estimates. For bigeye, the corrected grab samples overestimate the catch by 11% compared to the spill-sample-based estimates. This indicates that corrected grab samples may be considered adequate for the purpose of estimating highly aggregated catches. However, the variability of the estimates at the trip level and at the set level (particularly) is high, and corrected grab sampling is probably not adequate if accurate and precise catch estimates are ever required for management purposes at these levels. It was suggested that future work should include finalisation of analyses of existing data, the collection of further paired sampling data where these results can be compared to accurate estimates of landed weights by species and simulation modelling to assess alternative sampling protocols. It was also suggested that further technical consultation is necessary to evaluate on-board sampling options in the context of overall data collection requirements by observers.

Discussion

98. EU asked for clarification around two issues – first, whether spill sampling misrepresents large fish, and if stratifying sampling by size would be more effective. Second, whether logbooks represent a good estimate for total catches for each trip. The experience suggests that it might not be the case as vessel skippers might tend to underreport catches in logbooks, to various degrees. This CCM asked about the possibility of a conversion factor from port unloadings.

99. In response, J. Hampton acknowledged that the way purse-seiners operate is changing. Some are separating the large fish from the smaller fish at an early stage, and depending on when that separation is taking place there is a logistical challenge to take account of and this could vary from boat to boat or fleet to fleet. Sampling of large and small fish or placing two observers might be required. Regarding logsheets, J. Hampton acknowledged that SPC does not have sufficient unloadings data to compare actual unloadings with logsheet declarations and there is no subsequent correction for variability.

100. Japan with reference to EU's questions on estimating the total catch of 2 million tonnes, which is the baseline for the calculation of species composition, noted that a small under or over-estimation could have a substantial impact on stock assessment results. SC should consider how to achieve a better estimate of total catch. Catch composition data is improving and progress to date is welcomed. Japan is contributing to good species composition data, by providing unloading data and conducting spill sampling, but they queried the cost of any other further work if needed.

101. J. Hampton noted that where flag states are able to provide corrected estimates using reliable data, SPC would use those for total catches by flag state, but most flag states simply use the logbook data without correction using sampling data, to which they may not have ready access..

102. FFA members supported in principle future plans for improving purse-seine catch composition data as laid out in SC11-ST-WP-02, but requested further information from SPC on the budget required and an indication of timeframes to complete the work. These CCMs requested that Table 1 be updated annually to ascertain catch composition and suggested an integrated approach be adopted by the Commission to improve purse-seine species composition data (scientific and compliance aspects). The updated plan should therefore be forwarded to the TCC for that Committee to include compliance aspects.

103. USA noted requests from both SC9 and SC10 and thanked SPC for fulfilling recommendations on species composition and purse seine catches. This CCM enquired whether responses had been received by the Secretariat to the Circular on spill sampling issued earlier in the year. USA conveyed views of its industry: some vessel operators do not support spill sampling because of issues related to deck and the implications for health and safety of observers, crew and others, simply too intrusive for some because of the limitations the container puts on working deck space. Industry suggested that spill sampling be limited to larger vessels and those better able to accommodate. Two potential projects were highlighted: 1) provide an analysis of observer grab and port sampling (American Samoa), pending availability of observer grab sampling from FFA and 2) a comparison of RPL purse seine catches with Final Out-Turns (FOTs).

104. Philippines shared the experience of its national observer program, which adopted spill sampling late last year. Paired observations were also done with catch estimates from observers and logsheet submissions, producing statistically significant lower estimates in logsheets by 1 tonne per set.

105. Korea noted that this work has been discussed for five or six years. This CCM observed that it is possible to identify big differences in bigeye tuna catches using logsheet versus spill sampling and hoped that spill sampling techniques will be used in the observer sampling as soon as possible. Korea strongly supports of future work and associated additional funding.

106. The SC Chair noted SC's support for this project and that the work would require funding and suggested taking this issue up in ISG-3 when discussing the budget.

Recommendations

107. SC11 recommends that:

- a. The WCPFC science/data service provider produce an update to Table 1 in ST-WP-02 annually (until an agreement on methodology can be reached) as it provides a very useful summary of the purse-seine catch estimates derived using the four different methods to ascertain catch composition.**
- b. In regards to the implementation of observer spill sampling in the tropical purse seine fishery,**
 - i. The WCPFC Secretariat and the WCPFC scientific services provider investigate operational aspects including alternatives for spill sampling on purse seine vessels where the current spill sampling protocol is difficult to implement and report back to SC12.**

- ii. **The WCPFC scientific services provider will undertake additional data collection and analyses to evaluate the benefits of spill sampling compared to corrected grab-sampling.**

b. Catch estimation in aggregate purse-seine data and industry's feedback on spill sampling

108. J. Hampton brought two information papers relating to this agenda item to the attention of the Committee – SC11-ST-IP-08_rev1 ‘The bigeye tuna catch composition estimation of Taiwanese purse seine fishery’ and SC11-ST-IP-09, ‘Feedback on Purse Seine Species Composition Sampling.’ He noted that it was similar to method 2 in SC11-ST-WP-02, where skipjack catch is taken as being true and sampling data are used to disaggregate yellowfin and bigeye tuna. He cautioned that it appears frequently on logsheets that skipjack catch is overestimated; this was a broad finding in a previous SC paper (SC7-ST-WP-02) which went into the issue in detail.

109. FFA members recommended that species and size composition of purse seine catches be undertaken on the basis of spill sampling by observers as it has been found to provide more accurate estimates and more useful information than other techniques analysed. These CCMs noted their preference for spill sampling by observers, observing that corrected grab sampling is relatively accurate on a large scale but with the growth of electronic technology and the management challenges faced by the WCPFC, accurate set by set data is becoming more important. They also noted that only 750 paired sets have been done using both spill and grab sampling and also noted the importance of continuing this work and extending it to non-compliance including mis-reporting in the future.

110. Chinese Taipei noted EU conducted the same research into fishing vessel operations in the Indian and Atlantic Oceans, finding that purse-seine vessels’ catch recorded on logsheets was not correct, including the skipjack catch. Chinese Taipei would like to do this but stated that it has data constraints; they can collect logbook data and some tagging data from canneries but could not currently provide bigeye tuna catch composition data. If there were more observer data they could do some analysis to do more catch estimation work including skipjack.

111. While Japan had not provided a response to the Secretariat’s request, it reported the spill bin was introduced on some of its large purse-seiners but its industry generally did not welcome it due to operational constraints. Japan also reported that it was difficult to install spill bins of the typical size of Japanese vessels.

112. EU reported that although the EU fleet is not currently using the spill sampling method, it would be open to use it if the opportunity arises or if the Commission requests the method be introduced.

113. The SC Chair asked for views about whether CCMs should go ahead and implement it where they can, wait for industry, or put the issue to IWG-ROP to elicit a wider range of views about the implementation of spill sampling to determine how to progress.

114. FSM concurred with other CCMs that for smaller sized domestic vessels the bin takes up a lot of space on deck.

115. EU noted that despite the goodwill expressed, observers are provided by the ROP; the working group on ROP-related issues should get involved. The issue was not fully in flag states hands.

116. Nauru suggested taking the issue to IWG-ROP, where coastal states that provide observers can explain what it entails.

117. Japan observed that SPC was trying to estimate how accurately it can estimate the catch composition without full implementation of spill sampling. Japan wondered if the issue fit well with the TOR of the IWG-ROP. It emphasised the operational aspect of the issue, its costs, benefits and alternatives needed to be discussed.

118. J. Hampton suggested a possible way forward – continue to work as proposed in the presentation and give further consideration to the budgetary implications. In addition, SC could recommend that the IWG-ROP be tasked with giving full consideration to all of the issues with appropriate expertise at the meeting to cover them.

119. Japan observed that most of the participants at IWG-ROP are managers not scientists and therefore questioned the WG is appropriate for this scientific issue. It would be more appropriate to discuss the issue at SC next year with more information including scientific options for coming up with accurate estimates.

120. Nauru supported J. Hampton’s proposal, noting that the science parameters could be determined by SC but the IWG-ROP could translate the information to the managers of observer programs and consider how they are going to take this forward on the ground.

121. EU proposed a way that would incorporate both SPC and Japan’s suggestion. It would be a pity to postpone progress until next year without knowing if there would be any new data, this CCM suggested progressing the issue concurrently in other forums including the IWG-ROP, which could throw up some important insights, then combine the outcomes of the different discussions.

122. USA observed that the IWG-ROP meets infrequently and questioned the value of sending the issue to that body. One path forward might be to prioritise those items in the budget and determined how much funding was necessary to progress the work. Other fleets with large vessels could volunteer to assist.

3.2 Regional Observer Programme (ROP)

3.2.1 Intersessional Working Group – Regional Observer Program (IWG-ROP)

123. WCPFC ROP Coordinator K. Staisch presented SC11-ST-WP-03 ‘IWG-ROP4 Summary Report’, a report on the summary record of the fourth IWG-ROP which met in July 2015 in Fiji to discuss issues which had been forwarded by the TCC and Commission. The IWG-ROP4 report contains 25 recommendations and suggestions on ROP issues. K. Staisch highlighted the outcomes of the IWG-ROP and noted a number of issues under discussion, including alcohol-related misconduct by observers, ID cards, transshipment notification rules, facilitating the provision of data and observe reports, a pre-notification scheme which would allow vessel captains or owners to be advised quickly if they had been reported by an observer for an alleged infringement. Discussions also took place on issuing satellite communicators to individual observers for their safety, mechanisms and metrics approved for longline observer coverage, data flow to the Commission, and the hybrid approach on the sourcing of observers.

124. There were no comments against this paper.

3.2.2 Submission of ROP-defined observer data

125. P. Williams (SPC-OFP) brought to the attention of the committee information papers SC11-ST-IP-02 ‘Status of observer data management’ and SC11-ST-IP-03 ‘Report of the Tuna RFMO Expert

Working Group: Harmonisation of Longline Bycatch Data Collected by Tuna RFMOs?. Some of the information in these papers will be forwarded to TCC. The meeting of technical experts on tuna longline fisheries provided the first opportunity to progress harmonisation of bycatch data collected by observers for these fisheries. The objective of this meeting was to review the respective longline observer data fields that are equivalent, and those that are unique to particular RFMOs for the purpose of assisting with comparison across tuna RFMOs.

126. There was no discussion of this item.

3.2.3 ROP longline coverage

127. P. Williams reminded SC11 that last year an informal small group chaired by R. Campbell (Australia) established metrics to report longline observer coverage. This work went through TCC, producing a table on both purse-seine and longline coverage. SC11-ST-IP-02 will progress to TCC11 and invited comments on the paper and its tables 3, 4 and 5.

Discussion

128. Australia noted it was clear through a number of meeting papers, including those on sharks, that the work of the SC is being constrained by a lack of observer data from longline fleets. It was also noted that a number of the large longline fleets were nowhere near the required 5% observer coverage while some domestic fleets were well above the required coverage. This CCM encouraged fleets to achieve 5% coverage. The IWG-ROP was encouraged to report on metrics but it did not encourage fleets to achieve the 5% level.

129. FFA noted the need to address consistency with the metrics used by CCMs to determine longline coverage, as adopted by the Commission. We note that CMM 2007-01 requires “coverage of effort” and encourage all CCMs to ensure that the adopted metrics are used to enable comparative analyses for the different fisheries under the purview of each CCM and the Commission. We encourage CCMs to work towards achieving the minimum required coverage levels, if not more, to facilitate comprehensive scientific analyses in the assessment of fishery interactions.

130. USA noted that CMM 2007-01 gave CCMs five years to get their observer coverage up to 5%, making it a requirement in 2012.

131. Japan reported that it could not fulfil requirement of coverage for ice/fresh short trip vessels because some vessels operated in Japan’s EEZ only. This CCM noted Japan will try it’s best to achieve the required coverage levels next year.

132. Chinese Taipei reported its small scale tuna longline fleet did not reach the 5% coverage level, though the observer program for small scale vessels had been in place from 2012. Because of space limitation it was hard to deploy observers on board. They reported that they are developing an E-monitoring system and said it will use E-monitoring to replace observers for the small scale tuna longline vessels.

133. WWF reminded the committee that 5% is an arbitrary benchmark and that CCMs should strive to achieve observer coverage levels appropriate to effectively manage the fishery.

134. China reported that it has a government program to encourage a higher coverage rate and held a national training session for compliance matters including observer issue this year. China asked for technical support from SPC to assist capacity building in this area.

135. Korea reported that it is encouraging a higher observer rate but noted that the operation of longline gear is labour intensive and different from purse-seine gear. This CCM noted that Korea's data collection scheme included catch and effort data and this data could be improved by cross checking with observer data.

136. In response to a query from USA about the inconsistency between CCMs' self-declared coverage levels and other data in SC11-ST-IP-02, SPC explained that there might be a lag in provision of data. In future SPC will tie together Tables 4 and 5 against what has been received by SPC on behalf of the Commission to help identify gaps and assist an enquiry into why there are gaps.

137. FSM reported that its observer coverage levels were increasing slightly over the years; it was investigating MOUs with other observer providers for their longline vessels operating in national jurisdictions.

138. ACAP observed that SC will need to look at the degree to which data collected by E-monitoring can be used to fill the requirements for longline vessels. SC had heard that it can be difficult to put observers on smaller vessels, and E-monitoring could play a vital role. However, E-monitoring cannot replace all the functions of an observer. SC needs to review the data required and decide what can be provided by E-monitoring. CCMs should be aiming for higher levels of coverage, and once E-monitoring is installed there is no reason why there could not be 100% coverage.

Recommendations

139. SC11 recommends that:

- a. **WCPFC12 notes that a number of CCMs did not achieve the 5% observer coverage of their longline fleets according to the requirements in CMM 2007-01 and this is impacting on the SC's ability to address a number of scientific issues. Coverage of observer data submitted to the WCPFC (that is, Table 5 in SC11-ST-IP-02) be forwarded to TCC11 for consideration.**
- b. **The WCPFC Scientific services provider include an additional table in future versions of their paper on ROP Data Management (starting with SC12) which compares the coverage of longline observer trips, as provided by CCMs (Table 4 in SC11-ST-IP-02) with the coverage of data submitted for longline observer trips (Table 5 in SC11-ST-IP-02).**

3.2.4 Marine pollution data collected by observers

140. P. Williams (SPC-OFP) brought the committee's attention to SC11-ST-IP-05 'Marine pollution originating from purse-seine fishing vessel operations in the Western and Central Pacific region, 2004-2014.' This paper contains information related to their work collected by observers over the last 15 years. There are ROP minimum data fields regarding marine pollution, and data against these fields are available.

Discussion

141. FFA members noted that the study focused on purse-seine observer data; the conclusions do not make it clear that longline vessels outnumber purse-seine vessels by about 10 to 1; it provides an analysis of pollution by zone but does not take into account that longliners have a different distribution including high seas fishing. These CCMs encouraged the data to be reviewed in the context of fishing pattern, and

to scale the pollution incident data according to the number of vessels by type and by area for this work to assess where WCPFC efforts should be focussed. Breaking down the incidents by flag as well as by EEZ would also be useful.

142. Birdlife International made a statement that marine pollution especially from plastics makes up 36% of the marine pollution incidents highlighted in this report. It is a serious issue for the marine environment. Plastics and other non-biodegradable material such as discarded nets cause entanglement of marine wildlife such as turtles, marine mammals and seabirds. Other plastics breakdown and can be ingested by wildlife such as seabirds which is also a potential vehicle for toxins adsorbed onto plastics to be taken up by wildlife such as seabirds. This report highlights that illegal dumping of this material is occurring and is a snapshot of a much larger problem. Birdlife International supports FFA in asking that a recommendation be made to TCC and the Commission on this issue.

143. SC11 agreed that the SC11-ST-IP-05 (Marine pollution originating from purse seine fishing vessel operations in the Western and Central Pacific region, 2004-2014), revised if necessary, should be presented at TCC11 where it is more suited for discussion and consideration.

3.3 Electronic monitoring and electronic reporting

144. The WCPFC Compliance Manager presented SC11-ST-WP-04, a summary report on the First E-Reporting and E-Monitoring Intersessional Working Group Meeting on behalf of the EMandER Chair Kerry Smith (Australia). The meeting held in Nadi, Fiji from 8-10 July 2015. Electronic reporting is recognized as providing ways to enhance data accuracy, data entry efficiency, reducing reporting burden and avoiding duplication for vessel operators and national fisheries agencies. The key output from the meeting (Attachment 5 of WCPFC SC11-WP-04) is a set of draft electronic reporting standards which are to apply initially to five reporting requirements: Eastern High Seas Pocket Special Management Area reporting (CMM 2010-02); High Seas Pocket One Special Management Area reporting (CMM 2014-01 Attachment C); Manual position reporting in the event of ALC/MTU failure; Operational level catch and effort data; and Observer data. The proposed draft electronic reporting standards are expected to ensure 1) that electronic technologies can be fully utilized to satisfy agreed Commission scientific data and other reporting requirements; and 2) that technologies can be developed in a way that suits the needs of countries, and vessel operators and the Commission. The proposed draft electronic reporting standards have been recommended to TCC for consideration. The views of SC11 were sought on the report and its proposed draft electronic-reporting standards.

Discussion

145. FFA members appreciated the work that has gone in to the development of the draft standards, specifications and procedures (SSPs) and supported the further development of E-reporting standards for observer data provision, SSPs and strategies to incorporate these tools into the Commission and continued efforts by FFA members and their collaborative partners to develop, trial and implement these. FFA members noted that CCMs may need more time to review the draft standards. They thanked those that have offered to work with the Secretariat in trialling the draft standards and E-reporting formats, and looked forward to their feedback. FFA members noted the development and trial of EMandER tools in the observer programs.

146. A number of CCMs spoke in support of developing this work and the value of technologies to facilitate data reporting and developing a standard format for E-reporting. One CCM announced that it would host jointly with ISSF an E-monitoring workshop later currently scheduled for 16-18 December 2015.

147. In response to a question about future meetings of the working group, the WCPFC Compliance Manager noted that it will depend in part how receptive the Commission is to the draft E-reporting standards which have been developed. If they are approved, a working group may be scheduled for 2016 with a focus on E-monitoring work.

148. EU noted it supports similar work in other RFMOs and that European companies have developed and commercialised technologies for e-reporting and e-monitoring.

149. In response to an EU query about WCPFC engagement with the work taking place at the FAO level over the last year, the Compliance Manager explained that when K. Smith was attached to the Secretariat in 2014 she considered developments taking place at FAO including the work on data exchange standards and the March 2014 workshop received a paper from the EU on these developments which were duly considered in the development of the working group's TOR. In addition, ISO standards are used in the draft electronic reporting standards proposal. The Secretariat is watching the developments on data exchange formats, but given that the draft e-reporting standards relate to the format that the Secretariat will receive data from CCMs and as appropriate, vessels there is presently no anticipated conflict.

150. P. Williams noted the use of the North Atlantic Format (NAF) as a standard for fisheries data exchange but that there have been recent developments/discussions about moving away from this format. He commented that if a new standard is established to replace NAF elsewhere, it would be interesting to see if it would be appropriate for WCPFC.

151. Korea is developing an E-reporting system which is hoped to be in place around September.

152. WWF commended the efforts of Australia, USA, New Zealand, Fiji and Solomon Islands for their work on EM and noted that PNG and PNA's efforts implementing ER go a long way towards ensuring the quality, utility, objectivity, and integrity of data. WWF announced that they have initiated a cost benefit analysis on EMandER that will address the legal, policy, and regulatory frameworks necessary for candidate countries to make those technologies available. The analysis will also review potential cost recovery mechanism that may facilitate sustainable self-funding of the implementation and maintenance of the technologies. WWF selected three initial candidate countries including Fiji, RMI, and Solomon Islands, and elected to also review PNG, which has implemented legislation which could represent a model for the other candidates. WWF also announced an emerging technologies event to be held in association with the International MCS Network Global Fisheries Enforcement Training Workshop in Auckland in March 2016, which expects to bring in MCS technology providers from around the world. WWF cautioned that although these technologies are advancing rapidly, it is important to have a well-designed plan and a clear set of objectives for using the technologies, especially E-monitoring.

153. Philippines reported that it conducted an E-reporting Pilot Study in 2014 using the Marlin (Marine Electronic Logbook) terminal attached to an installed VMS ALCs on board. This CCM reported good results from the study, achieving near real-time reporting of logsheet data. Philippines brought the Committee's attention to ST-IP-06, noting that it applied the system to 32 out of 35 vessels operating at HSP1, achieving 85% effectiveness for timely logsheet reporting. The 15% ineffectiveness was attributed to non-functionality or defects of the Marlin system which should be addressed when the vessels are in the high seas. There is a need to continuously train vessel captains, officers and technicians on the operation and maintenance of the system to fix problems and sustain the proper recording and encoding of complete catch information and avoid data lapses. Philippines expressed support for the adoption and application of E-monitoring and E-reporting among CCMs.

154. The SC Chair noted that those who spoke on this issue did so in support of EmandER.

155. SC11 noted and supported the recommendations in SC11-ST-WP-04.

3.4 WCPFC-funded Port Coordinators

156. WCPFC Assistant Compliance Manager, A. Taholo, presented SC11-GN-IP-04, an initial report on the implementation of the trial WCPFC Port Coordinators programme. This is a joint report by the Secretariat, SPC, FSM and Kiribati. TWCPFC11 established a trial WCPFC port coordinators programme. The terms of reference for this programme are provided on page two of the information paper IP-04. Five members with ports eligible to receive funding under this programme are FSM, RMI, Kiribati, PNG and Solomon Islands, three of which have submitted claims and received funding under this programme. The trial programme has been underway for only a few months and this initial report is the progress to-date.

Discussion

157. FSM noted that it received Port Coordinator funding in January this year and was in the implementing phase. The Port Coordinator will be responsible for collecting purse-seine and longline unloading forms. Data would be collected in Pohnpei Port for both target and bycatch species. Shark monitoring and samples would also be taken in Pohnpei Port. A stakeholder meeting is planned to take place after SC11 (no date confirmed yet).

158. Kiribati's implementation is targeting their senior observers and notes their valuable experience. Kiribati hopes to report next year on how the port coordinators are going.

159. PNG thanked WCPFC for the funding to recruit a port coordinator. PNG has contracted personnel to take up the position of port coordinator beginning in June 2015. The Port Coordinator reports directly to the executive manager and is based in Rabual, not mainland PNG, as it is the main transshipment port. The Port Coordinator works closely with the observer and is also responsible for tag recoveries.

160. The Solomon Islands noted that it has had internal difficulties related to its Finance area but hoped the Port Coordinator will be able to start soon.

3.5 Others

3.5.1 Fiji's membership of the Northern Committee

161. P. Williams (SPC-OFP) brought SC11-GN-IP-03 (Table of catches for the Fiji national longline fleet north of 20°N) to the Committee's attention, explaining that any CCM with fishing activity north of 20°N is eligible for membership of the Northern Committee (NC). The Commission accepted NC's recommendation that SC11 review Fiji's membership request by reviewing the available data. The evidence that Fiji has fished north of 20°N is presented in SC11-GN-IP-03.

Discussion

162. Japan accepted the information provided in the paper and supported Fiji's membership of NC, however it asked for some clarification from Fiji about apparent discrepancies between Fiji's Annual Report (reported catch by vessel) and Japan's import data for bigeye tuna.

163. P. Williams suggested that the discrepancy may be due to non-Fijian fishing fleets fishing and unloading from Fijian waters – therefore the import figures might represent more flags than just Fiji’s exporting to Japan.

Recommendations

164. SC11 recommends that Fiji be admitted as a member of the Northern Committee.

AGENDA ITEM 4 STOCK ASSESSMENT THEME

4.1 WCPO tunas

4.1.1 WCPO bigeye tuna (*Thunnus obesus*)

4.1.1.1 Review of research and information

a. Progress report on Project 35 (Refinement of bigeye parameters Pacific-wide)

165. S. Nicol presented SC11-SA-WP-01 (Project 35: Bigeye Biology & WCPFC Tuna Tissue Bank). Project 35 has been implemented over the last 6 years. It is designed to address the scientific committee’s requirements for improved knowledge on bigeye tuna age, growth and reproductive biology. WCPFC has provided funding to collect 2500 otoliths and 300 gonads across the WCPO to estimate spatial variation in growth and reproductive biology. The European Union provided further funding in 2014 to extend this collection to other tuna and billfish species for the purposes of establishing a WCPFC tissue bank that will allow the WCPFC to have immediate access to biological material to answer stock biology and provenance questions. The project has successfully met the initial sampling targets set and WCPFC now has the necessary biological resources to progress to analyses to estimate growth and reproductive biology parameters for bigeye and other tuna and billfish species. Procedures for granting access to the WCPFC tuna tissue bank by third parties have been established. Observer training targets for sample collection have been exceeded. Over 5% of active senior observers are contributing to the WCPFC Regional Observer Programme have been trained in biological sampling methods and procedures. WCPFC Regional Observer Programme training standards have also been prepared and adopted to ensure longer term capacity within the observer programmes is maintained to collect biological samples. Web-based tool for WCPFC CCMs and external parties to query the WCPFC Tuna Tissue Bank have been developed and continuously improved. The web database is currently accessed by over 1550 unique users from all over the world. The tissue bank is already utilised by the Science Services Provider for WCPFC and ten other organisations.

Discussion

166. A number of CCMs raised the issue of resourcing. Japan noted that this program required an indefinite cost to continue storage of the samples. Japan supported the original goal of project to improve knowledge of the biology of bigeye tuna but expressed concern that this program was expanded to include development of tuna tissue bank.

167. FFA members supported the continuation of Project 35 and the collection of biological samples to contribute to the WCPFC tissue bank, and noted work undertaken to establish sampling protocols, training, infrastructure and logistical arrangements to support the work within observer and port monitoring programmes. These efforts increase FFA members’ contribution to research which furthers

understanding of the biology and ecological significance of species with which WCPFC fisheries interact, and provide an avenue for researchers from Pacific Island nations to learn and advance their careers in fisheries related fields.

168. EU considered that the collection of samples was of utmost importance, as was increasing the number of samples, so that institutes, which are making ongoing requests for bigeye tuna and other tuna samples, can access and analyse them. However, cost efficiency and rationalisation should be sought.

169. On the issue of cost, Nicol noted that a request for funding to conduct analysis had been made but rejected at the Commission level. He observed that programs cannot be turned on and off and it can take years to operationalise them at the observer level, which is the reason this project was put in place. Nicol commented that low level ongoing sampling should occur to replenish samples taken out of the bank for research.

170. Japan mentioned that this program should be focused on its original goal and also opposed the Commission taken budget for expanded area of the program.

171. FFA members noted a recommendation of the Pacific wide sensitivity analyses to analyse the collected bigeye tuna biological samples to better understand the spatial growth variation across the Pacific. SC had included this work in the budget for 2015, but it was removed by the Commission in December 2014. These CCMs supported the budgetary requirement of USD\$50,000 to proceed with analysis of samples in 2016, as included in the provisional 2016 budget, and a strong recommendation noting this as high priority work of the SC.

Recommendations

172. SC11 recommends that funding be continued to maintain the Project 35: Bigeye Biology and WCPFC Tuna Tissue Bank, with particular emphasis on WCPO bigeye, yellowfin, and skipjack tunas. SC11 also recommends that the Commission adopt the “WCPFC Tissue Bank Access Protocols” developed within Project 35 and modified by ISG-2 at SC11 (Attachment D).

173. SC11 recommends that funding be provided for the analysis of Project 35 Tissue Bank samples, with a short-term focus on characterizing spatial and temporal variation in the growth of bigeye tuna.

b. Progress on Project 69 and 70 (Improvement of MULTIFAN-CL and stock assessments)

174. No paper was presented against this item however the Committee was referred to SC11-SA-IP-08, ‘Implementing the recommendations from the bigeye tuna assessment review’.

c. Update of WCPO bigeye stock assessment

175. R. Scott (SPC) presented SC11-SA-WP-04 ‘Short-term stochastic projections for skipjack, yellowfin and bigeye tunas’, which presented the results of catch based stochastic short term projections for the three tropical tuna stocks. The projections were conducted to provide an indication of stock status resulting from recent catches in between full stock assessments. Two hundred projections were run for each stock based on the reference case assessment model with future recruitment derived from random resampling of historic recruitment values between 2002 and 2011. The results show that stock status for bigeye, yellowfin and skipjack relative to the limit reference point remains unchanged from the status estimated in 2014.

Discussion

176. In response to a question from Japan about whether the reference level was dynamic or fixed at 2012, R. Scott explained that the projections are based on the 2014 base case projection model, and the projection moves forward by 3 years. The reference point uses the same information as was used for the 2014 stock assessment and was carried forward based on the catch multiplier.

177. Theme convenor J. Brodziak asked participants if SC was of the view that this projection information could be used directly for developing stock status advice. A number of CCMs questioned the value of the projections as a basis for providing management and stock status advice.

178. Japan welcomed the idea of providing information about stock status in between the stock assessments but questioned the merit of conducting a projection rather than a streamlined stock assessment. SPC responded that the work involved in doing a projection with updated catch data was markedly less than conducting a full assessment or updating the data for a single model run.

179. China was concerned about using a projection as a sole indicator for the stock status without comparing the performance of the projection model with the stock assessment model and seeing if the projection can capture the dynamics of the population.

180. Japan observed that $SB_{F=0}$ was calculated by moving the average for ten years and enquired whether in this study $SB_{F=0}$ was calculated the same way. SPC confirmed that $SB_{F=0}$ was based on that for terminal period in the latest stock assessment. Japan recommended SC simply note the results of the projection.

181. The USA held similar views and preferred the rigour of the SPC and ISC stock assessments as the best path forward. New Zealand stated it was risky basing information on stock status and providing management advice based on short term projections without other information backing it up.

182. The theme convenor summarised the group's views as expressing a preference for a stepwise approach – to verify that the projections contain a similar quality of information as the stock assessment and encouraged them to consider the stock status section of the report for the next session.

183. SC11 noted that the results of the updated short-term projections for 2013-2015 indicated that the median spawning biomass depletion in 2015 was projected to be $SB_{2015}/SB_{F=0} = 0.17$ with a 99 out of 100 chance of remaining below the adopted LRP for bigeye tuna.

184. SC11 requests scientific services provider to evaluate the accuracy of short-term projections for the provision of stock status advice in the years for which there is no assessment via a retrospective analysis.

d. Pacific-wide bigeye tuna stock assessment

185. S. McKechnie presented SC11-SA-WP-02 'Longline CPUE indices for bigeye tuna based on the analysis of operational catch and effort data.' At the recommendation of SC10, an extensive dataset of operational-level longline fishing was collated for the estimation of CPUE indices for the Pacific-wide bigeye tuna stock assessment model. CPUE indices were calculated by cleaning the datasets, using clustering analyses to assign sets to putative targeting groups and then standardising CPUE using generalized linear models. Two datasets were modelled – one long dataset where vessel identification was not available for all sets, and a short dataset where it was. Several different scenarios were investigated,

each with different assumptions made about targeting and how it should be modelled. Results were very region-specific owing to large differences in fishing activity among regions although in general trends were relatively similar to those used in the 2014 stock assessment. A significant advantage of the 2015 indices is that they begin much earlier in the assessment period than previously, particularly for regions 3, 5, 7 and 8. SPC recommend a number of improvements to analyses if these data again becomes available including; further investigation of clustering analyses, alternative error distributions to improve diagnostics, and geostatistical and other random effects models that attempt to account for spatial dynamics in the CPUE datasets.

Discussion

186. Japan expressed appreciation for the first Pacific-wide assessment using operational data. In response to a question from Japan asking about a comparison between the 2015 Pacific-wide CPUE indices and CPUE indices of the 2014 assessment in WCPO or CPUE indices of the 2014 assessment in EPO, S. McKechnie stated that they cannot update the 2014 CPUE analyses and the objective of the Pacific-wide analysis is to compare results for the WCPO region. He commented that there are substantial absolute differences between the two models.

187. Australia congratulated all parties involved in compiling and analysing the operational level data and stated that this was a very positive step forward. Australia queried the rationale for the combined-fleet analysis noting that different fleets often have different spatial coverages and fishing characteristics which may not be appropriately accounted for in a single analysis.. It was also noted that the filter used to remove vessels which had fished less than 10 quarters had removed a high percentage of the vessels which indicated that there was a surprisingly high turnover. Australia also queried whether the vessel ID was actually a proxy for the skill of the fishing master on the vessel and asked what information may be available to indicate whether fishing masters remained on a given vessel.

188. In response, S. McKechnie commented that ideally the analysis would be restricted to a fleet which is representative of abundance through time and region. However, the spatial coverage of most fleets is patchy in a given region. Previous indices were calculated just for Japan, which can be done in some regions (e.g. Region 1 and 2) but as effort has declined there are years with limited data and poor spatial coverage. Vessel IDs are probably the best approach to get good temporal and spatial coverage. Regarding the high turnover of vessels, this is especially so in a small region. Vessels that cross regions may be lost in the analysis. S. McKechnie acknowledged they had no information regarding changes in skippers and crew and that catchability could change a lot with a different skipper.

189. In response to a question from China about spatial correlation having a potential impact on the result of CPUE standardization and a suggestion for a different way to evaluate the performance of the model (cross-validation and leaving some data out to test later), S. McKechnie acknowledged that this was relatively preliminary work. On the question of spatial auto-correlation a 5x5 degree cell effect was evident, but this was done instead of environmental variables because it attempts to capture spatial effects without confusing catchability and abundance. In future SPC would like to investigate other things including geo-statistical techniques. Cross validation was a sensible idea and the analysis will consider the computation involved. An important question to consider was around what the most adequate model is to achieve the objectives.

190. FFA members noted the work undertaken by SPC to facilitate the development of the integrated operational longline dataset for the Pacific wide bigeye analyses. These CCMs saw benefits to the data access arrangements between certain CCMs and SPC but voiced concern with the time and resource implications of these arrangements. FFA members considered the data sharing arrangements to be a temporary fix. They constrain SPC's ability to properly analyse the data and use it in such work as cluster

analyses, CPUE indices and improving spatial and temporal coverage. These CCMs implored the five CCMs to enable SPC to retain the dataset and not delete it; to extend the life of the arrangement and allow SPC to continue using the data for analyses for bigeye tuna as well as other WCPO stocks, particularly skipjack, yellowfin and albacore.

191. EU saw merit in incorporating environmental factors in the future for comparisons with past CPUE indices in the EPO, as mentioned by Japan.

192. Chinese Taipei noted that there might be a large difference between distant water and non-distant water fleets and asked whether different fleets have different catchability rates and if they are separated or combined when the standardisation is conducted.

193. SPC responded that there is not a fleet predictor variable so they use vessel ID where possible. Even with offshore fleets, some vessels will be more efficient than others and would be expected to improve over time.

194. Japan enquired about the retention of operational data used in the projection, stating that it had provided the data on the condition that the usage of the data is strictly limited to collaborative work for the purpose of the 2015 Pacific-wide bigeye assessment, and all data, including intermediate products which can restore the data, shall be deleted by the end of the last day of SC11, unless agreed otherwise by the Parties, as provided in the *Report Text concerning Commitments to Support the Pacific-wide Bigeye Assessment with Provision of Operational-level Data* (Attachment F of SC10 report)..

195. Australia enquired about the definition of ‘trip’ used in the CPUE analyses. While it was noted that it was convenient to use vessel month, fishing activity over a month may not in fact be stable and asked whether there was any information to confirm this assumption. Australia also suggested caution around trying to identify clusters which might be targeting bigeye tuna, reporting industry views that it might not be a dominant species in a cluster even though it is the target. S. McKechnie responded that there are issues with defining ‘trip’ – it needs a time scale that is long enough to remove random variation but not so long that a significant change in target might occur (e.g., a vessel moves from the tropical longline fishery to target southern bluefin tuna).

196. The extent of IATTC participation in the longline data analysis for the pan-Pacific stock assessment was raised. IATTC has provided data to WCPFC for this assessment.

Sensitivity analysis – bigeye tuna stock assessment

197. S. McKechnie presented SC11-SA-WP-03 ‘Sensitivity of the WCPO bigeye tuna stock assessment results to the inclusion of EPO dynamics within a Pacific-wide model’. To address the recommendations of the review of the 2011 bigeye tuna stock assessment a Pacific-wide stock assessment model for bigeye tuna (PW15) was compared to a WCPO-only model (WC15) and the reference case of the 2014 stock assessment (WC14). Data sets were updated to include 2013 and large amounts of tagging data from the EPO were included in PW15. Changes in data between 2014 and 2015 included moderate changes in catch after the revision of Indonesian catch estimates and new CPUE indices produced from the extensive operational-level longline fishing dataset. Absolute estimates of recruitment and biomass for PW15 showed differences with WC15 and more particularly WC14, though relative trends in these quantities and estimates of depletion and depletion-based reference points were very consistent between models. The ratio of spawning potential to spawning potential in the absence of fishing was estimated to be 0.16, 0.15 and 0.14 for WC14, WC15 and PW15, respectively, all below the WCPFC limit reference point. Substantial differences in growth were estimated between the WCPO and EPO external to the stock assessment models, although this cannot currently be modelled using age-structured models with

movement between regions. Due to the similarities in estimated stock status between the WC15 and PW15 models and the potential misspecification of growth and other biological parameters, we recommend persisting with the use of WCPO-specific models for the WCPFC area. Further analyses of growth data and consideration of the regional structure of WCPO stock assessments are also recommended.

Discussion

198. The Theme convenor, J. Brodziak noted that this is presented as a sensitivity analysis.

199. In response to a question from Australia about scaling issues between the different assessments, S. McKechnie observed that a large amount of tagging data from release groups in the central Pacific were used; there were also different CPUE indices used in the 2014 and 2015 models. He added that there will always be a scale issues between the two models.

200. Responding to a query about Figure 17 and the possible causes of the temporal patterns evident, S. McKechnie noted that the MULTIFAN-CL model puts recruits into some regions and quickly moves them out. Pointing to Region 6, it was explained that to be as realistic as possible the models assignment of recruits among regions must be constrained in some way.

201. China asked about the drivers for the differences between MULTIFAN-CL's estimated growth curve versus an externally estimated growth curve using otolith data, and whether SPC had conducted retrospective analyses looking at the stability of the estimates in the last year with different lines of data and if there are retrospective errors. China also asked for more information on the model's assumptions.

