Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

Report of the Twentieth Meeting of the Scientific Committee

5 September 2015
Incheon, South Korea

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Agenda Item 1. Opening meeting

1. The independent Chair, Dr Annala, welcomed participants and opened the meeting.
2. The list of participants is at **Appendix 1**.

Agenda Item 2. Approval of decisions taken by the Extended Scientific Committee

3. The Scientific Committee endorsed all the recommendations made by the Extended Scientific Committee for the Twentieth Meeting of the Scientific Committee, which is at **Appendix 2**.

Agenda Item 3. Other business

4. There was no other business.

Agenda Item 4. Adoption of report of meeting

5. The report of the Scientific Committee was adopted.

Agenda Item 5. Closure of meeting

6. The next meeting of the Scientific Committee is proposed to be held on 11 September 2016, in Narita, Japan.
7. The meeting was closed at 5:58 pm, on 5 September 2015.

List of Appendices

Appendix

1. List of Participants
2. Report of the Extended Scientific Committee for the Twentieth Meeting of the Scientific Committee

Appendix 1

List of Participants
Extended Scientific Committee Meeting
of the Twentieth Meeting of the Scientific Committee

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
CHAIR								
John	ANNALA	Dr			NEW ZEALAND			annala@snap.net.nz
COMMISSION CHAIR								
Hyun-Wook	KWON	Ms	Director, Quarantine and Inspection Division	National Fishery Products Quality Management Service, Ministry of Oceans and Fisheries	337, Haeyang-ro, Yeongdo-gu, Busan, Korea	82 51 400 5710		6103kwon@naver.com
ADVISORY PANEL								
Ana	PARMA	Dr		Centro Nacional Patagonico	Pueto Madryn, Chubut Argentina	54 2965 451024	54 2965 451543	parma@cenpat.edu.ar
John	POPE	Professor			The Old Rectory Burgh St Peter Norfolk, NR34 0BT UK	44 1502 677377	44 1502 677377	popeJG@aol.com
James	IANELLI	Dr		REFM Division, Alaska Fisheries Science Centre	7600 Sand Pt Way NE Seattle, WA 98115 USA	1 206 526 6510	1 206 526 6723	jim.ianelli@noaa.gov
CONSULTANT								
Mark	BRAVINGTON	Dr	Research Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 3 6232 5118	61 3 6232 5000	Mark.Bravington@csiro.au

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
MEMBERS								
AUSTRALIA								
Ilona	STOBUTZKI	Dr	Assistant Secretary	Department of Agriculture	GPO Box 858, Canberra ACT 2601, Australia	61 2 6272 4277		ilona.stobutzki@agriculture.gov.au
Belinda	BARNES	Dr	Senior Scientist	Department of Agriculture	GPO Box 858, Canberra ACT 2601, Australia	61 2 6272 5374		belinda.barnes@agriculture.gov.au
Campbell	DAVIES	Dr	Senior Research Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 2 6232 5044		Campbell.Davies@csiro.au
Ann	PREECE	Ms	Fisheries Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 3 6232 5336		Ann.Preece@csiro.au
Rich	HILLARY	Dr	Senior Ecological Modeller	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 3 6232 5452		Rich.Hillary@csiro.au
Matt	DANIEL	Mr	Southern Bluefin Tuna Fishery Manager	Australian Fisheries Management Authority	GPO Box 7051, Canberra, ACT 2601, Australia	61 2 6225 5338		Matthew.Daniel@afma.gov.au
Brian	JEFFRIESS	Mr	Chief Executive Officer	Australian SBT Industry Association	PO Box 416, Fullarton SA 5063, Australia	61 4 1984 0299		austuna@bigpond.com
INDONESIA								
Saut	TAMPUBOLON	Mr	Deputy Director for Fisheries Resource in Indonesia EEZ and High Seas	Ministry of Marine Affairs and Fisheries	Jln. Medan Merdeka Timur No. 16, Gedung Mina Bahari II, Lantai 10, Jakarta Pusat, 10110 Indonesia	62 21 35190 70 ext. 1002		s.tampubolon@yahoo.com and sdi.djpt@yahoo.com
	ILHAM	Mr	Senior Officer of Directorate for Fisheries Resources Management	Ministry of Marine Affairs and Fisheries	Jln. Medan Merdeka Timur No. 16, Gedung Mina Bahari II, Lantai 10, Jakarta Pusat, 10110 Indonesia	62 21 35190 70 ext. 1002		

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
JAPAN								
Tomoyuki	ITOH	Dr	Group Chief	National Research Institute of Far Seas Fisheries	5-7-1 Orido, Shimizu, Shizuoka 424-8633, Japan	81 54 336 6000	81 543 35 9642	itou@fra.affrc.go.jp
Norio	TAKAHASHI	Dr	Senior Scientist	National Research Institute of Far Seas Fisheries	2-12-4 Fukuura, Yokohama, Kanagawa 236-8648, Japan	81 45 788 7501	81 45 788 5004	norio@fra.affrc.go.jp
Hiroyuki	KUROTA	Dr	Senior Scientist	Seikai National Fisheries Research Institute	1551-8 Tairamachi, Nagasaki 851-2213, Japan	81 95 860 1600	81 95 850 7767	kurota@fra.affrc.go.jp
Osamu	SAKAI	Dr	Researcher	National Research Institute of Far Seas Fisheries	5-7-1 Orido, Shimizu, Shizuoka 424-8633, Japan	81 54 336 6000	81 543 35 9642	sakaios@fra.affrc.go.jp
Izumi	YAMASAKI	Dr	Researcher	National Research Institute of Far Seas Fisheries	5-7-1 Orido, Shimizu, Shizuoka 424-8633, Japan	81 54 336 6000	81 543 35 9642	izyam@fra.affrc.go.jp
Doug	BUTTERWORTH	Professor		Dept of Maths & Applied Maths, University of Cape Town	Rondebosch 7701, South Africa	27 21 650 2343	27 21 650 2334	Doug.Butterworth@uct.ac.za
Ryo	OMORI	Mr	Assistant Director	Fisheries Agency	1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8907, Japan	81 3 3502 8459	81 3 3502 0571	ryou_oomori@nm.maff.go.jp
Yuji	UOZUMI	Dr	Advisor	Japan Tuna Fisheries Cooperative Association	31-1, Eitai 2 Chome, Koto-ku, Tokyo 135-0034, Japan	81 3 5646 2382	81 3 5646 2652	uozumi@japantuna.or.jp
Michio	SHIMIZU	Mr	Executive Secretary	National Ocean Tuna Fishery Association	1-1-12 Uchikanda, Chiyoda-ku, Tokyo 101-8503, Japan	81 3 3294 9634	81 3 3294 9607	ms-shimizu@zengyoren.jf-net.ne.jp

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
NEW ZEALAND								
Kevin	SULLIVAN	Dr	Team Manager Fisheries Stock Assessment	Ministry for Primary Industries	PO Box 2526, Wellington, New Zealand	64 4 819 4264	N/A	Kevin.Sullivan@mpi.govt.nz
Dominic	VALLIÈRES	Mr	Senior Fisheries Analyst	Ministry for Primary Industries	PO Box 2526, Wellington, New Zealand	64 4 819 4654	N/A	Dominic.Vallieres@mpi.govt.nz
Simon	HOYLE	Dr	Fisheries Scientist	National Institute of Water and Atmospheric Research (NIWA)	217 Akersten Street, Port Nelson 7010, PO Box 893, Nelson, New Zealand	64 3 548 1715	N/A	simon.hoyle@niwa.co.nz
REPUBLIC OF KOREA								
Doo Nam	KIM	Dr.	Senior Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2334	82-51-720-2337	doonam@korea.kr
Sung Il	LEE	Dr.	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2325	82-51-720-2337	k.sungillee@gmail.com
Mi Kyung	LEE	Ms.	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2338	82-51-720-2337	cc.mklee@gmail.com
Hee Won	PARK	Dr.	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2332	82-51-720-2337	heewon81@gmail.com
Ari	SHIN	Ms	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2336	82-51-720-2337	arishin8@gmail.com
Jeong Eun	KU	Ms	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2338	82-51-720-2337	red1594@gmail.com