202. S. McKechnie responded that there were a number of reasons why empirically-derived growth estimates might be different to those estimated by MULTIFAN-CL, commenting that in theory it would be good to estimate the growth with the tagging data within MULTIFAN-CL. The growth curve for MULTIFAN-CL looks at composition data and changes in modes of sizes over time, whereas otolith and tag recovery data are used to estimate growth externally. In addition, if tagging data is included in the model differences would be expected because the model handles the selectivity better inside the assessment. S. McKechnie noted uncertainty around how representative the WCPO empirical data was as it was quite piecemeal; some otoliths dated back to the 90s and those from around French Polynesia appeared to be quite different to those from further west, making comparisons difficult but these issues were vitally important for the stock assessments. Retrospective analyses were not conducted for this sensitivity analysis. If a full stock assessment had been performed SPC would have looked at different types of retrospective analysis as was done for the 2014 assessment. The tables referred to in the paper are from 2012 and they are spawning stock biomass; these are not expected to be strongly affected. A full stock assessment would look at these issues in more detail. As for assumptions around selectivity and catchability, the analysis used CPUE indices and assumed constant catchability among the longline fisheries so it could scale abundance between regions. The modellers tended to share selectivities among neighbouring regions, for example the Region 10 longline fishery shares selectivity with Region 2.

203. In response to an enquiry from China about whether it is still a preliminary study and a work in progress, S. McKechnie noted that it was not SPC's intention to make definitive statements of stock status based on the Pacific-wide stock assessment, preferring to get the model right in the western area of the Pacific where biological parameters are thought to be more homogenous. This would provide more reliable advice than a full Pacific-wide model.

204. USA noted that this work came out of a recommendation from the 2012 bigeye tuna review, and asked about the standardised CPUE indices depicted in the paper and recruitment in Region 3.

205. S. McKechnie responded, saying that the standardised CPUE indices, which were quite similar except for Region 4, S. McKechnie responded that Region 4 was treated differently — the large decrease in the 2014 index seemed unrealistic and the 2014 stock assessment model did not handle it, perhaps because the data set didn't have a lot of data in the early years. When the 2014 stock assessment was conducted for SC10 there were problems and it wasn't used in the assessment, and consequently was not used in the WC14 model. The index used in the 2014 stock assessment for Region 4 came from the alternative set (based on Japanese operational data that were originally estimated for the 2011 stock assessment) presented last year. In response to the query around recruitment, S. McKechnie noted that Region 3 has always been a problem; the recruitment trend through time is quite pronounced. There were increases in catches in later years which the model struggled with and it bumped up recruitment in that region.

206. The EU sought clarification about the extent of the collaboration with IATTC, which the Committee had understood would be taking place. SPC responded that there wasn't a specific intention to do a comparison with the eastern Pacific – it was an outcome of the review of the bigeye tuna assessment conducted several years ago. Whilst SPC was doing this work, IATTC was doing its own required annual assessment work for EPO stocks. The opportunities for intense and formal collaboration were limited. SPC commented that it was up to the committee to decide on the collaboration between the two organisations for this work and suggested that if the committee decides it would be fruitful to do so, WCPFC members here who are also IATTC members should encourage that in IATTC.

207. Japan queried why the eastern Pacific CPUE was not compared against the result of the new assessment, commenting that the proportion of the SSB in the EPO is about half of the total while recruitment is very small. S. McKechnie explained that IATTC uses a different steepness value to determine their reference points; the intention of this model was to concentrate on the WCPO – if SPC were to model the EPO they would have developed the model differently.

208. In response to a question from Chinese Taipei about spawning potential by region, S. McKechnie commented that the main differences between WC14 and WC15, especially in Regions 3, 7 and 8, is that these are the regions in which only short CPUE indices were available for WC14.

209. Australia noted on behalf of FFA members that the objective of this work was to test the sensitivity of management advice to the assumption that dynamics of bigeye tuna in the EPO can effectively be ignored when conducting our stock assessments. This CCM stated that this work should not be considered a new assessment and the SC should maintain its advice on 'status and trends' and 'management advice and implications' from SC10. However, the SC should note the comparative results between the three models in the Pacific wide sensitivity analysis, in particular PW15 and WC15 models, and note the reliability and robustness of WCPO stock assessment. The SC should advise the Commission of these outcomes and the continued use of closed WCPO models in the determination of stock status for WCPO tuna stocks.

210. K. Schaefer from IATTC commented on the Pacific-wide assessment including its cooperation with growth data, EPO bigeye tuna tagging data, comments provided on the draft of this report and the virtual collaboration between the head of the IATTC stock assessment group and SPC. He commented that many assumptions used in the Pacific-wide model are different to those used in the IATTC assessments; IATTC sees uncertainty around growth and maturity as well as putative stock structure in the Pacific as important. It takes the view that it would be better to focus on resolving those assumptions in the WCPFC than spending more time on a Pacific-wide model.

211. In response to a question from Vietnam about the difference between the 2014 and 2015 total catch, S. McKechnie noted that the best estimates of catch and species composition of catch have changed, mainly for Indonesian fisheries.

212. Noting that there is still insufficient data – for example the collection of otoliths has been limited to WCPO – Korea recommended that Project 35 sampling be expanded to the EPO in collaboration with IATTC.

213. China commented that the new stock assessment shows that spawning biomass of bigeye tuna is reduced to very low levels. This CCM strongly supported the development of indicators of bigeye tuna mortality, especially in the purse-seine fishery.

Operational level data agreement to support WCPFC stock assessments

214. J. Hampton presented SC11-SA-WP-07, ‘Continued use of longline operational-level data provided by fishing nations to support WCPFC stock assessments,’ which outlined a proposal from SPC for the continued use of longline operational-level data provided by fishing nations to support WCPFC stock assessments. The current agreement concerning these data is that all data, including intermediate products which can restore the data, shall be deleted by the end of the last day of SC11, unless agreed otherwise by the Parties. Given the considerable investment by SPC and fishing nations required to compile the data, and the range of collaborative work on the data that has been identified for the improvement of stock assessments, it was argued that deletion of the data at the end of SC11 would be counter-productive. It was proposed that a new agreement, allowing retention and updating of the data and its use to support relevant WCPFC stock assessments, be made between SPC and the fishing nations concerned.

Discussion

215. A lengthy discussion took place about the agreement between five DWFNs and SPC to provide operational catch level data for the purposes of the Pacific-wide stock assessment other than the 2015 Pacific-wide bigeye assessment. Many CCMs spoke in support of the value of retaining of the data and the utility still to come out of the data as it is analysed.

216. In relation to the integrated operational longline dataset, FFA members supported the request in SC11-SA-WP-07 that the CCMs involved in the data sharing arrangement with SPC agree to extend the life of the agreement to advance work that will help to refine the understanding of the influence of certain parameters on the management reference points produced in assessments, and address uncertainties which require the SC to provide advice which is precautionary in nature. FFA members strongly urged the CCMs involved not to proceed with the deletion of this dataset, to enable the continuation of cooperative analyses to complete development of indices of abundance and analyses identified in SC11-SA-WP-02 and SC11-SA-WP-07 that may be requested by SC11 and future assessments for all WCPO stocks.

217. Japan reiterated that it had provided the operational data on the condition the usage of the data is strictly limited to the collaborative work for the purpose of the 2015 Pacific-wide bigeye assessment and all data, including intermediate products which can restore the data, shall be deleted by the end of the last day of SC11, unless agreed otherwise by the Parties as provided in the agreement. This CCM stated that the agreement should be kept.

218. Australia commented that the best practice WCPFC hopes to achieve demands the use of the best data – that is, operational level data rather than aggregated data. USA hoped for another agreement for the

retention of the operational data for a bigeye tuna stock assessment to be conducted in 2016. New Zealand strongly urged that a way is found to retain the data set.

219. The DWFN CCMs agreed that the work completed with the operational level data they had provided was valuable. Korea supported the retention of the data for further use under conditions of confidentiality, and noted the large amount of work which had been done with this longline operational data to reconstruct the database for analysis and found the results very useful. Chinese Taipei noted the February workshop, and commented on the time and effort needed to compile the data; given appropriate security, if the data is used collaboratively, and if contributors are informed of the purpose of the data, then this CCM may be flexible in the provision of operational data. The DWFN CCMs were amenable to crafting an acceptable new agreement, with Japan emphasising that provision of the data is a voluntary contribution to SPC from the parties and was an issue between the parties and SPC. A number of CCMs agreed with this point with USA suggesting that the five CCMs meet among themselves and with the SPC to further this issue.

220. In response to an enquiry from Samoa about the cost and time required, SPC noted that in staff time it cost about US\$25,000 – organising the receipt of the data, storage, pre-processing, integration and assembly of the data; the fishing nations also made a considerable investment in their own staff time. SPC commented that integrating annual updates would also take time but not nearly as much as starting from scratch.

221. J. Hampton noted SC11's consensus to work together to foster the retention of the data for the purposes of stock assessment.

222. In response to an enquiry from Cook Islands about whether any CCMs had provided plans in relation to paragraph 57 (catch and effort data) of CMM 2014-01, the WCPFC Executive Director noted that the Secretariat has not received any plans in accordance with the measure.

223. Theme convenor J. Brodziak noted the strong scientific consensus for retention of the operational level data provided by the five CCMs for the purposes of stock assessment. The five CCMs and SPC should seek to arrive at a means to go forward to implement the recommendation from the SC which is to retain the data by a means to be determined.

224. SC11 expressed its appreciation for the cooperation by those CCMs who have provided operational data that enabled the Pacific-wide bigeye analysis. Given the amount of effort put into compiling the data and the possible future work based on the compiled data, SC strongly requested those CCMs involved to consider not to require SPC to delete the data and data products for further analysis recognizing that is beyond what was agreed between SPC and relevant CCMs.

225. After the discussion among the involved CCMs, it was reported that the CCMs needed domestic clearance before finally agreeing to a new arrangement. However, as a way of cooperation in response to the SC's appreciation and request, those CCMs agreed not to require SPC to delete their operational data provided to SPC and the products thereof under the condition that they will not be used in any way until a new agreement is reached with SPC. Those CCMs will discuss the new arrangement intersessionally with SPC based on the draft text for the *Agreement for Provision of Operational-level Data to SPC to Support WCPFC Stock Assessments* shown in **Attachment E**, with the intention of finalizing the arrangement prior to WCPFC12.

226. SC11 appreciated the cooperation and flexibility shown by those CCMs involved and expressed its hope that the new arrangement will be agreed among relevant CCMs promptly so that the SPC's work can be maintained.

Recommendations

227. SC11 recommends that collaborative research on the use of multi-fleet operational-level data for CPUE standardization be continued if the data are available, with particular emphasis on application to WCPO bigeye tuna. SC11 noted that the treatment of spatial variation in CPUE, the effects of species targeting, the analyses of specific fleets, the effects of environmental variation, the investigation of the performance of alternative standardization models, e.g., random effects and GAMs, and robustness testing through cross-validation were important topics for further consideration.

4.1.1.2 Provision of scientific information

228. As there was no new stock assessment for bigeye tuna, a lengthy discussion took place around the crafting of stock status and management advice and the manner in which SC11 wanted to proceed in this circumstance. Theme convenor J. Brodziak queried whether SC wanted to carry over last year's report from SC10 in the absence of a new stock assessment.

229. Japan supported the idea as being efficient.

230. Australia commented that SC should essentially maintain its advice on 'status and trends' as well as the 'management advice and implications' from SC10; and reiterate earlier commentary that the SC should note the comparative results between the three models in the Pacific wide sensitivity analysis and note the reliability and robustness of WCPO stock assessment. The SC should advise the Commission of these outcomes and the continued use of closed WCPO models in the determination of stock status for WCPO tuna stocks. Two years ago SC9 had a form of words that would be useful for status and trends or management advice, with a suggestion that SC11 could note that the catch of bigeye tuna was 161,299 tonnes which was a 5% increase over 2013 and a 5% increase over the average of 2010-2013. There was no disagreement on this point and it was accepted as consensus.

231. Japan supported Australia's proposal, suggesting that wording could be carried over except a consideration for some of the outdated information. Japan proposed to request SPC to evaluate potential impact of CMM 2014-01 for the consideration of tropical tuna measures at WCPFC12.

232. Korea supported this approach, and commented that there was interest in the Pacific-wide analysis, and commented that some direction on this should be noted in the management advice.

233. Some CCMs suggested that additional information should be included on the robustness test on the modelling and information on the increase in catch.

234. Some CCMs expressed the preference to not include the tables and figures from SC10 but a short paragraph; other CCMs preferred to retain them so as to avoid readers needing to go to last year's report to make sense of this year's report.

235. The theme convenor proposed distributing some text for comments on the stock status and trends sections. SC11 would include points about the catch changes as well as the sensitivity analysis for bigeye tuna, with words from Australia and yellowfin catch information from SPC.

a. Status and trends

236. SC11 noted that no stock assessment was conducted for WCPO bigeye tuna in 2015. Therefore, the stock status description from SC10 is still current.

237. SC11 noted that the total bigeye catch in 2014 was 161,229 mt, which was a 5% increase over 2013 and a 5% increase over the average for 2010–2013. SC11 also noted that the bigeye catch in 2014 was 48% above the estimated maximum sustainable yield (108,520 mt), although those two numbers are not directly comparable because MSY is calculated based on the historical average recruitment.

238. SC11 also noted the analysis of the sensitivity of the WCPO bigeye tuna stock assessment to the inclusion of EPO data and dynamics within a Pacific-wide model. SC11 concluded that the dynamics of bigeye tuna in the WCPO estimated using the Pacific-wide model are not substantially different from those estimated using the WCPO-only model, especially with respect to the main stock status indicators used by WCPFC. Therefore, SC11 recommends that it is reasonable to continue to provide management recommendations to WCPFC on the basis of WCPO-only regional stock assessment models.

239. SC11 did not consider the Pacific-wide sensitivity analysis to be a new stock assessment for the purpose of formulating management advice.

b. Management advice and implications

240. SC11 noted that no management advice has been provided since SC10. Therefore, the advice from SC10 should be maintained, pending a new assessment or other new information.

4.1.2 WCPO yellowfin tuna (*Thunnus albacares*)

4.1.2.1 Review of research and information

a. Update of WCPO yellowfin stock assessment

241. Presentation of SC11-SA-WP-04 for yellowfin tuna projection by R. Scott (SPC) is covered under Agenda 4.1.1.1a.

Discussion

242. SC11 noted that the results of the updated short-term projections for 2013-2015 indicated that the median spawning biomass depletion in 2015 was projected to be $SB_{2015}/SB_{F=0} = 0.45$ with a less than 1 out of 100 chance of falling below the adopted LRP ($SB_{F=0}$) for yellowfin tuna.

243. In response to a query about the time period used for stochastic recruitment resampling in the projections, Scott confirmed that it was 2002-2011, which is the same time period used to determine the LRP ordering.

244. Japan commented that, as with the bigeye tuna projection, SC11 should not use the results of the updated short-term projections for stock status determination and suggested not to change the stock status or management advice from SC10. This CCM noted that the 2014 catch of yellowfin was 608,800 mt (SC11- GN-WP-01) while SC10 recommended that the catch of WCPO yellowfin should not be increased from 2012 levels (612,000 mt) – more than this year, so there is a need to be careful when developing the management advice. There may be a change in the data refinement.

4.1.2.2 Provision of scientific information

245. As there was no new stock assessment for yellowfin tuna, SC11 discussed the crafting of stock status and management advice at length. The Theme convenor, J. Brodziak, observed that there was no new assessment, but there was projection information in addition to last year's information. Brodziak proposed to retain SC10 information for SC11, and noted the discussion which had taken place earlier in the meeting around the provision of information for bigeye tuna.

246. Australia said it was problematic to include the complete set of text from last year's recommendations section, observing that while it was convenient for the reader, it was not consistent with past practise and required re-examining text without having been reminded of the research. This CCM suggested going by past practice and referring to SC10 advice, with a statement about catches and percentages.

247. The theme convenor noted that crafting the stock status and management advice section is typically done by SPC when they conduct a stock assessment, and requested that SPC provide words on the change in catch from last year to this year, consistent with the discussion which had taken place about the same sections for bigeye tuna.

a. Status and trends

248. SC11 noted that no stock assessment was conducted for WCPO yellowfin tuna in 2015. Therefore, the stock status description from SC10 is still current.

249. SC11 noted that the total yellowfin catch in 2014 was the highest ever recorded at 608,807 mt, which was a 10% increase over 2013 and a 9% increase over the average for 2010–2013.

b. Management advice and implications

250. SC11 noted that no management advice has been provided since SC10. Therefore, the advice from SC10 should be maintained, pending a new assessment or other new information.

4.1.3 WCPO skipjack tuna (*Katsuwonus pelamis*)

4.1.3.1 Review of research and information

a. Update of WCPO skipjack stock assessment

251. Presentation of SC11-SA-WP-04 for skipjack tuna projection by R. Scott (SPC) is covered under Agenda 4.1.1.1a.

252. SC11 noted that the results of short-term projections for 2013-2015 using observed catches for this period indicate that the median spawning biomass depletion in 2015 was projected to be $SB_{2015}/SB_{F=0} = 0.52$, similar to $SB_{2012}/SB_{F=0} = 0.51$.

b. Project 67 (Skipjack fishery impacts on the margins of the Convention Area)

253. G. Pilling presented SC11-SA-WP-05, an examination of trends in abundance of skipjack tuna with an emphasis on temperate waters. The analysis examined both fishery data sources (skipjack CPUE, size frequency and tagging information) and information from integrated models (MULTIFAN-CL and

SEAPODYM) for evidence of 'range contraction' within the WCPO skipjack stock, under SC project 67. Skipjack CPUE data from twelve industrial or coastal longline, troll, and pole and line fisheries distributed across much of the WCPFC-CA latitudinal range showed no spatial or temporal consistency. This was also true within EEZs where data from multiple fisheries were available (e.g. French Polynesia, Hawaii and Japan). There was no clear indication that skipjack range contraction was occurring, nor which of the two potential 'causal' mechanisms might drive it. Length frequency data from five longline fisheries, anticipated to provide an early signal of any regional or local abundance changes, showed no clear trends and little insight into population-level impacts. Skipjack RTTP/PTTP tagging information suggested limited connectivity between tropical and temperate regions. However, the design of recent tagging programmes, given their focus on tropical waters and the distribution of fishing effort that influences recaptures, affected their ability to address the question. The integrated models provided slightly different views of regional connectivity. MULTIFAN-CL indicated limited connectivity between the tropical and northern temperate model regions, and that exploitation in the northern temperate region was comparatively limited. SEAPODYM results indicated localised effects in the coastal Japan area from overall (tropical and temperate) WCPO fishing impacts, which was consistent with Japanese CPUE data. The outputs also indicated a higher level of connectivity between tropical and temperate regions than MULTIFAN-CL or the tagging data. Whether those levels of connectivity were sufficient to lead to range contraction effects through density dependent habitat selection or local depletion could not be identified. Overall, the available data were not considered to be of sufficient quality to support a detailed modelling exercise using the simulation model also developed under Project 67. Recommendations for SC to consider the prioritisation of further areas of work to improve the information available, and the assumptions within integrated models, relative to other areas of work, were provided.

Discussion

254. Japan stated that its coastal skipjack fisheries are suffering from local depletion due to range contraction. There is strong interest in the scientific explanation about the condition of the stock and Japanese fishermen are losing confidence in the result of the last assessment which reported that the skipjack stock is healthy. Japan thanked SPC for their analysis of range contraction and requested further work. Japan noted the importance of the tagging study in the temperate region. There may be significant cost implications to this but collaboration between Japan and SPC could reduce that burden. Further work is critical for Japan to have confidence in the skipjack assessment which is essential for the evolution of management of skipjack tuna. Japan queried which countries catch skipjack using longline.

255. G. Pilling responded that skipjack is typically a bycatch species for the longline fleets. SPC has some concerns that as a result, the potential changes in abundance identified within the analysis may be due to a shift in targeting by the longline fleets.

256. FFA members noted the data were considered insufficient to support a detailed modelling exercise using the simulation model developed under Project 67. While it helps explain connectivity between regions, it currently is not sufficient to base management decisions on. FFA members are interested in the spatial impacts of fishing as several members have reported reductions in biomass of particular species in their EEZs. These CCMs are interested in the spatially-differentiated impacts of fishing and considered that priority be given to further tagging studies to provide more conclusive findings and asked SPC to provide an estimate of the budget required and an indication of the timeframe required before conclusions are available which can assist in informing management decisions.

257. EU noted that local depletions are not particularly rare, giving examples such as bigeye tuna around the Azores in the Atlantic, albacore in Samoa, albacore in the Bay of Biscay. This CCM noted that environment seems to play an important role and queried whether this would be incorporated in future research.

258. In response Dr Pilling noted that the standardised index that came from Japan for its coastal fleet included a sea surface temperature component in the CPUE standardization. There was potential for a local oceanographic influence in that region, where local currents may shift the availability of fish quite considerably. Noting this, SEAPODYM might be able to better take local environmental conditions into account.

259. China noted that range contraction was a very important indicator for stock status and an early warning about trouble with stock. This CCM wondered whether there has been an evaluation of changes in habitat, which is another important driver for range contraction and suggested a habitat suitability modelling approach which would try to match thermal habitat over time with the CPUE data.

260. G. Pilling noted that SEAPODYM tries to take these issues into account; it tries to detect habitat suitability. This could be investigated further in the future.

261. Australia noted that range contraction has been seen in some fisheries outside the WCPO but also noted that it is a difficult hypothesis to prove. Noting that the data for many fisheries in the Pacific is not complete and not informative enough, this CCM reiterated the need for good data for these fisheries, especially the need to increase the levels of ROP data available for such analyses. Standardised CPUEs might not adequately account for changes in fishing practices if the necessary data is not available. Inconsistent trends might also mean the spatial distribution of skipjack is patchy and subject to local environmental and fishing pressures. It was also noted that the skipjack stock assessment undertaken last year indicated a decline in biomass since 2000, which if uniform across the whole stock could be driving CPUE down in some fisheries. Noting that CPUE within the off-shore Japanese pole-and-line fishery remains relatively stable over the longer-term, this CCM also noted the possible influence of the environment, including climate change, which may already be influencing ecosystems, particularly in coastal areas. Australia wondered how much further the data can be pushed or if there was a need to go and collect new data.

262. G. Pilling pointed out that the first two recommendations from the paper were: ‘Feasibility of expanding SKJ tagging to temperate regions’ and ‘Utilise field of biological markers (Project 35)’ are good candidates to explore connectivity between the regions.

263. SPC noted that the situation in the NW Pacific appears very complex, with broad scale abundance (evidenced by the pole and line CPUE which is used directly in the assessment) remaining fairly stable, but on the other hand the fisheries in Japanese coastal waters are in decline. However, these changes don’t appear to be related to broad scale abundance in the north-western Pacific region. J. Hampton suggested that the forage base for skipjack available to the coastal fisheries may need to be examined, noting that the fine-scale distribution of skipjack is strongly related to the local distribution of suitable prey.

264. PNA members expressed strong interest in improved understanding of the spatial impacts of fishing for skipjack, and supported additional work on spatial impacts including more extensive tagging. These CCMs noted that efforts directed at looking for evidence of range contraction in skipjack have not found that evidence, and work on spatial impacts needs to be balanced with other priorities relating to skipjack management.

265. French Polynesia expressed concern about the skipjack range contraction issue due to the reliance of its domestic, artisanal, coastal pole-and-line fisheries on skipjack, and asked for further analyses on this topic.

266. Korea supported an approach to analyse the effect of environmental conditions in SEAPODYM.

267. USA noted that it contributed four indices to the study including Hawaii, CNMI and Guam. This CCM commented that while range contraction may be happening it cannot be statistically demonstrated and noted that the management advice should be made based on the evidence.

Coastal skipjack in Japan

268. H. Kiyofuji presented SC11-SA-IP-09, an information paper on the status of coastal skipjack in Japan and the long-term abundance trend estimated from the operational coastal troll fisheries logbook. This related to Project 67 and involved S. Harley (SPC) visiting Kushimoto, Wakayama – a major Japanese coastal fishing town.

269. Operational logbook data from two coastal troll fisheries were investigated to evaluate long-term skipjack abundance trend in Japanese coastal area. One shows recent level of abundance (2004-2015) has dropped significantly from higher period (1990-2003) with 35% decrease. The other declined constantly and it shows the lowest in 2014 (46% declined since 1983). They are considered to indicate local decrease of abundance of skipjack in Japanese coastal area. Possible mechanisms of local depletion are summarized as follow. Skipjack range of subtropical is contracted, and then migrating stock to the Japanese coast would decline mainly from winter to spring. Hence, decreasing availability cause CPUE decline in Japanese coastal areas. Joint efforts among CCMs in particular those situated in Region 4 and 5 is an important. To improve our understanding of skipjack stock in the WCPO, particularly in the subtropical area the area stratification of the next stock assessment should be reconsidered. Research on catchability changes by major fisheries such as purse seine in tropical area should be further conducted because technological improvements (FADs with echo sounder, using helicopter to find school) might reflect to not only fishing operations or strategies but also catchability or CPUE estimates. This would lead to our understanding of this fisheries and improvements of stock assessments results.

Discussion

270. Australia commented that from the presentation there appear to be a decline in CPUE off the coastal parts of Japan but noted this was not replicated in other parts of the skipjack fishery, including the offshore pole-and-line fishery in Japan which seems fairly stable. This CCM asked why there might be declines in the coastal area but not offshore Japan and wondered whether Japan was considering ecosystem studies to examine changes in habitat, environment or climate which might be influencing the distribution of forage fish rather than range contraction.

271. H. Kiyofuji responded that he was not aware of any changes in the distribution of forage species in the coastal area or offshore and noted that offshore pole-and-line CPUE remains stable. Kiyofuji agreed future work was needed.

272. Japan asked for SPC's support for the next stock assessment and suggested again the recommendation to change the area stratification for the next assessment, considering that current area definition divides the subtropical are by half and combined with either temperate area or tropical area, which makes it difficult to obtain accurate information regarding abundance trend in subtropical area..

273. SPC appreciated the suggestion from Japan regarding the area stratification used in the assessment, but noted a number of constraints. SPC's assessments are for the purpose of determining stock status in the WCPFC. There are many local fishery questions but SPC cannot address them all within the context of a stock-wide assessment. They may be able to look at area stratification as a

sensitivity analysis but, as far as possible, SPC tries to keep common area stratifications and fisheries definitions in all tropical tuna assessments. SPC is happy to work with Japan but the stratification and fishery definitions might not be the ones that get used in Commission assessments.

274. In light of inconsistency between inshore and offshore, China pointed out the possibility that there might be a local population.

275. PNA members understood Japan's concern about declines in small scale skipjack fisheries; these CCMs have seen declines in their coastal pole-and-line and troll fisheries for reasons including competition in the market with purse-seine catch, socio-economic factors and declining catch rates. In response, PNA members have taken strong measures domestically to address local depletion, including by closing areas. PNA members were happy to take advice from SPC on the suggestion for re-stratification of the skipjack assessment regions and requested SPC to provide additional aggregate CPUE information, suggesting that the data in Table A14 might be useful for this purpose.

276. USA asked about vessels in Figure 2 catching only 40kgs per vessel per year and wondered how informative a trend that might be and whether they are targeting other species. Kiyofuji explained that the local fishermen in Wakayama prefecture do not target any species, but the fishermen in Chiba prefecture target skipjack tuna during the research periods.

277. The Philippines announced that Philippines, Indonesia and Malaysia are in the second stage of planning for a study looking at coastal skipjack, yellowfin and bigeye tuna in the Sulu and Celebes Seas.

4.1.3.2 Provision of scientific information

278. There was no new stock assessment for skipjack tuna, and a lengthy discussion took place around the crafting of stock status and management advice.

a. Status and trends

279. SC11 noted that no stock assessment was conducted for WCPO skipjack tuna in 2015. Therefore, the stock status description from SC10 is still current.

280. SC11 noted that the total skipjack catch in 2014 is provisionally estimated to be 1,957,693 mt, which is the highest catch recorded, a 6% increase over 2013 and a 14% increase over the average for 2010–2013.

281. The SC noted that skipjack tuna catch in 2014 was 20% above the estimated MSY (1,618,800 mt) although those two numbers are not directly comparable because MSY is calculated based on the historical average recruitment.

282. SC11 reviewed information related to identifying changes in the spatial distribution of skipjack (including range contraction) in response to increase in fishing pressure. Project 67 on the impacts of recent catches of skipjack tuna on fisheries on the margins of the WCPFC Convention Area demonstrated no statistical evidence for skipjack range contraction (SA-WP-05). SC11 recommends that WCPFC12 take note of the analyses completed to date and that further work on this issue be undertaken, including:

- **more extensive skipjack tagging activities, including in sub-tropical and temperate regions to provide better information on stock connectivity and movement; and**

- **analysis of operational longline data including skipjack catch to improve the estimation of relative abundance trends by latitude.**

b. Management advice and implications

283. SC11 noted that no management advice has been provided since SC10. Therefore, taking note of the current catch status pointed above, the advice from SC10 should be maintained.

4.1.4 South Pacific albacore tuna (*Thunnus alalunga*)

4.1.4.1 Review of research and information

a. Review of South Pacific albacore tuna stock assessment

284. A new stock assessment was conducted for South Pacific albacore tuna. S. Harley presented SC11-SA-WP-06. He noted there were five supporting docs for the stock assessment: SC11-SA-IP-01, SC11-SA-IP-03, SC11-SA-IP-04, SC11-SA-IP-06 and SC11-SA-IP-07.

285. SC11-SA-WP-06 describes the 2015 stock assessment of south Pacific albacore tuna (*Thunnus alalunga*) – the first assessment since 2012 (SC8-2012/SA-WP-04). There have been many developments since the last assessment in terms of both the fishery and the integrated stock assessment model known as MULTIFAN-CL (SC11-2015/SA-IP-01) which is used to assess this stock. The current stock assessment includes much new data and new features reflecting recommendations from previous south Pacific albacore tuna assessments as well as relevant recommendations from the review of the 2011 bigeye tuna assessment. This assessment is supported by the analysis of operational longline data to construct both the CPUE time series (SC11-2015/SA-IP-03) and regional (SC11-2015/SA-IP-07) and the analysis of longline size data (SC11-2015/SA-IP-07). Finally the assessment includes results from a wide-scale study of the biological parameters of albacore – in particular results from the age and growth study aimed to address uncertainty around growth which has troubled previous assessments.

286. The main developments in the 2015 assessment are described in Table 1 of the working paper. The three most significant changes are: (1) the use of a spatially explicit model covering the southern region of the WCPFC Convention area; (2) the inclusion of direct age-length observations and tagging data from the 2009-10 releases; and (3) changing natural mortality from 0.4 to 0.3 per annum for consistency with albacore stock assessments conducted elsewhere.

287. The major structural changes (e.g., the spatial and fishery structures) to the assessment mean that full consideration of the impacts of individual changes from the 2012 assessment is not possible. However, generally the results and main conclusions of the current assessment are similar to those from the 2012 assessment.

288. In addition to a single reference case model which we present here, we report the results of “one-off” sensitivity models to explore the impact of key data and model assumptions for the reference case model on the stock assessment results and conclusions. We also undertook a structural uncertainty analysis (grid) for consideration in developing management advice where all possible combinations of those areas of uncertainty from the one-off models were included. The main conclusions of the current assessment are consistent with the previous assessment conducted in 2012. The main conclusions based on results from the reference case model and with consideration of results from performed sensitivity model runs, are as follows:

- 2) The new regional structure used for the 2015 assessment is better aligned with those of the assessments for bigeye and yellowfin tunas and provides an improved basis for further development of this assessment and providing advice to WCPFC;
- 3) There is some conflict between some of the data sources available for this assessment including conflicts between the length-frequency data and the CPUE series and between the troll length frequency samples and the age-length data;
- 4) Current catch is either at or less than MSY;
- 5) Recent levels of spawning potential are most likely above the level which will support the maximum sustainable yield, and above the WCPFC-adopted Limit Reference Point (20%SBF=0);
- 6) Recent levels of fishing mortality are lower than the level that will support the maximum sustainable yield;
- 7) Increasing fishing mortality to FMSY levels would require a significant increase in effort, yield only very small (if any) increases in long-term catch, and would greatly reduce the vulnerable biomass available to the longline fleet;
- 8) Recent levels of spawning potential are lower than candidate bio-economic-related target reference points currently under consideration for south Pacific albacore tuna, though these analyses should be updated to incorporate the results of this assessment; and
- 9) Stock status conclusions were most sensitive to alternative assumptions regarding the weighting off different data sets and natural mortality, identifying these as important areas for continued research.

Discussion

289. China raised concerns about the analysis using only one selectivity from 1960 onwards, despite all the technological advancement and changes in gear (querying whether time blocks for different selectivity and catchability had been considered), the effective sample size, binning of the size composition data (in particular small and large size classes), inconsistency in the retrospective analysis, retrospectivity of only three years, and the procedure of the data weighting on the different fleets, noting the importance of the data with respect to the dynamics of the fish population.

290. S. Harley responded that time-invariant selectivity was used for this assessment. Selectivity time-blocks were used in the previous assessment, but in the current assessment consideration was not given to this approach; rather we focussed efforts on incorporating a regional structure. Future consideration of time-blocks was a recommendation of the assessment report. He indicated that it was not necessary to examine time-varying catchability for longline fisheries because this should be address in the standardization of the operational CPUE data. He acknowledged that tail compression had now been implemented in MULTIFAN-CL, but had not yet been used in an assessment, but also noted that SPC was examining new approaches to model size composition data which will also be relevant. SPC acknowledged that the retrospective analyses should be expanded for future assessments. He noted that the results were sensitive to size data weighting and that it would be important to examine more extensive consideration of data weighting (e.g., alternative CVs for CPUE data) in future assessments.

291. China noted there are consequences even after the 2010 data, which was acknowledged to be nonsensical, was taken out, suggesting that if there is a pattern the retrospective errors will need to be corrected.

292. SPC noted that it has used retrospective analysis in the past to determine the period over which reference points are developed but that we have not included the key management quantities in the retrospective analysis for south Pacific albacore.

293. Australia queried the lack of seasonal selectivity noting that it had been incorporated into the previous assessment, the regional weighting (SC11-SA-WP-07 appendix) and how much of the operational catch and effort data was dominated by the Australian fleet information. This CCM suggested working together on the next assessment to standardise the CPUE due to the large amount of Australian data available.

294. In response, S. Harley noted that seasonal selectivity was considered for all longline fisheries, but that the improvement in model fit did not warrant the additional estimated parameters. However, on reflection he noted that if it had just been considered for the southern longline fisheries, then it was likely that inclusion would have been warranted. He noted that a flag-effect was included in the regional weights and commented that one of the biggest issues for this region was the lack of Japanese longline data from the 1960s and 1970s. Unfortunately Japan was not able to allow SPC to include these data in the CPUE analysis. This is the first time SPC has calculated regional weights for this fishery and improvements can no doubt be made.

295. FFA members considered that the 2015 stock assessment for South Pacific albacore represents the best scientific information currently available for providing advice to guide regional and subregional management decisions. These CCMs observed that it paints a more pessimistic picture of the stock status than the 2012 assessment had done, but with the higher catch levels since 2010 this was to be expected. It was noted that the 2015 assessment includes methodological and data improvements including using eight regions instead of one, being more spatially explicit than the 2012 model, tagging data is better used, and it uses an estimate of natural mortality consistent with albacore assessments conducted outside of WCPFC.

296. FFA CCMs drew a number of important points out of the new assessment for the attention of WCPFC:

- i. The biomass reference point indicator (the current adult biomass compared to the biomass in the absence of fishing) has dropped to two-thirds of its previous estimate, meaning the stock available to longline fisheries is now 40% of the biomass it would have been in the absence of fishing. While acknowledging new data and other factors, in the 2012 assessment it was nearly 60%.
- ii. While overfishing is not yet occurring, the new level of the fishing mortality indicator, estimated to be $0.39F_{MSY}$, is almost double the 0.21 estimated by the 2012 assessment. In addition, $SB_{MSY}/SB_{F=0}$ is 0.14, below the LRP. This should give the Commission some confidence to use $SB/SB_{F=0}$ for LRP rather than using MSY-based limits.
- iii. Although there is still some way to go before fishing mortality reaches MSY levels, if F is allowed to increase to MSY then members will only obtain a 20% increase in total catch from the stock from a 250% increase in effort and CPUE will fall by 65%, with implications for the economics of the fishery.

297. Japan commented that catch has been continuously increasing despite the CMM 2010-05 capping the number of vessels activity fishing for South Pacific albacore, and requested SPC if the number of those vessels by country could be produced. Regarding the Majuro plots, Japan asked whether there was a general pattern across species of increasing dynamic $SB_{F=0}$, as this pattern was evident for bigeye tuna and appeared to be also apparent in the south Pacific albacore assessment.

298. S. Harley responded that in fact there was not an increasing trend in dynamic $SB_{F=0}$ for south Pacific albacore and the recent level of $SB_{F=0}$ was similar to the equilibrium SB_0 . He further responded that while there were increasing trends in $SB_{F=0}$ in recent years for skipjack and bigeye tuna, there were decreasing trends for yellowfin tuna and striped marlin in the southwest Pacific. Therefore, there are not in general patterns across the assessments.

299. EU noted the changes to the spatial extent of the south Pacific albacore assessment to only include the convention area south of the equator and enquired whether this would be favourable from a management perspective. From a biological perspective, were there implications for the stock as a whole. It was noted that there was a recommendation in the paper to seek formal collaboration with other t-RFMOs on information to inform assumption on natural mortality. This collaboration could occur within the joint-tRFMO working group on Management Strategy Evaluation and be extended beyond natural mortality to other important issues such as building a consistent platform to conduct simulation testing.

300. S. Harley responded that the best way to address the change in spatial structure would have been to rerun the previous assessment with the eastern catch below, but this analysis had not been undertaken. Due to the low catches to the east, there is no reason to think it would change our perception of the stock status much, or in any particular direction.

301. Indonesia enquired about the Majuro plot in SC11-SA-WP-06 and asked whether the TRPs were accepted by WCPFC or still under discussion. SPC responded that the caption at Figure 36 provides the basis for the green shaded area (SC11-MI-WP-04) but there had been no decision or adoption.

302. China recommended comparing the projection model results with the assessment results if the stock is monitored by projection results in between assessments. Secondly, China suggested that other experts get involved during the stock assessment process instead of at the last stage which is the SC meeting, adding that the stock assessments could be reviewed before the meeting.

303. In response to a USA enquiry about the effect of fish migrating in or moving out of the area on mortality and the abundance trends, S. Harley commented that we could not evaluate this with the current model, but this could be done through a robustness analysis similar to that undertaken in the Pacific-wide bigeye analysis (SC11-SA-WP-03).

304. Korea noted that in IOTC the natural mortality for albacore is set at 0.2 for mature fish and 0.4 for juveniles.

305. Vietnam enquired about the natural mortality value estimate, noting support for Korea's comment on age-specific natural mortality. This CCM also queried the growth rate, noting the 2012 stock assessment and the difference in growth rate for males and female.

306. In response, S. Harley first noted that given the age-specific fishing mortality profile for this stock (Figure 29; SC11-SA-WP-06) the assessment was unlikely to be as sensitive the higher natural mortality for juveniles as other stock assessments (e.g., yellowfin tuna). He noted that there was insufficient information in the tagging data to estimate natural mortality and this was the basis of the recommendation to work with other ocean basins to pull together enough information. Regarding the potential impact of assuming a natural mortality of 0.2 for the adults – this would make a big difference to the assessment results. When the modellers used 0.25 it already gave a very low stock status – the low mortality in the analysis had MSY at 62,000 tonnes; if natural mortality is even lower than that it and drops off badly. When considering the likelihood components (Table 7; SC11-SA-WP-06), the available data do not support low mortality. Regarding growth, he noted that this was a big concern in the previous assessment and was the source of most of the uncertainty. Age-length data is included in this stock

assessment. If the assessment was extended to include sex-structure this would essentially double its size and increase the time it takes to run (already at 15 hours). Therefore we indicate that careful examination is needed into the costs and benefits of expanding to a sex-structured model, also noting that there are different growth rates between east and west and current modelling approaches do not really address that issue either.

307. Australia and New Zealand supported the assessment and SC's ability to provide advice from it. There was some discussion around using either the reference case or the median of the grid and, if the latter, which sensitivities would be used. In response, S. Harley noted the difficulties of using the median of the grid as there isn't a single model run and therefore there isn't a single model to use; SPC would not recommend it. SPC further noted that the only sensitivity axes here for which there is evidence to exclude would be the regional weight axis. All the other axes considered here are plausible alternative models.

308. In response to an enquiry from USA about the inclusion of the size data weighting axis in the grid of sensitivities, S. Harley commented that size data weighting was important and an area in which SPC should continue to do work; it should not be excluded from consideration as it is an important area of uncertainty.

309. Samoa, Tonga and Cook Islands urged SC11 to use economic indicators in developing management advice for the Commission. Samoa observed that the stock status is more pessimistic than the 2012 assessment and noted that Samoa's fleets rely heavily on albacore as the main targeted species. Its domestic fleets were tied up in the first quarter with no fishing for some months. Samoa has few options other than albacore. Bio-economics are important considerations in the development of management targets and limits. Samoa requested that this year SC not just report against biological limits. Tonga requested that the recommendation from SC9 is repeated by SC11.

310. The Cook Islands strongly urged SC11 to provide advice to WCPFC12 highlighting the urgency of the South Pacific albacore situation for Pacific Island Small Island Developing States and the need for immediate action to avoid permanent damage to SIDS domestic fleets and significant negative impacts on the economies of small Pacific States. This CCM stated that more comprehensive management of the fisheries targeting albacore was needed, including advice on the risk of breaching the limit reference point of recent effort levels, and on setting a target reference point that is appropriately qualified by relevant environmental and economic factors, including the special requirements of developing states in the Convention area.

Recommendations

311. SC11 recommends that the following be undertaken to support the next south Pacific albacore assessment:

- v. More extensive retrospective analyses examining a longer period of time and including the key management quantities;**
- vi. Compare the observed and predicted sample sizes for size composition data as one aspect of a more detailed examination of how size data are modelled and weighted within the stock assessment;**
- vii. Collaborate with albacore assessment scientists in other RFMOs and research organizations around data upon which to base a plausible range of values for natural mortality – including consideration of the sensitivity of the assessment results to higher natural mortality for younger ages; and**

- viii. Further examination of seasonal selectivity – especially for longline fisheries in southern regions of the assessment.

312. SC11 recommends that the following be undertaken prior to MOW4 and WCPFC-12 to support the Commission consideration of south Pacific albacore:

- iii. Update the bio-economic model described in (MI-WP-04); and
- iv. Conduct medium-term projections (2014-2034) under current fishing conditions to determine the predicted impact of these levels on the abundance of albacore vulnerable to the longline fishery.

4.1.4.2 Provision of scientific information

a. *Status and trends*

313. There have been significant improvements to the 2015 stock assessment including: improvements to the MULTIFAN-CL modelling framework, a regional disaggregated framework, access to operational data for construction of CPUE indices and regional weights, age-length data to improve growth estimation, and additional tagging data. Further, the regional structure of the model was changed to cover the southern Convention area and be better aligned with the other tuna assessments. This will enable better consideration of the multispecies impacts of management measures. Natural mortality was set at 0.3 in the reference case for consistency with the value used in the assessments performed in other RFMOs.

314. SC11 selected the reference case model as the base case to represent the stock status of south Pacific albacore tuna. To characterize uncertainty SC11 chose all the grid model runs except for those relating to the alternative regional weight hypothesis. This gave a total of 18 model runs and we report the 5%, median and 95% values on the base case estimate in this stock status summary. Details of the base case and axes of uncertainty for the grid are provided in Table SP-ALB1.

Table SP-ALB1: Description of the structural sensitivity grid used to characterize uncertainty in the assessment. The base case option is denoted in bold face.

Name	Description	One-off change model name(s)
Natural mortality	0.25, 0.30 , and 0.40 per year	Low_M and High_M
Length data weighting	Standard weighting or down-weighted	SZ_dwnwht
Steepness	0.65, 0.80 , and 0.95	h_0.65 and h_0.95

315. Time trends in estimated recruitment, spawning biomass, fishing mortality and fishery impacts are shown in Figures SP-ALB 1–5.

316. The estimated maximum sustainable yield (MSY) of 76,800 mt is lower than in the 2012 assessment (2012 MSY = 99,085 mt). Aside from general improvements to the stock assessment this was also influenced by 1) exclusion of catches from outside the southern part of the WCPFC Convention area; and 2) a reduction in the assumed value of natural mortality. Based on the range of MSY estimates (range: 62,260 - 129,814 mt), current catch is likely at or slightly less than the MSY.

317. Fishing mortality has generally been increasing through time, with F_{current} (2009-12 average) is estimated to be 0.39 times the fishing mortality that will support the *MSY*. Across the grid $F_{\text{current}}/F_{\text{MSY}}$ ranged from 0.13 - 0.62. This indicates that overfishing is not occurring, but fishing mortality on adults is approaching the assumed level of natural mortality (Table SP-ALB2 and Figure SP-ALB5).

318. The fishery impact by sub-tropical longline fisheries has increased continuously since 2000 (Figure SP-ALB6).

319. The latest (2013) estimates of spawning biomass are above both the level that will support the *MSY* ($SB_{\text{latest}}/SB_{\text{MSY}} = 2.86$ for the base case and range 1.74—7.03 across the grid) and the adopted LRP of $0.2SB_{F=0}$ ($SB_{\text{latest}}/SB_{F=0} = 0.40$ for the base case and range 0.30-0.60 across the grid). It is important to note that SB_{MSY} is lower than the limit reference point ($0.14 SB_{F=0}$) due to the combination of the selectivity of the fisheries and maturity of the species.

320. For the first time SC considered an index of economic conditions in the south Pacific albacore fishery (MI-WP-03). This index, which integrates fish prices, catch rates, and fishing prices, estimates a strong declining trend in economic conditions, reaching an historical low in 2013. While there was a slight recovery in 2014, conditions are still well below the average primarily due to high fishing costs and continued low catch rates. Domestic vessels from some longline fleets have reduced their fishing effort (i.e., tied up for periods of time) in response to these conditions.

Table SP-ALB2: Estimates of management quantities for base case and grid of 18 models (see Table SP-ALB1 for details). For the purpose of this assessment, “current” is the average over the period 2009–2012 and “latest” is 2013.

	Base case	5%	Grid Median	95%
$MSY(\text{mt})$	76,800	62,260	84,980	129,814
C_{latest}/MSY	1.00	0.60	0.91	1.23
$F_{\text{current}}/F_{\text{MSY}}$	0.39	0.13	0.34	0.62
B_0	711,400	638,465	806,900	1,024,500
B_{current}	456,984	365,962	509,653	783,308
SB_0	396,500	368,925	438,700	502,275
SB_{MSY}	57,430	35,762	59,180	90,778
$SB_{F=0}$	408,361	392,358	442,163	486,146
SB_{latest}	164,451	131,456	190,467	272,696
$SB_{\text{latest}}/SB_{\text{MSY}}$	2.86	1.74	3.20	7.03
$SB_{\text{latest}}/SB_{F=0}$	0.40	0.30	0.44	0.60

Table SP-ALB3: Comparison^a of selected south Pacific albacore tuna reference points from the 2009, 2011, 2012, and 2015 assessments. These represent the value used to provide management advice. Note that the time window for assessment and reference point calculation changes for $F_{\text{current}}/F_{\text{MSY}}$ and $SB_{\text{latest}}/SB_{F=0}$ and that prior to the 2015 assessment, the south Pacific albacore assessments covered the entire south Pacific Ocean rather than the convention area south of the equator used in 2015.

Management quantity	2015	2012 ^b	2011	2009 ^c
MSY(mt)	76,800 ³	99,085	85,130	97,610
$F_{\text{current}}/F_{\text{MSY}}$	0.39	0.21	0.26	0.25
$SB_{\text{latest}}/SB_{F=0}$	0.40	0.58	0.60	0.68

^a 2015 assessment was conducted for WCPF CA and 2011/2012 stock assessment was for the whole South Pacific.

^b The median of the grid was used to provide management advice instead of a single model run

^c Only SB_{current} is available

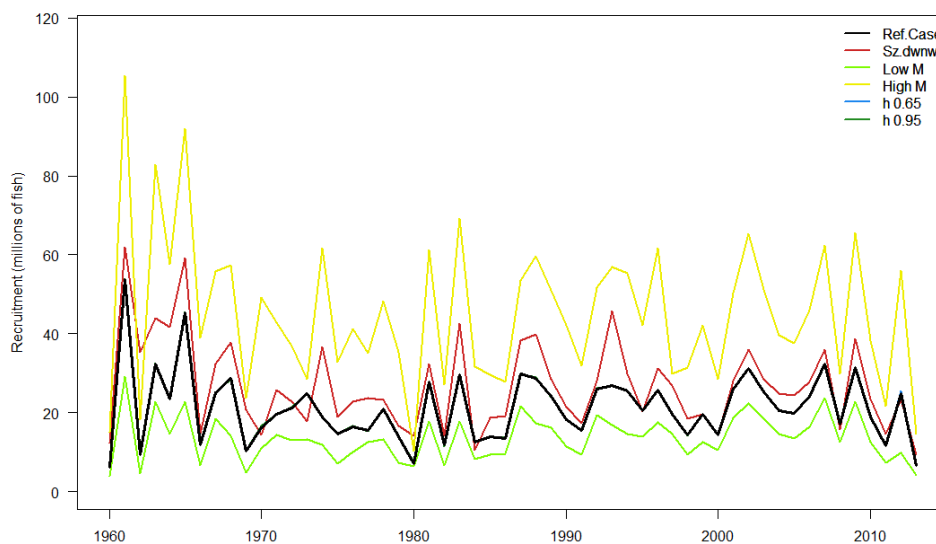


Figure SP-ALB1: Estimated annual recruitment (millions of fish) for the base case model and one-change sensitivity analyses (a subset of runs from the grid). See Table SP-ALB1 for a description of these sensitivity analyses. The model runs with alternative steepness values give the same recruitment estimates.

³ This is the reference case, not the grid median, as per 2012.

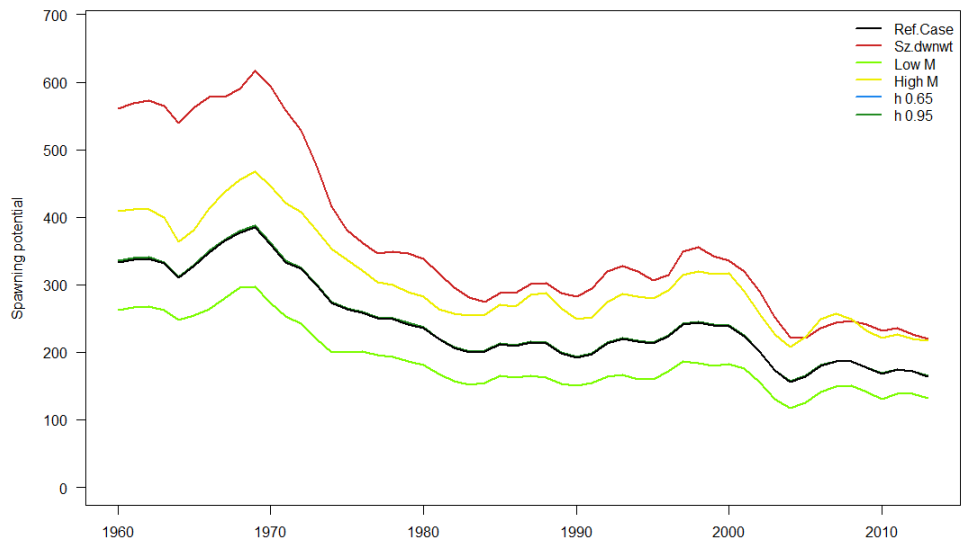


Figure SP-ALB2: Estimated annual average spawning potential for the base case model and one-change sensitivity analyses (a subset of runs from the grid). The model runs with alternative steepness values give the same spawning potential estimates.

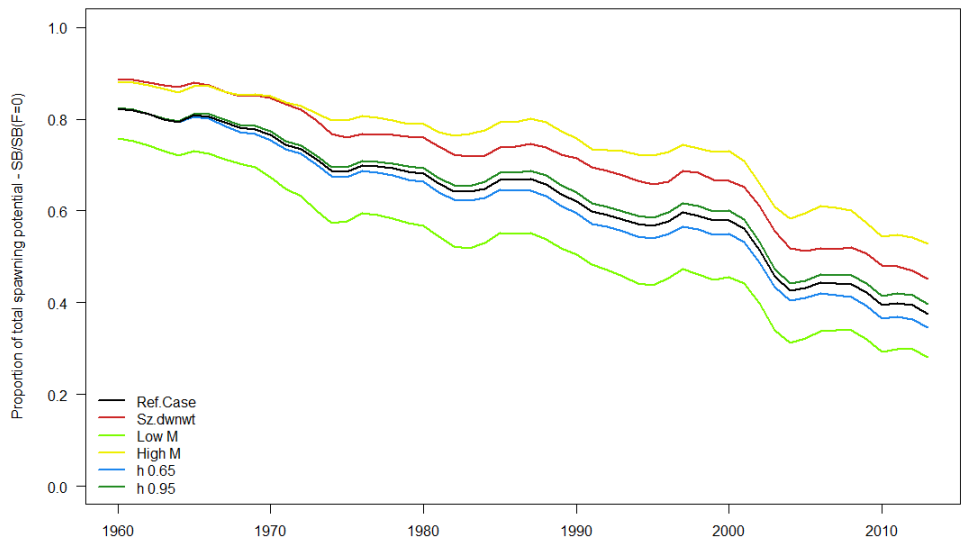


Figure SP-ALB3: Estimated annual average spawning depletion for the base case model and one-change sensitivity analyses (a subset of runs from the grid).

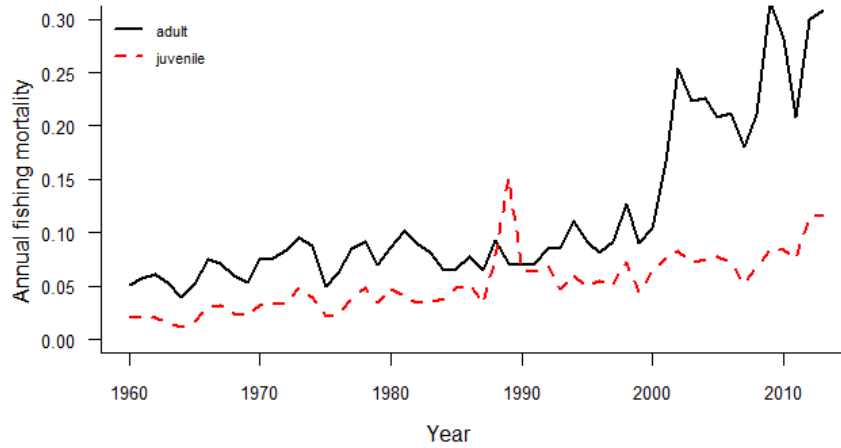


Figure SP-ALB4: Estimated annual average juvenile and adult fishing mortality for the base case model.

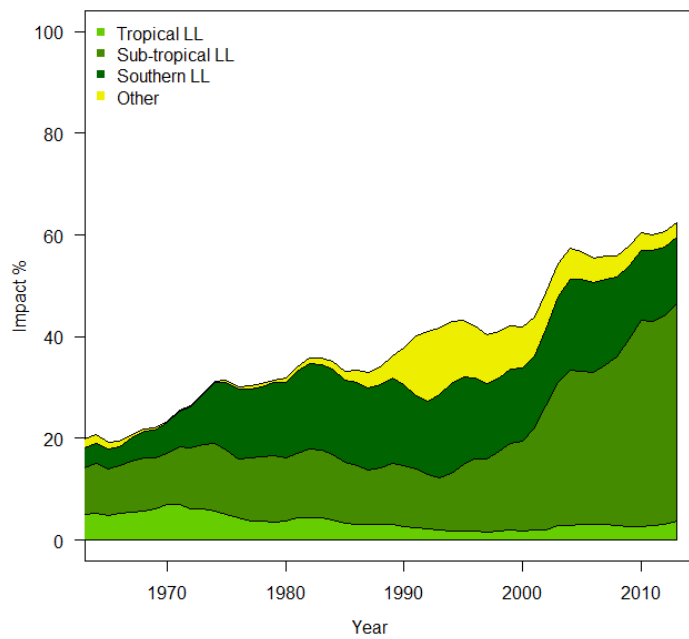


Figure SP-ALB5: Estimates of reduction in spawning potential due to fishing (fishery impact = $1 - SB_t/SB_{t,F=0}$) to different fishery groups for the base case model.

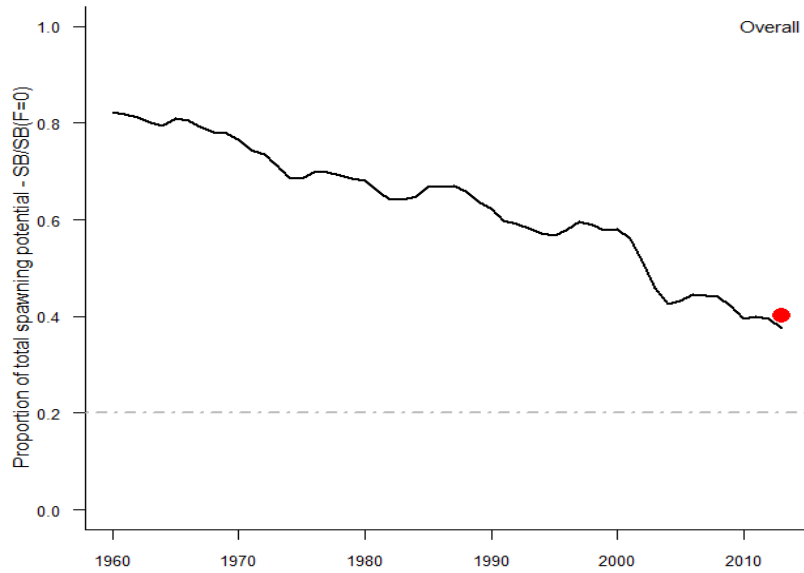


Figure SP-ALB6: Ratio of exploited to unexploited spawning potential, $SB_{latest}/SB_{F=0}$, for the reference case. The current WCPFC limit reference point of $20\%SB_{F=0}$ is provided for reference as the grey dashed line and the red circle represents the level of spawning potential depletion based on the agreed method of calculating $SB_{F=0}$ over the last ten years of the model (excluding the last year).

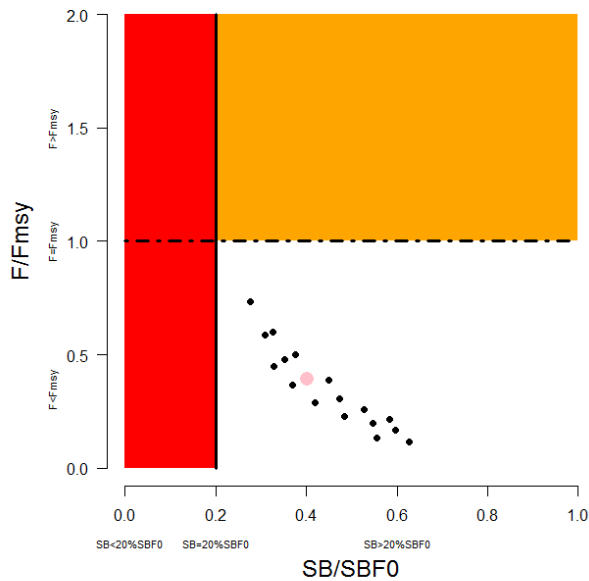
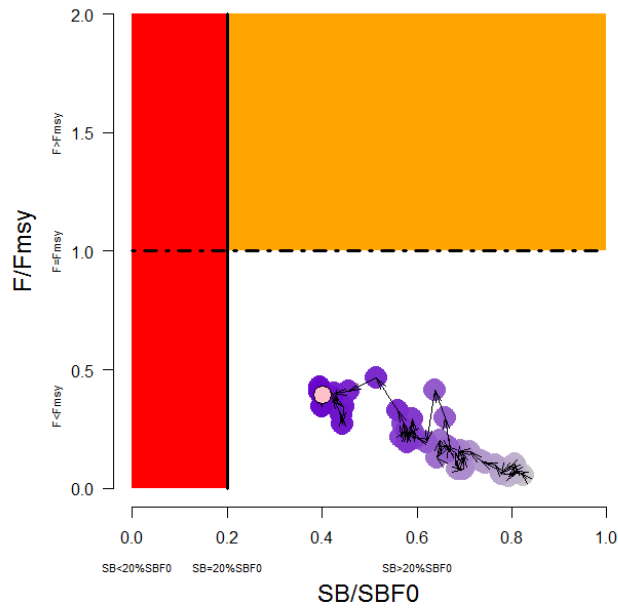


Figure SP-ALB7: Temporal trend for the base case model (top) and terminal condition for the base case and other sensitivity runs (bottom) in stock status relative to $SB_{F=0}$ (x-axis) and F_{MSY} (y-axis). The red zone represents spawning potential levels lower than the agreed LRP which is marked with the solid black line ($0.2SB_{F=0}$). The orange region is for fishing mortality greater than F_{MSY} ($F=F_{MSY}$; marked with the black dashed line). The pink circle (top panel) is $SB_{2012}/SB_{F=0}$ (where $SB_{F=0}$ was the average over the period 2002-2011). The bottom panel includes the base case (pink circle) and 18 models from the grid.

b. Management advice and implications

321. The South Pacific albacore spawning stock is currently above both the level that will support the MSY and the adopted spawning biomass limit reference point, and overfishing is not occurring (F less than F_{msy}).

322. While overfishing is not occurring, further increases in effort will yield little or no increase in long-term catches and result in further reduced catch rates.

323. Decline in abundance of albacore is a key driver in the reduced economic conditions experienced by many PICT domestic longline fleets. Further, reductions in prices are also impacting some distant water fleets.

324. For several years, SC has noted that any increases in catch or effort in sub-tropical longline fisheries are likely to lead to declines in catch rates in some regions (10oS-30oS), especially for longline catches of adult albacore, with associated impacts on vessel profitability.

325. Despite the fact that the stock is not overfished and overfishing is not occurring, SC11 reiterates the advice of SC10 recommending that longline fishing mortality and longline catch be reduced to avoid further decline in the vulnerable biomass so that economically viable catch rates can be maintained.

4.2 Northern stocks

326. J. Brodziak presented SC11-GN-IP-01, an activity report of the 15th meeting of the ISC on behalf of ISC Chair, G. DiNardo, who was not in attendance at SC11. The report summarized ISC activities during 2015 and ISC participants and ISC Working Group Workshops & Activities. In particular, the assessments work of the North Pacific albacore tuna, Pacific bluefin tuna, Billfish, and Shark Working Groups. The report also provided the up to date ISC Stock Status & Conservation Advice in 2015. This included conservation information from the new stock assessment of North Pacific striped marlin through 2013 conducted by the ISC Billfish Working Group and the new indicator-based evaluation of North Pacific shortfin mako shark status by the ISC Shark Working Group. The report also outlined future ISC research and that the ISC16 Plenary meeting will be held in Japan in July 2016, hopefully in Sapporo. Important future activities included planned research to conduct stock assessments for Pacific bluefin tuna and Pacific blue marlin in 2016.

Discussion

327. There was no discussion against this agenda item.

4.2.1 – 4.2.3 North Pacific albacore (*Thunnus alalunga*), North Pacific bluefin tuna (*Thunnus orientalis*) and North Pacific swordfish (*Xiphias gladius*)

Review of research and information

328. No working papers were presented against these agenda items.

Provision of scientific information

a. Status and trends

329. SC11 noted that no stock assessments were conducted for these species in 2015. Therefore, the stock status descriptions from SC10 are still current.

b. Management advice and implications

330. SC11 noted that no management advice has been provided since SC10. Therefore, the advice from SC10 should be maintained, pending a new assessment or other new information.

4.3 WCPO sharks

4.3.1 – 4.3.3. Oceanic whitetip shark (*Carcharhinus longimanus*), Silky shark (*Carcharhinus falciformis*) and South Pacific blue shark (*Prionace glauca*)

Review of research and information

331. No working papers were presented against these agenda items.

Provision of scientific information

a. Status and trends

332. SC11 noted that no stock assessments were conducted for these shark species in 2015. Therefore, the stock status descriptions from SC8 and SC9 are still current for oceanic whitetip shark and silky shark, respectively.

333. SC11 noted that no stock assessment has been conducted for South Pacific blue shark.

b. Management advice and implications

334. SC11 noted that no management advice has been provided since SC8 and SC9 for oceanic whitetip shark and silky shark, respectively. Therefore, previous advice should be maintained, pending a new assessment or other new information.

335. SC11 noted that no management advice has been provided for South Pacific blue shark.

4.3.4 North Pacific blue shark (*Prionace glauca*)

4.3.4.1 Review of research and information

a. Evaluation of North Pacific blue shark as a northern stock

336. The theme convenor noted that a bibliography was included in SC11-SA-WP-09 ('ISC Shark working group and information papers on blue shark') to inform scientists of the available information for determining whether North Pacific blue shark is a northern stock from a scientific perspective. No presentation or text has been provided.

Discussion

337. Japan stated that determining the designation of North Pacific blue shark as a northern stock, including establishing criteria and process for the designation of northern stocks is a priority work for SC as WCPFC11 agreed, but there is a lack of information on which to base a judgement. This CCM proposed that SC11 request ISC, in its future work, to give some information which enables SC to determine the stock occurs mostly in the area north of 20°N parallel. .

338. The USA noted the procedural difficulties with such a request to the ISC – SC would have to go to Commission with a request to Northern Committee which would then go to the ISC, which can take some time.

339. The theme convenor noted the difficulties but suggested a request could still be made.

340. Japan suggested an alternative: that SC note that the information about the distribution is critical for SC to make a judgement.

341. SC11 noted that ISC provided a bibliography of studies undertaken on North Pacific blue sharks. SC11 also noted that it is important for ISC, in collaboration with SPC, to continue to work to provide information regarding the stock distribution north and south of 20°N in order to enable the SC to provide a recommendation to the Commission about whether this should be considered a northern stock.

4.3.4.2 Provision of scientific information

a. Status and trends

342. SC11 noted that no stock assessment was conducted for North Pacific blue shark in 2015. Therefore, the stock status description from SC10 is still current.

b. Management advice and implications

343. SC11 noted that no management advice has been provided since SC10. Therefore, the advice from SC10 should be maintained, pending a new assessment or other new information.

4.3.5 North Pacific shortfin mako (*Isurus oxyrinchus*)

4.3.5.1 Review of research and information

344. ISC presented SC11-SA-WP-08, an indicator based analysis of the status of shortfin mako shark in the North Pacific Ocean. Shortfin makos are distributed throughout the pelagic, temperate North Pacific. Nursery areas are found along the continental margins in both the western and eastern Pacific, and larger subadults and adults are observed in greater proportions in the Central Pacific. A single stock of shortfin mako sharks is assumed in the North Pacific Ocean based on evidence from genetics, tagging studies, and lower catch rates of shortfin makos near the equator than in temperate areas. However, within the North Pacific some regional substructure is apparent as the majority of tagged makos have been recaptured within the same region where they were originally tagged, and examination of catch records by size and sex demonstrates some regional and seasonal segregation across the North Pacific.

Discussion

345. Australia supported the simulation analyses undertaken as part of these analyses and asked whether the utility of other metrics such as the 95th percentile of the size distribution of fish in the catch had been assessed together with just the medium size.

346. Carvalho responded that the working group had looked at a number of different ways to analyse the data to represent the best indicator.

347. Australia noted that CPUE-based indices of abundance had been developed for eight fisheries, of which three were selected as the most plausible - one showing a strong increasing trend (Japanese shallow-set longline), one indicating a relatively flat (or slightly increasing) trend (Hawaiian deep-set longline), and one showing a decreasing trend (Hawaiian shallow-set longline). Australia observed that all three cannot be simultaneously correct and reiterated that only CPUE indicators attempt to standardise for factors apart from stock status influencing the indicator. Australia welcomed the qualitative assessment of the data underpinning each CPUE-based indicator but commented that it wasn't clearly laid out why the Japanese shallow-set longline index was considered the best and the Hawaiian shallow-set longline fishery has high data quality. Australia commented that the SC repeatedly discusses the reliability of data for various fleets and their suitability for constructing indicators and stated that it would be useful to compile reports (which can be updated as required) on all fleets detailing the history of fishing strategies, gears and sampling regimes and unless this information is available the SC is likely to continue to debate what changes have occurred in these fisheries and whether they are adequately accounted for in the development of related indicators. Australia proposed that the SC recommend that each CCM develop reports for each of their fleets detailing this history and changes these fleets have undergone. Given the anomalous nature of the Japanese shallow-set longline fleet index in comparison to the two Hawaiian-longline based indices, Australia commented that a hypothesis that the increase in CPUE for this fleet is due principally to an increase in the reporting of mako sharks in the logbook, not an increase in the underlying stock abundance, cannot be ruled out and the presenter was asked to comment on this.

348. Carvalho noted that the ISC shark working group had decided that those three indices were considered the best indicators to inform abundance, especially the Japanese index. However, the working group recognize the uncertainty in the Japanese shallow longline data set, and its inconsistency with what is known of the productivity of mako sharks, and offered to pass these considerations to the ISC Chair

349. USA noted the standardized CPUE for the Japanese shallow longline fishery represents a 300% increase in 10 years which is unrealistic for a lamnid species. SC9 and SC10 were critical regarding the ability to remove targeting effects in Japanese indices for the blue shark assessment. The USA expressed a lack of confidence in removing targeting effects in Japanese shallow longline fisheries with regard to striped marlin, mako and blue sharks.

350. Carvalho responded that the unrealistic increase was considered by the working group during the analysis, adding that this was included in the SRP discussions, where more in-depth analysis of this specific index was requested.

4.3.5.2 Provision of scientific information

a. Status and trends

351. SC11 noted that ISC provided the following conclusions on the stock status of North Pacific shortfin mako shark:

“Shortfin mako is a data poor species. Recognizing that information on important fisheries is missing, the untested validity of indicators for determining stock status, and conflicts in the available data, stock status (overfishing and overfished) could not be determined. Managers should consider the undetermined stock status of shortfin mako shark in the North Pacific when developing and implementing management measures.”

The ISC SHARKWG reviewed a suite of information to determine the stock status of shortfin mako shark in the North Pacific. Of the three indices considered to have the greatest value in providing stock status information, abundance trends in two of the series appear to be stable or increasing, while the abundance trend in the third series appears to be declining.”

b. Management advice and implications

352. SC11 recommends that the Commission consider the undetermined stock status of shortfin mako shark in the North Pacific when developing and implementing management measures.

Recommendations

353. SC11 noted the following conservation advice from ISC:

“It is recommended that data for missing fleets be developed for use in the next stock assessment scheduled for 2018 and that available catch and CPUE data be monitored for changes in trends. It is further recommended that data collection programs be implemented or improved to provide species-specific shark catch data for fisheries in the North Pacific.”

354. SC11 noted that the quality of fisheries data for shortfin mako shark, varied for the fleets in the indicator analysis. SC11 recommends that changes in fishing practices of all fleets fishing in the WCPO be documented through time and noted that this information would be important for assessing fishery impacts on all species including shortfin mako shark.

4.4 WCPO billfishes

4.4.1 South Pacific swordfish (*Xiphias gladius*)

4.4.1.1 Review of research and information

355. No new stock assessment information was presented for South Pacific swordfish. No working papers were presented against this agenda item.

Discussion

356. FFA members noted that the catches between the equator and 20°S in the last 6 years were relatively constant, while the overall southern WCPFC catch has fallen. The proportion in the area north of 20°S has therefore gone up to record high of 69% in 2014. These CCMs conclude that management attention on this species should be throughout the range of the stock regardless of the uncertainty in the stock assessment. They note that the increased catches of South Pacific swordfish between the equator and 20°S is largely driven by catches on the high seas. Prior to this year there were poor or no operational level data on this species, making it difficult to assess whether longline fleets were targeting swordfish or catching it as a bycatch. These CCMs suggested that current new datasets can be interrogated to

investigate the question of targeting, depending on the data coverage. Given the uncertainties with stock status and the potential risk that overfishing is occurring, FFA members reiterated advice from SC9 that encouraged no further increase in catches of south Pacific swordfish until a formal assessment is concluded in 2017 and supported revising the swordfish CMM to consider the need for management measures throughout the range of the stock.

4.4.1.2 Provision of scientific information

a. Status and trends

357. SC11 noted that no stock assessment was conducted for South Pacific swordfish in 2015. Therefore, the stock status description from SC9 is still current.

b. Management advice and implications

358. SC11 noted that no management advice had been provided since SC10. Therefore, the advice from SC9 should be maintained.

4.4.2 Southwest Pacific striped marlin (*Kajikia audax*)

4.4.2.1 Review of research and information

359. No new stock assessment information was presented for Southwest Pacific striped marlin. No working papers were presented against this agenda item.

Discussion

360. FFA members noted that the stock assessment in 2012 indicated that catches were increasing between the equator and 15°S. These CCMs observed that more recently the annual catch estimates provided by SPC in SC11-ST-IP-01 indicate that the striped marlin catch in the Convention area south of the equator dropped in 2013 and significantly in 2014. FFA members advocated that the southwest Pacific striped marlin CMM be amended to account for increased catches taken in waters north of 15°S and throughout the range of the stock, and supported this species being a candidate for formal assessment in 2016.

4.4.2.2 Provision of scientific information

a. Status and trends

361. SC11 noted that no stock assessment was conducted for southwest Pacific striped marlin in 2015. Therefore, the stock status description from SC8 is still current.

b. Management advice and implications

362. SC11 noted that no management advice had been provided since SC10. Therefore, the advice from SC8 should be maintained.

4.4.3 North Pacific striped marlin (*Kajikia audax*)

4.4.3.1 Review of research and information

363. J. Brodziak Chair of the ISC Billfish Working Group (BILLWG), presented ISC presented SC11-SA-WP-10 (Stock assessment update for striped marlin (*Kajikia audax*) in the western and central North Pacific Ocean through 2013). The Western and Central North Pacific striped marlin stock is separated from the Eastern North Pacific stock based on results of population genetic studies and empirical patterns in the spatial distribution of fishery catch-per-unit effort. The boundary of the Western and Central North Pacific stock is defined to be the waters of the Pacific Ocean west of 140°W and north of the equator. (Figure S1).

Discussion

364. Australia noted that SPC does a full grid of structural uncertainties and it is disappointing that ISC doesn't do the same thing; it was hoped ISC can do so in the future. Australia stated that the CPUE indices used in the assessment were discontinuous at two points in the time-series and queried how the assessment scaled the biomass before and after these split years.. Australia also stated that fitting 16 different CPUE indices to the model, with each being equally weighted, may compromise the estimated abundance trends because some CPUE indices appear to show a conflict trend.

365. Brodziak explained that CPUE breaks are based on changes in fishing practices and deployments that affect striped marlin. The basic impact of this is a less contiguous time series. The index is scaled based on catchability co-efficient as calculated in the stock synthesis. Each block has its own estimates.

366. Australia noted that the assessment indicated that around 50% of the adult biomass is being caught each year and a lengthy discussion took place about the biological plausibility of this result. Brodziak noted that a number of stocks have experienced 50% catch of the standing stock each year and most of them stayed in an overfished state for a long time. This particular species grows very rapidly, is more long lived and is very fecund; it has a strong "bounceback" potential. The difference between this and the Pacific tunas - which have steepness between 0.65-0.95 – whereas the steepness for this stock is 0.87. This difference in steepness is important as this species is quite resilient, however recruitment is a problem: this species is patchily distributed and the number assumes the animals can find mates; it is possible that this is occurring for this species, and chronic overfishing is not good.

367. FFA members expressed concern over the worsening state of this species. In the 2015 assessment, the North Pacific striped marlin stock, being evaluated relative to MSY-based reference points, was overfished and overfishing was occurring. The 2013 spawning stock biomass is 61% below SBMSY and the 2010-2012 fishing mortality exceeds FMSY by 49%. These CCMs stated that CMM 2010-01 appears not to be working to reduce the total catch of striped marlin north of the equator and asked that the SC11 advice reflects these trends. The SC11 advice should include more stringent measures like catch limits and reduction in fishing mortality to allow rehabilitation of the stock.

368. Australia queried the domed-shaped selectivity found for the longline fleets, noting that the assessment undertaken on south Pacific striped marlin in 2012 had estimated asymptotic selectiveness for most longline fleets, and asked what might be causing the differences. Brodziak commented that in the 2011 assessment, logistic curves were used for all fleets but the results were not plausible for the biomass trends. No systematic evaluation was undertaken as this was not a benchmark analysis, it was an update and what was found in the past was propagated into this current evaluation.

369. FFA members expressed grave concern that the stock has been in an overfished condition since 1977, with the exception of 1982 and 1983, and fishing appears to be impeding rebuilding. They noted that the conservation advice states this is especially true if recent (2007-2011) low recruitment levels persist below its long-term average since 2004. FFA members underscored the urgency to recover this stock and stated that this should not be dismissed because the species is resilient. North Pacific striped

marlin is caught as bycatch in some of FFA EEZs north of the equator. It also forms an important component of these CCMs' domestic fisheries and recreational sector. FFA members supported SC11 advice reflecting a requirement to substantially reduce fishing mortality and catch.

370. On the issue of ratio of the catch as a ratio of current biomass, Japan gave the example of skipjack. Its total biomass is about 3.6 million mt and current catch is 2 million mt. Taking note of FFA members' comments Japan had doubts about the result of the stock assessment. This was an update assessment, but it is very different from the past assessment – fishing mortality was going up and down against F_{MSY} but now looks like it is continuously above F_{MSY} . As this is an update and there is a difference from previous fishing mortality, this CCM suggests there is a change in perception about whether stock would bounce back when at F_{MSY} . Japan suggested a recommendation requesting the Commission to take action based on the stock assessment from ISC. The wording could be SC11 notes the stock status and conclusions for North Pacific striped marlin provided by ISC. SC11 has concerns about the stock status and current catch.