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
OBSERVERS								
FISHING ENTITY OF TAIWAN								
Sheng-Ping	WANG	Dr	Professor	National Taiwan Ocean University	2 Pei-Ning Road, Keelung 20224, Taiwan (R.O.C.)	886 2 24622 192 ext 5028	886 2 24636 834	wsp@mail.ntou.edu.tw
I-Lu	LAI	Ms	Specialist	Fisheries Agency of Taiwan	8F., No.100, Sec. 2, Heping W. Rd., Zhongzheng Dist., Taipei City 100, Taiwan (R.O.C.)	886 2 23835 895	886 2 89987 395	ilu@ms1.fa.gov.tw
INTERPRETERS								
Saemi	BABA	Ms						
Kumi	KOIKE	Ms						
Yoko	YAMAKAGE	Ms						
CCSBT SECRETARIAT								
Robert	KENNEDY	Mr	Executive Secretary					rkennedy@ccsbt.org
Akira	SOMA	Mr	Deputy Executive Secretary		PO Box 37, Deakin West ACT 2600 AUSTRALIA	61 2 6282 8396	61 2 6282 8407	asoma@ccsbt.org
Colin	MILLAR	Mr	Database Manager					CMillar@ccsbt.org
Glen	Hong	Mr	Assistant					GHong@ccsbt.org

Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

Appendix 2

Report of
The Extended Scientific Committee for the
Twentieth Meeting of the Scientific Committee

1-5 September 2015
Incheon, South Korea

Extended Scientific Committee for the Twentieth Meeting of the Scientific Committee
1 - 5 September 2015
Incheon, South Korea

Agenda Item 1. Opening

1.1 Introduction of Participants

1. The Chair of the Extended Scientific Committee (ESC), Dr John Annala, welcomed participants and opened the meeting.
2. Each delegation introduced its participants. The list of participants is included at **Attachment 1**.

1.2 Administrative Arrangements

3. The Executive Secretary announced the administrative arrangements for the meeting.

Agenda Item 2. Appointment of Rapporteurs

4. Australia, New Zealand and Japan provided rapporteurs to produce and review the text of agenda items 6 to 14 inclusive.

Agenda Item 3. Adoption of Agenda and Document List

5. The agreed agenda is shown in **Attachment 2**.
6. The agreed document list is shown in **Attachment 3**.

Agenda Item 4. Review of SBT Fisheries

4.1. Presentation of National Reports

7. Japan tabled paper CCSBT-ESC/1509/SBT Fisheries-Japan that described the Japanese commercial longline fishery for SBT. In 2014, 90 vessels caught 3,371 tons and about 60,000 individuals of SBT. Following the CCSBT template, it described geographical distributions of catch and effort, nominal CPUE year trend, length frequency and fleet size. It also reported the results of cross-verification of datasets and advised that no substantial difference was found.
8. Japan presented paper CCSBT-ESC/1509/27 which reported on Japanese scientific observer activities for southern bluefin tuna fishery in the 2013 and 2014 calendar years. The revised observer coverage for 2013 was 10.2% of effort, with the coverage for 2014 being 15.2% of effort.
9. New Zealand presented paper CCSBT-ESC/1509/SBT Fisheries-New Zealand which describes its SBT fishery for 2014 and the 2013/14 fishing year.

Commercial landings were 825t for the period 1 October 2013 to 30 September 2014. There were no reported non-commercial SBT catch in 2014 based on reporting from recreational charter boat operators. From scaled observer data, it is estimated that there were no dead SBT discarded from the charter fleet and 276 from the domestic fleet during 2013/14. The particularly high number of dead releases in the domestic fleet are largely attributable to a single trip that was subject to predation from orcas. Nominal CPUE remained high in the charter fleet although down from its peak of 2010 while the domestic fleet reached the highest level seen in over 20 years. In recent years there has been a change in the distribution of fishing by the domestic fleet with more catch taken from the west coast of the South Island (CCSBT Area 6). Overall, 25% of the total catch (numbers) and 37% of the total effort (hooks) was observed in New Zealand in 2014. All four charter vessels were covered by observers in 2013/14, resulting in 71% of the catch and 83% of the total effort being observed. For the domestic fishery in 2013/14, coverage was 8% of catch and 11% of effort.

10. Taiwan presented paper CCSBT-ESC/1509/SBT Fisheries-Taiwan. For the 2013 and 2014 calendar years, the catches of SBT accounted for 1,004 t and 952 t, respectively. The catches for the 2013 and 2014 quota years took up 992 t and 968 t, respectively. The catches for these two years were below the allocated catch. Due to the lack of good catch rates for tropical tuna in tropical areas in 2013 and 2014, fishing vessels returned to engage in the SBT fishery and the number of SBT longline fishing vessel increased substantially to 76 and 71 respectively. The threat of Somalia piracy still exists in the tropical Indian Ocean. For safety, most of Taiwan's observers are deployed on fishing vessels that operate in the southern Indian Ocean, so the observer coverage rate for SBT fishing vessels increased substantially. For 2014, 11 observers were deployed on 11 fishing vessels authorised to seasonally target SBT. In 2014, the observer coverage rates were about 15.49% by vessel and 11.88% by hooks.

11. Indonesia presented CCSBT-ESC/1509/SBT Fisheries-Indonesia. In 2014 191 longliners caught 11573 individual SBT and about 1,063t. CDS data for 2014 indicated that the main catch was taken from statistical area 1 (75.3%) with length ranges of 40 to 300 cm FL, followed by area 2 (23.4%) with 80 to 188 cm FL, and then area 8 (1.3%) with 121 to 175 cm FL. While catch by size of vessel indicated that 25% of SBT were caught by large vessels with a size of ≥ 200 GT which operated in area 2 and 8, 18% (<30GT), 33% (30-100 GT) and 25% (100-200 GT) operated in area 1. Annual research projects consisted of collection of data on the ratio of green weight to gutted weight by on-board observers, collecting SBT otoliths in the spawning ground, and collecting samples to support close kin analysis in collaboration with CSIRO.

12. Korea presented paper CCSBT-ESC/1509/SBT Fisheries-Korea. The SBT catch for the 2014 calendar year by the Korean tuna longline fishery was 1,044 t with 9 active vessels. In general, Korean SBT fishing vessels operated in the Western Indian Ocean (10°E-50°E) from April to July/August and in the Eastern Indian Ocean 90°E-120°E from July/August to December. For the 2014/15 fishing year, they moved further westward than previous years and operated in the Atlantic Ocean in the area between 20°W-15°E, then in the eastern Indian Ocean off Western Australia. SBT catch and effort were relatively higher in the Western Indian Ocean (area 9) than usual, and the fishing season finished earlier, in September. Since the 1st of September 2015, the Act on Fisheries Information

and Data Reporting will be revised to report the catch statistics to the National Fisheries Research and Development Institute (NFRDI) from a weekly to a daily basis through the electronic reporting system in order to manage/cross check the data in real time.

13. CCSBT-ESC/1509/SBT Fisheries-Australia was presented describing the 2013–14 SBT fishing season report. The report summarises catches and fishing activities in the Australian SBT fishery up to and including the 2013–14 fishing season1 (December 2013 – November 2014) and some preliminary results of the 2014–15 season (December 2014 – November 2015). It also provides a summary of the history of the Australian SBT Fishery and fishing by Japan in the Australian Fishing Zone under bilateral access agreements. Australia's allocation as agreed by the EC was 5193 t for the 2013–14 fishing season. However, this was adjusted to account for undercatch in the previous fishing season so the effective TAC was 5312 t. A total of 25 commercial fishing vessels landed SBT in Australian waters in the 2013–14 fishing season for a total catch of 5420 t. A total of 92.8% of the catch was taken by purse seine with the remainder taken by longline. Six purse seiners fished off South Australia for the Australian farming operations during the 2013–14 fishing season. Most of the purse seine fishing commenced in mid-December 2013 and finished in early February 2014. Length frequency data from the purse seine fishery from 2005–06 to 2006–07 indicated a shift to smaller fish, but this trend has showed signs of reversal since 2007–08, possibly due to the targeting of larger fish. The average length of SBT transferred to farms in South Australia in 2014–15 was 94.4 cm. In the 2014–15 fishing season, observers monitored 9.1% of purse seine sets where fish were retained for the farm sector and 19.9% of the estimated SBT catch. In 2014, observers monitored 3.1% of longline hook effort in the Eastern Tuna and Billfish Fishery during the months and in the areas of the SBT migration through that fishery. Observer coverage of longline hook effort in the entire Western Tuna and Billfish Fishery was 9.1% in 2014. Paper CCSBT-ESC/1509/08 which describes Australia's data preparation and validation process was noted.

14. Members tabled their national reports and in response to questions from participants, the following was provided to clarify the information in reports:

    - Japan advised that the release and discard practices differed between vessels and that there is large spatial and temporal variation in these practices. It is difficult to provide a rule that describes these practices because it is subject to individual vessel behaviour based on economic reasons.
    - New Zealand explained that the reduction in recreational charter catch was likely due to operational changes rather than availability of SBT with a number of operators exiting the fishery since mandatory reporting began.
    - Indonesia noted that no SBT catch was landed in Jakarta in 2014 and that there is no transhipment of SBT by Indonesian vessels. There was a concern due to the increase in catch of smaller size fish and whether they were caught on the spawning ground. Indonesia advised they probably came from catch in area 2 and 8, and that they contributed about are quarter of the total catch.
    - Korea advised that the lack of observer coverage in area 9 during 2014 was because fishing in this area had already been completed by the time that the observer program design had been completed. Size data have been mainly

collected through the observer program. From this year, CDS information will be used for collecting size data.

- Australia noted that the increase in its longline catch was due to changes in quota availability. The low (3.1%) observer coverage for its longline fleet in 2014 was because the fishery was moving to monitoring by electronic cameras, but that this did not go ahead on the scale anticipated. However, for 2015, it is expected that the fishery will be fully covered by electronic observation. Australia also advised that its project to develop a method for estimating recreational catch is due for completion in around September or October 2015, and will be publicly available soon after that. Australia noted a summary of other species catch recorded by observers was provided in the report to the ERSWG and can be added to next year's report.

15. The European Union (EU) was not present to respond to questions on its national report, so the meeting agreed to send the following questions to the EU:

    - A zero SBT catch has been reported by the EU for 2013, 2014 and 2015. What level of confidence does the EU have in these zero catches given the low level of observer coverage for the relevant part of the EU fleet?
    - The data in the EU's national report is based on the swordfish fleet. It would be useful to have the same reporting based on the blue shark fisheries as the range overlap is similar to SBT.

16. The ESC noted that South Africa and the Philippines did not provide national reports to the meeting and requested that reports be provided in the future.

4.2. Secretariat Review of Catches

17. The Secretariat introduced paper CCSBT-ESC/1509/04. The reported SBT catch for the 2014 calendar year was 12,745 t, an increase of 65 t or 0.5% from the 2013 calendar year. The global reported SBT catch by flag is shown at **Attachment 4**. The paper included late upward revisions of South Africa's 2013 and 2014 catches which were provided after the annual data exchange was completed. The paper also included comparisons of global TAC against reported catch which showed that reported catch exceeded TAC by 485 t and 354 t for 2013 and 2014 respectively.

18. It was suggested that future comparisons of reported catch against the global TAC could include details of carry-forward of uncaught allocations where applicable.

Agenda Item 5. Report from the SFMWG meeting

19. The Secretariat summarised relevant aspects of the report of the Strategy and Fisheries Management Working Group (SFMWG) held on 28-30 July 2015 in Canberra, Australia (CCSBT-ESC/1509/Rep01). The SFMWG agreed to conduct a reduced aerial survey in 2016 that involved using one plane for three months and a second plane for one month. However, after the SFMWG meeting, it was determined that this option could not be conducted unless a three year commitment to the aerial survey was made. Consequently, CCSBT Members

decided to conduct an aerial survey in 2016 using a single plane together with calibration of a new spotter. The SFMWG requested that the ESC provide advice to the Extended Commission (EC) in 2015 on:

- The ESC's relative research priorities for 2016 to 2018 inclusive, noting that the research budget is limited;
- The costs and benefits of continuing with the current MP including conducting the aerial survey from 2017 to 2019; and
- Any preliminary consideration of alternatives to the current MP approach including an indication of their relative costs and benefits if possible.

20. The ESC's advice is provided in agenda item 13.

21. In addition, the SFMWG4 requested that the ESC commence assessment and provide as much advice as possible on the relative merits of the alternatives to the current approach to the MP for reporting back to the EC in 2016.

22. The meeting noted that the SFMWG also requested that the ESC consider the implications of unaccounted SBT mortalities (UAM) in the review of the MP and its application.

Agenda Item 6. Report from the OMMP meeting

23. The Chair of the Operating Model and Management procedure Technical Group (OMMP), Dr Ana Parma, provided a report on progress made in OMMP 6 (immediately before the ESC20, 30-31 August 2015).

6.1. Technical implications of changes to the scientific aerial survey

24. In light of the requests made by the SFMWG the agenda for the OMMP was focused mainly on the "Technical implications of changes in the AS on the MP process, including the possible discontinuation of the AS beyond 2016". Topics discussed under this agenda item included:

- Value of the AS as input to the MP and the costs of losing it;
- Performance of the AS as an index of recruitment and as input to the OM;
- Alternative indices of recruitment; and
- Alternatives to the current MP.

6.1.1 Value of the AS as input to the MP and implications for cancelling the AS beyond 2016

25. Before the meeting the technical WG had evaluated the implications of using an AS with lowered-precision (due to a reduction in the scale of the survey) as input to the MP. The results of those trials (CCSBT-SFM/1507/09) indicated that the performance of the MP was virtually unaffected for the range of survey precision examined.

26. Further tests were conducted intersessionally and during the meeting; these involved comparisons of performance of the current MP with and without the AS under a number of scenarios.

27. The results evaluated during the meeting indicated that:

    - Under the reference set of OMs, the probability that the SSB attained the interim rebuilding target by 2035 was virtually unaffected by the removal of the AS.
    - The catches however could be affected, as an MP without the AS would be slower to increase the TAC in response to increases in biomass as the stock rebuilds. There was an appreciable opportunity loss in TAC (i.e. value of foregone TAC relative to costs of the AS) in the absence of the AS.

28. In terms of the risk of further reductions in SSB, the new tests conducted involved more extreme scenarios with respect to the extent of a recruitment failure in the immediate future either per se or in combination with a change in catchability introducing bias in the future CPUE. These tests indicated that in the face of these more extreme scenarios the MP without the AS resulted in appreciable increases in risks to the stock (probability of decline below 2014 levels of SSB) and in achieving the rebuilding target of the CCSBT.