4.4.3.2 Provision of scientific information

a. Status and trends

371. SC11 noted the stock status and conclusions for North Pacific striped marlin provided by ISC in SC11-SA-WP-10.

*“Estimates of population biomass of the Western and Central North Pacific (WCNPO) striped marlin stock (*Kajikia audax*) exhibit a long-term decline (Table S1 and Figure S2). Population biomass (age-1 and older) averaged roughly 20,513 mt, or 46% of unfished biomass during 1975-1979, the first 5 years of the assessment time frame, and declined to 6,819 mt, or 15% of unfished biomass in 2013. Spawning stock biomass is estimated to be 1,094 mt in 2013 (39% of SSBMSY, the spawning stock biomass to produce MSY, Figure S3). Fishing mortality on the stock (average F on ages 3 and older) is currently high (Figure S4) and averaged roughly $F = 0.94$ during 2010-2012, or 49% above F_{MSY} . The predicted value of the spawning potential ratio (SPR, the predicted spawning output at current F as a fraction of unfished spawning output) is currently $SPR_{2010-2012} = 12\%$ which is 33% below the level of SPR required to produce MSY. Recruitment averaged about 308 thousand recruits during 1994-2011, which was 25% below the 1975-2013 average. No target or limit reference points have been established for the WCNPO striped marlin stock under the auspices of the WCPFC.*

The WCNPO striped marlin stock is expected to be highly productive due to its rapid growth and high resilience to reductions in spawning potential. The status of the stock is highly dependent on the magnitude of recruitment, which has been below its long-term average since 2007, with the exception of 2010 (Table S1). Changes in recent size composition data in comparison to the previous assessment resulted in changes in fishery selectivity estimates and also affected recruitment estimates. This, in turn, affected the scaling of biomass and fishing mortality to reference levels (Figure S6).

When the status of striped marlin is evaluated relative to MSY-based reference points, the 2013 spawning stock biomass is 61% below SSBMSY (2819 t) and the 2010-2012 fishing mortality exceeds F_{MSY} by 49% (Figures S3, S4, and S5). Therefore, overfishing is occurring relative to MSY-based reference points and the WCNPO striped marlin stock is overfished.”

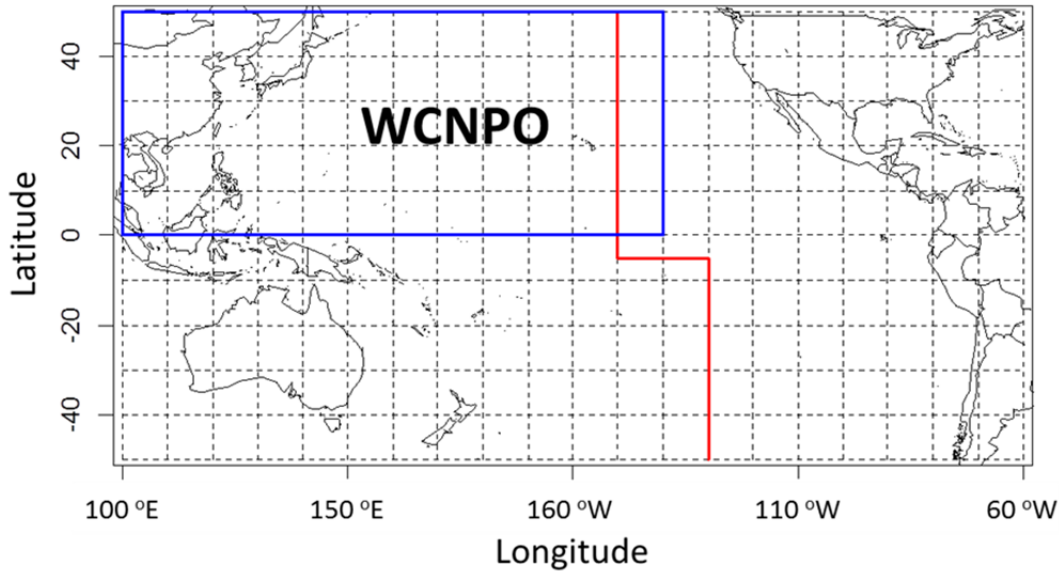


Figure S1: Stock boundary for the stock assessment update of Western and Central North Pacific Ocean striped marlin (WCNPO) as indicated by the blue lines. Red lines indicate the WCPFC convention area.

Table S1: Reported annual values of catch (mt) and posterior mean values of exploitable biomass (B , mt), relative biomass (B/B_{MSY}), harvest rate (percent of exploitable biomass), relative harvest rate (H/H_{MSY}), and probability of annual harvest rate exceeding H_{MSY} for the EPO swordfish stock.

Year	2007	2008	2009	2010	2011	2012	2013	Mean ¹	Min ¹	Max ¹
Reported Catch	3084	3503	2468	2852	3125	3521	2984	5822	2468	10594
Population Biomass	6915	6773	6409	5156	7823	7349	6819	12758	5156	28440
Spawning Stock Biomass	1192	1171	970	984	873	1013	1094	2025	815	6946
Relative Spawning Biomass	0.42	0.42	0.34	0.35	0.31	0.36	0.39	0.75	0.29	2.46
Recruitment (age 0)	240	242	63	496	155	224	352	410	63	1369
Fishing Mortality	0.82	0.99	0.80	0.96	0.89	0.97	0.76	0.95	0.47	1.54
Relative Fishing Mortality	1.29	1.57	1.27	1.51	1.41	1.53	1.20	1.50	0.74	2.44
Exploitation Rate	45%	52%	39%	55%	40%	48%	44%	48%	32%	65%
Spawning Potential Ratio	15%	12%	16%	13%	12%	12%	14%	13%	7%	24%

¹ During 1975-2013

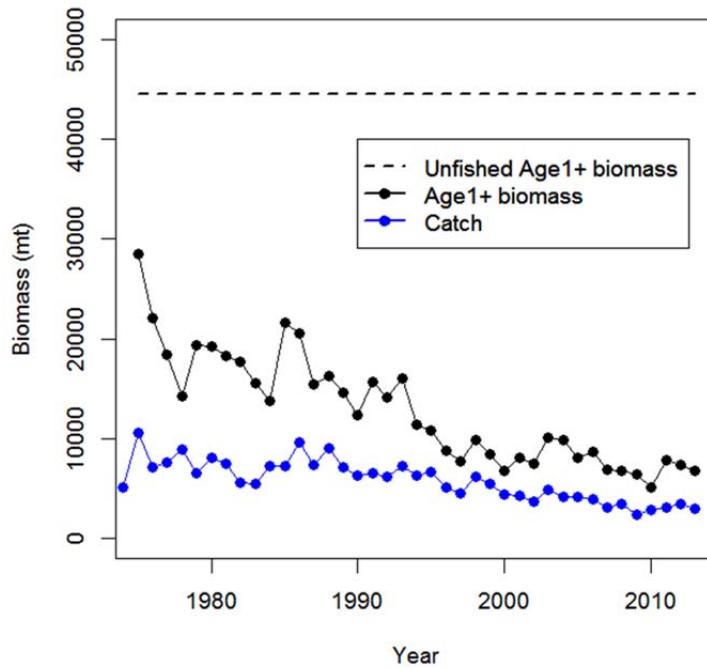


Figure S2. Trend in population biomass and reported catch biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2013.

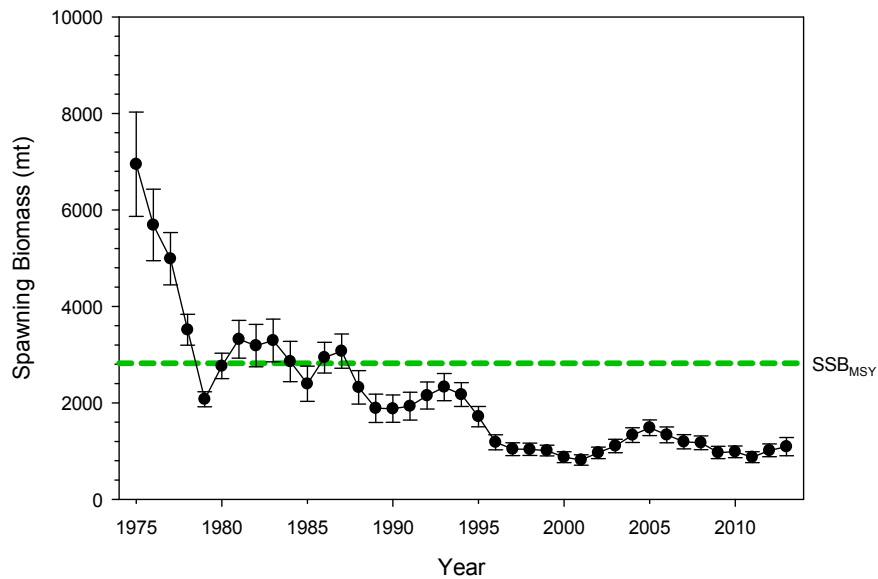


Figure S3. Trends in estimates of spawning biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2013 along with 80% confidence intervals.

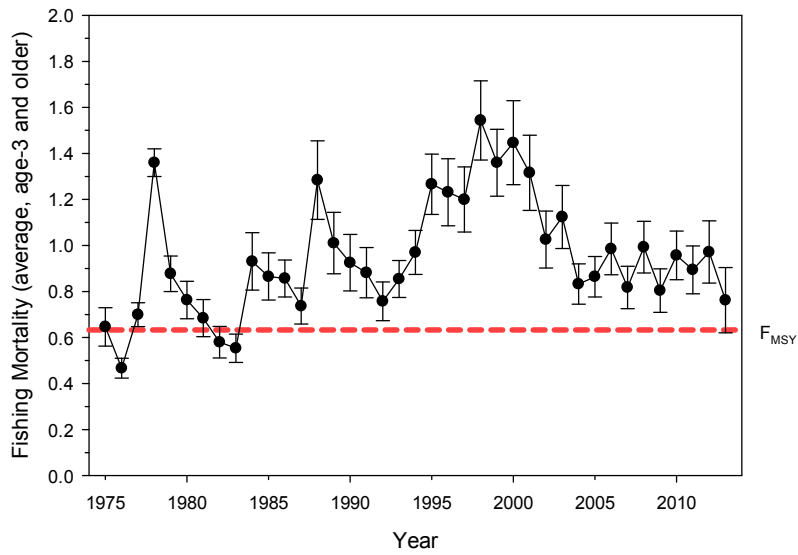


Figure S4. Trends in estimates of fishing mortality of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2013 along with 80% confidence intervals.

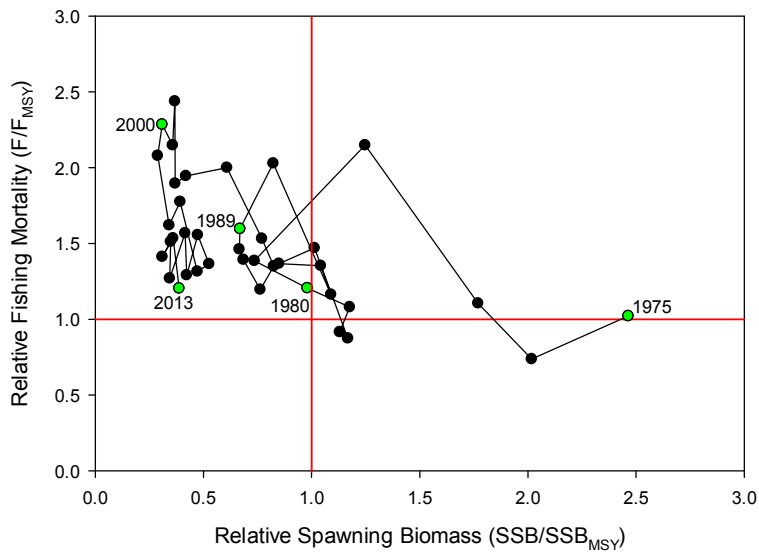


Figure S5. Kobe plot of the trends in estimates of relative fishing mortality and relative spawning biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2013.

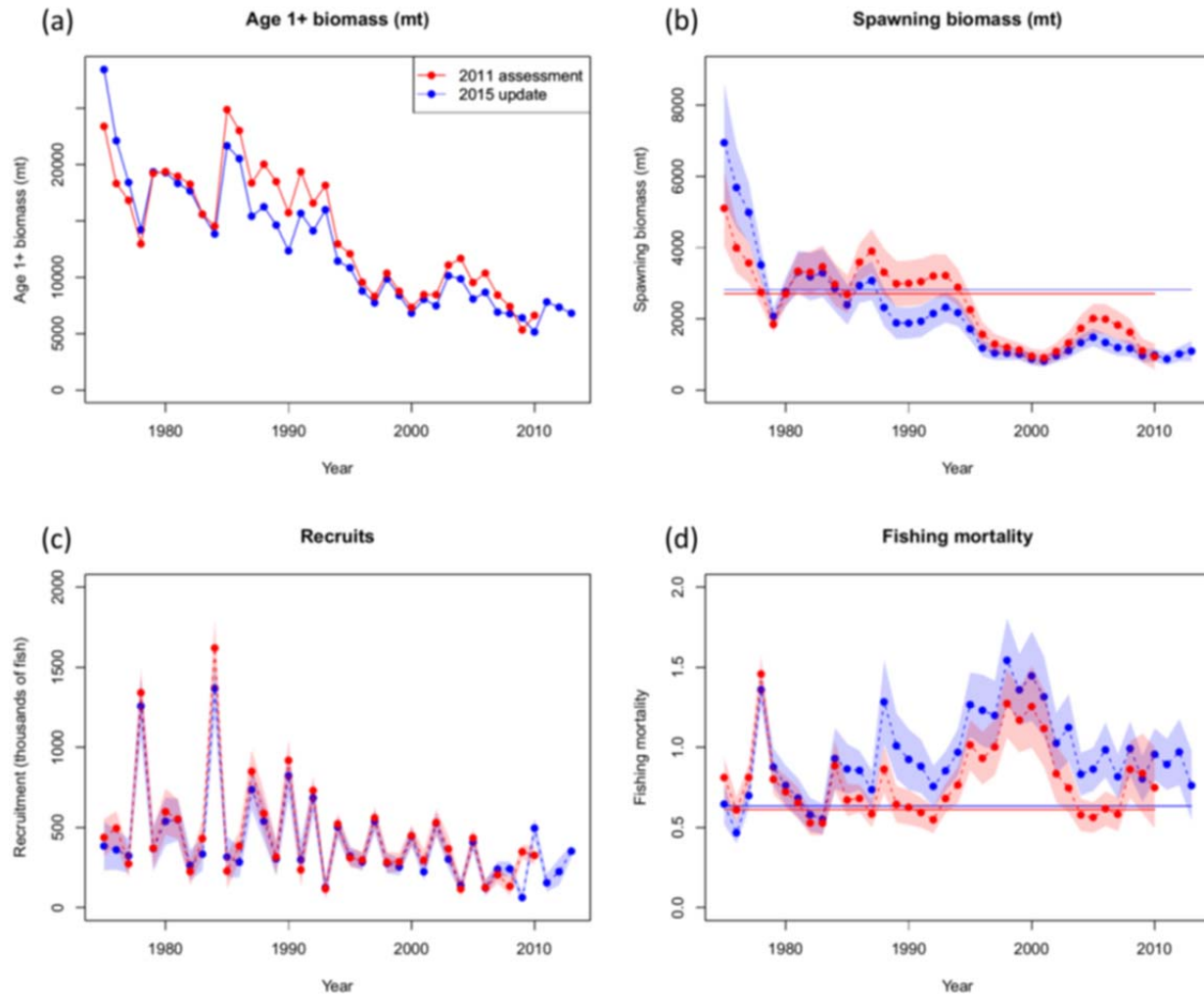


Figure S6. Comparison of time series of total biomass (age 1 and older) (a), spawning biomass (b), age-0 recruitment (c), and instantaneous fishing mortality (year-1) (d) for the WCNPO striped marlin between the 2011 stock assessment (red) and the 2015 update (blue). The solid line with circles represents the maximum likelihood estimates for each quantity and the shadowed area represents the 95% asymptotic intervals of the estimates (± 1.96 standard deviations). The solid horizontal lines indicated the MSY-based reference points for 2011 (red) and 2015 (blue).

b. Management advice and implications

372. SC11 noted the following conservation advice from ISC.

“The stock has been in an overfished condition since 1977, with the exception of 1982 and 1983, and fishing appears to be impeding rebuilding especially if recent low recruitment levels persist.”

Projection results show that fishing at FMSY could lead to median spawning biomass increases of 25%, 55%, and 95% from 2015 to 2020 under the recent recruitment, medium-term recruitment, and stock recruitment-curve scenarios.

Fishing at a constant catch of 2,850 t could lead to potential increases in spawning biomass of 19% to over 191% by 2020, depending upon the recruitment scenario.

In comparison, fishing at the 2010-2012 fishing mortality rate, which is 49% above FMSY, could lead to changes in spawning stock biomass of -18% to +18% by 2020, while fishing at the average 2001-2003 fishing mortality rate ($F_{2001-2003}=1.15$), which is 82% above FMSY, could lead to spawning stock biomass decreases of -32% to -9% by 2020, depending upon the recruitment scenario.”

373. SC11 expressed concerns about the updated stock status of WCNPO striped marlin, noting that the stock was overfished (SSB₂₀₁₃ at 61% below SSB_M) and that overfishing was occurring ($F_{2010-2012}$ exceeds FMSY by 49%). Although a LRP for billfish species has not been adopted by the WCPFC, SC11 noted that $SSB_{current}/SSB_{current,F=0}=0.12$ and is below the LRP adopted for tunas. SC11 also noted that projections indicate that $Prob(SSB_{2020}>SSB_{2015})<50%$ for all constant catch scenarios over 2,850 mt (under the three recruitment hypotheses modelled), which means that in order to allow the spawning biomass to rebuild then catches need to be reduced to less than 2,850mt.

374. SC11 recommends that the Commission develop a rebuilding plan for North Pacific striped marlin with subsequent revision of CMM 2010-01 in order to improve stock status.

4.4.4 Pacific blue marlin (*Makaira nigricans*)

4.4.4.1 Review of research and information

375. No new stock assessment information was presented for Pacific blue marlin. No working papers were presented against this agenda item.

4.4.4.2 Provision of scientific information

a. *Status and trends*

376. SC11 noted that no stock assessment was conducted for Pacific blue marlin in 2015. Therefore, the stock status description from SC9 is still current.

b. *Management advice and implications*

377. SC11 noted that no management advice had been provided since SC9. Therefore, the advice from SC9 should be maintained, pending a new assessment or other new information.

4.5 Independent review of stock assessments

378. A discussion took place around a suggestion by China earlier in the meeting for participation in and review of stock assessments.

379. The Theme co-convenor noted that bigeye tuna has received a review and it would make sense to do the same for yellowfin and skipjack, further noting that the North Pacific striped marlin assessment was reviewed in 2012 to positive feedback. Brodziak suggested that one review per year might be useful, recognising that it will cost time and resources for SPC and others to conduct. Brodziak noted that ongoing peer review by experts has improved WCPFC science but cautioned that it is not a panacea.

380. The EU saw value in the discussion prompted by China on the process of reviewing the stock assessments performed by SPC. This CCM pointed to WCPFC Resolution 2012-01 as providing a basis for this.

381. The USA noted that in the past the Center of Independent Experts (CIE) has conducted reviews and the USA has funded those reviews for a variety of species, noting that it conducted a 2012 bigeye tuna review.

382. SPC noted that there is a difference between participating in a stock assessment and doing a peer review; not least because a peer review would typically deliberately involve people who did not participate in the stock assessment.

383. USA noted that there is an opportunity in March of each year to participate in a preparatory workshop which discusses the process of conducting that year's stock assessments.

384. SC11 noted para 3 of Resolution 2012-01 stating the need to strengthen peer review mechanisms within the Scientific Committee, SPC-OFP and ISC by participation of invited experts (e.g. from other RFMOs or from academia), particularly for stock assessments.

385. SC11 also noted that WCPFC does not have a formal process of external review of the stock assessments.

Recommendations

386. SC11 recommends that the Secretariat develops a proposal to establish a formal process and its cost implication to independently review stock assessments. This proposal will be presented to SC12.

AGENDA ITEM 5 MANAGEMENT ISSUES THEME

387. The Management Issues theme was convened by R. Campbell (Australia). The Theme Convener informed the meeting that nine working papers would be presented during this session and that a further two Information Papers had also been prepared.

5.1 Limit reference points for the WCPFC

5.1.1 Implications of alternative levels of acceptable risk

388. The Theme convenor reminded the SC that in 2013 the Commission had adopted the SC9 recommendations on LRPs but had not yet adopted the corresponding level of acceptable risk to be associated with breaching a LRP. The convenor also noted that while SC10 had provided additional information to the Commission to help it identify this level of risk the Commission had still not made a decision and was seeking further advice from SC11. The convenor noted that no additional working

papers on this issue had been prepared for SC11 and that he was of the opinion that the SC had already provided the Commission with sufficient information for them to make a decision. He requested any additional comments on this issue from the SC.

389. The USA agreed that this was an issue for the Commission.

Recommendations

390. Noting that SC10 had considered levels of risk associated with breaching the LRP within the range 5-20%, that the identification of acceptable risk is a management issue, SC11 reaffirmed the recommendation made by SC10 that WCPFC12 identify the level of acceptable risk which should be applied to breaching a LRP for the key target species, noting that the UN Fish Stocks Agreement states that the risk of exceeding LRPs should be very low.

5.1.2 Identifying appropriate LRPs for elasmobranchs within the WCPFC

391. The convener noted that SC10 had made a number of recommendations to the Commission in relation to the identification of appropriate LRPs for elasmobranchs in the WCPO. First, that a similar tiered approach as adopted for the tuna species be developed for sharks, second that an expert panel should be convened to review life history parameters for sharks, and third that another work necessary to support the development of LRPs be included in the updated shark research plan. A meeting of an expert panel to review the life history parameters was held and their report is provided in Information Paper EB-IP-13 and the ISG-5 meeting at SC11 had included the further development of LRPs in the updated SRP. This work is proposed to be carried out over next year and the results and recommendations based on this work provided to SC12 for further consideration.

392. The Theme convener brought to the attention of the SC that WCPFC doesn't have any adopted LRPs for striped marlin (as noted in WP-SA-10) or other billfish species and noted this might be something for SC to consider and provide a paper on for SC12.

393. There were no working papers and no further discussion against this agenda item.

Recommendations

394. SC11 noted the work undertaken in support of identifying appropriate LRPs for elasmobranchs within the WCPFC, in particular the report of the Pacific shark life history Expert Panel Workshop (WCPFC-SC11-2015/EB-IP-13) and that other work necessary to identify and support the development of LRPs for sharks has been included in the updated shark research plan. SC11 recommends that the WCPFC12 continues to support this work.

5.2 Development of target reference points (TRPs) and harvest control rules (HCRs) for the WCPFC

5.2.1 Development of WCPFC harvest strategies

395. J. Larcombe (Australia) presented SC11-MI-WP-01 (Harvest strategy for key tuna species in the WCPO – draft work plan). This paper comprises a draft work plan to give effect to the requirements of paragraph 13 of CMM 2014-06 which establishes a harvest strategy approach for key tuna species to the WCPFC:

“The Commission shall agree a work plan and indicative timeframes to adopt or refine harvest strategies for skipjack, bigeye, yellowfin, South Pacific albacore, Pacific bluefin and northern albacore tuna by no later than the twelfth meeting of the Commission in 2015. This work plan will be subject to review in 2017. The Commission may agree timeframes to adopt harvest strategies for other fisheries or stocks.”

396. Australia noted that the draft work plan is a proposed schedule of actions to develop harvest strategies in the WCPO for skipjack, bigeye and yellowfin tuna and south Pacific albacore required under the measure. It is anticipated that the Northern Committee will be responsible for developing a schedule for Pacific bluefin and north Pacific albacore to be included in this work plan. Australia sought the SC’s comments and recommendations, from a technical and scientific perspective, on issues including: the feasibility of the indicative timeframes; technical considerations (such as operating model structures) that will influence the work plan’s structure and scheduling; and the roles for the Committee as identified in the draft work plan.

Discussion

397. FFA members thanked Australia for taking the lead in this process, and noted that all 17 FFA CCMs support it and commended the draft work plan. These CCMs felt that the timing in the work plan was ambitious but feasible as much of the scientific work for the 2015 elements had already been completed, such as advice on the risk of breaching LRPs by setting TRPs at different levels. FFA members asked to hear from others about the feasibility of the scientific inputs and from the Northern Committee members about what sort of timetable might be envisaged for the two priority northern stocks agreed by CMM 2014-06 for inclusion in this process, Pacific bluefin and North Pacific albacore, including resources required for the science to underpin the harvest strategy approach for these northern stocks.

398. FFA members noted additional principles that will need to be taken into account: a) recognition that tropical tunas and South Pacific albacore are caught mainly within the EEZs of FFA members, who have an overwhelming interest in the sustainable management of these stocks. These members similarly recognised the interest of Northern Committee coastal states in the northern stocks, b) noting that this process will require additional scientific and bioeconomic analysis and in working through the decisions. This will need to be integrated into the existing work of the SC, TCC and the Commission without needing additional subsidiary bodies and meetings which Small Island Developing States cannot afford, c) the harvest strategy process is an opportunity to increase the effectiveness of measures already in place. It should not become a way of reopening and restructuring management arrangements which have already been agreed.

399. EU noted its support for the approach, seeing value in global discussions on these issues including in RFMOs where this work is performed. EU reminded CCMs that it is financially supporting the MOW meeting this year and advocated for additional resources from elsewhere were available. Also asked if the plan was to work through these issues at the MOW later this year. This CCM added that when the Commission agrees RPs for species it should also decide on the probability of reaching these RPs within a certain time frame.

400. J. Larcombe acknowledged EU funding for the current year and noted that there will be an ongoing need to resource this technical work. Responding to the EU question around specifying probabilities for achieving target reference points for depleted stocks, J. Larcombe explained that TRPs and probabilities are contained in the harvest strategy principles and can pertain to stocks that are depleted. In the case of depleted stocks which may have interim TRPs it may be necessary to specify a

probability of achieving that target within a certain timeframe. Nothing in the draft work plan proposed is inconsistent with that idea

401. EU noted that what it is providing for the MOW in terms of funding is not enough to do this work; it is very ambitious. SC needs to come up with scheduling and budget. EU asked if the ABNJ Tuna Project can contribute to the work. In response, S. Clarke noted that harvest strategy development is part of the ABNJ Tuna Project but not the part that the WCPFC has been funded to implement. The upcoming activity in this regard is to hold workshops in tRFMOs; FAO has approached the WCPFC and noted that it would be useful if this meeting could identify what needs to be done and the amount of money required to go to FAO for its consideration.

402. PNA members supported the work plan, considering that harvest strategies should be seen as opportunities to improve the decision-making framework for Conservation and Management Measures. These CCMs stated that harvest strategies should not be seen as a way of reshaping arrangements and approaches that have already been agreed, except where this is necessary to ensure sustainability. If Commission members use the harvest strategy process to try to change existing arrangements to secure more favourable outcomes, the timetable in the work plan will not be feasible and the potential benefits from the improved decision-making will be put at risk. For PNA members, an essential element in the harvest strategy approach for tropical stocks and fisheries is that the strategies should continue to recognise that the tropical tuna catch is overwhelmingly taken in the waters of SIDS, along with Indonesia and Philippines.

403. USA agreed the work plan had an ambitious timeline but considered it had a good vision for what needs to be done. SC needs to give a lot of thought to resources and funding to accomplish its implementation and this CCM suggested SC consider whether it would be helpful to consider tropical tuna stocks as a group rather than three separate ones or by fishery. In the tables in the work plan one of the tasks is to provide advice for a monitoring strategy – the USA thinks the Commission already has data mechanisms in place. This CCM stated that it was wary about choosing harvest strategies before agreeing various HCRs to test to ensure we are selecting the best one.

404. J. Larcombe responded that there are various options for treating stocks separately or aggregating them. Australia tried to keep the work plan simple by separating the species but we recognize the clear need to account for interactions between the HCR for different species (such as bigeye and skipjack). This CCM reported that there will be a meeting of technical experts later this year where those issues will hopefully get canvassed. If that suggests a fishery-based structure rather than a species structure, the work plan can be modified. Regarding whether targets are adopted before HCRs tested or WCPFC keeps its options open and also tests for the performance of various targets, J. Larcombe noted that this would also be a valid approach.

405. The Sustainable Fisheries Partnership observed that harvest strategies often contain approaches to rebuilding plans and suggested that the SC considers adding additional elements about rebuilding plans within this program.

406. Korea noted the large number of pieces of work to be processed within the work plan. It is difficult for scientists to understand and may be difficult for stakeholders and managers to understand. This CCM suggested that SC should advise national managers.

407. In response to a question from Korea about the term ‘record’ management objectives, J. Larcombe made it clear that the term ‘record’, not agree, was deliberate. Progressing the work of the plan is not contingent on agreement of management objectives. WCPFC can ‘record’ them and as the performance of the HCRs is examined it can be assessed to what extent the various management

objectives are being achieved. In response to a further question, Australia explained that the plan finishes in 2018 and does not, for any species, have a clear point where the Commission ‘adopts’. This may change following future discussions.

408. WWF noted the work plan gave clear direction and supported FFA and PNA’s earlier comments. WWF agreed with EU on the need to understand the budgetary requirements of this work and commented that it was helpful to have an indicative schedule. This observer noted the strong interest by external parties in this work, including WWF and ABNJ Tuna Project, and stated that where there are gaps WWF is willing to try and fill them.

409. EU noted that it will consider further support on this work and hoped other members around the table will consider similar initiatives and reiterated that there is a lot of work for SC on South Pacific albacore and skipjack in 2016 and enquired of SPC what resources and budget requirements would be involved. This CCM proposed that there be more intersessional work on the further development of the plan to give more opportunity for members during the work’s development not just when they arrive at the meeting as it is more difficult to provide comprehensive comments; there was a suggestion of an informal group working electronically.

410. SPC commented that at WCPFC12 in Apia it was agreed on a work plan for SPC to provide technical support to the MOW process including budget. SPC acknowledged EU’s support for a large component of the first year, with the Commission topping that up in Year 1. Years 2 and 3 were supported in the indicative budgets which are ratified on an annual basis. SPC noted that Australia’s proposal contains some items which are similar to the budget identified in Apia, so there will need to be some rationalisation.

411. J. Larcombe supported the EU’s proposal for intersessional work for dialogue in progressing the plan be continued.

412. Japan commented that SC was not expected to agree whether the SC support the proposal or not. Japan asked SPC to provide at the TCC or Commission meeting the resources necessary for the project in 2016 and 2017.

413. The Theme convenor clarified that this was a proposed work plan for progressing work under a CMM and the SC has been asked to review the proposal, noting that SC has done work on LRPs and has been asked to do work on harvest strategies and TRPs; the work plan is the first step in this process.

Recommendations

414. SC11 considered the draft work-plan (WCPFC-SC11-2015/MI-WP-01) provided by Australia to progress the harvest strategy approach, which is required under CMM 2014-06. SC11 strongly supported the initiative by Australia to develop this plan. SC11 recommends that Australia continue to develop this work-plan, noting the comments provided by SC11, and in consultation with other CCMs intersessionally, and that the updated plan be presented to TCC11 and WCPFC12, including an estimation of budget and resources required.

5.2.2 Skipjack tuna target reference point

415. L. Clark (PNA) presented SC11-MI-WP-02, a draft Conservation and Management Measure on a target reference point for WCPO skipjack tuna put forward by PNA for scientific comment. This paper explains the basis for a PNA proposal to adopt 50 per cent of the estimated recent average spawning biomass in the absence of fishing as a Target Reference Point for WCPO skipjack. A draft CMM for this

purpose is attached. The draft CMM responds to the advice from SC10 advocating for the adoption of a TRP and Harvest Control Rules for skipjack. The analytical basis for the proposal was presented to SC10. The draft CMM was presented to WCPFC11 but was not adopted, and has been revised to take into account comments made by Commission members at WCPFC11. The paper also assesses the draft CMM against the requirements of CMM 2013-06 on the Criteria for the Consideration of Conservation and Management Proposals. PNA welcomes comments and suggestions from Scientific Committee members before submitting the draft CMM for consideration at WCPFC12.

Discussion

416. Japan raised the issue of effort creep, noting it could be important when discussing TRPs. This CCM noted that the result of projection shows that if current effort is maintained, the stock will be maintained, which indicates that level of catch in 2014 was confirmed to be sustainable because effort hardly changed recently. On the other hand, Japan pointed out that skipjack tuna catch in 2014 was jumped to be 20% above the estimated MSY. Reiterating that its coastal fishermen are recently suffering from local depletion of skipjack tuna, Japan stated that the difference between the result of assessment that the stock is healthy and local depletion actually occurred indicated the model used in the assessment did not fully capture the reality and thus expressed discomfort to decide TRPs based on the model..

417. L. Clark noted that the approach is to look at 2010-2012 effort levels – that is, the fishery now – to retain that will require reductions in total effort over time to deal with effort creep.

418. Japan commented that regarding the data, referring to the base year of 2012 is roughly the same as the years referred to in the draft CMM.

419. FSM reminded SC that there had been a good understanding and strong support for the PNA proposal at the Commission meeting in Samoa in 2014, largely because of the work done by SC in the Management Issues Theme discussions over several years. PNA members hoped to build a wider understanding of the proposal this year, and welcomed any comments or suggestions from committee members on the scientific and technical basis for the proposal.

420. EU suggested updating para 18(e) of the draft CMM where it refers to range contraction, as based on the latest information shared at SC11 there is no scientific evidence of that.

421. FFA members supported the PNA proposal and draft Target Reference Point CMM, stating that it responds to the decision of WCPFC10 to consider and adopt a TRP for skipjack tuna at WCPFC11, and the advice from SC10 recommending the adoption of a TRP and harvest control rules for skipjack tuna. These CCMs stated that the proposed CMM is an important step in the implementation of CMM 2014-06 and a major step forward for the tropical tuna measure, which envisages replacing its current stock-specific objectives with TRPs as they are agreed by WCPFC. These CCMs stated that developing a better understanding of the spatial impacts of fishing and how they would interact with the proposed TRP is important, particularly for SIDS fisheries on the periphery of the skipjack range. These CCMs reminded SC that the recent increases in SKJ catch, which they stated were likely to continue in the absence of a TRP with effort permitted under CMM 2014-01 would drive the stock below 50%, exacerbating spatial impacts or range contraction concerns. FFA members stated that compared to most international fisheries and many single country stocks, the proposed TRP is very precautionary.

422. The USA commented that the table of performance measures was appropriate, noting it would be helpful to add another table that showed the variability of the simulated performance measures. This would provide an idea of the inter-annual variability expected under each of the target levels.

423. The theme convenor noted that while the MSE process is being undertaken, SC member may want to consider any adoption of a TRP as interim.

Recommendations

424. SC11 considered the scientific aspects of the draft CMM on a target reference point for WCPO skipjack tuna (WCPFC-SC11-2015/MI-WP-02) provided by PNA. SC11 recommends that PNA take into consideration comments provided by SC11 in further developing this draft CMM.

5.2.3 South Pacific albacore tuna target reference point

Economic conditions in the southern longline fishery

425. C. Reid (FFA) presented SC11-MI-IP-03, which noted that recent albacore stock assessments indicate that relative to MSY the stock is not overfished nor is overfishing occurring, however, many members of the WCPFC, particularly Pacific Island Countries and Territories (PICTs), have expressed concerns in relation to the impact on catch rates, and the economic viability of fleets, of the recent expansion in effort in the southern longline fishery. These concerns are reflected in the recommendations of the 10th meeting of the Scientific Committee with regard to albacore that “longline fishing mortality and longline catches be reduced to avoid further decline in the vulnerable biomass and possibly exceeding the biomass LRP, and so that economically viable catch rates can be maintained.” In this study an index of economic conditions in the southern longline fishery is developed in an attempt to obtain a better understanding of historical trends in economic conditions in the fishery and drivers of changes in it. The developed index clearly demonstrates that economic conditions in the fishery between 2013 and 2014 were poor driven by high fuel prices and low catch rates. While conditions in 2011 and 2012 were better than that seen for 2013 and 2014 they were still significantly worse than average conditions over the period examined (1997-2014) despite the fact that real fish prices were at the second highest and highest levels respectively. With recent significant declines in fuel prices, which has returned fishing costs to around their period average, and fish prices also being around the period average significant improvements in economic conditions in 2015 are likely. However, if the reductions in catch rates seen since 2011 continue then future relatively good economic conditions will likely occur at levels that to date would have been deemed average and future relatively poor economic conditions at levels around or below that seen in 2013 and 2014.

Discussion

426. China expressed concern regarding the economic situation of the albacore longline fishery, commenting that 2 million tonnes goes to the cannery – not just skipjack but albacore, too – and suggested that the economic situation of southern albacore tuna may also be affected by the over-provision of skipjack tuna catch.

427. C. Reid responded that albacore catch rates are a function of the effort in the fishery. There may be a relationship between the albacore catch and the skipjack price but in 2012 year there were good prices. This analysis looks at the specifics for each boat. He added that if the skipjack catch does impact on it then that will be reflected in the indices.

428. PNG commented that the analysis was done by EEZ and wondered if it had also been done by fleet. Reid responded that SPC is planning to examine that aspect in the future.

429. Samoa noted that this analysis reflected what is happening in Samoa.

430. Chinese Taipei pointed out that the analysis calculates money value of the fishery and asked if future research could look at the economic value which also covers domestic consumption and employment. Reid responded that that was a good next step but it was not simple. Ongoing research is looking at economic conditions for the vessel operators and measuring net economic benefits to countries over time was a complicated step but future research is hoping to move in that direction.

431. Cook Islands noted the information presented here and, reiterating the position of a number of SIDS, urged SC to provide language about the amount of effort reduction that would be required. Environmental and economic factors also should be considered.

432. FFA members hoped the SC report will not confine itself to biology but will start to identify scientific information on economic and environmental factors that WCPFC needs to consider. Article 5(b) of the WCPFC Convention requires WCPFC to take a range of factors into account when formulating Conservation and Management Measures and these CCMs noted that SC is probably the most appropriate WCPFC body to identify the best available economic and environmental evidence for the Commission. FFA members requested that management advice should take into account information presented on South Pacific albacore. FFA members stated that it is not enough to maintain a stock that is biologically sustainable; it needs to be maintained at a level that is socially useful and economically feasible which is important for the coastal states within the range of the stock.