29. The additional robustness trials explored included:

    - Base case_noAS (**base2013sqrt** grid configuration) with the aerial survey removed;
    - *lowR10:* first 10 years recruitment @ 50% of expected;
    - *lowR10_noAS:* first 10 years recruitment @ 50% of expected with no aerial survey; and
    - *Upq2018 (35% catchability increase)* from 2018 onwards crossed with the lowR10 and lowR10noAS scenarios

30. The SSB summary statistics presented are: Probability of attaining the interim rebuilding target - p (B>0.2B0) - in 2035 and 2041, and the lowest future SSB level attained in projections relative to the SSB level in 2014 (Bmin/B2014). The 2041 statistics were included to explore potential transient effects on future catches. Table 1 shows the SSB rebuilding statistics for the recruitment failure scenarios (*lowR10*) and where the CPUE experiences a 35% catchability increase in 2018 (which continues to apply thereafter) (upq2018). Table 2 shows the average annual catch statistics for these scenarios in 10 year blocks.

Table 1. SSB rebuilding statistics for recruitment failure scenarios including the upq2018 robustness test as an example of CPUE failing to track abundance proportionally. Bmin is the lowest value of the trajectory. Figures in parenthesis are 0.1-0.9 probability intervals.

Scenario	**p(B35>0.2B0)**	**p(B41>0.2B0)**	**Bmin/B2014**
Base	0.71	0.75	1.09 (1.07-1.11)
Base_noAS	0.73	0.80	1.09 (1.07-1.11)
lowR10	0.38	0.59	1.09 (1.02-1.11)
lowR10_noAS	0.32	0.5	1.09 (0.8-1.11)
lowR10_upq2018	0.31	0.5	1.09 (0.97-1.11)
lowR10_upq2018_noAS	0.23	0.38	1.08 (0.63-1.11)

Table 2. Catch statistics (in thousands of t) for recruitment failure scenarios including the upq2018 robustness test as an example of CPUE failing to track abundance proportionally.

Scenario	**E(TAC) (2016-2025)**	**E(TAC) (2026-2035)**	**E(TAC) (2036-2041)**
Base	18.2 (14.9-19.2)	23.8 (15.9-29)	28.3 (18.9-36.2)
Base_noAS	17.2 (15.2-19.1)	20.7 (15.2-26.1)	24.7 (17.4-31.1)
lowR10	14.9 (13.3-17.9)	12.8 (8.2-20.2)	18.9 (12.1-26.5)
lowR10_noAS	16.6 (14.8-18.5)	14.6 (11-19.6)	17.8 (12.2-23.6)
lowR10_upq2018	15.8 (13.5-18.7)	14.3 (8.6-23.0)	20.1 (13.0-29.3)
lowR10_upq2018_noAS	17.6 (15.5-19.1)	17.1 (12.5-22.7)	20.1 (13.5-27)

31. The quantitative analysis of AS data in the MP demonstrates the value of the AS as a fishery independent recruitment index in the MP.

32. Overall, these numerical results emphasise the value of having a reliable index of juvenile abundance to detect possible recruitment failures, especially when there is a possibility that changes in catchability affect the ability of the CPUE to detect those recruitment failures.

6.1.2 Performance of the AS as an index of recruitment and as input to the OM

33. Relative to other recruitment indices considered, the AS index is the most consistent with recent OM estimates, and provides the earliest and only direct information on recruitment in the OM in the most recent years.

34. The AS data are valuable as a fishery-independent index of recruitment given reliance on fishery dependent long-line CPUE in the OM, and problems with unresolved uncertainties related to the market anomaly in the past. Because the AS design, data, standardisation, consistency with other data and ability to provide information on recruitment have been evaluated in a series of reviews, the ESC agreed in 2005 that the index be included in the OM, and in 2008 it agreed to include it in the MP given an historically low series of recruitments (1999-2002).

6.1.3 Alternative indices of recruitment

35. The meeting participants collated the information on all of the potential alternative recruitment indices and discussed their limitations and benefits, spatial temporal coverage, consistency over time, scales on which the data were collected and component of the stock that they cover. Table 3 summarises qualitative attributes of the different recruitment indices discussed. The need for a fishery independent index of recruitment was highlighted, given the historical problems with the CPUE data. The AS, troll survey and gene-tagging are the only current candidates. The AS index is the only currently available and accepted candidate.

36. The OMMP working group had agreed:

- A fishery independent index was required for use in the MP;
- For development of a new MP in the near term, gene-tagging would provide the best recruitment indicator.

Table 3. Alternative recruitment indices qualitative summary.

	Inform stock trend/status?	How useful for MP?	Useful in stock Assessment?	Improvements needed to be useful within an MP
	Attribute	**Input to 'Decision Rule'**	**Input to Stock assessment**	**Research needed**
Aerial Survey	2-4 year olds (aggregated)	Yes – fishery independent recruitment index in Bali MP	Yes – fishery independent recruitment index	Nil
SAPUE	2-4 year olds (aggregated)	Unlikely, also currently unavailable and may continue to be so in future	No, used qualitatively as indicator	Constraints unlikely to be resolved. Shift in coverage compromises interpretation as index.
Gene tagging	Juveniles (2yr old, possibly 3yr olds)	Yes, good prospect subject to pilot study outcome.	Yes–fishery independent recruitment estimate, estimation of F & M	Initial experiment to provide initial rec estimate and refine field operations
LL CPUE (age-specific)	Juveniles (2,3,4 yr olds)	Unlikely	No, used qualitatively as indicator	Formal design study including estimation of CV and process error Careful age-composition estimation
Grid-type Troll Index (GTI)	Age 1	Potentially, contingent on results of additional research	No, used in robustness test and qualitatively as indicator, potentially in future	Field method details Design study to determine required sampling effort for desired CV, including process error and alternative forms for incorporation in MP Further evaluation of environmental covariates, and temporal trend in residuals

6.1.4 Alternatives to current MP

37. At the request of the Extended Commission, the OMMP working group started to consider the suitability (e.g. data quality and cost effectiveness) of developing an MP with recruitment information from sources other than the AS (e.g., gene tagging, trolling survey, CPUE from young age classes etc.) or only with long-line CPUE.

38. The OMMP working group concluded that there was no replacement MP that could be rapidly developed. It was also agreed that an MP based only on fishery dependent data, CPUE only, was unacceptable given the low status of the spawning stock and in the absence of a reliable recruitment index to monitor possible recruitment failures.

39. A new MP would need to be designed, or potentially modified from the current MP. It was acknowledged that the development of a new MP would be a costly and time-consuming exercise, and would need to include:

    - Evaluation of the quality of new candidate indicators of recruitment;
    - Adjustments to the OMs to accommodate the use of these new indicators as inputs to the MPs; and
    - Development and assessment of performance of the candidate MPs.

40. The schedule and tasks needed for the development of a new MP were outlined in order to help in evaluating costs associated with having to replace the current MP in the event that the AS was discontinued.

41. The OMMP working group had deferred further discussion of development of a new MP to the ESC.

6.2. Reconsideration of OM structure

42. This sub-agenda item was deferred given the requests from the Extended Commission and SFMWG related to the AS and future of the MP. However, progress made in 2014 in the handling of within-cell uncertainty was presented. It was recommended that this be included in the next MP evaluation noting that inter-sessional work is required to incorporate these changes.

6.3. Other issues

43. OMMP Agenda Item 3, technical issues for evaluation of unaccounted sources of mortality, was deferred to the ESC.

44. OMMP Agenda Item 4, code refinements and version control system, was discussed by a small group which will continue to work intersessionally.