Alternative Potential TRPs for South Pacific albacore

433. G. Pilling (SPC) presented SC11-MI-WP-04, which noted that both biological and economic objectives for the south Pacific albacore fishery have been proposed in previous WCPFC Management Objective Workshop meetings. These objectives can guide decision making on Target Reference Point levels. The key question addressed in this paper is: “are candidate target reference points capable of meeting both biological and economic management objectives?” To do this, the paper examines the implications of different candidate TRP levels for the south Pacific albacore stock and fishery. ‘Minimum’ TRP levels for albacore defined through analyses identifying the consequences of different levels of risk (5%-20%) of falling below the limit reference point imply 50% lower CPUE levels than those in 2010, and are hence likely inconsistent with fishery objectives. In turn, the use of MSY as a long-term target for south Pacific albacore is incompatible with a low risk of falling below the agreed limit reference point. When the stock is at MSY the risk of falling below the LRP is 34% (a 1 in 3 chance). MSY as a target is therefore too close to the LRP. These results suggest that economics, rather than biology, will provide the basis for defining a TRP for albacore. Reductions in effort required to maintain CPUE at 2010 levels are insufficient to generate profits on average within the fishery at current price levels, unless costs were at the lowest level examined in the bio-economic analysis. Economic target levels were identified from an updated bio-economic analysis. Those economic targets, particularly where an on-average profit is desired, require greater reductions in fishing effort than those required to maintain CPUE. Maximum Economic Yield (MEY) estimates require considerable reductions in effort to be achieved, down to 25% of 2010 levels, influenced by recent low prices for south Pacific albacore. A more ‘realistic’ target of 10% revenue margin over economic cost still requires notable reductions from 2010 fishing effort levels, by between 6% and 53% dependent on fishing costs. At these economic target levels there was zero risk of falling below the limit reference point. SC11 was invited to:

- Consider the relative consequences of candidate target reference points for the south Pacific albacore stock and – on average – the fleets exploiting it;
- Note that if economic objectives are to be achieved within the southern longline fishery, an appropriate Target Reference Point for south Pacific albacore lies within the range 0.65-0.80 $SB_{F=0}$;

- Note that CPUE is expected to decline by 72% relative to 2010 levels if MSY is chosen as a Target Reference Point;
- Consider the implications of these analyses when providing advice to WCPFC12.

Discussion

434. Japan noted the second recommendation in the working paper (“Note that if economic objectives are to be achieved within the southern longline fishery, an appropriate Target Reference Point for south Pacific albacore lies within the range 0.65-0.80 $SB_{F=0}$ ”) and observed that this assessment assumes the cost element of the vessels is equal. This CCM noted, however, that there are different costs: country by country, by fleet size, and also probably relating to availability of the stock. Japan expressed discomfort with SC choosing a specific range because it varies so much from an economic perspective. In response, G. Pilling explained that the same cost for all vessels/fleets is assumed (at three levels) but noted that it would be good to get more economic information to assess the impact of Japan’s observation - SPC has this information for some fleets but not all.

435. The Theme convenor clarified that the ranges are based on the old assessment and SC would not be making a recommendation at this time on a range for the Commission to adopt.

436. USA shared Japan’s concerns about the generalised costs and assumptions, and commented that it would be useful to see the range of economic information for different fleets to see what the bounds were. USA also suggested looking at higher levels of risk in the analysis.

437. In response, G. Pilling noted that SPC had looked at a reasonable range and could expand on that if the extreme values of cost per hook were known. He observed that there is potential for an indicator fleet to be used in this fishery, perhaps one of the less profitable ones if it was considered important, on the rationale that if one of the ‘lower-performing’ fleets is performing well and is making money, better performing fleets could make more money. On the issue of risk, he noted that it would be useful if the Commission provided guidance on the level of risk.

438. Chinese Taipei supported Japan’s suggestion and reiterated the point that this study does not analyse the true economic value of the fishery, urging analysis of true economic value including domestic consumption and employment. More analysis is needed, as the range suggested here is quite dangerous for managers.

Recommendations

439. SC11 reviewed information related to the identification of an appropriate TRP for south Pacific albacore tuna, noting in particular a decline in the economic performance of this fishery (WCPFC-SC11-2015/MI-WP-03) and the consequences for the stock and the fishery of a range of candidate target reference points (WCPFC-SC11-2015/MI-WP-04). SC11 noted these analyses and recommended that the latter be updated based on the 2015 stock assessment of south Pacific albacore tuna and presented to both MOW4 and WCPFC12 for consideration of TRPs.

5.3 Implementation of CMM 2014-01

5.3.1 Evaluation of impacts of the purse-seine fishery

440. J. Hampton presented material from SC11-GN-WP-01 and SC11-WCPFC11-03 relevant to the evaluation of the tropical tuna CMM. Tropical purse seine effort, as indicated by raised logsheet data, increased steadily to 2011 and has been stable thereafter. However recent effort data are known to be

under-reported because of increased attribution of fishing/searching days to “transit” on logsheets. VMS data on the other hand, indicate that fishing effort peaked in 2013, reduced slightly in 2014, and has declined significantly in the first half of 2015. The number of associated sets (which are responsible for most of the purse seine catch of bigeye tuna) increased to about 2009, but has since stabilised due to the introduction of seasonal FAD closures. On the other hand, the number of unassociated sets (which catch relatively little bigeye tuna) has risen strongly over this period. The FAD closures continue to indicate strong reductions in bigeye catch, and more moderate reductions in the catches of skipjack and yellowfin during the closure periods. Longline effort in the core area of the fishery appears to have reduced in 2014 and CPUE rose sharply. This seems to have occurred across all major longline fleets and could be associated with the current El Nino event. Multi-model projections were undertaken to evaluate the possible impact of the tropical tuna CMM on bigeye tuna stock status. The results suggest that, if implemented as intended, the CMM would reduce the risk of spawning biomass falling below the limit reference point from 32% in the absence of the CMM to about 4% for a fully implemented CMM. It was cautioned however that many assumptions need to be made in estimating total catch and effort under the CMM, and if these assumptions are not met then these results might not be achieved.

Discussion

441. Japan asked if it was possible for SPC to prepare this analysis for the Commission based on the most recent year, 2014. Japan concerned that the number of associated sets are not very different from 2004 but the catch of bigeye tuna per set jumps up in 2011 and stays at that level. Noting FADs activity level in 2014 still exceeded that of 2010, the level which SC8 recommended, . Japan suggested reproducing the second half of paragraph 586 from the SC10 report, which reads: “Also noting that previous CMMs have failed to reduce the fishing mortality of bigeye tuna to the level intended, SC10 reaffirms the recommendations made at previous SC meetings (para 351 of the SC8 Summary Report and para 409 from the SC9 Summary Report) supporting the need for additional or alternative targeted measures to reduce fishing mortality on bigeye tuna, as seen as appropriate by the Commission.”

442. J. Hampton responded that over recent history a number of new vessels have entered the fleet which are larger and more effective, as well as the adoption of new technologies for FAD fishing in particular including acoustically equipped FADs, which have made purse-seine FAD fishing more effective. The other thing evident is the distribution of the purse seine fleet – there is a much higher purse-seine CPUE in the central Pacific so if there is a movement of effort to the eastern part of the region, which we might expect under El Nino conditions, we would see a greater impact on bigeye tuna. He commented that SC should consider what has changed and where the current measure stands – there is not a 5 month closure in 2016 so the evaluation done last year may be slightly optimistic. The evaluation last year did not try to quantify the potential impact of the high seas FAD closure, but the fact that we didn’t take that into account would be approximately equivalent to the 5th month FAD closure. SPC noted that if the SC and the Commission want this repeated, SPC can examine it but a large change is not expected.

443. China mentioned technologies including helicopters, were increasing effective skipjack tuna fishing effort, and commented that priority should be given to reduction of the fishing capacity for the purse-seine fishery. This CCM reminded the Committee that the objective of the Commission is to take a precautionary approach to maintain stocks.

444. Chinese Taipei stated its own case - due to the reduction in catch quota, an unfavourable low price of bigeye tuna and the depreciation of the Japanese Yen, last year some companies ceased operation and transferred their quotas to other vessels, which reduced the fishing effort in 2014. Catch rates in 2014 were good in the WCPO due to El Nino conditions.

445. Korea asked about the relationship between purse-seine sets and the bigeye tuna catch, noting that for Korea the bigeye tuna catch by purse-seine and longline vessels was the lowest in 5 years.

446. EU inquired about the origin of the purse seine effort data used for the analysis, and whether comparison of logsheet and observer data is undertaken. J. Hampton responded that it was primarily logsheet data, but noted that SPC makes regular checks of logsheet data against observer data and generally find them to be comparable.

Recommendations

447. SC11 reviewed information related to tropical tunas (WCPFC-SC11-2015/GN-WP-01). Noting the longline bigeye catch and the total number of FAD sets in 2014 was still higher than in 2010 (taken as a reference year for the current CMM), and the number of FAD sets was 5% above the mean total number for the 2005-2014 period, SC11 recommends the need for additional or alternative targeted measures to reduce the fishing mortality on bigeye tuna, as seen as appropriate by the Commission.

448. SC11 also reviewed evaluation of CMM-2013-01 (WCPFC-SC11-WCPFC11-03). Noting revised tropical tuna measure adopted at WCPFC 11 (CMM-2014-01) is slightly different from the assumption used in the analysis, SC11 requests the Science Service Provider consider the implementation of updated projections, including evaluation of the potential impact of CMM 2014-01, for the consideration of tropical tuna measures at WCPFC12.

Skipjack tuna purse-seine associated and unassociated set effort

449. J. Hampton presented SC11-MI-WP-05, which investigated the effects of different proportions of purse seine associated and unassociated set effort on the catch and stock status of skipjack tuna. The work concluded that purse seine skipjack catch is relatively insensitive to the mix of set types in the total purse seine effort, while higher proportions of unassociated set effort give modest benefits to stock status. It was noted that it was assumed in the modelling approach that CPUE would be proportional to abundance regardless of the mix of effort types.

Discussion

450. FFA members queried the results which indicated that skipjack tuna stock status and catches are relatively insensitive to whether tropical purse seine effort is primarily comprised of associated sets or unassociated sets. These results indicate that overall purse-seine CPUE would be roughly the same if the effort is primarily comprised of associated sets or unassociated sets. These CCMs observed that this seemed unlikely and is probably related to the assumption in the model that CPUE is proportional to abundance. They requested advice from SPC about how these results differ from what was expected and also on what additional research could be undertaken to look at alternatives for purse seine CPUE and skipjack abundance.

451. J. Hampton responded that some assumptions (constant catchability over time of purse seine effort on FADs and free-schools) have to be made when projected effort is perturbed. If those assumptions are incorrect, then this could affect the conclusions of the analysis.. Because there is currently not a good basis for assuming how catchability for the two modes of purse seine fishing might change in the future, we adopted the most simple assumption and assumed, as is done generally for stock projection analyses, that catchability remains constant at the most recent estimated level. He noted further that while purse-seine CPUE for unassociated sets is currently substantially lower than CPUE on FAD sets, fish size is smaller in FAD sets compared to unassociated sets..

452. Japan noted the results showed positive impact, at least no negative impact, occurred to skipjack tuna stocks for purse-seine effort compositions favouring unassociated sets. Japan suggested that SPC might consider following specific vessels' behaviour to help model differences in the catch between associated to non-associated sets for future discussion.

453. FFA members noted that the working paper did not consider issues of effort creep, and observed that as FAD technology improves FAD CPUE has grown. If this trend continues, the same level of FAD effort would catch significantly more skipjack tuna than in the 2010-12 reference period, resulting in an even greater difference in the resulting stock status for scenarios with high FAD effort compared to those with high free-school effort. As well as the change in stock status, there would probably be economic implications resulting from increased supply of raw material to processors. These CCMs would like to see further work to take effort creep into account.

454. SPC indicated that it plans to address effort creep in future analysis.

455. PNA members requested that additional work be undertaken using the scenario approach proposed in SC11-MI-IP-02 to explore the effects of alternative relationships between purse seine CPUE and stock abundance.

Recommendations

456. Noting the request in paragraph 584 of the SC10 report, SC11 reviewed working paper WCPFC-SC11-2015/MI-WP-05 which analysed the relative impact of associated and unassociated set types on skipjack tuna stock status. Results indicated that skipjack stock status is relatively insensitive to the proportions of associated or unassociated sets of purse seine effort, with slight benefits to stock status with a higher proportion of unassociated sets. In addition, SC11 noted that the analyses had assumed a linear relationship between CPUE and stock abundance (potentially unrealistic in purse seine fisheries) and had not taken account of effort creep in purse-seine effort, for both associated and unassociated sets. SC11 also noted that a decrease in days searching and an increase of days in transit in logbooks might partially explain the increased CPUE observed. SC11 recommends that WCPFC12 take note of this paper and that further analyses be undertaken taking into account the issues identified above.

Productivity changes within the tropical WCPO purse-seine fishery

457. G. Pilling (SPC) presented SC11-MI-WP-06. The Western Central Pacific Ocean (WCPO) is one of the most productive tuna fisheries in the world and catches by weight of tuna are dominated by the purse seine fleet. The tropical WCPO purse seine fishery is primarily managed through effort limitations (limits on the number of fishing days per year). However, constant innovation leading to more efficient ways to find, catch and process fish, can result in an increase in productivity e.g. the amount of catch per fishing day. Increasing fleet productivity is a key feature of concern in effort/input controlled fisheries, as it can have detrimental effects to health of the stock if not properly accounted for. This paper reflects our first examination of potential evidence for historical productivity increases within the WCPO tropical purse seine fishery. Results show that purse seine catchability (as estimated within the MULTIFAN-CL assessment of the WCPO skipjack stock) has increased by 3.0-5.0% per annum, which if solely attributed to increase in purse seine productivity suggests that a day fishing in 2011 is 19-34% more effective than a day fishing in 2005. Increases in the number of sets made per day were also found, likely reflecting fewer days where no set was made. Over the period 2005-2011, the rate of free school setting increased by 1.6% per annum, while FAD sets increased by 0.7% per annum. Set rates have been near constant in the most recent period (2011-2013), with only small increases in free school sets. More efficient purse seine

vessels tended to be younger, and this was linked to vessel size (being larger, even within a 50-80m size category) and greater engine power.

458. The analyses above have identified potential evidence for productivity increases within the tropical purse seine fleet. Further work is suggested to help improve our knowledge of productivity change within WCPO fisheries. SC was invited to:

- Note the importance and implications of this research and consider its prioritisation within the SC work plan;
- Note that there is evidence from several sources that purse seine vessels have increased their efficiency relative to the effort metrics being used to manage the tropical purse seine fishery. This needs to be taken into account when developing management measures and maintaining stocks relative to TRP biomass levels.

Discussion

459. In response to a question about FAD technologies being used in the fishery, Dr Pilling commented that SPC does not currently have this information, but that this information would be valuable and some information may be gathered from trials of FAD tracking in the WCPO.

460. In response to a query from Chinese Taipei about how the increase in the reported days spent in transit by purse-seine vessels in recent years affected the calculation of CPUE, G. Pilling responded that it does affect it; as transit days are not included within the calculation of fishing days, and so the resulting CPUE estimates would be biased upwards. Some of the increasing trend in CPUE over time will result from this shift in reporting and lead to biased estimates of purse seine productivity change.

461. USA noted that the observer and logbook data has correlated quite well, and queried whether SPC has examined whether observer reports reflect what is in the logbooks.

462. G. Pilling responded that SPC is currently looking into this.

463. Chinese Taipei commented that in the literature there are papers estimating fishing days from VMS data and that SPC should use the VMS data to overcome mis-reporting of search days in the logbook data.

464. China noted that as an important tuna fishing nation in the WCPFC Convention area, it will continue to strengthen its capacity building to meet the conservation and management requirements for highly migratory stocks, especially for minimizing data gaps. China hopes for capacity building assistance.

465. SFP inquired about whether there were any management changes that coincided with this change in reporting.

466. G. Pilling commented that it was difficult to ascertain what drove the shift in logsheet effort reporting. The key tropical purse seine management regime does not currently rely on logsheet information for day-to-day management of the fishery against effort limits, and hence changes in logsheet effort reporting would not influence this.

Recommendations

467. SC11 reviewed information related to changes in catchability within the tropical WCPO purse seine fishery (WCPFC-SC11-2015/MI-WP-06) and noted that results based on several sources indicate significant increases in catchability over the past 20 years (e.g. a 3-5% average annual increase (2005-2011) in purse-seine vessel efficiency based on the 2014 skipjack stock assessment). SC11 noted these analyses, and recognized the need for further analyses and additional information to help identify the causes of these increases, and recommends that WCPFC12 takes note of this paper.

Purse-seine catches of bigeye tuna

468. S. Harley presented working paper SC11-MI-WP-07, 'Examination of purse seine catches of bigeye tuna.' Examination of the spatial distribution of bigeye tuna catches indicated strong contrast in the nature of interactions within the WCPO: the western part of the WCPO can be characterized by high effort and high catches, with a small amount of bigeye tuna in most sets and bigeye tuna catches being relatively unimportant in the overall context of this part of the fishery; while for the central Pacific Ocean (CPO) there is a relatively low amount of effort, but high bigeye tuna CPUE, and bigeye tuna represents a significant and likely economically important component of the catch. In many respects the central Pacific is far more similar to the Eastern Pacific Ocean (EPO). In the CPO, bigeye tuna are generally taken in more than 80% of FAD sets and in some areas it is higher than 90%. This frequency of occurrence declines as you move to the west, but even there the rate of occurrence is 30-40% of FAD sets. Areas where FAD sets are dominated by bigeye tuna, i.e., where at least 50% of the total tuna catch is comprised of bigeye tuna, are represented by localized regions towards the east of the WCPO, where 20-30% of FAD sets can be dominated by bigeye tuna. In the main (western) part of the fishery closer to 5% of FAD sets are dominated by bigeye tuna. Considering the period 2010-13, 9-14 vessels were responsible for 25% of the bigeye tuna purse seine catch and 34-43 vessels were responsible for 50% of the catch. We examined what differences might exist between those 'top' vessels with high bigeye tuna catches versus the rest of the fleet. There was no strong difference in the regions of the WCPO fished, but perhaps more effort by the top vessels occurs to the east of High Seas Pocket 2 (HSP2) than for the rest of the fleet. Nevertheless the top vessels fished throughout the extent of the fishery, i.e., there is effort for top vessels in all the areas fished by the rest of the fleet. For the top vessels, bigeye tuna comprised 12% of their total tuna catch (i.e., all set types) versus 4% for the rest of the fleet. Top vessels also had a much higher reliance on FADs (60% versus 43%), more of their FAD sets contain bigeye tuna (62% versus 42%), and more of their FAD sets are dominated by bigeye tuna (9% versus 3%). Further this same percentage (9% versus 3%) also applied to the percentage of annual catch that came from bigeye tuna dominated sets. We found that 22-28% of total purse seine-caught bigeye tuna were taken in sets dominated by bigeye tuna. While this is lower than the 43% of total purse seine bigeye tuna catch from dominated sets found previously for the EPO, it still provides some scope for benefits to bigeye tuna from pre-set identification of such schools and then incentives for fishers to not set on such aggregations.

Discussion

469. Japan commented that tropical purse-seine fishing in the Pacific Ocean is affected by oceanographic conditions, for example around 1997, Japanese purse-seine fishing grounds shifted eastward because of a strong El Nino event. Therefore Japan asked for this to be taken into account when considering area closure measure noting that fixed area closures could limit fishing opportunities more than is necessary. Japan requested SPC to present the results to the TCC and Commission.

470. USA commented that the working paper's methodology mentioned that sometimes observer data was not available to correspond with logbook data.

471. S. Harley responded that where that was the case, these sets were removed from the analysis. To overcome this some sort of substitution approach must be taken, deciding what species composition to apply when you do not have observer samples. This is identified in the paper under future work.

472. FFA members noted that the working paper highlights that improvements are required for CMM 2014-01 to meet its objectives. These CCMs requested that SPC analyse options for purse-seine closures in areas that would reduce substantial amounts of bigeye catch without necessarily impacting on the overall purse seine catch. FFA members noted the spatial contrasts in the impact of the purse-seine fishery on bigeye, which may help to inform the design of potential management options.

473. Chinese Taipei and SPC agreed to discuss aspects of Table 3 in the margins of SC11.

Recommendations

474. SC11 reviewed information related to understanding bigeye tuna interactions in the purse seine fishery through characterisation of catches in space and between sets with the aim of identifying management options that reduce impacts on bigeye with minimal losses to the purse seine fishery (WCPFC-SC11-2015/MI-WP-07). SC11 noted that while bigeye tuna catches are common in both the central and western Pacific, around one-third of the purse-seine catch of bigeye is taken by a small component (~10%) of the fleet. SC11 recommends that further research on the various issues identified by the paper be undertaken, for example time of the purse seine sets relative to nautical dawn and the effects on species composition, and that WCPFC12 takes note of this paper.

5.3.2 WCPFC FAD Management Options Intersessional Working Group

475. B. Kumasi (PNG) briefly updated SC11 on progress made so far by the WCPFC FAD Management Options Intersessional Working Group, a mostly virtual group which was formed at the Commission meeting in Apia last year. Kumasi noted that the group has set up a portal on the WCPFC website to collect and display relevant information to determine the best way forward. There are 19 papers on that site so far. The first stage has been spent consolidating – working with the Secretariat and compiling information. They are looking at developing a work plan for consideration at TCC13. A Circular will be sent out from the Secretariat shortly.

Discussion

476. EU expressed interested in the work this group will do and commented that having a meeting of this working group back to back with SC meeting would have been an opportunity to push forward its agenda. EU enquired about the documents being collected.

477. Kumasi responded that the 19 documents spread across the issues in the TOR. It was planned that the website would be open to allow for inclusivity for CCMs to provide comments including how they see the working group progressing. Kumasi cited the need to consolidate the work plan in order to progress.

5.3.3 Yellowfin tuna catch limit

478. The Convener noted according to Paragraphs 28 and 43 of CMM 2014-01, SC11 should provide recommendations for the Commission's formulation and adoption in December 2015, for yellowfin tuna catch limits. In this regard, SC11 may consider relevant issues including setting catch limits, identifying species composition, real-time catch reporting, etc., and provide comments/recommendations on how to further develop catch limit options to the Commission.

479. K. Satoh (Japan) presented working paper SC11-MI-WP-09. Following Conservation and Management Measure 2013-01, J. Hampton and G. Pilling (2014) addressed deterministic projection for yellowfin tuna stock that calculated relative impact of different effort ratio of purse seine types (FAD sets or unassociated sets). However, this study did not suppose effort regulation (reduction) for purse seine fishery. In order to gain a deeper understanding of yellowfin tuna management, we attempted deterministic projection for yellowfin tuna stock to assume effort regulation for each purse seine types, effort reallocation (FAD sets to unassociated sets) and spawner-recruitment relationship. A future projection result suggested 1) to decrease effort of associate sets is the most effective for increasing yellowfin tuna stock, however purse-seine catch was decreased largely, 2) when effort of associate sets was redistribute for unassociated sets, catch reduction was minimized and stock status is as same as management of unassociated sets. In conclusion, most effective regulation for yellowfin tuna is effort reallocation for unassociated sets.

Discussion

480. Japan referred to SC11-MI-WP-05, which was similar analysis but related to skipjack tuna, not yellowfin, on relative impacts of converting from FAD sets to non-FAD sets. This CCM noted that the analysis conducted here came to the same conclusion.

481. FFA members noted SC11-MI-WP-05 from SC10 and SC11-MI-WP-09 from SC11 and suggested that, for the purse-seine fishery, the current approach of limiting overall effort and managing FAD use are likely to be sufficient to manage the fishery's impact on yellowfin tuna. While the reduction in FAD sets has some positive biological outcomes for yellowfin tuna, it also has economic benefits by increasing the value of the purse-seine catch (large YFT form free-schools as opposed to small skipjack from FADs). It is concerning that there were increased catches of yellowfin tuna by a number of longline fleets in 2014 (SC11-GN-WP-01) resulting in a record catch of yellowfin and demonstrating that CCMs' commitments to take measures not to increase yellowfin catches by their longline vessels is not being complied with. These CCMs reiterated previous concerns with the significant growth in the fisheries in Philippine and Indonesian waters, due to the higher proportion of smaller yellowfin caught in their fisheries. They strongly recommended that these CCMs implement the catch and effort limits in CMM 2014-01. FFA members also recommended that the Commission adopt catch limits in the longline fishery to 2012 levels, which will need to be applied in a manner that is consistent with efforts to develop zone based limits.

482. China strongly supported the reduction of FADs to improve conservation of yellowfin tuna. China suggests limitation of the purse-seine fishery not just a shift from FADs to unassociated sets.

483. EU noted an inconsistency between the conclusions in this study and that of SC10-MI-WP-05 in terms of impact on the unexploited spawning biomass, but noted the consistency between this paper and SC11-MI-WP-05 as both indicate that the impacts of changes in the proportion of associated and unassociated sets on the status of skipjack and yellowfin are relatively insensitive.

484. SPC commented that the paper from 2014 showed impact in terms of unexploited spawning stock biomass ranged between 0.43 and 0.39 while the current paper indicated that the range was between 0.29 and 0.32. However, despite the difference in absolute values, the impact on the range of values (0.04) and (0.03) was similar for the two studies. SPC considered the results to be relatively insensitive and, based on this new paper, SPC is of the same view.

485. The theme convenor observed the results indicated a slight positive impact on the stock status of skipjack and yellowfin. He also noted that the results from the study presented this year are consistent

with results from last year with both indicating impacts being relatively insensitive to a switch from FAD to free school fishing.

486. Nauru recalled discussions on a similar paper (on skipjack) and noted the results of this analysis may depend on the assumption of a linear relationship between CPUE and stock abundance which is potentially unrealistic in purse-seine fisheries. PNA members proposed noting this paper and suggested further work exploring the effect of alternative relationships between CPUE and abundance.

487. Japan made the point that deciding what is substantial and what is not is difficult in this context. The theme convenor has indicated that the difference in impact is slight – that the more fishing you have on associated sets the bigger impact you will have. Japan said that the trend shown in the results of this study was clear and proposed that SC11 should note there are some positive biological impacts and at least there are no negative impacts.

488. EU asked that any recommendation should make a clear reference to these studies.

489. PNG observed that SC can note the paper, recognising more work needs to be done in teasing out the relationship between CPUE and abundance for the purse seine CPUE series used, taking into account the difference in catch composition along longitudinal bands for different species. PNG supported PNA's earlier statement.

490. Indonesia sought clarification about whether the catch reduction and the SB ratio in MI-WP-09 has been statistically tested, before coming to the conclusion that the operational shift from associated sets to unassociated sets is effective for managing the purse seine fishery.

491. Satoh noted that there is no information indicating any statistical difference at this time but stochastic information would make possible such a test in future.

Recommendations

492. SC11 reviewed working paper WCPFC-SC11-2015/MI-WP-09 which analysed the relative impact of associated and unassociated set types on yellowfin tuna stock status. SC11 advises WCPFC12 that based on the results of the analyses described in this paper yellowfin tuna stock status in the WCPO is relatively insensitive to whether purse seine effort is comprised of mainly associated sets or unassociated sets and these results are consistent with working paper WCPFC-SC10-2014/MI-WP-05. SC11 also noted that a slightly better stock status (higher spawning biomass) for yellowfin tuna and slightly lower average catch of yellowfin tuna occurred when purse seine effort compositions favoured unassociated sets. SC11 recommends that WCPFC12 take note of these conclusions and that further analyses be undertaken taking into account alternative relationships between CPUE and abundance.

5.3.4 Other issues related to CMM 2014-01

493. G. Pilling (SPC) presented working paper SC11-MI-WP-10. Given recent WCPFC member concerns on WCPO fishery capacity, this paper provides an example process to identify capacity levels. It estimates purse seine fleet sizes compatible with current effort management limits and with candidate skipjack target reference point levels. Fleet sizes are expressed in terms of 'full time equivalent' vessels (FTEs; a vessel assumed to fish for 250 days per year). This provides a common currency for the evaluation. The impact of those fleets that operate for part of the year outside the WCPO (and hence do not reflect an FTE) is assessed. Finally, noting that purse seine fleet productivity is suspected to have increased over time, we examine the potential implications of this phenomenon on future fleet capacity.

FTE purse seine fleet sizes compatible with limits allowed under CMM2014-01 were 281-289 vessels (either all FTE vessels or taking into account part-time WCPO vessels). FTE fleet sizes compatible with candidate TRP effort levels were generally lower, with 50% or 60%SBF=0 TRPs equating to 142-220 vessels. It is noted that alternative assumptions of purse seine fleet dynamics relative to skipjack abundance would affect TRP-compatible fleet sizes. In turn, if the ‘worst’ performing (less profitable) vessels were removed from the fishery first to achieve fleet size reductions, catch levels would remain higher than expected, and reductions in vessel numbers would need to be greater than evaluated here. To compare estimated limits with current levels of effort, preliminary 2014 tropical purse seine effort estimates were equivalent to 229 FTE purse seine vessels (ignoring EPO ‘part-time’ vessels). This represents 19% less vessels than estimated compatible with CMM limits, but 8-61% more vessels than estimated as compatible with TRPs of 50% or 60%SBF=0. It implies current purse seine effort levels (and fleet sizes) are likely in excess of those required to achieve these two TRP levels. To maintain effective effort at CMM limits where purse seine productivity increased (3% per annum for 5 years), the number of FTEs was reduced to 258 vessels. The number of FTEs compatible with candidate TRPs was reduced to a range from 122 FTE vessels (60% SBF=0) through to 274 vessels (40% SBF=0). SC was invited to:

- consider the importance of this field of research and its prioritisation within the SC work plan;
- propose further work to identify patterns of participation by vessels within the fishery;
- consider expansion of the approach to longline and other fisheries;
- suggest specific analyses that assist the Commission's consideration of fleet capacity; and
- consider the implications of these analyses when providing advice to WCPFC12.

Discussion

494. A lengthy discussion took place about the calculation of the figures in Table 3 with SPC undertaking to confirm the calculations of the FTE figures. G. Pilling clarified that the FTE figure should be number of days divided by 250; the calculation with effort creep is basically 250 days per FTE vessel times 1.03⁵, deriving 3% annual effort creep compounded over five years. SPC later confirmed that the figures were correct; there was a difference in the CMM column as the Philippines vessels fishing in HSP 1 were treated differently and as such those calculations are not based on just a simple division by 250 days.

495. PNA members considered this an important contribution to the development of a purse seine capacity management scheme for the WCPFC. PNA members supported the proposal in the paper for further work to identify patterns of participation by vessels within the fishery, noting the need for further analysis of the annual fishing days for different fleets, and of participation by part-time vessels.

496. Several CCMs also noted this work’s importance. EU expressed its support for the recommendations in SC11-MI-WP-10, and would like to see more work done for all fisheries, including longline and enquired about the method of coming up with the 3% figure for effort creep.

497. G. Pilling clarified that this came from one of the values in SC11-MI-WP-06, the catchability estimates derived from MULTIFAN-CL. 3% was chosen as a middle value.

498. Solomon Islands explained that the work is based on the Commission definition of capacity. The analysis was about capacity measurement and relating fleet sizes to the allowable effort and sustainable catch levels, and not about fleet size limits. In PNA waters, purse seine capacity would continue to be managed by effort limits and the price of vessel days. If analysis like this shows there are too many

vessels for the allowable effort limits, that would indicate that the price of vessel days is too low and needs to increase.

499. Korea enquired about the identification of effort creep in the reporting.

500. G. Pilling explained that in SC11-MI-WP-06 different indicators for effort creep were examined. The definition of effort creep is basically the increased efficiency/impact of a day of fishing on the stock. It is calculated using a number of different approaches. SPC does not think it has yet found the right measure of effort creep, but saw this study as a good first step. Dr Pilling noted the increase in the proportion of days spent in transit and explained that SPC is looking at the pattern of transit reporting. SPC observed that there is now more transiting being reported in days just before a set is made and stated that the different behaviours in the logsheets are being examined.

501. China stated that the purse-seine fishery should be limited, including part time fishing and fishing days.

502. Nauru requested on behalf of PNA Members that some baseline data be included in the paper in future showing the recent pattern of vessels fishing in the tropical purse seine fishery, preferably broken down by vessel size or engine power, separately for the Pacific Island and other fleets.

503. G. Pilling confirmed that SPC can look into whether the current available data allow this sort of breakdown to be performed, and would include the resulting baseline data if so. There were issues with some of the characteristics of vessels held within the various databases, and this investigation might help clearly identify those issues and draw out more information.

504. Chinese Taipei observed that the study uses 250 days observed in one year as the mean number of days fished by a purse-seine vessel but according to its own industry, vessels have 3-5 year fishing cycles, and suggested calculating the average over 3 or 5 years.

505. EU supported the idea of factoring in vessel power in the analysis, and enquired whether the analysis included the factors that are driving the effort creep, as this might identify ways for mitigating these factors.

506. G. Pilling explained that SPC was looking at vessel characteristics over time and the factors which might increase a vessel's effective effort over time. This will help to refine the types of information to be used for management controls beyond a simple vessel day.

507. EU noted the paper and enquired about economic or management incentives for fisher behaviour. G. Pilling responded that yes, fisher decisions (e.g. entry/exit models) was an important area to include where data allowed, and work was planned within this research area.

508. The USA noted that in a previous presentation SC11-MI-WP-06 there was a bias evident in CPUE due to searching days being recorded as transit days, which biases the CPUE upwards. How is that bias distinguished from effort creep?

509. G. Pilling made the observation that this pattern of reporting is a form of effort creep in itself. Once SPC has conducted a planned study looking at the details of this reporting, it will be possible to remove any trend from the data.

510. The theme convenor noted that SC supports this work and seeks guidance on how that can be further developed.

Recommendations

511. SC11 reviewed analyses undertaken to estimate potential tropical purse seine fleet sizes given existing effort limits and candidate target stock levels (WCPFC-SC11-2015/MI-WP-10). SC11 noted that these analyses are an important contribution to the development of a purse seine capacity management scheme for the WCPFC and supported further work to identify patterns of participation by full-time and part-time vessels within the fishery, the need to relate both participation and effort creep to vessel characteristics, and the expansion of similar analyses to the longline fleets. SC11 recommends that WCPFC12 take note of these preliminary analyses and requests the Commission identify any specific analyses which may assist the Commission's consideration of fleet capacity.

AGENDA ITEM 6 ECOSYSTEM AND BYCATCH MITIGATION THEME

6.1 Ecosystem effects of fishing

512. Ecosystem and Bycatch Mitigation Theme convenor J. Annala reminded the Committee that SC11 has been asked to review five CMMs and provide advice. SC11 was also asked to conduct a brief review of the SEAPODYM model.

6.1.1 Review of research and information

6.1.1.1 SEAPODYM

513. S. Nicol presented SC11-EB-WP-07, 'Project 46: Monitoring the pelagic ecosystem effects of different levels of fishing effort on the WPO warm pool.' Monitoring the pelagic ecosystem effects of fishing includes WCPFC-SC Project 46. The scope of this project is the development and review of models, such as full development of an ECOSIM model, for evaluation of fishery and environmental impacts on ecosystem, including development of reference points. An Ecopath with Ecosim model has been constructed for the warmpool ecosystem of the WCPO. Ecopath describes the static state of trophic flows (predator-prey relationships) within a food web that balance the net production of functional groups (assemblages of species with a similar ecology, or a species or a size class within a species) with all sources of mortality and migration. Ecosim is a dynamic form of Ecopath that allows the forecasting of ecosystem responses to specific perturbations (e.g. changes in water temperature or fishing effort) through time. The ecosystem model constructed for the Pacific warm pool is characterised by five trophic levels (TL), a high number of trophic links between groups, and a diverse pool of prey for predators. In the model, the majority (74%) of the ecosystem's biomass is in TL 1-2 (phytoplankton, zooplankton), whereas 89% of the industrial fish catch (tuna, edible bycatch and other top predators) is in TL 3-5. The model was used to explore nine different scenarios of fishing effort, ranging from measures designed to reduce and/or increase the amount of bycatch, decrease and/or increase the amount of tuna harvested by altering the amount of longline fishing and purse-seine fishing effort on unassociated (i.e. free) schools and on schools associated with fish aggregating devices (FADs), and by simulating the implementation of bycatch mitigation measures. The outcomes of this modelling showed that the structure of the warm pool ecosystem is resistant to considerable perturbation (e.g. large changes in the harvest of the surface fish community). The intrinsic resistance of the ecosystem to perturbation appears to be related to the high diversity of predators in the food web that consume a wide range of prey. The structure of the ecosystem was most sensitive to changes in the biomass of prey groups (e.g. small pelagic fish such as anchovy) because these important mid-trophic level species are both important prey for tuna, and are predators of

organisms in the lower trophic levels. Key indicators of the ecosystem show that: 1) the catch of bycatch species, such as sharks and billfish, in the warm pool has increased; 2) the tuna fishery has expanded in recent decades; and 3) the diversity and biomass of groups in the higher trophic levels (TL3–TL5) have diminished. The simulations showed that the largest impacts of changes in purse-seine and longline fishing effort are likely to be on the groups comprising long-lived, bycatch species with lower productivity (e.g. silky and white-tip sharks, opah, swordfish and blue marlin). These groups are the most sensitive to changes in harvests of fish species due to their longevity, age-at-first maturity, and low rate of reproduction. The model has some utility for developing ecosystem indicators that WCPFC may wish to incorporate into its regular reporting. SC11 was requested to advise on the priority for pursuing this line of investigation.

Discussion

514. China queried some of the assumptions in the model including that around the relationship between predator and prey based on species. China suggested the consideration of a size-spectrum model where the analysis considers the size of the predator. Nicol responded that the model presents as best as possible the true trophic structure. China suggested consideration of size spectrum based modelling and commented that there was no problem using the current analysis to form an overall picture but caution may be required when using it for management.

515. In response to a question from Vietnam about implementing management measures from the model and its timeframe, Nicol explained that the purpose of the model is not to test scenarios WCPFC is facing at the moment but to try and understand how the ecosystem behaves and show how the model will respond to changes in fishing effort. The model currently suggests there is quite a bit of stability with the current species in place. On the issue of the model's timeframe, it was explained that the model is tuned based on the history of the fishery and on CPUE and catch series. The point at which the model reaches equilibrium happened to be 2046.

516. Australia queried whether the model could reveal what the ecosystem was like before the advent of large scale purse-seine or FAD fishing. Nicol indicated that the Ecopath model is balancing with data from the fishery; to balance the model before the fishery existed required information that is not extant but with new information you could probably rebalance the model and test how far the trophic structure changes.

517. SC considered the discussion points in the paper. Nicol queried how much work the Committee wanted SPC to do in developing indicators to assist the MOW process, and whether target species should be prioritised or non-target species prioritised concurrently with target species. China commented that there was utility in developing an ecological indicator if a wider one is selected and it can be verified. It was suggested that SC might want to consider concentrating activity on the development of sound guidelines for how SC will develop and select ecological indicators.

518. Fiji drew SC's attention to SC11-EB-WP-07, whose recommendations included the Commission to start the process of identifying objectives for ecosystem management and identifying indicators to measure progress towards whole-of-ecosystem objectives. The recommendations also point to the need for increased monitoring of catch and bycatch species that include prey species, and adding a spatial component to the Ecopath with Ecosim model. This CCM supports these recommendations as they are specifically geared towards improving the use of ecosystem models to advise management and on behalf of FFA members, requested that these recommendations be reflected in the SC advice and report to WCPFC12.

519. The EU considered this work important and indicated that it is supportive of the implementation of the ecosystem approach to fisheries management, and asked that SC define the resourcing implications and how it sits with other important priorities.

520. The USA considered that SC had a wide spectrum of issues and the possibility that the Committee's objectives and work plan has become too broad, especially with the recent evolution and development of harvest control rules and MSEs. USA noted that ISC and PICES are working on collaboration for ecosystem indicators and the Commission could view the progress of this international work in coming years.

521. FFA members appreciated the papers on ecosystem effects of fishing and environmental conditions, including climate change. They noted that the SEAPODYM application for yellowfin tuna in the Pacific Ocean demonstrates the utility of the tool for understanding ecosystem effects and observed that there were interesting trends in the average spatial distributions of yellowfin biomass with and without fishing. The model casts light upon the impact of environmental variability, spatial fishing impacts relative to the warm-pool, connectivity and climate change impacts which are useful and complementary outcomes to that provided by MULTIFAN-CL, providing better understanding of the influence of fishing and environmental factors on the spatio-temporal dynamics of fish populations and fisheries in the WCPO. FFA members noted with concern, and contrary to other points made, that in recent years the SC has spent little or no time discussing the overall ecosystem effects of fishing and environment; most discussion has concentrated on specific issues like sharks and seabirds. FFA members wondered if this was a reflection of a lack of priority and anticipated the review of the SEAPODYM model which will cover these aspects and suggest possible remedial actions.

522. In response to an EU query about work taking place in other RFMOs and whether there was any formal collaboration with these other organisations on the topic, Nicol noted there was, informally. He reminded SC that this work was not directly funded by WCPFC.

523. FFA members noted that they have benefitted from increased understanding at a fine spatial scale of the combined effects of fishing, other human impacts, oceanography and climate change on tuna populations and fisheries in the WCPO. They supported the further development and application of all ecosystem models such as SEAPODYM and APECOSM-E, ECOSIM and ECOPATH under Project 62 and 46 and endorsed the 6-point current and future work plan of the SEAPODYM work as set out in SC11-EB-IP-01. Samoa noted that it welcomed these ecosystem models' investigation of specific questions including climate variability, range contraction issues, and application to Pacific tropical tuna and billfish populations and fisheries.

524. Korea noted that the SEAPODYM model assumes recruitment will occur within the region when conditions are sufficient to allow recruitment. This CCM suggested that oceanographic conditions on the distribution and production of skipjack tuna stock, linkages oceanographic conditions to fleet and fisher behaviour and climate change should be included in this research project.

525. The Theme convenor noted that the Commission has had and is having a series of MOW meetings and a recommendation from this Committee requesting that the Commission provide guidance to the SC on whether they would like the SC to move forward with the development of ecosystem indicators in the MOW process. There's not a clear opinion within the group about a way forward and it would also be of value to consider work that is currently underway internationally. J. Annala suggested drafting a recommendation along those lines for consideration by the Committee.

526. The WCPFC Secretariat's ABNJ Tuna Project Technical Coordinator Sharks and Bycatch, S. Clarke, noted that under the project there will be a reinvigoration of the Joint Tuna RFMOs Technical

Working Group on Ecosystem-based Fisheries Management. It will be coordinated by ICCAT and likely result in a workshop being held in 2016.

Recommendations

527. SC11 recommends that:

- a) the Commission/WCPFC12 acknowledge the funding received from ISSF for an external review of the SEAPODYM project and further notes the outcomes from that review will assist the Commission in evaluating potential applications and future directions.**
- b) the Commission/WCPFC12 provide guidance to the SC on whether they would like the SC to move forward with the further development of ecosystem indicators for possible incorporation in the MOW process, building on the work of other international fisheries bodies, e.g. ISC and ICAAT.**

6.2 Sharks

6.2.1 Review of potential mitigation measures to reduce fishing-related mortality on silky and oceanic whitetip sharks

528. S. Harley presented SC11-EB-WP-02, 'Monte Carlo simulation modelling of possible measures to reduce impacts of longlining on oceanic whitetip and silky sharks'. The paper develops and applies a model for how oceanic whitetip shark and silky shark might interact with longline gear; using it to quantify potential sources of fishing-related mortality. It integrates available information of gear characteristics, spatial differences in the density of the two species, and the results of previous studies on catchability and survival. With this model we evaluate four simple potential management measures: (1) removal of shallow hooks; (2) removal of shark lines; (3) requirement for circle hooks; and (4) requirement for monofilament leaders. The key conclusions of the analyses are: (1) we need to address the critical gaps in our knowledge of longline gear configurations; (2) Collection of data on hook location (i.e., whether the hook was swallowed, or the shark was hooked in the lip), and how oceanic whitetip shark and silky shark are released (e.g., cut-off on the line in water or brought on-board and hook retrieved) will be critical for better understanding the potential fishing-related mortality and the effectiveness of the current Conservation and Management Measures (CMMs). We recommend that collection of these data by observers be considered; (3) There are few relevant scientific studies of likely rates of release mortality for oceanic whitetip shark and silky shark caught and released under commercial fishing conditions. This should be a priority for field studies, but the design of such studies should consider information under (2) above, particularly how sharks are released. The following results were obtained from application of the model through Monte Carlo simulation testing:

- The initial interaction of silky shark and oceanic whitetip shark with longline gear can be reduced by both the banning of shark lines or the removal of "shallow-hooks", which we defined as the three hooks closest to the start/end of the basket;
- Banning shark lines has the potential to reduce fishing mortality by 14.7% and 23.3% for silky shark and oceanic whitetip shark respectively, and removing shallow hooks has the potential to reduce fishing mortality by 11.7% and 6.7% respectively;
- Banning wire trace -- while unlikely to influence initial interaction -- lead to increased bite-offs which resulted in the greatest reductions in fishing mortality of the measures considered - 17.6% and 23.3% for silky shark and oceanic whitetip shark respectively;

- Prohibiting both shark lines and wire trace is predicted to reduce mortality by 29.4% and 40% for silky shark and oceanic whitetip shark respectively.
- The tendency for greater lip-hooking with circle hooks and therefore fewer bite-offs meant little predicted benefit from requiring circle hooks; and
- Given the high levels of fishing mortality experienced by these two species, it is unlikely that the options under the shark CMM (2014-05) of either banning shark lines or wire traces will result in sufficient reductions in fishing mortality. Strengthening this measure may be necessary.

Discussion

529. Japan noted that there is also bycatch of these sharks from purse-seiners and wondered what the overall impact was; commenting that for silky sharks the purse-seine catch is significant and these sharks are all dead. A further question related to the basis for one of the paper's conclusions that the current shark CMM was likely insufficient.

530. S. Harley noted that given the purse seine impacts the overall reduction in fishing mortality for silky sharks from the longline measures would need to be done in the context of a stock assessment. While the focus of the paper is longline mortality, there is a significant mortality associated with FAD fishing. Secondly, unless shark mitigation measures are operating together the reduction in mortality for silky shark is around 14% at best.

531. In response to a queries from Australia about the abundance surfaces used and the sensitivity of results due to wide distributions and distribution surfaces of the fish, S. Harley noted that for some of the distributions it does not matter if they are wide or not and some aspects are more important than others regarding mortality. He further noted that they had not specifically undertaken an analysis to determine which input uncertainties had the greatest impact on the output uncertainties, but it could be done. He indicated that sensitivity to the abundance surfaces was not examined because they did not have plausible alternatives to test; the more complex surface was considered biased due to non-representative observer data; this is the reason SPC went with the simpler surface.

532. A number of CCMs noted the value of the work, and USA noted the conclusions slide will illustrate to managers that these species are unlikely to recover, given a required fishing reduction of 77% just to get back to F_{MSY} , even more for oceanic whitetip sharks, and queried what future priorities there would be for this work. This discussion would be undertaken under agenda item 6.2.3 – Shark Research Plan.

533. Japan asked for an explanation regarding the mathematical calculations underlying the research and asked about a similar analysis for the purse-seine fisheries. S. Harley hoped to make the R code (the computer code used to run the analysis) available in the public domain so other researchers could use it and, responding to Japan's other query noted that the Committee needed need consider which mitigation measures would be examined for the purse-seine fishery.

534. China queried whether the model predictions had been tested with real data and the assumed survival rates, noting that long term survival rates might be different to the short term survival rates. In response, S. Harley noted that observer data was used to parameterize the model and wherever possible with data from the WCPFC fishery; all available observer data have been used in the model. The model was used to predict the impact of management options not yet in operation, so it was not possible to test the model predictions. On survival rates, one of the critical issues is that there are no specific post-release mortality studies for the species of interest and few shark studies with large sample sizes operating under

commercial conditions. Post-release mortality work is a high priority in the Shark Research Plan. It was noted that how the sharks are treated – whether dragged on board or cut off in the water – is important to survival rates. S. Harley further noted that the status quo scenario is the prediction of the mortality in catch as it is believed to be occurring in the fishery, based on available data.

535. Australia noted that SC had prioritised this work last year and the modelling was a significant step forward in helping the SC to direct research, evaluate mitigation approaches and advise the Commission of the effectiveness of current measures and alternatives. Because the current CMM 2014-05 provides a choice between prohibiting shark lines or wire leaders, CCMs would likely choose the option to prohibit gear they do not actually use. This would mean that the 'status quo' scenario of the model is likely very close to the current circumstances in the fishery - with this CMM having little impact on shark mortality. . Australia queried the poor performance of circle hooks with respect to reducing mortality.

536. S. Harley noted the poor performance of the circle hook option could be explained by the assumption that circle hooks are harder for the shark to bite off and escape. They are dying because they are staying on the line, unable to bite off, then they are discarded. When those fleets using circle hooks were examined there was an increase in mortality. He suggested that the best way to reduce fishery interactions was likely to not to catch them in the first place.

537. EU queried whether the work was focused on the area between 20°N and 20°S because of abundance and strongly recommended that attention in the budget is paid to removing some of the uncertainty around some of the key parameters. EU brought the Committee's attention to SC11-EB-IP-11 and noted recent work funded by EU with the aim to reducing mortality on silky sharks in purse-seine fisheries.

538. S. Harley confirmed that 20°N-20°S is where most of these two shark species are found but confirmed they can be caught outside that area; where gear configurations become quite different and this would have added complexity to the analysis with little change in conclusions. He added that the paper discusses work around observer information refining the way information is collect on these species and noted that some of the data collection procedures for sea turtles might be applicable to this.

539. WWF noted that WCPFC has an obligation to reduce mortality of oceanic sharks and this study is a valuable tool. It would be more effective if the data were not so deficient and discussions in SC should continue around obtaining more observer data, E-monitoring, and operational data submission.

540. FFA members noted the simulation work supports the approach that these CCMs have been pursuing over the past 4 years to amend CMM 2010-07. FFA members observed that the simulation highlights the importance of banning both wire trace and shark lines, rather than having the option of using either one method under the current CMM 2014-05. They suggested SC might consider using the simulation method to test other mitigation options if the data are available but noted critical knowledge gaps regarding longline gear configurations for most of the distant water longline fleets due to the paucity or absence of observer data; this would hamper future analysis. FFA members noted that a lot of assumptions went into the simulation testing and getting better information on things like post-release mortality will improve the ability of the model to accurately predict mortality rates.

541. In response to a question from Japan about the data period used (2008-2013) and whether the analysis had taken into account impact of unilateral measures of prohibition of shark catch introduced by several Pacific Island countries into their waters, S. Harley explained that the observer data was so sparse that SPC had to aggregate data over that period. They looked at a time series effect and considered a fleet effect and acknowledged that it was possible that some fleets may have changed their gear configuration in response to changed management in some EEZs but there was insufficient data to examine that.

542. S. Clarke (WCPFC ABNJ-TCSB) highlighted that the working paper's recommendations included getting more information from observers, including where on the body the shark was hooked and whether it was brought on board, issues which are picked up in SC11-EB-IP-05 and which will be discussed in ISG-5. She queried whether there was another method, noting that if we rely on observer data it will still be a couple of years before there are good data and there will only be a small sample size because there is only a 5% observer coverage requirement.

543. In response to S. Clarke's suggestion that as a supplement CCMs could be surveyed to see what gear their fisheries are using, S. Harley commented that data managers could be approached or CCMs could look at the table in the paper which contains SPC's assumptions of CCMs' gear configurations and if a CCM thinks their numbers are wrong they could convey this to SPC.

Recommendations

544. SC11 recommends that the Commission:

- a) Consider the Monte Carlo analysis of longline shark mitigation methods (e.g. hook type, leader material, non-deployment of shallow hooks, and a prohibition on shark lines) presented in SC11-EB-WP-02, in order to inform WCPFC12's further consideration of revising shark CMMs to incorporate shark mitigation requirements that reduce catch rates and at-vessel mortality.**
- b) Note the Monte Carlo simulations run presented in EB-WP-02, which showed that given the model assumptions, banning wire trace and shark lines would further reduce fishing mortality of oceanic whitetip and silky sharks by longline compared to the current choice between the two mitigation measures.**
- c) Note that the Monte Carlo mitigation model and its inputs can be improved through an increase in available observer data and more studies on post-release survival rates for key shark species.**
- d) Request that the Monte Carlo simulation work be expanded to a) account for flag-state choice between prohibition of shark lines and/or of wire leader with respect to CMM 2014-05, b) additional modeling of combinations of available mitigation options, and c) inclusion of purse seine fisheries to assess the effects on fishing mortality of sharks when effort on FAD sets was re-distributed to unassociated sets.**
- e) Request that CCMs quantify and describe longline gear configuration inputs and provide these to SPC to inform the Monte Carlo simulation work.**

6.2.2 Review of conservation and management measures for sharks

a. CMM 2010-07 (CMM for Sharks)

545. Theme co-convenor A. Batibasaga opened discussion, stating that no papers were submitted for this CMM.

Discussion

546. In response to a question by EU about implementation of paragraph 7 of the CMM and whether countries have provided implementation information to the Secretariat, the WCPFC Compliance Manager explained that for a number of years CCMs have been provided an opportunity to report relevant information through their Annual Reports Part 2. In 2014, the compliance monitoring review (CMR) process included CMM 2010-07 paragraph 7, and findings related to implementation were reviewed by TCC and in the final compliance report (see WCPFC11 Summary Report). The Secretariat closely examined the Annual Report Part 2 reporting by CCMs as part of compiling the information for TCC's review of implementation on paragraph 7 of CMM 2010-07, but she recalled that there was little detail about how CCMs are implementing the 5% fin to carcass weight ratio provision. Compliance with the shark CMM is not being reviewed by TCC in the CMR process this year, so the Secretariat has not looked at the Part 2 reporting related to the fin to carcass ratio as reported by CCMs. A preliminary review suggests there is not much detail which would assist SC with its review in accordance with paragraph 8 of CMM 2010-07.

547. FFA members considered this CMM to have limited effectiveness due to unclear definitions of key components of the CMM and supported the definitions of the form of the fins and carcass being clearly specified. They noted this CMM was originally endorsed to allow industry to retain shark fins while inspectors checked the corresponding number of shark carcasses onboard and is based on a 5% fin to body ratio. However, without clear definitions of the form of the fins (i.e. whether they are frozen or dried), and the form of the body (such as whole weight, dressed or partially dressed carcass), it is difficult to enforce. FFA members advised the meeting that they may again seek substantial amendments to this CMM at WCPFC12, based on the examination and implementation of technical mitigation measures to reduce shark capture and reiterated their widely expressed views that more comprehensive arrangements that reduce mortality for all sharks are preferable to species-specific fixes.

548. EU reminded the Committee that the CMM was adopted in 2010 and it appears that SC is not able to accomplish the task required by the CMM, and the CCM proposed a recommendation to TCC and the Commission indicating that once again SC is not able to complete the task it had been asked to address. Consequently the CMM cannot be assessed and something different for the future is needed to implement the finning ban.

549. Japan stated that it could support the first part of the proposed recommendation from EU, that SC could not review the ratio of fin weight to shark weight, but could not accept the second part, expressing the view that it is not something for SC to decide the enforcement of the CMM..

550. USA commented that the Committee could evaluate the validity of the 5% rule and noted that the New Zealand paper suggests that shark fin weight data suffered from some serious limitations and potential biases and errors, making it difficult to draw strong conclusions. A major issue for fishers is the apparent confusion over whether shark fin sets should include the entire tail or just the lower lobe. For pelagic sharks (blue, porbeagle and mako sharks), this is an important consideration, because Japanese chartered Surface Longline (SLL) vessels typically included the whole tail, whereas the New Zealand domestic SLL vessels typically retained only the lower lobe. USA expressed the view that there are serious considerations in the 5% metric.

551. EU reminded the Committee that the CMM says 'As finer resolution data become available, the specification of the ratio of fin weight to shark weight described in paragraph 7 shall be periodically reviewed by the SC and the SC will recommend any appropriate revisions to the Commission for its consideration. The SC and the TCC are directed to consider if additional appropriate measures that give effect to paragraph 7 are required.' This CCM noted that if, after 5 years, SC has not been able to do the

work, this Committee needs to say something in the context of management advice and the second part of the recommendation reflected this.

552. Australia noted that there are numerous problems with calculating and enforcing shark fin to carcass ratios as highlighted in SC11-EB-IP-03 and other studies that the SC has previously considered. The SC should reiterate these deficiencies in the SC's advice on the effectiveness of CMM 2010-07.

Recommendations

553. SC11 recommends that the Commission:

- e) SC11 was able to review the ratio of fin weight to shark carcass weight from one study (SC11-EB-IP-03). This study demonstrated that shark fin weight data suffered from some serious limitations, potential biases and errors. SC11 was unable to confirm the validity of using a 5% fin to carcass ratio in CMM 2010-07 and forwards these concerns to TCC, noting that an evaluation of the 5% ratio is not currently possible due to insufficient information for all but one of the major fleets implementing these ratios.**
- f) Notes that according to the most recent information provided by SPC, finning still occurs in the Convention Area.**
- g) Notes that information which can be used to evaluate the effectiveness of the WCPFC ban on shark finning (CMM 2010-07) is currently very limited.**
- h) Encourages CCMs to gather and submit information on the implementation of CMM 2010-07, including data on fin to carcass ratios where CCMs apply that approach, to the Secretariat, in their AR-Part 2 reports or other formats, in order to support future evaluation.**

Shark reporting and data gaps assessment

554. S. Clarke presented SC11-EB-WP-08, 'Changes to Shark Reporting and Data Gaps Assessment Processes.' This paper presents three proposals for streamlining and clarifying the shark-related content of SPC's annual paper on "Scientific Data Available to the WCPFC". The SPC paper provides a snapshot of the Commission's data holdings but the format could be improved to better grasp where the most important shark data gaps lie. Once these gaps are clearly understood, studies such as those under the ABNJ Tuna Project, can be developed to address and help remedy them. The proposals presented here would involve six additional annotations to the standard tables prepared each year by SPC, and would allow the tables to more closely reflect the WCPFC's existing data rules. It is also proposed that guidelines be formulated for determining whether shark catch and catch/effort data are under-reported and that the key shark designations of mako and thresher sharks be confirmed on a species-specific basis.

Discussion

555. FFA members recognised the importance of improving shark data and assessments and supported the recommended changes to the data gaps paper. These CCMs supported disaggregation of mako and thresher sharks in the list of key shark species, but advised SC that it will take time to implement these changes through amendments to logsheets and educate industry of these suggested changes – a two year period is needed before these new fields can be assessed under the Compliance Monitoring Scheme.

556. The USA noted that observer data is always used in the shark assessments, and asked about the impetus for the operational data and aggregated data having these extra codes. USA doubted whether it would help the shark assessment analysts.

557. S. Clarke noted that the species complex reporting level has diminished the ability of the scientists to assess those species. Even in observer data a large number of catches are just ‘makos’ or ‘thresher’. With observer coverage so low, logsheet data is important. Some CCMs are already reporting these species complexes to species level. She encouraged CCMs that can to report to species level.

558. SPC commented that the shark assessments rely on observer data and clarified that SPC have not used logsheet estimates for either the silky or oceanic whitetip shark stock assessments. In terms of hammerhead and thresher shark species complexes, it was noted that in recent years observer data has broken down into species level. SPC commented that part of the barrier to assessment is the low number of observed sharks.

b. CMM 2011-04 (CMM for oceanic whitetip shark)

559. No working paper was presented under this agenda item. Theme co-convenor A. Batibasaga noted the need for biological sampling for oceanic whitetip shark killed in the WCPFC longline and purse-seine fisheries. A research proposal by USA for oceanic whitetip shark and silky sharks is discussed at 6.2.2 d).

Discussion

560. There was no discussion under this agenda item.

c. CMM 2012-04 (CMM for protection of whale sharks from purse seine fishing operations)

561. S. Clarke (WCPFC ABNJ-TCSB) presented SC11-EB-WP-03_rev1, ‘Understanding and Mitigating Impacts to Whale Sharks in Purse Seine Fisheries of the Western and Central Pacific Ocean’ which brought to the Committee’s attention some of the data we have and opportunities to progress toward reducing impacts on whale sharks in the purse-seine fishery. CMM 2012-04 prohibits setting a purse seine on a school of tuna associated with a whale shark if the whale shark is sighted prior to commencement of the set. Implementation of this CMM on 1 January 2014 extended similar rules applicable within PNA waters to the entire WCPFC Convention Area. With one year of data in hand, it is now possible to evaluate the scientific evidence for reduced impacts on whale sharks as a result of the measure. This paper supplements the review to be provided by the Secretariat as part of the Annual Report on the Regional Observer Programme (ROP) by considering this from two aspects: non-ROP reporting and the potential for advancement of simple guidelines on behaviors to avoid when releasing whale sharks. Findings on whale shark post-release survival from studies in the Atlantic purse seine fishery in 2014 are highlighted.

Discussion

562. Japan commented that it might be difficult to detect the effect of the new measure since detail information of implementation began to be obtained concurrently with the introduction of the measure. Japan spoke in support of the adoption of ‘negative guidelines’ as suggested in the working paper and noted that a member of the Japanese delegation is leading the ISG this week on this issue.

563. Australia was encouraged to see results coming from tag and release program for whale sharks and the USA study described in SC11-EB-IP-10 and noted that SC has been discussing whale shark

release guidelines for some time. Australia expressed strong support for developing guidelines for the survival of released sharks even if that means spelling out what not to do.

564. FFA members noted that interactions with whale sharks have increased in recent years and supported the adoption of the basic behaviours to avoid guidelines detailed in EB-WP-03, to maximise the survival rates of captured whale sharks. FFA members also supported reporting by CCMs in their Annual Reports Part 1 of all levels of whale shark interactions and any advancements made on their safe release.

565. EU noted that its fleet had introduced a number of initiatives, including one relating to the safe release of whale sharks following among others some guidelines defined by ISSF.

566. S. Clarke noted that ISG-4 will continue discussions on the draft guidelines for encircled and non-encircled sharks, and commented that current draft guidelines for non-encircled sharks reflect the ISSF-sponsored work, as well as other guidelines proposed on the basis of research in this region.

567. USA noted that SC11-EB-IP-10 details a collaborative project between USA, SPC, ABNJ Tuna Project and PNG which can hopefully document the mitigation methods used and assess post-release mortality. Regarding the guidelines, the USA is hesitant to move from draft guidelines to formal guidelines because more science is required.

568. Indonesia enquired about the increase in whale shark interactions with the purse-seine fleet, what the basis for the data was and whether conclusions can be drawn from the data based on the status of the stock.

569. S. Clarke responded that all of these data come from observer data; there may be a bias and there is a small sample size. She suggested it was not an increased mortality rate in 2014 as the sample size is low, however there is also no evidence that is the rates are decreasing rather than stable.

ISG4 guidelines

570. H. Kiyofuji presented the report of ISG-4 – Guidelines for the safe release of encircled animals, including whale sharks.

Discussion

571. There was widespread support in ISG-4 for the adoption of the recommendations in this report. After some brief discussions, the guidelines were adopted by SC11.

Recommendations

572. SC11 recommends that WCPFC12 adopt the guidelines for safe release of encircled animals including whale sharks as contained in the ISG-4 report (Attachment F) and recommends that TCC11 provide any additional considerations for the Commission's decision.

d. CMM 2013-08 (CMM for silky sharks)

573. No working paper was presented under this agenda item. Theme co-convenor A. Batibasaga noted that this issue can be discussed in the SWG held during SC11 and also under the SRP agenda item.

Discussion

574. USA asked for guidance on the procedure required for new research proposed by NOAA which will look at longline post-release mortality of oceanic whitetip sharks, silky sharks, pelagic thresher sharks and blue sharks. This CCM plans to tag these sharks and cut the line, and also bring them on board and remove the hook and branch line, however the two shark CMMs are rather prescriptive about cutting these sharks loose. A. Batibasaga suggested these discussions take place in the ISG and suggested the current CMM could be improved as it is a bit prescriptive.

575. Upon consideration of a proposal from the USA to engage in post-release mortality tagging studies of blue, thresher, oceanic whitetip and silky sharks which involve bringing those sharks onboard the vessel, SC11 recommended that these studies, and other similar studies proposed in the WCPFC Shark Research Plan, be supported on a scientific basis and that the proposal be considered by TCC.

Recommendations

576. SC11 recommends that the Commission notes that the SC endorses the post-release mortality study being proposed by USA and other similar studies proposed under the WCPFC Shark Research Plan

e. CMM 2014-05 (CMM for sharks)

577. No working paper was presented under this agenda item. Theme co-convenor A. Batibasaga pointed out that two CCMs that target sharks – Japan (SC11-EB-IP-14) and Chinese Taipei (SC11-EB-IP-15) – have submitted shark management plans to SC11 in accordance with the CMM. This CMM came into force in July 2015.

Discussion

578. FFA members requested more detail from Japan and Chinese Taipei on how the catch limits and number of authorisations to fish have been derived under their shark management plans for their target shark fisheries so SC has a better understanding if these plans should be determined as “acceptable”. These CCMs also noted the Monte Carlo simulations run in EB-WP-02 show that given the model assumptions about release mortality, banning wire trace or shark lines will reduce longline interaction with oceanic whitetip and silky sharks. However, banning both would reduce these interactions even further.

579. EU expressed the view that the two plans contained discrepancies and gaps that are likely to weaken the potential of these plans to be properly implemented. EU noted that there were stock assessments last year including for North Pacific blue shark, a species targeted in both plans, but there is no reference to that in the plans. This CCM wondered how the TACs proposed were developed so SC11 can judge if they are robust, as envisaged by the CMM. This CCM observed that the two proposed TACs totalled 25% of the MSY estimated for North Pacific blue shark for the reference case model outputs proposed last year. In addition there are other implementation elements missing in these plans, in particular those which could be relevant for monitoring and control. The EU suggested that SC11 recommends to TCC and the Commission a list of minimum requirements that should be included in future shark management plans to ensure consistency and a strong scientific basis to those plans.

580. There was a lengthy discussion about the content and evaluation of shark management plans during the recommendations session.

Recommendations

581. After considering the shark management plans submitted by Japan and Chinese Taipei in accordance with paragraph 2 of CMM 2014-05, review by SC11 was made difficult due to the lack of guidance on what should be incorporated into the shark management plans, what is considered a target fishery, and how the review should be performed. SC11 recommends that the Commission:

- a) Consider development of a list of minimum requirements that such a plan should include, guidelines to evaluate such a plan, and the definition of a target shark fishery for future review by SC, TCC and the Commission;
- b) Notes the need for plans to contain species specific information and a rationale for how catch, effort or capacity limits are derived, amongst other minimum requirements.

f. Safe release guidelines

582. This issue was discussed in ISG-4 which met in the margins of SC11.

583. SC11 noted the presentation of ISG-4 and requested that the Commission note the recommendations under Agenda Item 6.2.2 c) CMM 2012-04, above.

584. *Development of new guidelines for the survival of sharks (other than whale sharks) to be released from longline and purse seine gear* was not finalized by ISG-4 and is retained in draft form for future discussion by SC (**Attachment G**). It was noted that further information is necessary to advance the development of these guidelines.

6.2.3 Shark Research Plan (SRP)

Indicators for key shark species

585. R. Scott presented SC11-EB-WP-04_rev1, which presents, for seven of the fourteen key shark species, information on data holdings for both purse seine and longline fisheries and the results of a number of indicators of stock status as calculated from those data. The analysis provides indicative trends for silky, oceanic whitetip, mako, blue and porbeagle sharks. More limited inferences are made for whale sharks and for hammerhead and thresher shark complexes for which fewer data are available. In addition the paper provides information on the feasibility of stock assessments for each of the species and information on the potential impact of recent shark conservation and management measures. Recommendations are made with regard to future data collection requirements, research priorities and a proposed schedule for stock assessments.

Discussion

586. A discussion on CPUE analyses in the paper took place about the CPUE analysis in the paper. Japan noted that there was inconsistency in the CPUE series of north Pacific blue shark (Japanese CPUE increased but Hawaiian CPUE decreased). Japan pointed out the analysis on north Pacific blue shark and north Pacific shortfin mako shark did not cover some data used in the ISC analysis and did not support the results of analysis on those species. SPC responded that the analysis was general and broad, examined a number of species across a wide area to give a relatively simple overview of abundance and trend in stock

status. If a full stock assessment was being undertaken, a deeper analysis of the CPUE trends would be required.

587. USA noted that Hawaiian data were only available from 1996-2011 and none of the Hawaiian data were used in the CPUE time series. This CCM noted that SC11-ST-IP-02 showed observer coverage rates of about 4% of longline trips in the WCPO; removing the Hawaiian data makes it about 2%.

588. Australia noted that catch estimated by observer data was about double what is reported in logbooks and SC cannot expect logbooks to be comprehensive for the minor species. Indicators provide information on the system under study but many factors influence those indicators and they need good data. Noting that indicators are underpinned by different levels of data, this CCM wondered if it would be useful to develop a metric for reliability. Australia raised the issue of spatial factors and time periods for the analyses, noting that they have coincided with the implementation of CMMs for sharks but mitigation measures are not included in the standardizations of the indicators.

589. Regarding indicator metrics, R. Scott suggested a possible approach for those species which have a stock assessment, comparative indicators could be run to check the information coming out of the model for inconsistency. On CPUE standardisation, Scott confirmed that there was no explicit spatial component included but noted the observer-program categorical variable used was highly correlated with the spatial component.

590. SPC noted the rationale for doing this work was to look at the data currently held and feed it into the SRP to assist with priority setting. Stock assessments are the best way to make recommendations to the Commission on stock status; however this analysis helps to prioritise the species on which to conduct stock assessments.

591. Korea raised concerns about a discrepancy in the working paper, relating to longline logsheet reporting of sharks (59%) versus observer reporting of sharks (93%).

592. EU supported the recommendations in the paper but queried two of the recommendations: 'develop catch histories for unassessed stocks' and 'collect information on post release mortality rates', pointing out that liaising with scientists from national institutes and other RFMOs doing similar work would be helpful. While disappointed that after five years WCPFC has not been able to eradicate the practice of shark finning, the EU queried the level of a general trend of reduction in shark finning and the reliability of the conclusion.

593. Scott confirmed he would need to come back to the group on a statistical basis for the conclusion about finning reducing but noted that just because observer coverage is quite low, the data are subject to inter-annual variation and there are qualitative trends over time.

594. FFA members noted the lack of data, or data uncertainties, making it difficult for WCPFC to determine the status of bycatch species and priorities for action. Lack of data from the high seas in particular hampered the analysis as large areas of the ocean had to be excluded. FFA members supported the recommendations coming from the analysis but recognised that funding for shark research is limited, so the recommendations need to be prioritised. As such, FFA members requested that SPC provide advice on which of the recommendations would be most immediately useful to develop a process to establish LRPs for elasmobranchs and implement measures to reduce shark interactions with fishing gear. These CCMs urged the SC to ensure these are included in the revised shark research plan.

595. The USA noted that of the 14 key shark species, three are complexes (mako, thresher and hammerheads), inquiring what percentage of them are identified to species. R. Scott said he would come back to the USA on this.

596. Japan commented that it was difficult to analyse shark CPUE data as the introduction of shark CMMs and prohibitions by some Pacific Island countries on catching sharks has affected the data. Scott responded that future studies would benefit from trying to include those considerations in the CPUE standardisation approach.

597. S. Clarke (WCPFC ABNJ-TCSB) noted that there was no evidence of decline for specific stocks in New Zealand waters and pointed out that while the New Zealand EEZ is a small part of the South Pacific, a large portion of the South Pacific observer data available to SPC was New Zealand data, and the indicators analysis presented in EB-IP-12 lends uncertainty as to whether it can be concluded that the South Pacific blue shark stock is in decline. She noted the serious decline in thresher sharks, pointing to the species' core habitat (Regions 4 and, to a lesser extent, Region 3) and commented that IOTC and ICCAT have prohibited retention of these species. She also noted bigeye thresher and the pelagic thresher have the most vulnerable life histories of the WCPFC key sharks. She suggested SC may need to take into consideration calls for protection for thresher sharks from the conservation community and to consider them among the priorities for stock assessment.

598. In response to inquiries from Korea and Chinese Taipei about the under-reporting of sharks in both the longline and purse-seine fisheries and whether it related to catch retained or discarded, Scott responded that the statistic was not broken down, relating to instances of shark interaction with fishing gear.

Recommendations

599. Recognizing that the analysis on north Pacific blue shark and north Pacific shortfin mako shark did not cover some data used in the ISC analysis on these stocks, SC11 recommends that the Commission:

- a) Notes the results of analysis described in paper EB-WP-04 are useful for prioritizing the stock assessment of the various shark stocks.**
- b) Take note of the following recommendations from the SC:**
 - **Increase observer monitoring (at least to CMM requirements) in order to:**
 - **Support to develop stock assessments**
 - **Monitor the impact of CMMs**
 - **Reconcile differences in logbook and observer reporting**
 - **Develop a stock assessment schedule**
 - **Develop catch histories for unassessed stocks**
 - **Collect information on post release mortality rates, especially for silky, oceanic whitetip and whale sharks**
 - **Develop a time series of whale shark interactions and mortalities.**
 - **Repeat the indicator analysis in 2-3 years.**
- c) Requests that SPC be tasked with reviewing available information on mobulid species (mantas and devil rays) and their interactions with fisheries managed by the WCPFC and prepare a paper for SC12 for consideration of these species for designation as WCPFC key sharks.**
- d) Notes that there are limitations imposed on shark analyses due to low levels of observer coverage and lack of representativeness in the observer data.**

Shark Research Plan 2016-2020

600. S. Brouwer presented SC11-EB-WP-01, the Draft Shark Research Plan: 2016-2020. The first SRP covered the period 2010-2014. SC10 agreed in 2014 on a programme of shark work for the Scientific Services Provider. This work was to be carried out in 2015, and included that the Scientific Services Provider drafts a new SRP for consideration by SC11 to cover work in 2016 - 2020. This document outlines the draft 2016-2020 SRP. The paper outlined a draft plan for shark research aimed to providing advice to the Commission, and included a list of work to be carried out under the plan and proposed budgeting for the projects allocated to 2016. The body of work was develop based on the needs of the Commission, current research thrusts and developing needs highlighted in other work tabled at SC11, particularly the shark indicators paper SC11-EB-WP-04 and the Monte Carlo simulation work SC11-EB-WP-02 that were presented to SC11. The work is intended to be carried out by the Science Service Provider and other organisations and is intended to focus work for the Commissions needs while avoiding duplication of research effort. The SC was asked to review and comment on the plan. Once the SC had completed the review and accepted the plan, the plan will be updated to include the SC decisions and tabled for the SC's records.

Discussion

601. FFA members thanked SPC for the draft new SRP and acknowledged the work undertaken under the first SRP over the past 5 years. These CCMs considered the proposed SRP to be dynamic so new work can be undertaken as necessary. They saw it as important to retain the existing projects already identified as covered under SPC core shark funding under the proposed list for the SRP in 2016. Noting Article 10.1 (c) of the Convention, FFA members considered clarification of what level of spawner biomass constitutes a level where reproduction is “seriously threatened” to be a key issue, decided as a first step in developing LRPs for elasmobranchs. For target species such as blue shark FMSY could be used, but these CCMs do not consider it appropriate for non-target species caught as bycatch in fishing operations.

602. FFA members reiterated concerns raised at SC10 about the level of resourcing and the high cost of some of the work, and encouraged SPC to work with the ABNJ Tuna Project. FFA members encouraged NGOs interested in science-based shark management to undertake some of the SRP work or provide funding for full implementation of the SRP, particularly some of the high budget items such as post-release survival, and assessment of hook type and branchline material. FFA members noted significant improvement in species-level reporting when the extended logsheet is used and urged all CCMs to use the extended longline logsheet in their access agreements and as a mandatory requirement for their fleets.

603. Some CCMs supported a recommendation to task SC with reviewing available information for mobulid species including manta rays and devil rays and prepare a paper for SC12.

604. It was noted that the plan was ambitious, but S. Brouwer commented that some of these items may be undertaken by other organisations.

605. In response to a question from Indonesia about the resources required to do a shark assessment, Dr Brouwer suggested it would take about the same amount of time and resources as a tuna assessment would take, and it will be conducted within the MULTIFAN-CL model.

606. When asked about stock status of sharks, S. Brouwer noted that for some species such as North Pacific blue, silky or oceanic whitetip sharks, we have an estimate of stock status from integrated stock assessments. Other species had a status inferred from the shark indicators paper.

607. EU queried the development of materials for species identification, as this sort of work has likely already been done by other organisations for other oceans, suggesting not doing this could relieve the budget. SPC explained that this had come from a recommendation which was carried over for a year or two to address the situation where sharks were being landed with fins naturally attached but because of the way it was landed it was not able to be identified to a species level; the material would help identify sharks which are being landed this way.

608. Queried about the schedule set out in the SRP, S. Brouwer commented that the SC might prefer to do two shark assessments next year and no tuna or billfish assessments, but that this decision was the SC's to make. The final assessment schedule was developed under ISG1 and was presented in plenary.

Shark Research Plan 2016-2020 and stock assessment schedule

609. J. Larcombe (Australia) presented the report of ISG-1, which met four times during SC11. A large portion of this time was spent discussing the stock assessment schedule.

Discussion

610. Japan noted that a North Pacific striped marlin stock assessment was conducted this year and asked that this be taken into account for the North Pacific. The process was clarified: SC11 will adopt the SRP and provide a recommendation for the Commission to endorse the plan.

611. SC11 noted that, given the complexity of the current tropical tuna assessments and other work required of the Scientific Services Provider within its core funding from the WCPFC, the Scientific Services Provider indicated that it was not possible to undertake stock assessments for the three tropical tunas in a single year within resources provided by the Commission.