Agenda Item 7. Implications of changes in the scientific aerial survey on the MP process

45. CCSBT-ESC/1509/12 on the MP meta-rules was presented, and details are included below.

46. CCSBT-ESC/1509/9 presented information on the implications of cessation of the aerial survey (AS) for the management procedure (MP) and TAC setting. The AS index of juvenile abundance provides essential fishery independent information on recruitment for the CCSBT MP and meta-rules processes and schedule of events; 1) The AS index is used in the annual indicator-based review of the stock and consideration of exceptional circumstances, 2) the index is an input data series for the CCSBT operating models (OMs), which are used for assessment of the status of the stock every three years, management strategy evaluation of MPs, and will be central to the scheduled review of the MP in 2017, 3) the aerial survey data is one of two data series, and the only fishery independent data, used in the MP decision rule adopted by the CCSBT for recommending TACs. The value of the component of historical and future TACs that can be attributed to the aerial survey exceed the costs of the aerial survey by an order of magnitude. In 2008, the ESC agreed that candidate MPs must include the AS index to provide an earlier signal of year class strength, and due to the concern of relying on an MP using CPUE only, given unresolved uncertainties in the historical time-series. Potential alternative sources of information on recruitment are considered. Cessation of the aerial survey beyond 2016 would mean the Extended Commission would cease to have a scientifically tested, explicitly precautionary, rebuilding plan for the SBT stock. It would also mean under-utilising substantial investments in research and monitoring to develop the current MP and potentially foregoing large future catches that would otherwise have been possible under the agreed MP.

7.1 Implications of cancellation of the aerial survey in 2015

Implications for recruitment monitoring

47. The AS index is used in the annual review of indicators of stock status and related consideration of exceptional circumstances. To date the AS index has been the only accepted quantitative fishery-independent indicator of recruitment. Recruitment monitoring and detecting and responding to periods of low recruitments, and the associated risks of further decline in SSB, has been a high priority for the Extended Commission. Given that the SBT stock is depleted, and a substantial proportion of the catch is taken from the juvenile and sub-adult components of the stock, continued recruitment monitoring is essential for early warning of possible low recruitments in the future, as indicated by the analyses conducted at OMMP meeting (agenda item 6).

Implications for the operating models

48. The aerial survey provides fishery-independent information on recruitment that has been critical in the CCSBT Operating Model (OM) used for development and testing of MPs and for periodic assessments of stock status.

49. The fit and influence of the AS index in the OM was discussed extensively at the OMMP meeting and in comparison to other recruitment indices currently available. The AS index was shown to be the most consistent with predictions from the OM even when the AS data were not included in the conditioning of the OM. The gridded trolling index, which was the other fishery independent index considered in comparisons, showed higher variability and a trend in residuals. The AS index provides the earliest direct information on recruitment estimates in the OM. High recent estimates of recruitment from the AS are not outside the range of predicted values (in "high aerial CV" robustness test) and will be down-weighted when used in the MP. The missing 2015 data point can be accommodated in the OM. If the AS is conducted in subsequent years it will provide data on recent recruitments in 2016 and 2017 for the scheduled 2017 stock assessment and for use in operating models for MP review.

Implications for the MP

50. The MP specifications and meta-rules adopted by the CCSBT (Anon 2013, Attachment 10) provide the over-arching framework for recommending TACs the implementation of the MP. This framework includes the AS as the only fishery independent data used in the MP decision rule for recommending TACs. The MP is a central component of the SBT rebuilding plan. The AS index is a required component of the MP, and without it the MP cannot be used to recommend TACs. The next scheduled TAC setting is in 2016, and the ESC has agreed that the MP can be run with a missing 2015 data point if there is AS data from 2016.

51. At the time of cancellation of the 2015 aerial survey, it was suggested by the EC that, perhaps, the aerial survey could be run every other year. It has been clarified that this is not feasible from a logistics perspective (see Davies 2015b and CCSBT–SFM/1507/09). An aerial survey "every-other-year" would also constitute a new MP that would need to be fully evaluated.

52. Re-tuning of the current MP was also suggested by the Extended Commission in 2014. As noted by the ESC, the adopted MP cannot be run without AS data in the

future. Re-tuning is not required to run the current MP with a single missing data point in 2015 and a reduced aerial survey in 2016.

7.2 Implications of cancelling the 2016 aerial survey

53. In the case that the 2016 AS data point is not available, the MP could not operate and exceptional circumstances would be triggered. The MP is scheduled to be used in 2016 to recommend the 2018-2020 TACs, and therefore alternatives for setting the TACs would need to be sought. The meta-rules process for transitioning to a new MP would need to be implemented urgently.

54. The recommendation of the ESC, based on the inter-sessional work of the OMMP-WG, to the SFMWG4 (CCSBT–SFM/1507/09) was that the aerial survey for 2016 should proceed to allow the use of the MP to recommend the 2018-2020 TAC in 2016. The SFMWG4 agreed to fund the aerial survey, in a reduced form, in 2016. It was noted that there is a risk that the 2016 aerial survey may be restricted by weather or equipment failures that would result in an incomplete survey, and an index that is not useful for the MP. If there is bad weather, then fewer survey transects will be flown. There will also be limited opportunity for calibrating an additional spotter. Any breakdowns in equipment or loss of availability of personnel will be a risk to the completion of the survey.

7.3 Implication if aerial survey ceases after 2016

55. If the aerial survey is discontinued after 2016, a new MP will need to be developed, which will take additional time and funding to complete. In the interim, the CCSBT will be without a tested and agreed rebuilding plan.

56. As noted above, the current MP incorporates the AS index as a monitoring series of recruitment. The continuity of the MP is important as it contributes to performance in that the feedback mechanism in the MP will correct future TACs. If there is no AS beyond 2016 and no MP in place, this will need to be considered as part of the meta-rule process in 2016 and 2017 and beyond.

57. CCSBT-ESC/1509/12 reviewed the MP Specification and Meta-rules is the agreed framework for the implementation of the Bali Procedure (ESC18, Attachment 10). These include the objectives and performance measures for the rebuilding of the stock; the detailed specification of the MP itself (monitoring series, analyses, harvest control rule and implementation); the schedule for TAC recommendations, periodic assessments of stock status, formal review of MP performance; and the process and criteria for identifying exceptional circumstances (i.e. circumstances/events outside the range for which the MP was tested during the Management Strategy Evaluation (MSE) phase of development). The paper reviewed the purpose and function of the Meta-rules with a particular focus on: i) the identification of exceptional circumstances and the actions that may flow when they are identified. It presented four potential options, in terms of implications for the MP, TAC recommendations and, depending on the Extended Commission's decision on the Aerial Survey beyond 2016.

58. CCSBT-ESC/1509/12 considers the implications of the aerial survey not continuing beyond 2016. This situation is less straightforward in the context of

exceptional circumstances, as it is a potential future event. However, were it to transpire, it would clearly represent exceptional circumstances as: i) it would not be possible to use the agreed MP to recommend future TACs, and; ii) there would be no recognised source of recruitment monitoring available to replace the survey index. Such a situation would require the development of new recruitment indices, new MPs and full MSE testing. This would entail considerable addition cost and time before a robust MP could be used to recommend TACs consistent with the Extended Commission's objectives for minimising the risk of future declines and rebuilding the spawning stock.

7.4 Costs and benefits of continuing with the adopted MP or development of a new MP

59. The main benefit of the adopted MP is having a scientifically tested rebuilding program for the stock – the first international tuna fishery to do so (Hillary et al 2015b). There has been a substantial investment in research and monitoring, by Members and the Extended Commission, to develop, test and implement the current MP. The adopted MP has been used successfully as the basis to set TACs for 2011-2017.

60. The quantitative value of the TAC increases that are attributable to the aerial survey component of the MP decision rule was discussed. For both historical and potential future TACs, the value of TAC increases related to the aerial survey component in the MP decision rule far exceeded the costs of the survey.

61. If the aerial survey does not continue in 2016 or beyond, and there is no alternative MP to recommend TACs, then precautionary TACs will need to be set and would likely involve appreciable catch losses relative to those anticipated under the current MP. There is not sufficient time to complete the required management strategy evaluation to test performance and robustness of alternative MPs before the scheduled 2018-2020 TAC recommendation in 2016.

62. The adopted MP and CCSBT SRP includes a method for transitioning to a new MP, via the MP review process (scheduled for 2017), which includes setting out a timetable for the transition, new monitoring indices and forms of MP.

63. If the aerial survey occurs in 2016, as agreed by the SFMWG, but does not continue beyond, a new MP will need to be developed as the current MP will not be operable. This would involve substantial inter-sessional work and costs (for both Members and the Extended Commission) as described below. This additional ESC work is likely to mean that other ESC work would be delayed or constrained. There is a risk that the work may not be funded and completed in time for the setting of the next TAC block (2021-2023) scheduled for 2019.

7.4.1 Process and costs for development of a new MP

64. In the event that a new MP is needed, the process steps, meetings required and estimates of costs involved were considered. Table 4 below provides a schedule for reviewing and developing alternative recruitment monitoring indices, and MP development, testing, adoption and implementation. This would constitute substantial additional work for the ESC.

Table 4. Preliminary schedule for development of alternative recruitment monitoring series and MP development and testing. Note shaded events (numbered with suffix "i") represents an intersessional activity, all activities are relative to year "y" which would be the year the Extended Commission requests a new MP be developed.

No.	Activity/Meeting	Purpose	Timing
1i	Evaluation of potential recruitment indices	Provide detailed evaluation of the statistical properties of potential recruitment indices	Nov in year "y"-May y+1
2	OMMP	Evaluate and select candidate indices	June-July y+1
2i	Initial conditioning	Initial conditioning, data generation etc.	
3	OMMP-ESC	Review of initial conditioning, data generation for projection models and form of potential MPs. These MPs may need to be quite different from the existing MP.	Sept y+1
3i	Finalise conditioning	Update OM with most recent data. Complete data-generation and specification of candidate MPs.	
4	OMMP	Finalise conditioning, data generation and initial MP runs	June-July y+2
4i	Refine MP performance	Refine MP performance and robustness tests	
5	OMMP-ESC	MP selection	Sept y+2
5*i*	MP TAC recommendation	Any refinements required from ESC	
6	Sp. Commission	MP adoption	
7	OMMP	Refinement and final tuning, if required	June-July y+3
8	ESC	Final review	Sept y+3
9	Commission	Final Adoption/Implementation	Oct y+3

65. Evaluation of recruitment indices was undertaken as part of the OMMP work in 2015. It was agreed that a fishery independent recruitment index is required in the current MP and in any future MP, and that gene-tagging would provide the best fishery independent recruitment index for use in a new MP in the near term. The ESC agreed that a CPUE only MP was not acceptable because CPUE is fishery-dependent index and might be affected by changes in fleet behaviours.

66. Options for development of a new MP are discussed under the SRP agenda item 12.

Agenda Item 8. Report from the CPUE modelling group

67. CCSBT-ESC/1509/39, the report of the CCSBT CPUE Modelling Group 16th /17th June 2015 Web Meeting was presented by the group's chairman (Professor John Pope). The main tasks of the meeting were:

- To check that the current Base CPUE series continues to behave adequately;
- To develop and encourage new work on CPUE.

68. Under the first task the group compared Japan's Base CPUE series with the available monitoring series. It was noted that generally the monitoring series and the base series were in close accord. The only monitoring series showing some deviation in recent years was the reduced base series but, since this is developed without interaction terms, this divergence was not considered to be too concerning. Overall the group was happy to endorse the Base series at this stage. It was agreed that the standard tests of the Base series of Japan's CPUE would be available for the ESC.

69. Under the second task the group were updated on progress with CPUE series from Taiwan and Korea. Papers on these have subsequently been reported to the ESC. Indonesia reported that work on CPUE was ongoing. New work included a paper presented on possible methods for including size or age information into CPUE calculations and an insightful paper on a specific example based upon Japan's CPUE. This illustrated usefully how age based CPUE provides validation of recent increasing trends in CPUE. Additionally an interesting paper was presented on the use of the technique of random forests to the problem of estimation of non-Member's catches using Members' CPUE and international fishing effort.

70. The group remains committed to developing testing and improving CPUE series for use in MP work and for the wider understanding of SBT dynamics.

71. The group also met in the margins of the ESC to discuss and give further consideration to papers that were of relevance to the group's work but which are referred to and used elsewhere in the ESC agenda, and to discuss their intersessional work programme for 2016. The report of their discussions is recorded at **Attachment 5**.

Agenda Item 9. Estimation of all sources of unaccounted catch mortality

72. The discussion was structured around the potential sources of unaccounted catch mortality as the same as ESC19's discussion, which was identified in the EC's request.

Unreported/uncertain retained catch by Members

73. Japan presented paper CCSBT-ESC/1509/32, which provides an update of unaccounted catch mortality in Australian SBT farming in 2015. Estimated growth rates based upon the 40/100 fish size sampling were very much higher than those from SRP tagging data and those of other farmed Thunnus species including Pacific bluefin tuna, and hence appear to be highly unlikely. Using the SRP tagging growth rate, the annual amount of catch was estimated to be higher than reported by between 724 and 2,546 tons, with a best estimate of 1,702 tons. As a proportion of the reported catch, this excess ranged from 14% to 56% with a best estimate of 35.5%, and shows an increasing trend over time. The authors stated that most suggestions given for their previous analyses had been addressed. They also suggested that it would be valuable to evaluate catch sizes further by analysing CDS data, which include individual body weight

information for all of the farmed individuals that Australia has reported to Secretariat. Further they suggested that the ESC should dispel concern regarding this uncertainty about catch by recommending immediate implementation of the stereo video camera system to provide reliable length data.

74. Australia presented paper CCSBT-ESC/20/35 reviewing the tuna growth rates in farming operations of SBT, Atlantic Bluefin Tuna (ABT), and Pacific Bluefin Tuna (PBT), as well as data from Mexico on bigeye and yellowfin tunas. The Australian paper updated their previous growth paper (CCSBT-ESC/1409/11). The paper aimed at checking the scenarios being considered by the ESC by testing them against the literature on growth in farming and in the wild. Australia pointed to the references in its 2014 and 2015 papers indicating that the results from Japan's methodology on farm growth were inconsistent with the evidence. One example was that the results of Japan's methodology produced a Feed Conversion Ratio (FCR) which if correct would mean that farming in Australia could not be commercially viable. Another example was Japan's contention that tagging had no real impact on the tagged SBT. Aside from the literature referenced to in ESC/20/35 showing the impact of tagging, CSIRO literature had pointed to the differences in fish behaviour between SBT tagged by different taggers.

75. In commenting on Japan's paper CCSBT-ESC/1509/32, Australia expressed concerns previously raised with the approaches and data used in the analysis; they considered that these concerns remained and therefore they could not accept the results. In particular, the updated method was dependent on a substantial number of assumptions and the analysis has not looked at the impact of these assumptions on the outcomes. Japan responded that they understand that the results are sensitive to the assumptions made, but consider the sensitivity is not sufficiently substantial, to distort the results.

76. Australia also outlined the implications of Japan's conclusions in Table 3 of the paper for length growth in Australian farms. Australia referred particularly to the implications for the Condition Index (CI), used to measure fatness and quality. Japan's methodology regarding growth in farms appeared to produce a CI for Australian farmed SBT which was far below sashimi quality and was equivalent to or below the CI for young wild SBT, often discarded by longliners. This indicated that if Japan's methodology was correct then it was not plausible that farming of SBT in Australia could be commercially viable. In light of this, Australia again requested that Japan provide the raw data being used by Japan, without identifying the source of the data.