Recommendations

612. SC11 adopts the Shark Research Plan and Stock Assessment Schedule (Attachment H) and recommends that WCPFC12 endorses it.

Changes to longline observer data collection standards for bycatch

613. S. Clarke briefly presented a paper SC11-EB-IP-05, which discussed the Joint Tuna Regional Fisheries Management Organizations' Technical Working Group-Bycatch, noting that it prioritized adopting minimum data fields and standardized collection protocols to enable interoperability of the t-RFMOs' observer-collected bycatch datasets. A January 2015 meeting of experts on tuna longline observer datasets held in Keelung, Taiwan, identified a need for a systematic review of existing information collected by the t-RFMOs' longline observer programmes in order to identify priority gaps in bycatch data. The group recommended developing a comprehensive list of variables that have documented significant effects on catch and mortality rates of taxa susceptible to capture in pelagic longline fisheries. It was intended that this comprehensive list would then facilitate identifying gaps in priority fields collected by each of the tuna RFMOs' longline observer programmes. WCPFC, with funding provided by the ABNJ Tuna Project, commissioned a study to implement this recommendation, which resulted in the report, Potentially Significant Variables Explaining Bycatch and Survival Rates and Alternative Data Collection Protocols to Harmonize Tuna RFMOs' Pelagic Longline Observer Programmes by Eric Gilman and Martin Hall (Appendix 1). Using the comprehensive list of 28 fields identified in the report, this summary document was prepared to identify a minimum suite of priority longline bycatch fields and standardized data collection protocols which, if not already implemented,

should be included in the WCPFC's longline observer programmes as soon as possible. Of the eleven fields in the minimum suite, seven are related to gear characteristics and fishing methods, whereas four are related to individual bycatch organisms.

614. K. Bigelow (USA) reported the ISG-5 report, 'Proposed amendments to the WCPFC Minimum Data Standards and Fields for bycatch data collected by longline observer programmes' regarding a number of new observer requirements.

Discussion

615. In response to a query from the EU about whether the proposed changes were feasible, K. Bigelow commented that there no implications for increased workload for observers.

616. S. Clarke stated that the first version of this table was cleared in this regard with the ROP coordinator and SPC.

617. Japan, noting the practicality of observers recording the hooking location, suggested that this requirement should be limited to silky and oceanic whitetip shark sharks.

618. **SC11 endorses the outcomes of ISG-5 as amended in Attachment I, and forwards them to TCC11 for technical consideration.**

6.3 Seabirds

Risk of seabird bycatch

619. K. Baird presented SC11-EB-WP-09, on the overlap of threatened seabirds with reported bycatch areas between 25° and 30°S in the Western Central Pacific Fisheries Commission Area. *EB-IP-09* was referred to under this agenda item. The Western Central Pacific Fisheries Commission Area (WCPFC) seabird conservation measure (CMM 12/07) requires that seabird bycatch mitigation measures are mandatory for all longline fishing effort south of 30°S. Here we show the distribution of five species of threatened albatrosses (Antipodean, Northern Royal, Wandering, Black-browed and White-capped Albatrosses) and two species of threatened petrels (Black and White-chinned Petrel) in the Western and Central Pacific Fisheries Commission area. The data indicate these threatened species are at risk from bycatch in the South Pacific up to 25°S, outside the current area where mitigation measures are mandatory. This is supported by published information on bycatch and sightings of seabirds in the area between 25 and 30°S. We conclude that these two lines of evidence represent a meaningful risk to seabirds, which would be mitigated by extending the area of application of CMM 12/07 to south of 25°S.

Discussion

620. Japan said it understood the importance of seabird mitigation, and commented that there were no catches of northern royal albatrosses and black petrels between 1992 and 2010. This CCM commented that the information contained in the document was not conclusive to necessitate the expansion of the area application of the CMM noting the analysis used 99% kernel density, where other studies have used 95% kernel density.

621. Baird responded that density of birds at that latitude is less than that further south, for example black petrels are going to be very hard to detect at low observer coverage levels – this is one of the issues with having very low observer coverage. Baird commented that 99% kernel density coverage is used because of the small sample of seabirds. 95% won't give a true reflection of their distribution. It was

recognised that fishing effort in the 25-30° band is significant. Even at much lower densities these species are still vulnerable because of their small population sizes.

622. In response to a question from Chinese Taipei about the distribution figures in the presentation and the cells denoting Chinese Taipei longline vessels, Baird noted that there are observed bycatch within those cells and the data used was the combined bycatch data which has been recorded by Japan and Chinese Taipei. Baird explained that because of the low density and low coverage this method shows that there are vessels in the area and that there are seabirds there that are likely to be vulnerable.

623. Chinese Taipei clarified that 7 seabirds (1 black petrel, 3 albatross without species identification information, and 3 other seabirds) were caught in these 6 cells.

624. Baird commented that this flagged one of the problems with bycatch rates: an overall bycatch rate doesn't necessarily indicate the risk to a species; even very low bycatch rates can impact a particularly vulnerable species. Baird advised that New Zealand has developed a risk assessment system which is looking at the Potential Biological Removal of a particular bycatch species before the population drops below half of its carrying capacity. For example, for black petrels the potential biological removal figure is 74 birds before you start impacting the populations. WCPFC may have to think about increasing our observer coverage to get an indication of what that removal figure might be.

625. USA noted SPC data holdings in the 25°-30°S latitudinal band was 27 million hooks fished from 2011 to 2014 and ~56,000 were observed with a coverage rate of 0.2%. Three interactions were observed with one interaction recorded as 'unidentified' and two interactions recorded as 'black footed albatross'; however this species does not occur in the south Pacific. Given the low observer coverage, data held by SPC is not very informative for understanding interaction rates from 25°-30°S.

626. Japan noted that its Annual Report this year reported a bycatch rate of 0.082 in the area 25°-30°S, which is relatively low and the coverage rate was over 10%. Japan noted that the species were vulnerable but advised again that the information contained in the document was not conclusive to necessitate the expansion of the area of application of CMM 2021-07.

627. Baird commented that there are no target bycatch rates – it is not known what would be an acceptable bycatch rate. Both Australia and South Africa have had target bycatch rates of 0.05, and that still does not give much information much about the impact on the rarest species. This is why New Zealand is looking at risk rather than bycatch rates, because it is going to be different for different species.

628. ACAP noted the increased level of observer coverage by Japan in the latitude referred to in discussions and that this had been clearly identified in Japan's Annual Report Part 1. ACAP urged other CCMs to do the same. ACAP reminded members that WCPFC is required to operate, and make management judgements, on a precautionary basis, and noted that a couple of the species being looked at during these discussions are incredibly vulnerable to the effects of longline fishing, for example the black petrel has a population of 5,000-6,000 birds and the entire global population occurs in the Pacific – it is potentially incredibly vulnerable to extinction and with such low levels of observer coverage it is difficult to know what impact fishing activities is having on the population. ACAP reiterated the point made by the USA that CCMs have had 5 years to reach the 5% coverage level, but even at that level it is not enough to identify the impacts. The recommendation under discussion here is not to ban fishing in this area but to apply mitigation measures which have been used effectively elsewhere.

629. Greenpeace supported the proposal to extend CMM 2012-07 to cover the area up to south of 25°S. Greenpeace noted that it will continue to advise retailers and tuna brands that if they buy tuna from longliners, it should only be from vessels using the full set of best practice mitigation measures relevant

to the areas in which they fish and Greenpeace will highlight this paper and the need for seabird mitigation measures in the region between 25° and 30°S.

630. FFA members advised that they would support shifting the mitigation measure boundary in CMM 2012-07 from 30°S to 26°S, rather than 25°S as proposed in SC11-EB-WP-09. These CCMs recognised the threat to threatened seabirds between the latitudinal bands 25°S and 30°S and expressed their willingness to work with others to improve the current measure. They noted that 5x5 degrees aggregated data were used in the determination of the boundary of the CMM. They could support shifting the boundary to 26°S, but noted there would be little difference in conservation value and a big difference in the regulatory burden to FFA countries situated around 25°S. Failing that, FFA members flagged that they could support the proposed shift of the boundary to 25°S if it is restricted to high seas areas. FFA members encourage observers to collect more data and conduct further spatial trialling for albatross and petrel species from longline vessels fishing within the 30°S and 25°S latitudinal band.

631. New Zealand noted its special significance as a breeding place for seabirds. New Zealand commented on the role it played in promoting awareness of the risks to seabirds through fishing operations and encouraged cooperation in the reduction of those risks. New Zealand explained that these threatened species, most of which breed in the New Zealand region, distribute into the latitudinal band 25°S. This CCM noted the compelling satellite tracking data and advised the Committee that black petrels only have about 1800 breeding pairs. Protecting the species from risk of bycatch across its whole range was critical. Antipodean albatross overlaps the band and is likely to be highly vulnerable to bycatch. New Zealand prefers precautionary outcomes and supports a recommendation to improve CMM2012-07 by expanding the measure to include areas south of 25°S.

632. During the recommendations session, views on moving the mitigation measure boundary were raised and considered.

633. A number of CCMs spoke against a recommendation for the Commission to consider moving the mitigation measure boundary.

634. New Zealand requested an SC11 recommendation, given impacts on seabirds as heard during the SC11 meeting. FFA members spoke in support of such a draft paragraph. Birdlife International noted that observer coverage is currently insufficient and bycatch is occurring in this area and bycatch mitigation should be considered by the Commission in this area.

635. The theme convenor suggested that a lack of consensus among the plenary suggested that a recommendation will not be forthcoming on this issue; it was agreed that SC11 will agree a majority and minority view for the record as points of view were too opposed to reach a compromise agreement.

636. The EU enquired whether there could be a reference that SC11 recommend that the Commission takes note of the paper which had been presented on seabird bycatch, opining that it should be considered at the Commission meeting in December.

637. There was no consensus on the recommendations presented in the SC11-EB-WP-09; two different views were expressed:

- A minority view was provided by Japan for the report: A number of CCMs considered that the information contained in SC11-EB-WP-09 was not conclusive to necessitate the expansion of the area of application of CMM 2012-07 further north from 30°S. Thus, they

did not support a recommendation for the Commission to consider moving the mitigation measure boundary.

- A majority view was provided by FFA members for the report: that the Commission note potential interactions of threatened seabird species with longline fisheries between 25-30°S. In order to reduce the probability of seabird interactions, that the Commission considers extending seabird mitigation within CMM 2012-07 to encompass 26°S-30°S within the WCPFC-CA or alternatively to 25°S-30°S but pertaining to only to the high seas (within 25°-30°S) within the WCPFC-CA.

Recommendations

638. SC11 recommends that the Commission take note of SC11-EB-WP-09 (The overlap of threatened seabirds with reported bycatch areas between 25° and 30° South in the WCPFC area).

Small longline vessels in the western North Pacific

639. N. Katsumata presented SC11-EB-WP-10, on at-sea experiment to develop the mitigation measures of seabirds for small longline vessels in the western North Pacific.

640. For consideration to develop appropriate mitigation measures for small longline vessels, the effectiveness of 2 designs of tori-lines, A: tori-line without streamer, B: bundled 3 polypropylene bands and C: without tori-line, was examined using chartered commercial longline vessel (Hanei-Marun No. 188, 19 GRT) in the western North Pacific by the on-board research. In the experiment, attacking rates of seabirds on baited hooks and their by-catch rates were recorded. Through 141 observations, streaked shearwaters, Laysan and black-footed albatrosses were mainly followed the vessel and all those were taking attack on baited hooks during line setting. Attacking rate by those three species (frequency of attacks/1000 hooks) in each segment of tori-line A, B and C was 9.5, 15.0 and 70.5, respectively. Number of by-caught birds in each segment of tori-line A, B and C was 1, 2 and 9 birds, respectively. These results indicated that all tori-lines deployed in this experiment substantially reduced bait attack and by-catch. Trial implementation of a light streamer tori-line showed entanglement of fishing gear during line setting. Further improvement and evaluation of tori-lines for small vessels should be necessary.

Discussion

641. Australia observed that, while sample sizes appeared to be adequate for understanding attack rates, larger sample sizes appear to be needed to provide robust estimates of the actual bycatch rates (birds on hooks). This will be an important consideration for future work, particularly when examining the effectiveness of alternate mitigation approaches such as a tori line configuration that uses streamers only on the above water component of the line.

642. Katsumata and Australia agreed to talk in the margins about these methods, noting there were many seabirds in this area.

643. FFA members observed that a reason for the successful adoption of a revised seabird CMM was SC advice supported by numerous research papers on seabird mitigation and interactions. However these CCMs noted that the three specific mitigation measures in the current CMM (weighted branch lines, night setting, tori lines) only came into effect on 1 July 2014. FFA members reiterated their support for a combination of these three measures being the most appropriate seabird mitigation measures to be applied in high risk areas during pelagic longline fishing. These CCMs encourage consideration of other factors such as practicality, the characteristics of the fishery and the use of safe mitigation techniques. The

importance of collecting quality data, trialling mitigation methods and undertaking cost-benefit analysis were highlighted, outcomes which would improve understanding of fishery impacts on seabirds and help assess the efficacy of mitigation measures currently used.

644. ACAP noted that this was an area in which there has been very little research. ACAP has been concerned for some time that small vessels are exempted from the current CMM, noting that it is alarming when you look at the results of this study – when no tori line was used the bycatch rate was very high. ACAP observed that this paper highlights a need to take action to remove the exemption for small vessels in the North Pacific and encouraged Japan to present this work to ACAP's seabird working group to examine what might be an effective tori line for small vessels.

645. Chinese Taipei provided preliminary research results from two trips which were undertaken to experiment with the tori line and branch line weighting. In Chinese Taipei's EEZ north of 23°N there were no seabird interactions with the fishing vessels; this makes it hard to convince the fishing industry to take mitigation measures. It was suggested that WCPFC consider moving the boundary to 30°N or 160°E.

6.4 Sea turtles

646. S. Clarke presented SC11-EB-WP-05, an analysis of Sea Turtle Mitigation Measure Effectiveness in Tuna Longline Fisheries. She noted that SC5 was the last time a paper was presented to SC on the issue of sea turtle bycatch.

Discussion

647. Greenpeace made a statement on behalf of Greenpeace, Birdlife International, Conservation International, Pew Charitable Trusts, WWF, Sustainable Fisheries Partnership, International Pole & Line Foundation, and ISSF: All of the species of turtles found in the WCPFC area are listed on the IUCN Red List of Threatened Species as Vulnerable, Endangered or Critically Endangered, and all species are taken as bycatch in the Commission area. We welcome the opportunity for Commission members to collaborate with the ABNJ Tuna Project by enabling the SC to undertake an analysis of the interaction and survival rates of turtles taken as by-catch by different fisheries across the Convention Area, followed by an investigation of effective mitigation options. We urge Commission members to support this project by providing all relevant data on by-catch of turtles, to ensure that a comprehensive dataset is developed covering all fisheries. This is important because there is no evidence that CMM 2008-03 has slowed or reversed negative trends on threatened and endangered sea turtle populations. We also recommend that the Commission collaborates with other relevant regional organisations, in particular SPREP and FFA, to develop potential synergies that will promote the conservation of all species of turtles in the region and minimise impacts connected with fishing activities.

648. Australia supported the workshop and hoped to participate. Australia strongly encouraged the primary longlining flag states to also participate in the workshop.

649. Japan commented that it would be informative to study not only longline but also purse-seine interactions. Japan requested further information about how the workshop will be organised – if non-public data would be provided to the workshop – and who is responsible for the data.

650. S. Clarke explained that this project focuses on longline because the opportunities for mitigation are much greater in longline fisheries. Analysis of the impact on these species from purse-seine fisheries is negligible whereas from longline they are quite significant. The workshop planning is at a very early stage. Responses from CCMs will determine under what conditions participants would be willing to share their data and so to structure a workshop accordingly.

651. FFA members thanked FAO and WCPFC for providing funding for the first workshop scheduled for early 2016 and expressed the hope that the venue would be selected to provide accessibility for broad participation by CCMs. These members supported SPC commencing their survey for potential participants for their interests and data holdings with the objective of compiling preliminary baseline data and commented that the survey results should not provide a basis for constraining participation.

652. Philippines advised that all turtles are protected in the Philippines. This CCM will coordinate with its Department of Environment regarding the workshop, as that department holds the relevant data.

653. SC11 noted that more detailed information regarding the organization of the project will be provided, CCMs are requested to consider if:

- a) they are interested in contributing data to ABNJ Tuna Project sea turtle bycatch mitigation project; and
- b) they are interested in participating in the workshops proposed for this project.

6.5 Bycatch mitigation for other species

654. S. Clarke presented SC11-EB-WP-06, a proposal for a Bycatch Data Exchange Protocol (BDEP) amongst the t-RFMOs. A meeting of invited experts, convened in January 2015 in Keelung, Taiwan, to progress elements of the Work Plan agreed by the Joint Tuna RFMOs Technical Working Group-Bycatch, recommended that an existing data exchange format be used as the basis for summarizing data in each of the five tuna RFMOs. Compiling basic metadata across the tuna RFMOs aims at i) understanding and harmonizing tuna RFMO bycatch data holdings; ii) reviewing and improving bycatch data collection and reporting programmes ; and iii) planning for intra- and inter-RFMO analysis of bycatch rates and mitigation effectiveness. The proposed t-RFMO bycatch data exchange protocol (BDEP) consists of i) a summary of the total fishing effort and total observed effort for each area by fishery and year; and ii) a summary for the same strata (area, fishery and year) of observed captures, mortalities and live releases of various taxa known to be vulnerable to interactions with tuna fisheries. It is understood that a lack of taxonomic identification, spatial resolution constraints, scarce data holdings and other technical and policy issues may limit the data that some t-RFMOs can provide. Nevertheless, initiating a flow of summarized information and taking stock of existing datasets is an important first step toward harmonization and improved management. WCPFC is invited to consider what bycatch data could be contributed to the BDEP.

Discussion

655. Japan asked for clarification around data management, who is responsibility for the management, what would happen to the completed BDEP template, who will utilise the BDEP data and for what purpose, its objectives (given it will be using publicly-available data), and what is benefit for WCPFC. This CCM noted that if it did not cost too much for SPC to do the work and if the data is managed in accordance with WCPFC data confidentiality rules, it could accept the idea.

656. S. Clarke clarified that the data would be held by SPC and placed online on the WCPFC website. It would provide a similar template for all t-RFMOs bring their information together. One of the t-RFMOs could eventually hold the information from all of the t-RFMO but this discussion can take place after each t-RFMO considers how it wants to respond to the request to fill in the template. This discussion was about whether WCPFC sees value in this. Addressing the questions about the benefit, she commented that the bycatch information they would be using is publicly available but it's not at all easy to access in summarised form. The ABNJ Tuna project can provide the resources for SPC to pull this together and make sure it is in the proper format.

657. SPC explained that the impetus for this proposal has come through the Joint t-RFMO Technical Working Group on Bycatch, to address the difficulty of being able to easily understand what is available and is not available. SPC commented that the plan would be for SC and the other bodies of the Commission through the 2016 series of committee meetings to determine if the BDEP is going to be useful and once members have had a look at it to judge whether it is worth pursuing into the future. SPC observed that global analysis is on the agenda of the t-RFMOs. In WCPFC, this work can be conducted due to the ABNJ Tuna Project for funding in 2016.

658. In response to an enquiry from the USA about what the end product would be, S. Clarke explained that the idea is to provide a one-stop inventory of who holds what data and what those data indicate. She clarified that CCMs would not be asked at this stage to undertake to fill in the template. Rather, the next step would be to poll the t-RFMOs to see what information they have.

659. FFA members expressed concerns about the practical implementation of the ABNJ Tuna Project third component's global scope, commenting that the development of a global database of bycatch mitigation and management information required commitment to feed the required information in the right format to the database. These CCMs noted that the Commission has struggled for years to fix the issue of operational data provision for target species – also a problem in other t-RFMOs – and non-target catch of sea turtles, sharks, seabirds, cetaceans and non-tuna fish. A centralised data repository for all t-RFMOs may be difficult to achieve.

660. New Zealand expressed the view that the existing process, where fisheries databases are maintained at the regional level, works well. It is suggested that sharing aggregated information as needed through a global clearing house or centralised data repository could be a more appropriate model.

661. Korea considered harmonisation between the t-RFMOs on bycatch data to be a good idea. Korea noted that WCPFC and other RFMOs have reporting requirements for some important bycatch species through logbooks and information is also reported through the many data to be provided to the Commission. In WCPFC, most of the data work is done by SPC, but scientists of member nations also participate in this work and they require capacity building. Korea suggested appointing a contact person at SPC who manages the data and a system wherein national scientists are able to be involved in the work.

662. The EU noted its general support for initiatives which stimulate cooperation and coordination with other RFMOs and saw value in facilitating end users' access to data. The EU sees this as a pilot initiative and supported it in that light.

663. PNA members supported the work but wanted to ensure that the protocol address reciprocity – where WCPFC data collected mainly by PNA observer programmes are made available, while there is little from other RFMOs. These CCMs suggested watching the pattern of data provision by different RFMOs, and they preferred a 3 year trial period for the protocol, or one that is reviewed after 3 years.

664. S. Clarke confirmed that this proposal related to just WCPFC at this stage and sharing can be considered later once it is ascertained whether other t-RFMOs are willing to fill out the template.

665. ACAP commented that the data should be provided to the lowest taxonomic level possible and asked that albatrosses and petrels be reported to species level. Other RFMOs require species-level information and the information would not be particularly useful in the current proposed BDEP format as other RFMOs do not do it that way.

666. S. Clarke confirmed that the BDEP proposal requests that the most detailed available taxonomy be provided, and that will be made clearer in further presentations.

667. SC11 requests that SPC, with help from ABNJ Tuna Project:

- **develop a process to populate the template; and**
- **provide the first BDEP template (for 2013-2015) to SC12 for review with ROP data subject to the WCPFC data rules.**

Bycatch data

Voluntary standards - Spanish operators

668. J. Santiago presented SC11-EB-IP-11, on the method to verify the voluntary agreement of good practices introduced by the purse seine Spanish operators in the three Oceans under tuna RFMOs based on information collected through a 100 % coverage observer program. EU noted that the standards voluntarily introduced and fully funded by the fishing industry are well above those implemented by some tuna-RFMOs. These include improved FAD designs and mitigation measures in order to reduce the impact of purse seine operations on bycatch species. This document also presents the initial situation (October 2014) in terms of implementation of good practices, the training for crew and observers, and the first data of good practices observed in the Atlantic Ocean (34 fishing trips on 19 vessels since December 2014). These first results are overall encouraging, with a majority of vessels displaying a level of compliance superior to 80% for non-entangling FADs and reaching 100% for fauna release operations.

Discussion

669. Japan noted that the survival rate for silky sharks is very low once they are brought on deck and queried the method by which those sharks are released.

670. J. Santiago noted that studies clearly show that silky sharks have a high mortality when they are manipulated once they are on deck. The idea of some of this work is to improve the handling of these animals to lower the rate of mortality. He referred CCMs to the work of Poisson et al, who are identifying good practices for release.

AGENDA ITEM 7 OTHER RESEARCH PROJECTS

7.1 West Pacific East Asia Project

671. The WCPFC Science Manager gave a brief presentation on the new GEF-funded ‘Sustainable Management of Highly Migratory Fish Stocks in the West Pacific and East Asian Seas’ project, including the development process, key activities, budget scope, and key outcomes from the previous projects (SC11-RP-WPEA-01).

Discussion

672. Philippines, Indonesia and Vietnam thanked WCPFC and the SC for Phase 1 and now Phase 2 of this project.

673. Philippines noted in particular that the assistance has facilitated the preparation of an annual report and data for use in stock assessments. This CCM advised that it has revised its national tuna

management plan, which it is updating using the framework of the ecosystem approach, and acknowledged the cooperation of the two other countries, Indonesia and Vietnam.

674. Indonesia noted the long duration of support under the WPEA project which has strengthened Indonesia's capacity and advanced its management of highly migratory species and strengthening data collection. This CCM noted that it had started from zero and now has a port sampling program and an industry trying to improve the data for managing Indonesia's tuna fisheries. Indonesia advised that it has a national tuna management plan.

675. Vietnam noted that the WPEA project has advanced this CCM's concept of tuna management and allowed it to establish a tuna management system including data collection, which is important for Vietnam's compliance with WCPFC measures. A draft management plan is currently with the Minister awaiting final endorsement.

7.2 Pacific Tuna Tagging Project

676. The Chair of the Pacific Tuna Tagging Project (PTTP) working group, L. Kumoru (PNG) noted that the group met on Thursday 6 August 2015 in Pohnpei, FSM. The steering committee summary report (SC11-RP-PTTP-01) was made available to SC11 participants.

Discussion

677. There was no discussion again this agenda item.

7.3 ABNJ Tuna Project and Bycatch Components

678. S. Clarke briefly presented SC11-EB-IP-06, a brief overview of progress with the ABNJ (Common Oceans) Tuna Project activities being led by the WCPFC Secretariat and the SPC. These activities are comprised of three components: i) shark data improvement and harmonization; ii) shark stock assessment and management; and iii) global bycatch management and information. Under the first component the project is contributing to the harmonization of observer longline bycatch data fields (EB-IP-05), the t-RFMO bycatch data exchange proposal (EB-WP-06), whale shark post-release mortality tagging (EB-IP-10), and compilation of shark life history information (EB-IP-13). Under the second component, one of four pan-Pacific shark stock assessments is commencing in the form of a southern hemisphere porbeagle stock status assessment, and priorities for the remaining three assessments are being considered. Under the third component of bycatch mitigation, SPC has begun re-development work on the Bycatch Management Information System (BMIS, see EB-IP-07)) and is proposing to hold sea turtle mitigation analysis workshops in 2016 (EB-WP-05).

Discussion

679. There was no discussion again this agenda item.

AGENDA ITEM 8 COOPERATION WITH OTHER ORGANISATIONS

680. The WCPFC Science Manager presented the Secretariat paper SC11-GN-IP-01 'Cooperation with other organizations', noting that this paper has been updated to include two new updates relating to two GEF projects being implemented by WCPFC: an MOU with UNDP for the implementation of the GEF-

funded WPEA project and an execution agreement between FAO and WCPFC on mitigating the adverse impacts of bycatch on biodiversity in global tuna fisheries – a part of the ABNJ Tuna Project.

Discussion

681. There was no discussion again this agenda item.

AGENDA ITEM 9 SPECIAL REQUIREMENTS OF DEVELOPING STATES AND PARTICIPATING TERRITORIES

682. The Assistant Science Manager, T. Beeching, Administrator of the Japan Trust Fund (JTF), briefly described how the fund was distributed in 2015, the fourth year of the second phase of the JTF Project. USD\$140,553.75 was available this year to support seven projects. The Secretariat informed plenary that the 2016 JTF funding would be announced during TCC, and urged participants to be ready for the call for next year's funding, which would likely have a closing date of 31 December 2015.

683. The SC Chair called for reports from members.

Discussion

684. FFA members thanked Japan for ongoing assistance through the Japanese Trust Fund and noted that the Special Requirements Fund is being well utilised. FFA members called upon CCMs to contribute to the fund to enable the continuation of projects that support capacity building. FFA members noted the Commission funding for regional capacity building workshops and noted funding support for recent regional stock assessment workshops, which provided SIDS participants the ability to understand how monitoring programmes in their fisheries contribute to the work of the Commission, how WCPO specific scientific analyses and stock assessments are undertaken and the interpretation and use of this work in the management of WCPO fisheries. These CCMs hoped for continued support for this line item in the Commission budget. FFA members thank FFA and Australia for providing the financial support for the Tuna Data Workshop delivered by SPC in April 2015. These CCMs noted that the funding provided by Australia and FFA was a one-off to reduce the Commission's 2015 budget and that in the future the Commission budget must account for all necessary costs and functions.

685. The EU asked whether the Secretariat maintains a database containing these projects and noted the value of having an easy to access place for basic information about project objectives and outcomes to get a comprehensive picture.

686. The WCPFC Assistant Science Manager explained that the JTF projects are tabled in an excel spreadsheet, and listing documents on the website is feasible.

687. Nauru noted it had received money under the fund recently, and had not yet started work on their project.

AGENDA ITEM 10 FUTURE WORK PROGRAM AND BUDGET

10.1 Review of the Scientific Committee Work Programme

688. Progress of the 2014-2015 work program since SC10 is briefly reported under Agenda Item 1.6 (Intersessional Activities of the Scientific Committee), the Chair invited the Secretariat to briefly describe progress of the SC Work Programme. In addition to the ongoing data management and other advisory services provided by the SPC, T. Beeching highlighted some specific outputs: the south pacific albacore stock assessments, the pacific-wide bigeye assessment, and short-term stochastic projections for bigeye, yellowfin and skipjack tuna; 41 papers (22 of which were working papers) that were authored or co-authored by SPC and submitted to SC11; work completed under the three main funding routes: the core Service Agreement with SPC, individual project contracts, and the use of the unobligated budgets for 2014. An unobligated budget was not provided for 2015. A progress report on an unobligated budget project on swordfish biology and ageing is posted as SA-IP-12 – the final report will be presented at SC12. Finally a description of EU supplementary funding for a variety of SPC projects was listed.

Discussion

689. The EU clarified that an SPC project proposal for research on bigeye tuna bycatch mitigation was undergoing a redraft with a modified scope.

690. ISSF explained that SPC work on cannery data, funded by ISSF included bigeye, yellowfin, skipjack and albacore tuna, and fieldwork had commenced in South East Asia.

10.2 Development of the 2016 Work Programme and budget, and projection of 2017-2018 provisional Work Programme and indicative budget

691. Co-Chair of ISG-3, R. Campbell (Australia) presented the report of ISG-3, ‘SC work plan and budget’.

692. A brief discussion about the budget cycle for technical support for the MOW and harvest strategies took place. It was confirmed by the Secretariat that the budget was intended for technical support for MOW.

693. SC11 adopted the SC work programme and budget as shown in Table 1.

Table 1: List of SC work programme titles and budget for 2016, and indicative budget for 2017–2018, which require funding from the Commission’s core budget (budget in USD and priority 1 = low, 3 = high).

Project	Essential	Priority	2016		2017		2018	
			Core	Other	Core	Other	Core	Other
SPC Oceanic Fisheries Programme Budget	x		1,031,200	400,000	1,031,200	400,000	1,031,200	400,000
Project 14. West Pacific East Asia (WPEA) Project	x		25,000	693,400	25,000	693,400	25,000	
Project 35. Refinement of bigeye tuna parameters		3	50,000					
Project 42. Pacific-wide tagging project		3	10,000	570,000	10,000		10,000	
Project 57. Limit reference points (LRPs) Develop proposed limit reference points for elasmobranchs (requires scope of work to progress)		3	25,000					
Project 67 – Review of impacts of recent high catches of skipjack on		2	40,000		40,000			

Project	Essential	Priority	2016		2017		2018	
			Core	Other	Core	Other	Core	Other
fisheries on the margins of the WCPFC Convention Area								
Project 60: Further paired sampling and unloading data comparisons. - Budget would cover at-sea data collection (2nd observer), associated travel, some analytical support. \$50,000 in each of 2016 and 2017.		2	50,000		50,000			
New Projects identified by SC11								
Maintenance and enhancement of the WCPFC Tissue Bank		3	80,000		80,000		80,000	
Review of Shark Length-weight conversion factor for all key shark species		1	10,000					
Sharks Monte Carlo mitigation analysis for purse seine, and extension of longline analysis		3	25,000					
EU funded projects that require 20% matching funds								
Technical support for the MOW4/HSW1 Project 63. Harvest control rules Project 66. Target reference points (TBC, max. EU contribution: 100,000 euro)	x		190,000	110,000	160,000			
Purse seine bigeye catch mitigation analysis. - Co-funding for expected EU contribution of Euro 200,000 (USD220,000) total.	x		25,000	110,000	25,000	110,000		
New mitigation trials or project for juvenile bigeye and yellowfin by purse seine (TBC, max. EU contribution: 400,000 euro)		3	44,000	440,000	44,000			
Post release of sharks and rays from longline and purse seine vessels (TBC, max. EU contribution: 400,000 euro)		3	44,000	440,000	44,000			
New projects Identified by SC10 as High Priority but not funded								
Further development of methods and analysis to account for changes in targeting practices on the catch of non-target species in particular shark species (alternative funding to be identified)		1	-					
Unobligated (Contingency) Budget related with any science-related projects requested by the Commission with no budget allocation			83,000		83,000		83,000	
TOTAL BUDGET			1,732,200		1,592,200		1,229,200	

AGENDA ITEM 11 ADMINISTRATIVE MATTERS

11.1 Future operation of the Scientific Committee

694. The SC Chair noted that the Secretariat had trialled a new procedure this year for developing its meeting report. Observing that it had worked well the Chair called for views from SC11.

Discussion

695. There was no discussion against this agenda item.

11.2 Election of Officers of the Scientific Committee

696. The SC Chair noted the need for an SC Vice-Chair.

697. Cook Islands noted that this was the SC Chair's third year as Chair and acknowledged his work. This CCM encouraged non-FFA members to provide support to the Commission as SC Chair.

698. J. Annala (New Zealand), co-convenor of the Ecosystems and Bycatch Theme advised SC11 that next year will be his last as co-convenor and his co-convenor, A. Batibasaga (Fiji), was not going to be available next year. There was a need to appoint a new co-convenor for this Theme and eventually two.

699. Tuikolongahau Halafihi (Tonga) was nominated by Fiji and accepted as the new co-convenor for the Ecosystems and Bycatch Theme. After discussions around whether or not the SC Chair and Vice Chair had to be from different chambers within the Committee, advice from the Secretariat and views of a number of CCMs in plenary, A. Batibasaga's nomination was accepted and he was accepted by SC11 as the SC Vice-Chair.

11.3 Next meeting

700. Indonesia confirmed to host SC12 in Bali, Indonesia, scheduled to take place from 3-11 August 2016.

701. The Cook Islands flagged that discussions are taking place in-country about the possibility of hosting SC13 in 2017. The SC Chair noted that if no other CCM offers to host SC13, it will be held in Pohnpei, FSM.

AGENDA ITEM 12 OTHER MATTERS

702. There was no discussion against this agenda item.

AGENDA ITEM 13 ADOPTION OF THE SUMMARY REPORT OF THE ELEVENTH REGULAR SESSION OF THE SCIENTIFIC COMMITTEE

703. A Conveners' Meeting was held on 12 August 2015 in the margins of SC11 to evaluate a new approach in developing and adopting the SC11 summary report which had been trialled during this

meeting. There was a general agreement from the theme convenors that their workload had been reduced with the lead rapporteur, J. Broweleit, now being responsible for all the discussions and putting together the report text. This left the theme convenors free to focus on the meeting itself and developing recommendations of the meeting, which is the most important element of the output for SC meetings. Finer details will be worked out intersessionally.

704. According to the Rule 33 of the Commission’s Rules of Procedure, the following procedure for the development of SC11 Summary Report was agreed by the SC11 plenary.

Due by	Activity
18 August	Theme convenors receive SC11 draft summary report for review from the Secretariat
24 August	The Secretariat posts the provisional Executive Summary on the SC11 website
24 August	The Secretariat receives theme convenors’ comments
28 August	The Secretariat distributes the draft summary report to all CCMs and Observers by email
2 October	The Secretariat receives comments from CCMs and Observers

AGENDA ITEM 14 CLOSE OF MEETING

705. Fiji stated that they would volunteer to host the 2016 Commission meeting.

706. Sincere thanks were expressed to the Chair, theme convenors, the Secretariat and the rapporteur for their hard work, professionalism and smoothly run meeting. The SC members were thanked for their good spirits and collaborative work. FSM’s hospitality was particularly noted.

707. On behalf of Secretariat, the Commission Executive Director registered his gratitude and congratulations to the SC for accomplishing its task.

708. FSM wished participants a safe trip home.

709. The SC Chair closed the meeting at 3:10pm on 13 August 2015.

LIST OF ATTACHMENTS

- Attachment A. Executive Director's Remarks
- Attachment B. List of Participants
- Attachment C. Agenda
- Attachment D. WCPFC tissue bank access protocols
- Attachment E. Agreement for provision of operational-level data to SPC to support WCPFC stock assessments
- Attachment F. Guidelines for the safe release of encircled animals including whale sharks
- Attachment G. Development of new guidelines for the survival of sharks (other than whale sharks) to be released from longline and purse seine gear
- Attachment H. Shark research plan and stock assessment schedule
- Attachment I. Proposed amendments to the WCPFC Minimum Data Standards and Fields for bycatch data collected by longline observer programmes

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

**Scientific Committee
Eleventh Regular Session**

Pohnpei, Federated States of Micronesia
5–13 August 2015

REMARKS BY THE WCPFC EXECUTIVE DIRECTOR

Feleti P. Teo

Chairman; thank you for allowing me to make some remarks at this opening session of the Scientific Committee at its eleventh regular session.

As you know Chairman, this is my first appearance at the Scientific Committee as your new Executive Director after assuming office in March of this year. In fact this is my first major Commission meeting as the Executive Director. So I am grateful for this opportunity to share with the Committee and members and observers of the Commission some of my perspectives and key objectives as your new Executive Director.

But before I do that, let me acknowledge the presence of the Commission Chair; Madam Rhea Moss-Christian. I have been somewhat fortunate to have the Chair also residing in Pohnpei. This has allowed me regular access to consult and confer with the Chair. I think I am reasonably clear on my marching orders from the Chair and as to what her vision for the Commission for this year and onward. As head of the Secretariat, it is my primary and entrusted responsibility to render fullest support to the Chair and the Commission, to pursue the Commission's ultimate objective of ensuring the long term conservation and sustainable use of the high migratory fish stocks in the WCPO, through effective management.

I also acknowledge the distinguished heads of delegation and delegates from member governments and observers. I wish make specific mention of our science services provider, the oceanic fisheries programme of the Secretariat to the Pacific Community. Dr John Hampton and his team have worked tirelessly in contributing material and documentation for the Scientific Committee meetings over the years. I also wish to recognize my Secretariat staff and to thank them in your presence for the enormous assistance and support they rendered me when I assumed office. I also pay my respect to our host government, the government of FSM and to NORMA for being hospitable host and for their continued support.

As you know, we have arrived at the meetings season for the Commission. The Scientific Committee meeting this week and next week will be followed by the Northern Committee and the Technical and Compliance Committee both in September and ultimately the annual Commission meeting in December. So it will be quite a congested second half of the year for the Secretariat and I am sure the same for some of you who also participate at these other Commission meetings.

As your new Executive Director, I have made it one of my first priorities to lift the profile of the Commission and its Secretariat through deeper engagement with, between, and amongst members and stakeholders. In the next week or so we will roll out a new Communication Plan that sets out a framework

for the Secretariat to deepen its engagement with Commission members and stakeholders. The Communication Plan will entail several communication activities that will make the Secretariat more connected, on a regular basis, to important stakeholders like Commission members and observers, NGO, fishing industries, the media and the local Pohnpei community. Some of you may have already received emails from me on Monday evening or yesterday introducing the inaugural edition of the new Secretariat Quarterly e-newsletter. The quarterly newsletter will keep members and stakeholders updated on Commission news and the work of the Secretariat team.