77. Australia expressed concerns previously raised about some of the data used in Japan's papers. First, Japan's paper still used the 1963 Robins data on SBT length which had been superseded by the later CSIRO work on increases in SBT growth. Japan clarified that they had used Robins' data only for length-weight relationships, and requested evidence of different length-weight relationships between wild and farmed fish. Secondly, Australia suggested that Japan's paper understated the growth rate in Pacific bluefin farms, according to data referenced in CCSBT-ESC/20/35.

78. Japan commented that there are a number of years of CDS data that could assist the ESC to resolve the issue and again asked Australia to provide those data. Australia responded that the approaches suggested to address this and other

potential concerns with uncertainty in Members' catches were outlined in Attachment 5, ESC2014; addressing these required data provision related to a range of issues.

79. In response to a question from NZ on paper CCSBT-ESC/20/35 on how the stress of tagging compared with the stress of farming, Australia commented that farming was much less stressful. For example, the tagging of a fish involved hooking it out of the water onto a deck, appreciable handling, body insertion, re-handling and release into the water. In farming the SBT were never touched or hooked – except for the weight sample of about 3,000 SBT each year. The result was in-farm mortalities of below 0.5% in 2015.

80. Japan requested Australia to calculate costs in two ways. For the mean body weight at the onset of farming, one is based on Japanese estimates and the other is based on 100 fish sampling. In Japan's calculation based on parameter values in the CCSBT-ESC/20/35, the cost calculation was not reasonable even in the 100 fish sampling case.

81. The chair commented that this issue was ongoing and expressed the view that it would not be resolved in the ESC without a prior full independent review.

Catch by non-Member fleets

82. Australia presented paper CCSBT-ESC/1509/10 to contribute to the 2014 ESC and EC requests to investigate options to estimate unaccounted mortality resulting from potentially unreported catch by non-Member fleets. The paper describes an analysis that builds on previous work which described overlap of longline effort in the Indian Ocean recorded in IOTC databases with regions where SBT is harvested, to provide estimates of catch that could be used in sensitivity analyses. The approach uses the random forests machine learning algorithm to fit prediction models for the catch of SBT in the Indian and Pacific Oceans. The models use characteristics of the effort and the CPUE of other tuna and billfish species which are assumed to be reliably recorded for all fleets. The model is fitted to aggregated CPUE data from CCSBT Members, and used to predict catch of SBT by non-Members for the years 2007-2013, based on their recorded effort and the catch rates of IOTC or WCPFC target species. Random forest methods are also used in a classification guise to assign selectivity of the non-Member SBT catch; this is to enable inference of the age classes of SBT captured by the non-Member fleets as necessary for incorporation in stock assessment scenarios. The estimates of catch range from 279 t (80% prediction interval: 130 t, 566 t) to 779 t (321 t, 1600 t) for the Indian Ocean and 0 t to 70 t (33 t, 237 t) for the Pacific Ocean. These estimates should be considered indicative rather than authoritative, but may be appropriate for analysis of the sensitivity of the operating model to plausible non-Member catch.

83. New Zealand presented paper CCSBT-ESC/1509/21 on estimating SBT catches by Non-Members of CCSBT. Information on longline fishing effort in the Indian Ocean and the Western Pacific were obtained from the IOTC and WCPFC. In order to obtain a sufficiently large dataset of CCSBT catch and effort data, Japanese catches by number were converted to catches in weight, by modelling fish size patterns in space and time. Catch rates (in weight per hook) were modelled to estimate expected catch rates by year, month, flag, and 5 degree square, with catchabilities of the Japanese and Taiwanese fleets used as

alternative assumptions for catchability associated with non-Member effort. These expected catch rates were combined with reported non-Member fishing effort by year, month, and 5 degree square, in order to predict expected catches. The resulting catch estimates for the Indian Ocean were lower than the estimates using the Random Forests method, and the authors noted that the Random Forest analysis did not use the full Japanese dataset for the Indian Ocean. The estimates for the Western Pacific that assumed the Japanese catchability were of a similar order to estimates from the Random Forests method, which did use the Japanese data in the Western Pacific.

84. The meeting discussed the reliability of the methods used in the two papers presented (comparison Figure 1 below). The group discussed the value of pursuing the issue further, given that the numbers mentioned were relatively low in most years. However, it was noted that one method produced estimates for the Indian Ocean that were substantial in some years, and that the estimates did not include potential non-Member catches in the Atlantic Ocean. It was agreed that given the status of the stock the estimates were not trivial, and that there was a need to investigate why the estimates differed between methods. It was also noted that there were some indications of upward trend in the estimates for the Indian Ocean. The ESC agreed to refer the issue back to the CPUE working group for further consideration intersessionally.

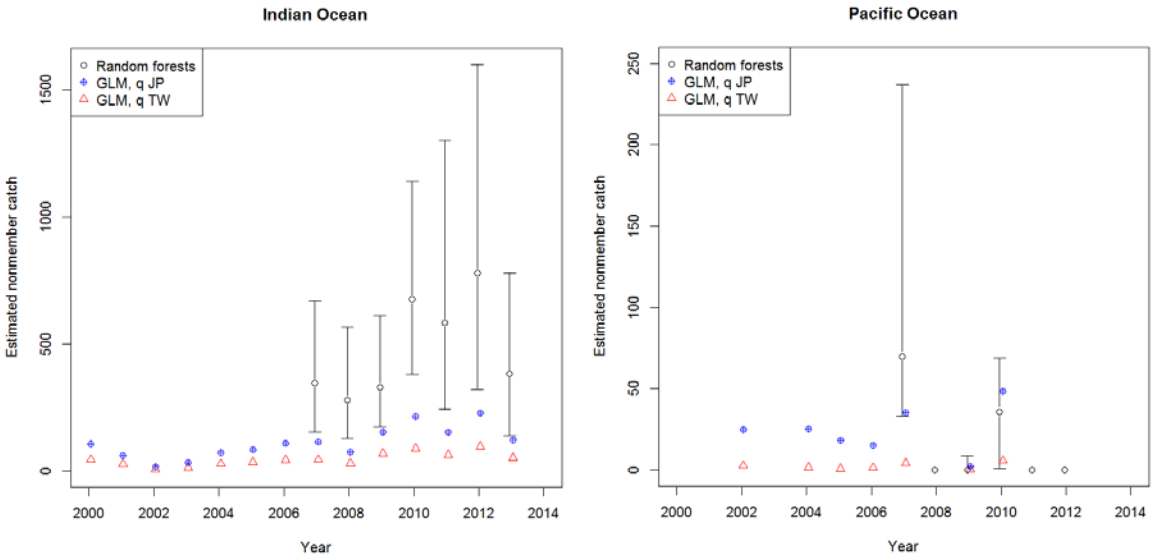


Figure 1: Comparison of non-Member catch estimates obtained using Random Forest methods and GLM-based methods, for both the Indian and Pacific Oceans.

Implications of Unaccounted Mortalities

85. It was noted that CCSBT 21 agreed to commission market analyses for important markets to contribute to estimating non-Member catch. The Secretariat advised that it has contacted a variety of organisations to obtain proposals for conducting this work, but responses to the requests for proposals had been extremely slow. Two proposals have been circulated to CCSBT Members. One proposal sought to determine the presence of SBT products in China through trade analysis and DNA species identification of sashimi tuna sampled from Beijing and Shanghai. The other proposal was for an investigation of the landings, imports and consumption of SBT in China (including Hong Kong) using any available market

data to provide an indication of the quantity and source of the SBT being traded in those markets. Some DNA work for species identification might also be conducted. The Secretariat commented that responses from Members on the proposals were due immediately.