As head of the Secretariat, I will be active in publicizing the achievements of the Commission in a wider range of media coverage. Despite the critics of the Commission, I firmly believe that the Commission has a great story to tell and as the Executive Director I need to be out there on behalf of the Commission letting people know about progress and current issues at the Commission. At the community level we plan to hold Commission open days and to enhance our community outreach. These actions will send an important message to the local community and the local media that we value being part of Pohnpei and we want to involve them more in the work we do, because Pohnpei is also our home. I believe that good communication is critical for any organization, so we at the Secretariat are starting to build a framework that will ensure we communicate in the best way possible with external groups and with each other.

In my first few months in office, I have been out and about meeting representatives of member countries and Commission observers, representative of NGO and fishing industries in non-Commission settings. I am a strong advocate that Commission work does not necessarily have to wait for a Commission meeting or a Commission sanctioned event for it to be transacted. I firmly believe that the kind of conversations that take place at the Scientific Committee or the annual Commission session should start well in advance of those meetings. I believe the sooner those conversations start, on whatever issues, the higher the chances of the Commission arriving at some meaningful decision on those issues. And I see it as my role to facilitate, support and provide a conducive environment for members to dialogue informally and frankly away from the constraints of the formalities of Commission meeting processes.

I am glad to observe here that there are ongoing non-Commission processes that have taken onboard the responsibility to continue the dialogue / conversation on critical management issues that remain unresolved at the Apia Commission meeting last year. An example of this is the work that is being done by the series of workshop on bigeye management options. The Secretariat, with the support of the Commission Chair, has supported that process on the condition that it is inclusive and transparent, and ultimately its outcomes will be brought back to the Commission.

Chairman, I am tempted to go on but I am mindful of your extensive agenda. So I should close here. As a non-science person, I have always observed the work of the Scientific Committee from a distance. But in the last month or so I have immersed myself in a mountain of scientific briefing and material and persevering long hours of listening to SungKown. But I am grateful for the experience and to SK and Tony.

Chairman in closing, I wish you and the Committee members most successful deliberations. I and the rest of my staff and members of our science service provider stand ready to support your work over the next two weeks.

Thank you.

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

**Scientific Committee
Eleventh Regular Session**

Pohnpei, Federated States of Micronesia
5–13 August 2015

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

**Scientific Committee
Eleventh Regular Session**

Pohnpei, Federated States of Micronesia
5–13 August 2015

AGENDA

AGENDA ITEM 1 OPENING OF THE MEETING

- 1.1 Welcome address**
- 1.2 Meeting arrangements**
- 1.3 Issues arising from the Commission**
- 1.4 Adoption of agenda**
- 1.5 Reporting arrangements**
- 1.6 Intersessional activities of the Scientific Committee**

AGENDA ITEM 2 REVIEW OF FISHERIES

- 2.1 Overview of Western and Central Pacific Ocean (WCPO) fisheries**
- 2.2 Overview of Eastern Pacific Ocean (EPO) fisheries**
- 2.3 Annual Report – Part 1 from Members, Cooperating Non-Members, and Participating Territories**
- 2.4 Reports from regional fisheries bodies and other organizations**

AGENDA ITEM 3 DATA AND STATISTICS THEME

- 3.1 Data gaps**
 - 3.1.1 Data gaps of the Commission
 - 3.1.2 Species composition of purse-seine catches
- 3.2 Regional Observer Programme (ROP)**
 - 3.2.1 IWG-ROP
 - 3.2.2 Submission of ROP-defined observer data
 - 3.2.3 ROP longline coverage
 - 3.2.4 Marine pollution data collected by observers
- 3.3 Electronic monitoring and electronic reporting**
- 3.4 WCPFC-funded Port Coordinators**
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 - 3.5.1 Fiji's membership to the Northern Committee

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- 4.1 WCPO tunas**
- 4.1.1 WCPO bigeye tuna (*Thunnus obesus*)**
 - 4.1.1.1 Review of research and information
 - a. Progress report on Project 35 (Refinement of bigeye parameters Pacific-wide)
 - b. Progress on Project 69 and 70 (Improvement of MultiFan-CL and stock assessments)
 - c. Update of WCPO bigeye stock assessment
 - d. Pacific-wide bigeye tuna stock assessment
 - 4.1.1.2 Provision of scientific information
 - a. Stock status and trends
 - b. Management advice and implications
- 4.1.2 WCPO yellowfin tuna (*Thunnus albacares*)**
 - 4.1.2.1 Review of research and information
 - a. Update of WCPO yellowfin stock assessment
 - 4.1.2.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.1.3 WCPO skipjack tuna (*Katsuwonus pelamis*)**
 - 4.1.3.1 Review of research and information
 - a. Update of WCPO skipjack stock assessment
 - b. Project 67 (Skipjack fishery impacts on the margins of the Convention Area)
 - 4.1.3.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.1.4 South Pacific albacore tuna (*Thunnus alalunga*)**
 - 4.1.4.1 Review of research and information
 - a. Review of South Pacific albacore tuna stock assessment
 - 4.1.4.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.2 Northern stocks**
- 4.2.1 North Pacific albacore (*Thunnus alalunga*)**
 - 4.2.1.1 Review of research and information
 - 4.2.1.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.2.2 Pacific bluefin tuna (*Thunnus orientalis*)**
 - 4.2.2.1 Review of research and information
 - 4.2.2.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.2.3 North Pacific swordfish (*Xiphias gladius*)**
 - 4.2.3.1 Review of research and information
 - 4.2.3.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.3 WCPO sharks**
- 4.3.0 Stock status indicators for key shark species**
- 4.3.1 Oceanic whitetip shark (*Carcharhinus longimanus*)**
 - 4.3.1.1 Review of research and information
 - 4.3.1.2 Provision of scientific information
 - a. Status and trends

- b. Management advice and implications
- 4.3.2 Silky shark (*Carcharhinus falciformis*)**
 - 4.3.2.1 Review of research and information
 - 4.3.2.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.3.3 South Pacific blue shark (*Prionace glauca*)**
 - 4.3.3.1 Review of research and information
 - 4.3.3.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.3.4 North Pacific blue shark (*Prionace glauca*)**
 - 4.3.4.1 Review of research and information
 - a. Evaluation of North Pacific blue shark as a northern stock
 - 4.3.4.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.3.5 Other sharks**
 - 4.3.5.1 **North Pacific shortfin mako (*Isurus oxyrinchus*)**
- 4.4 WCPO billfishes**
 - 4.4.1 South Pacific swordfish (*Xiphias gladius*)**
 - 4.4.1.1 Review of research and information
 - 4.4.1.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
 - 4.4.2 Southwest Pacific striped marlin (*Kajikia audax*)**
 - 4.4.2.1 Review of research and information
 - 4.4.2.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
 - 4.4.3 North Pacific striped marlin (*Kajikia audax*)**
 - 4.4.3.1 Review of research and information
 - 4.4.3.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
 - 4.4.4 Pacific blue marlin (*Makaira nigricans*)**
 - 4.4.4.1 Review of research and information
 - 4.4.4.2 Provision of scientific information
 - a. Status and trends
 - b. Management advice and implications
- 4.5 Other matters**

AGENDA ITEM 5 MANAGEMENT ISSUES THEME

- 5.1 Limit reference points for the WCPFC**
 - 5.1.1 Implications of alternative levels of acceptable risk
 - 5.1.2 Identifying appropriate LRPs for elasmobranchs within the WCPFC
- 5.2 Development of target reference points (TRPs) and harvest control rules (HCRs) for the WCPFC**
 - 5.2.1 Development of WCPFC harvest strategies
 - 5.2.2 Skipjack tuna target reference point

- 5.2.3 South Pacific albacore tuna target reference point
- 5.3 Implementation of CMM 2014-01**
- 5.3.1 Evaluation of impacts of the purse-seine fishery
- 5.3.2 WCPFC FAD Management Options Intersessional Working Group
- 5.3.3 Yellowfin tuna catch limit
- 5.3.4 Other issues related to CMM 2014-01

AGENDA ITEM 6 ECOSYSTEM AND BYCATCH MITIGATION THEME

6.1 Ecosystem effects of fishing

- 6.1.1 Review of research and information
- 6.1.1.1 SEAPODYM

6.2 Sharks

- 6.2.1 Review of potential mitigation measures to reduce fishing-related mortality on silky and oceanic whitetip sharks
- 6.2.2 Review of conservation and management measures for sharks
 - a. CMM 2010-07 (CMM for Sharks)
 - b. CMM 2011-04 (CMM for oceanic whitetip shark)
 - c. CMM 2012-04 (CMM for protection of whale sharks from purse seine fishing operations)
 - d. CMM 2013-08 (CMM for silky sharks)
 - e. CMM 2014-05 (CMM for sharks)
 - f. Safe release guidelines
- 6.2.3 Shark Research Plan

6.3 Seabirds

6.4 Sea turtles

6.5 Bycatch mitigation for other species

AGENDA ITEM 7 OTHER RESEARCH PROJECTS

- 7.1 West Pacific East Asia Project
- 7.2 Pacific Tuna Tagging Project
- 7.3 GEF ABNJ Shark and BMIS project

AGENDA ITEM 8 COOPERATION WITH OTHER ORGANISATIONS

AGENDA ITEM 9 SPECIAL REQUIREMENTS OF DEVELOPING STATES AND PARTICIPATING TERRITORIES

AGENDA ITEM 10 FUTURE WORK PROGRAM AND BUDGET

- 10.1 Review of the Scientific Committee Work Programme
- 10.2 Development of the 2016 Work Programme and budget, and projection of 2017-2018 provisional Work Programme and indicative budget

AGENDA ITEM 11 ADMINISTRATIVE MATTERS

- 11.1 Future operation of the Scientific Committee
- 11.2 Election of Officers of the Scientific Committee
- 11.3 Next meeting

AGENDA ITEM 12 OTHER MATTERS

**AGENDA ITEM 13 ADOPTION OF THE SUMMARY REPORT OF THE ELEVENTH
REGULAR SESSION OF THE SCIENTIFIC COMMITTEE**

AGENDA ITEM 14 CLOSE OF MEETING

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WCPFC TISSUE BANK ACCESS PROTOCOLS

Background

1. The WCPFC has established a tissue bank of biological samples collected from pelagic species in the WCPO for the purposes of life history studies to advance fisheries management in the WCPO. The bank contains otoliths, spines, gonads, liver, muscle, stomach and blood from tuna, billfish and other pelagic species.
2. The purpose of this document is to specify the rules for scientific researchers to access these samples for the purpose of scientific study.

Rules and Procedures

3. Applications to access samples from the tissue bank must include:
 - a. Applications should be addressed to the Executive Director, WCPFC Secretariat
 - b. Project Name and Objectives
 - c. WCPFC Scientific Committee Project Number or recommendation if these exist
 - d. Specification of the samples to be withdrawn from the bank (number, type, species, any location/sex/date limits, etc.)
 - e. The methods for processing and analyses
 - f. Past contributions to the tissue bank by researcher or CCM
 - g. Intended collaborations
 - h. Timelines and intended outcomes and reporting

Additional information may be requested from the researcher by the WCPFC Research Sub-Committee to assist with application approval.

4. It will be a requirement of the researcher or CCM to provide an annual report to the Executive Director, WCPFC Secretariat. This must include documentation of raw and analysed results, however this does not imply a requirement for this data to be publicly available. When data can be made publicly available a report to WCPFC's Scientific Committee is required on progress of the study. The reports must follow WCPFC standards and must include method description and meta data. All data will become publicly available 5 years after WCPFC Secretariat determines the project analyses are complete or at WCPFC's discretion.
5. The WCPFC Research Sub-Committee will give consideration to the sequencing of analyses such that those which involve the samples being destroyed or modified are undertaken last when approving

applications. For example otolith weight and morphometric analyses may be prioritised before sectioning, which may be prioritised before chemical analyses.

6. Where the analyses involves the preparation of secondary products such as sectioned otoliths and histological slides these products are to be provided to the WCPFC at the completion of the study for future comparative reference and study.
7. Researchers or CCM's must acknowledge the WCPFC tissue bank in any publication of results from the study undertaken.
8. The selection and approval of projects will be determined by the WCPFC Research Sub-Committee. This committee may meet within the margins of WCPFC meetings or electronically. This sub-committee will prepare and submit a summary of their decision on each project proposal to the WCPFC Executive Director for final approval. The project approval process will consider, inter alia, the following:
 - a. Preferential access to the tissue bank will be given to researchers or WCPFC CCM's who have contributed samples to the collection.
 - b. Preferential access to the tissue bank will be given to collaborative projects with priority to those where the collaboration includes several WCPFC CCMs.
 - c. Priority will be given to request that are part of the WCPFC Scientific Committee's research and work plan and those projects whose spatial scale is regional in preference to local.
 - d. Past participation with those who acknowledge the source of the samples and provide interim products as required above given priority.
9. Once approval for access to samples from the tissue bank has been provided by the WCPFC Research Sub-Committee the researcher/CCM will enter into a formal agreement with the Secretariat of the WCPFC that will specify access requirements, reporting and any data confidentiality that the WCPFC may require.
10. A reasonable fee may be charged for the cost associated with preparing the samples for shipping and cost recovery for freight or transport agent fees and freight (loss and damage) insurance. An additional fee will be charged to applications from organizations who are not associated with WCPFC CCMs. This fee will be based on the full cost recovery of the collection of samples requested (estimated at USD10 per sample in 2015). The total amount of this second fee that is collected in each year will be used to offset WCPFC's costs of running the tissue bank in the following year.

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**[DRAFT] AGREEMENT FOR PROVISION OF OPERATIONAL-LEVEL DATA TO SPC TO
SUPPORT WCPFC STOCK ASSESSMENTS**

Representatives from China, Japan, Korea, Chinese Taipei, United States and the Secretariat of the Pacific Community (SPC) (hereafter referred to as the Parties) have agreed that operational-level longline data will be provided to an integrated database maintained by SPC for the purpose of conducting collaborative research to support relevant WCPFC-mandated stock assessments. The following procedures and conditions shall be followed in the implementation of this work:

1. This agreement comes into effect on 1 January 2016 and shall remain in effect thereafter. Should any Party wish to withdraw from the agreement, they shall notify all other Parties in writing.
2. The format of the data to be provided shall include:
 - a. Set-by-set data for individual vessels, with vessel identity coded consistently through the time series;
 - b. Effort in number of hooks;
 - c. Number of hooks between floats;
 - d. Catch in number of bigeye, yellowfin, albacore and swordfish;
 - e. Date of set;
 - f. Start time of set in local time;
 - g. Position specified to the nearest 1 degree square.
3. The scope of the data will be from 1952 to the present, and for the entire Pacific Ocean.
4. Data for the 2014 calendar year shall be provided as soon as possible after this agreement comes into effect. Thereafter, updates shall be provided annually by 30 April, and shall include (i) new data for the most recent calendar year and (ii) any revisions of data from earlier years resulting from new data becoming available, or from the new availability of certain data fields that were not previously available in earlier data provisions.
5. Data files shall be transmitted to SPC using secure File Transfer Protocol (FTP), or as otherwise agreed between SPC and individual Parties.
6. If operational longline data in a form consistent with the specifications in point 2 above are already provided to WCPFC by any Party, separate provision to SPC is not necessary.

7. SPC shall maintain the data in a secure fashion. The security arrangements include the following:
 - a. The data shall be held in a secure server location at SPC headquarters in Noumea, New Caledonia that is accessible via login credentials only to the SPC Oceanic Fisheries Programme staff who are directly involved in the management and/or analysis of the data.
 - b. A list of staff members with access rights to the data shall be provided to the Parties upon request. It is noted that all SPC staff have strict contractual obligations in their terms of employment to maintain the confidentiality of information. Severe disciplinary action is taken for any breaches of these contractual obligations.
 - c. A backup copy of the data will be made to another identically-restricted server location. The purpose of this backup copy is limited to allow the data to be restored in the event of data loss or corruption (e.g. through computer hardware failure).
 - d. Apart from this single backup, the data shall not be copied or backed up to any other server location or to any portable file storage media.
 - e. The data shall not be disseminated or uploaded to any internet or email address.
8. The usage of the data is limited to collaborative research to support relevant WCPFC stock assessments being conducted by SPC, as agreed by the Scientific Committee and the Commission. Collaborative research may include the estimation of indices of abundance, the estimation of spatial weighting factors relevant to particular stock assessments, the estimation of spatial dynamics relevant to the understanding of spatial exploitation patterns, or other research topics that may be agreed by the Parties. In addition, the identification of missing data, and where possible the improvement of data, shall be an important aspect of the collaboration. Data reconciliation shall include the provision of data for the fleets of Parties that are held by SPC where those data are not currently available to the Parties.
9. Collaboration will be fostered by regular workshops to review the results of analyses, data improvement activities and plan additional work. These workshops may be stand-alone, or held in conjunction with SPC's regular Preparatory Assessment Workshops. Participation in such workshops shall be open to all Parties and at the cost of individual Parties.
10. Any report or presentation that documents the results of this collaborative work shall be provided to the Fishery Agency of each Party prior to release, allowing reasonable time for comments.

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**GUIDELINES FOR THE SAFE RELEASE OF ENCIRCLED ANIMALS,
INCLUDING WHALE SHARKS**

General principles

- Safety of the crew is a paramount consideration.
- When releasing encircled whale sharks, the stress the animal receives should be minimized to the extent possible.
- The following possible release methods should be used as general guidelines.
- The effectiveness of the following possible release methods has not been fully evaluated. Further scientific research is necessary in order to investigate survival after the release by various release methods. Therefore, CCMs are encouraged to conduct analysis on methods used by their purse seine vessels. In addition, several agencies have initiated a program of satellite tag deployments by experienced observers to assess survival of encircled animals associated with various release techniques.
- The appropriate release method should be chosen in a flexible manner depending on the circumstances and condition of the particular purse seine set, e.g. the size and orientation of the encircled animal, amount of fish in the purse seine set, weather conditions and brailing operation style.

As noted in the TCC9 Summary Report, Para 318, the PNA requires that when a whale shark is encountered in a purse seine net in PNA waters the net roll must be immediately stopped and the whale shark released.

In the WCPFC Convention Area the following actions are not recommended when releasing encircled whale sharks (see WCPFC-SC11-2015/EB-WP-03 Rev.1).

- Vertically lifting sharks by tail
- Pulling sharks by a loop hooked around its gill or holes bored into a fin
- Gaffing
- Leaving attached any towing ropes
- Brailing whale sharks larger than 2 meters
- Brailing whale sharks onto the deck




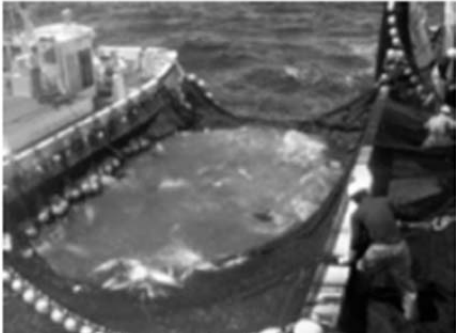
Noting that there is not sufficient scientific evidence to adopt the following possible safe release methods, these methods should be considered for possible use but are not adopted as part of these guidelines until such scientific evidence becomes available and is reviewed and agreed by the Scientific Committee.

Possible safe release methods

1. Cutting net
 - Experience indicates that cutting the net vertically (about 3-5 meters) is quick and efficient.
 - Caveat: Possible uncontrolled ripping of the net if under load from catch or currents, loss of entire catches and time to repair the net.
2. Passive removal or letting sharks go over corkline (ref. Japan proposal in WCPFC8-2011-DP-17, see Appendix 1)
 - Would be easy particularly for vessels sacking up with a skiff.
 - The manipulation of cork line is possible only if the vessel concentrates and loads catch using a brailing boom.
 - Very situation dependent and based on size and orientation of the animal.
 - Caveat: If it takes a long time to roll a shark out of the net which may expose the sharks to excessive stress, Some loss of catch is possible during the operation.
3. Horizontally pulling sharks by the tail or a Sling Method (see Appendix 2)
 - Encircling the caudal peduncle of the shark with a smooth sling (non-abrasive material) that is attached to a heavy line and towboat. A second line is run from the skiff through the sling and back to the skiff. The skiff slowly moves the shark's tail/body next to the cork line and is gently led over the cork line. Lowering corks from brailing boom or releasing some corks from attachment to net skiff. Slowly towing shark horizontally by the tail until clear of corks when rope is released and sling falls away.
 - Caveat: This procedure could be traumatic although likely less traumatic for small and medium sharks (5-6 m maximum). Probably inappropriate for fish >6 m.

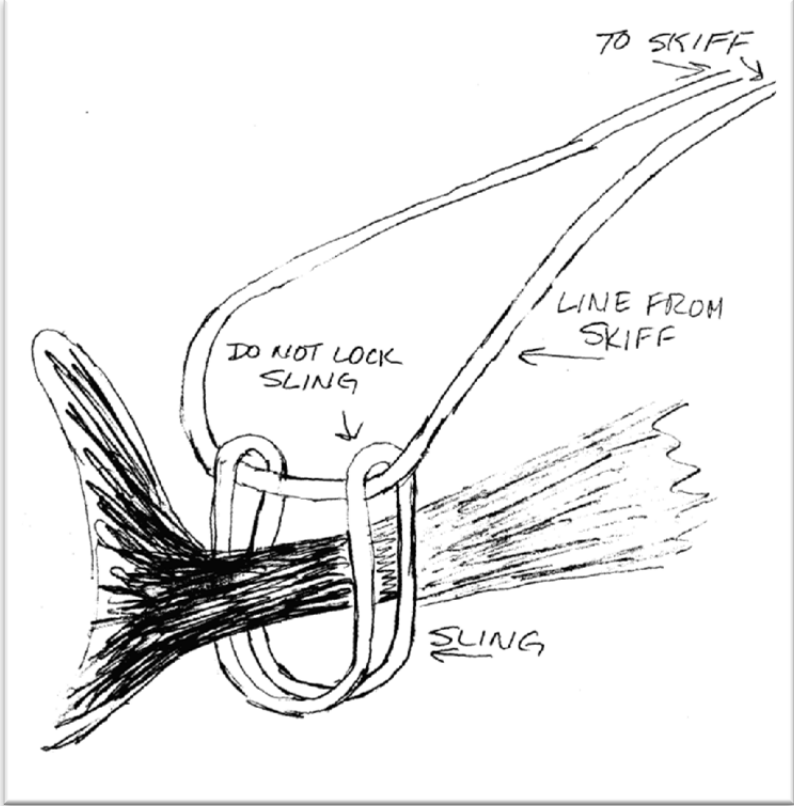
Note, animals should be kept in water at all times when using release methods 1-3.

[Appendix 1] Proposed by Japan at SC7 (Guidelines for safe and live release of encircled non-target animals during purse-seine fishing operations)

<p>a). lead the head to approach nearest cork rope by rolling up the net under the ventral and tail side.</p>	
<p>b). Release cork rope from their head side.</p> <p>c). Roll up the net of the tail side to run the head on the cork line</p> <p>d). Control the net carefully to keep whale shark calm down because if they wriggle, their body could be entangled in the net</p>	 
<p>e). Wait for escaping from the net themselves (whale shark swim away from the net)</p>	

[Appendix 2]

Design and deployment of a release mechanism for mid- to small-sized whale sharks



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**DEVELOPMENT OF NEW GUIDELINES FOR THE SURVIVAL OF SHARKS⁴ (OTHER THAN
WHALE SHARKS) TO BE RELEASED FROM LONGLINE AND PURSE SEINE GEAR**

SC10 (2014) developed a summary table for possible harm minimizing release techniques to be avoided (Table 1). There was no updated information provided at SC11. Informal small group participants are requested to investigate reliable methods for releasing sharks during longline and purse seine operations, and to report on any information at SC12.

Table 1. Possible harm minimizing techniques and release techniques to be avoided.

Harm minimizing techniques:	Release techniques to be avoided:
1. Minimize time spent handling sharks and rays to prevent stress	1. Do not attempt to dislodge a deeply hooked hook by de-hooking or pulling on the branch line
2. Have a lifting device, bolt cutters, dehooker and line-cutter readily available	2. Don't wrap your fingers, hands or arms in the line when bringing a shark or ray to the boat
3. Try lightly flicking the branchline to dislodge the hook	3. Don't lift sharks using the branchline, especially if hooked
4. Try to remove the hook using a de-hooker while the shark is still in the water (if sluggish)	4. Don't use a gaff or other pointed object other than in the underside of the jaw
5. Use a long-handled line cutter to cut the line as close to the fish as safely possible; remove as much line as possible	5. Don't lift sharks by the head or tail when out of the water, gravity can damage internal organs and the spine;
6. Bring small sharks onboard using a dipnet; if gaffing is necessary only gaff in the mouth (underside of jaw)	6. Don't lift or draft them by inserting your fingers into its gills
7. Immobilize the shark's mouth with a small object; insert a hose with flowing water if the shark is on deck more than 5 min; place a dark, wet cloth over its eyes	7. Don't lift or drag a manta ray only by its cephalic lobes or tail or gill slits
8. If the hook is visible use a bolt cutter to remove the barb, then remove the hook	8. Don't tie or insert a rope or wire around them to lift or drag them
9. Release the shark with both hands (or use two people: one at pectoral fins, one at caudal fin); carry small rays by the spiracles, and large rays by the wings--avoid the tail in all rays	9. Don't restrain them for a long time alongside the vessel (some species can suffocate if they can't freely move in the water).

⁴ The term shark refers to sharks, skates and rays

10. When releasing the shark slow or stop the vessel and gently drop head first, do not throw the shark (if releasing through a belt or chute, ensure the flow of water is strong enough for the shark to reach the sea)	10. Don't use a 'lazy line' and tow the shark or ray astern
11. Very large sharks and rays can be directly released from a purse seine brailer	11. Don't put a lot of pressure on their body – don't push or squeeze when carrying and don't throw, kick or hit
12. Remove entangled animals before they reach the net block or de-hooking machines; use clippers to cut the net if necessary.	12. Don't put them on deck where there is direct sun exposure
	13. Don't bring large sharks or rays on deck.
	14. Don't bring stingrays on deck
	15. Don't put them on deck where they could physically contact hard objects, including hard parts of other fish.
	16. Don't keep them out of the water too long.
	17. Don't de-hook through forced pulling as this could dislocate the jaw

References

1. Methods for longline fishers to safely release unwanted sharks and rays. (Gilman, E., 2014; http://fishing-living.org/wp-content/uploads/2014/04/Elasmobranch_LL_Handle-release_english1.pdf)
2. Good Practices to Reduce the Mortality of Sharks and Rays Caught Incidentally by Tropical Tuna Purse Seiners (Poisson et al. WCPFC-SC8-2012/ EB-IP-12; <http://www.wcpfc.int/system/files/EB-IP-12-Good-practices-reduce-mortality-sharks-and-rays-caught-incidentally-tropical-tuna-purse-sei.pdf> and Poisson, F., Séret, B., Vernet, A. L., Goujon, M., & Dagorn, L. (2014). Collaborative research: Development of a manual on elasmobranch handling and release best practices in tropical tuna purse-seine fisheries. *Marine Policy*, 44, 312-320.
3. Shark and Ray Handling Practices: A guide for commercial fishers in southern Australia (draft document received from Australia, not for circulation)

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SHARK RESEARCH PLAN AND STOCK ASSESSMENT SCHEDULE

1. Principles for determining stock assessment timing and scheduling

An informal small group (ISG) proposed the following set of principles for determining the schedule of stock assessments:

- Responsive to the requirements and expectations of the Commission.
- Feasible and practical from a technical and data availability perspective (for the estimation of management quantities).
- Gives consideration to current status, trends in indicators of status or other indicators of vulnerability.
- Efficient in terms of time and resources as well as from a technical perspective (synergies where possible).
- Within the expected budget allocation for assessments and the capacity of the science service provider (or other agency).

2. Stock Assessment Schedule for Tuna, Billfish and Sharks

With reference to the above principles, the ISG proposed the schedule of stock assessment contained in Table 1. The ISG proposed that the schedule should again be reviewed in 2017 with consideration of the years 2018 onwards.

3. Shark Research Plan – overall

The ISG considered the research plan for shark species of special interest (“key shark species”) to the Western and Central Pacific Fisheries Commission (the “shark research plan”). This plan is intended to be regional in scope and include all research deemed necessary to support management of sharks as WCPFC fulfils its obligations under its convention. The ISG did not propose any additions or amendments to the elements of the overall plan.

4. Shark Research Plan – priorities for 2016

The ISG considered which elements of the shark research plan to progress in 2016. The ISG proposal is contained in Table 2 and it is recommended that the draft shark research plan (SC11-EB-WP-01) be revised to reflect this and re-issued.

Table 1: SC11 ISG1 Proposed Assessment Schedule.

Species	Stock	Last assessment	2013	2014	2015	2016	2017	2018	2019	2020	Rationale/Comments**
Bigeye tuna	WCPO	2014		X			X			X	BET, YFT and SKJ will all use data to 2015 for next assessments (2016 for SKJ, 2017 for BET & YFT) (common baseline for management statistics). Operational data required (may become available from start of 2016). BET CPUE indices presented at SC12 (2016) Maintain 3 year schedule from 2017 onwards.
Skipjack tuna	WCPO	2014		X		X			X		SKJ tagging ceased in 2013 and the impact of tagging data in the assessment will become less current with delay. Separate SKJ to manage SPC workload. Maintain 3 year schedule from 2016 onwards.
Yellowfin tuna	WCPO	2014		X			X			X	Maintain 3 year schedule from 2017 onwards. Operational data required (may become available from start of 2016). YFT CPUE indices presented at SC12 (2016).
Albacore	South Pacific	2012			X			X			Maintain 3 year schedule from 2015 onwards.
Striped marlin	Southwest Pacific	2012						X			
	Northwest Pacific	2012			X			?			Pending ISC confirmation.
Swordfish	Southwest Pacific	2013	X				X				Efficiencies and synergies with SP blue shark. Growth/maturity review complete Jan 2016. Operational data may become available from start of 2016. SWO CPUE indices presented at SC12 (2016).
Silky shark	WCPO	2013	X					?			
	Pacific-wide	-									
Oceanic whitetip	WCPO	2012							?		
Blue shark	Southwest Pacific	-				X					Efficiencies and synergies with SP swordfish and ISC north Pacific blue shark. All shark assessments have high reliance on observer data for catch and CPUE trends – need full submission of observer data from fishing nations.
	Northwest Pacific	2014		X			X				ISC confirmed 2017
Mako shark (shortfin)	Southwest Pacific	-						?			Synergy with north Pacific Mako
	Northwest Pacific	-						X			ISC confirmed 2018, if data supports
Porbeagle	Southern Ocean	-			X*						

Thresher	Pacific-wide					X*					Prioritised after consideration of trends and vulnerability. Propose indicators analysis with the potential to proceed to full assessment depending on data and outcomes of indicators. ABNJ support.
Hammerhead	WCPO	-	No assessment scheduled but other work proposed in Table 6								
	Pacific-wide	-	No assessment scheduled								
Whaleshark	WCPO	-	No assessment scheduled but other work proposed in Table 6								
	Pacific-wide	-	No assessment scheduled								

* co-ordinated through the ABNJ

** SC8 (2012) also considered the schedule of stock assessments: “467. SC8 discussed the regularity of stock assessments from both biological and funding perspectives. SC8 considered that the stock assessments for the major tuna species should be conducted every three years, swordfish should be conducted every four years (i.e. next assessed in 2017), and other billfish species should be conducted every five years. An ongoing programme of shark assessments should be implemented once a decision is taken regarding whether to extend the Shark Research Programme.”

Table 2: Projects identified by SC11 ISG1 to be carried out in 2016.

Project title	Start date	Completion date	Organisation	WCPFC Budget (US\$)	Other Sources Budget (US\$)	ISG1 Notes
Blue shark stock assessment in the south Pacific	Jan 2016	August 2016	SPC-OFP	‡		SPC core shark funding.
Thresher shark indicators/assessment Pacific-wide.	Jan 2016	December 2016	ABNJ-Sharks		?	
Length-weight conversion factor review	Jan 2016	August 2016		10,000		
Develop proposed limit reference points for elasmobranchs [¥]	Jan 2016	December 2016		25,000		Budget amended to \$25k.
Monte Carlo analysis of mitigation approaches: extension of longline analysis and develop model for purse seine	Jan 2016	August 2016	SPC-OFP	25,000		
Maternal length and litter size in shortfin mako sharks	Jan 2016	December 2016	? (ISC)		30,000 (?)	May be undertaken by ISC. Required for stock assessment (Table 6).
Post-release survival of silky and oceanic whitetip sharks from longline sets	Jan 2016	December 2017	SPC-OFP + collaborators		250,000+	ABNJ sharks \$ identified. Further external \$ and/or opportunities for collaboration exist.
Post release mortality of sharks and rays from longline <u>and</u> purse seine vessels (EU)	Jan 2016	December 2017	?	44,000 (+ 44,000 in 2017)	440,000	EU funding to be confirmed. Involves 20% matching from Commission.
Experimental assessment of hook type and branchline leader material on shark catch	Jan 2016	December 2017	SPC-OFP + collaborators		150,000+	External \$ and/or opportunities for collaboration exist.
Observer form re-development to collect data on handling and release of sharks	Jan 2016	December 2016	SPC-OFP+FFA	‡		SPC core shark funding.
Review data for non-key sharks elasmobranchs	Jan 2016	December 2016	SPC-OFP	‡		SPC core shark funding
TOTAL				104,000		

‡ SPC core shark funding.

¥ Note the scope of this work is to be determined by the MI theme.

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**PROPOSED AMENDMENTS TO THE WCPFC MINIMUM DATA STANDARDS AND FIELDS
FOR BYCATCH DATA COLLECTED BY LONGLINE OBSERVER PROGRAMMES**

Table 1. Proposed amendments to the WCPFC Minimum Data Standards and Fields for bycatch data collected by longline observer programmes.

Suggestion if SC add priority to the research items of minimum standard. It will be useful for the observer training.

Notes:

1. For fields requiring recording at the set level, observer programmes can choose between requiring their observers to record gear fields for each set or instead allow observers to record gear information as a default/basic practice for the first set, and then record any deviations from that default/basic practice. .
2. Observer programmes should ensure that there is a clear distinction between situations in which gear are not used and situations in which fields are left blank.
3. Observer programmes should include the following information in coded fields rather than text-based comment fields as much as possible.

Field		Current WCPFC Minimum Data Standards and Fields Text	Proposed WCPFC Minimum Data Standards and Fields Text (new text in bold)
1	Hook Type	<p>Hook type: What type of hook or hooks is used? Examples are J hooks-Circle hooks-offset circle etc, the vessel usually uses one type, but may use a couple of types.</p> <p>Hook size: Size of the hooks used, if not sure ask the Bosun.</p>	<p>Hook type: Record at the set level what type of hook or hooks is used? Examples are J hooks-Circle hooks-offset circle etc, the vessel usually uses one type, but may use a couple of types.</p> <p>Hook size: Size of the hooks used, if not sure ask the Bosun or refer to a hook catalogue.</p>
2	Bait species	Name the bait species used Pilchards, Sardine, Squid, etc.	At the set level, name the bait species used Pilchards, Sardine, Squid, artificial bait, etc. Record the estimated weight of each; e.g. using package weight of boxed set.
3	Leader (trace) material	Indicate Y or N -if the vessel uses wire traces on all their lines or only on certain lines i.e. lines close to the buoys etc if no traces are used at all then record N.	indicate Y or N -if the vessel uses wire traces on all their lines (Y) or if no wire traces are used then record N. If only used on certain lines i.e. lines close to the buoys etc. record which lines. . If the proportion of leaders that are wire varies within a trip, record the average based on a sample of ten baskets in different sets.
4	Branchline Weighting	Do the branch lines have weighted attachments usually lead on the hook, or near the end of the leader of the branch lines? Record the mass of the weight attached to the branch line.	do the branch lines have weighted attachments usually lead on the hook, or near the end of the leader of the branch lines? Record the mass of the weight attached to the branch line. If more than one type of weighting is used during a trip, describe each type and indicate the proportion based on a sample of ten baskets in different sets.
5	Shark Lines	NA	At the set level, record the number of shark lines (branch lines running directly off the longline floats or drop lines) observed.
6	Number of Lightsticks	Does the vessel use light sticks on its line, record the number it may use, and where along the mainline they attach them to the branch lines.	At the set level indicate whether the vessel uses light sticks on its line, record the number it may use, and where along the mainline they attach them to the branch lines.

Field	Current WCPFC Minimum Data Standards and Fields Text	Proposed WCPFC Minimum Data Standards and Fields Text (new text in bold)
7 Seabird mitigation measures	<p><i>Tori pole</i> Indicate Y or No - whether the vessel uses a Tori pole when setting, this is mandatory in some areas. A Tori pole can have a number of different designs but is basically a pole with lines ribbons and other attachments to scare birds away from the branch line baits.</p> <p><i>Blue dyed bait</i> Bait that has been dyed especially to look blue. This has shown to reduce bird strikes in some trials.</p> <p><i>Underwater setting shoot</i> Some vessels may have special shutes or arms that protect the bait and take the line down to a depth before releasing the branch-line this makes it harder for birds to attack the bait.</p> <p><i>Disposal method for offal management</i> Most vessels discard their offal from processed fish by different methods, describe what the vessel does- example the vessel may just throw it over the side as they process the fish, they may accumulate offal in baskets and throw it over in one go, they may have machines that blends the offal and it is sprayed over the side.</p>	<p><i>Tori lines</i> Indicate Yes or No at the set level - whether the vessel uses a single or double Tori lines when setting, this is mandatory in some areas. A Tori line can have a number of different designs but is basically a pole with a line with ribbons and other attachments to scare birds away from the branch line baits.</p> <p><i>Blue dyed bait</i> Indicate Yes or No at the set level- whether the vessel used bait that has been dyed especially to look blue and whether this bait was thawed before dyeing.</p> <p><i>Underwater or side setting</i> Indicate Yes or No at the set level- whether the vessel used i) special chutes or arms that protect the bait and take the line down to a depth before releasing the branch-line, or ii) side-setting.</p> <p><i>Disposal method for offal management</i> Describe what the vessel does at the set level- for example the vessel may just throw it over the side as they process the fish, they may accumulate offal in baskets and throw it over in one go, they may have machines that blend the offal and it is sprayed over the side. Bis- Record if strategic offal disposal (dumping offal to attract seabirds away from hooks, or not dumping offal) is used.</p>
8 Hooking Location and Entanglement	NA	For the each observed silky and oceanic white tip shark, sea turtle, seabird or marine mammal , add three new codes to the existing ‘condition when caught’ fields: ‘hooked in mouth’, hooked deeply (throat/stomach)’, and for ‘condition when released’ fields: ‘hook and/or line removed’.