Agenda Item 10. Evaluation of Fisheries Indicators

86. There were limited and mixed signals from the indicators in 2015 (**Attachment 6**). The overall results can be summarised as follows:

- No new information on recruitment was collected in 2015. The aerial survey, SAPUE and trolling surveys all ceased in 2015. The indicators information on recruitment from 2014 is unchanged.
- Longline CPUE indices for the Japanese fleet for age 5 to 7 are well above the historically lowest levels observed in the mid-2000s. The index for age 5 shows somewhat decreasing trends in recent years. The CPUE index for ages 8-11 have increased gradually in the most recent four years. The index for age 12+ decreased from 2008 to 2011 and has fluctuated around at a low level after that. Where areas overlapped, Korean CPUE trends were in reasonable agreement with those of Japan.
- Monitoring of length and age of Indonesian catches on the spawning ground indicate a substantial shift towards smaller and younger size and age classes since 2012. Information presented to the meeting indicates that the unusually small size classes have been caught off the spawning ground (areas 2 and 8) and that these fish should be excluded from the monitoring series. Therefore these is no updated trend on the spawning ground indicators at this meeting.

87. Paper CCSBT-ESC/1509/11 provides a 2014–15 update of fishery indicators for the SBT stock summarises indicators in two groups: (1) indicators unaffected by the historic unreported catch; and (2) indicators that may be affected by the unreported catch. Interpretation of indicators is limited to subset 1, and recent trends in some indices from subset 2. The three indicators of juvenile (age 1–4) SBT abundance (i.e. scientific aerial survey index, surface abundance per unit effort (SAPUE) / commercial spotting index and the trolling index) were not undertaken in 2015 so no update for these indicators is available. The previous indices were presented for information. Indicators of age 4+ SBT exhibited mixed trends with the CPUE from the New Zealand joint venture fishery decreasing slightly in 2014. However, the New Zealand domestic longline fishery nominal CPUE exhibited a sharp increase in 2014. Similarly, the Japanese longline nominal CPUE for ages 4+ increased. The median length class of SBT on the spawning ground decreased in 2013–14 and 2014–15 compared to the previous seasons, with a large increase in small (young) fish reported in the fishery. There remains a strong need to understand the location of these catches. The mean age of SBT increased very slightly in 2013–14 while the median remained the same.

88. The ESC noted that the reported global catch increased from 11,434 t in 2013 to 12,803 t[1] in 2014. In both years the reported catch was higher than the global TAC.

89. Taiwan presented paper CCSBT-ESC/1509/23. In this study, cluster analysis was conducted to identify the characteristic of fishing operating for each data set based on catch compositions of Taiwanese longline fishery. The results of cluster analysis were used to be a criterion for extracting data from SBT targeting vessels and also to be a targeting effect in the model. CPUE standardisation was conducted using a generalised linear model. The results indicated that the cluster of fishing operation was the main effect which explained most of the variance. Standardised CPUE series reveal different trends for different area, while they substantially decreased for all areas in recent years. CPUE series for fishes with age of 3-5 years were much higher than other age groups, while obvious declining trends were evident in recent years for most age groups, except for age 10+ group.

90. The ESC recognised the substantial work that had been conducted in further developing the Taiwanese CPUE series. However, several concerns about the data and its standardisation analysis remain. Taiwan agreed to consider a number of suggestions for methodology and data interpretation, and present an improved series at the next meeting.

91. Korea presented paper CCSBT-ESC/1509/26. In this study SBT CPUE from Korean tuna longline fisheries (1996-2014) was standardised using Generalised Linear Models (GLM) with operational data. The data used for the GLMs were catch (number), effort (number of hooks), number of hooks between floats (HBF), fishing location (5° square), and vessel identifier by year, quarter, and area. The CPUE was explored by area and two separate areas were identified in which Korean vessels have targeted SBT. SBT CPUE was standardised for each of these areas using a delta lognormal approach. Explanatory variables for the GLM analyses were year, month, vessel identifier, 5° square, and number of hooks. GLM results for the whole area suggested that location, year and month effects were the most important factors affecting the nominal CPUE. The standardised CPUEs for both areas decreased until the mid-2000s and have shown an increasing trend after that.

92. Japan presented paper CCSBT-ESC/1509/29. In this paper, fisheries indicators along with fishery-independent indices were examined to overview the current status of SBT stock. The longline CPUE indicators suggest that the current stock levels for 4, 5, and 6 & 7 age groups are well above the historically lowest levels observed in the late 1980s or the mid-2000s. CPUE indices for age 4 and 5 classes show somewhat decreasing trends in recent years. The CPUE indices for age 8-11 group have increased gradually in the most recent four years. The indices for age 12+ decreased from 2008 to 2010 and have fluctuated around at a low level afterward. The current levels for these older age groups are still very low, similar to ones observed in past. Other age-aggregated (4+ group) CPUE indices that have been used in the OM and/or MP show increasing trends in recent years. The current levels of these indices are well above the historically

[1] The reported catch for the 2014 fishing season is a preliminary estimate as described in CCSBT-ESC/1509/04.

lowest observed in the mid-2000s. Various recruitment indicators inspected suggest that recruitment levels in recent years have been similar to or higher than those observed in the 1990s (before very low recruitments of 1999 to 2002 cohorts occurred) although the levels of recruitment have varied from year to year. These indicators for recent years have given no indication of recruitments as low as the 1999-2002 cohorts.

93. Japan presented CCSBT-ESC/1509/30. The operation pattern of the Japanese longline fishing, from which CPUE is the most important scientific data for the stock assessment and the MP, was examined by comparing between the most recent year and previous 10 years. No remarkable change was found in the 2014 operating pattern in terms of the catch amount, the number of vessels, time and area operated, proportion by area, length frequency and concentration of operations. It can be said that the longline CPUE in 2014 represents the change of SBT stock abundance consistently as in previous years. Continuous increases in the proportion of the number of operations in Area 7 for 10 years is due to return of fleet to that Area. Due to the increase of total catch quota in 2014, the number of operations in a month and five degrees cell has increased but the number of cells fished remained the same.

94. It was noted that for LL1 effort there has been a decline, since 2007, in the number of 5x5 and 1x1 squares fished (so an increased concentration of effort), which reflected the implementation of the introduction of IQ arrangements and reductions in total quota. However, there was a slight increase in the effort per 1x1 cell fished in the most recent years. The fishing effort distribution of the LL1 fleet remains concentrated in a historically low number of 5 x 5 and 1 x 1 squares. Japan responded that this did not reflect any unexpected changes in spatial or temporal effort; but that it could not be determined what to expect in the future and noted the importance of continuing monitoring as motivated in CCSBT-ESC/1509/30.

95. Japan presented CCSBT-ESC/1509/31. It summarised the core vessel CPUE which is an abundance index of SBT used for the Management Procedure in CCSBT. It described the details of data preparation, CPUE standardisation using GLM and area weighting. The data were updated to 2014. The index values in 2014, W0.8 and W0.5 from the base GLM model, were higher than the average for the last 10 years.

96. It was noted that currently releases/discards (affecting 3-4 year olds) are not included in CPUE standardisation, but data of releases/discards are submitted in data Exchange.

97. The ESC noted, that given this and the longer term shift in selectivity from large to smaller fish, it may be appropriate to use an age 5+ series for the standardisation.

Agenda Item 11. SBT stock status

11.1. Assessment of exceptional circumstances

98. At its Eighteenth annual meeting in 2011, the CCSBT agreed that a Management Procedure (MP) would be used to guide the setting of the SBT global total allowable catch (TAC). The CCSBT also adopted the meta-rule process as the method for dealing with exceptional circumstances in the SBT fishery (ESC

2013). The meta-rule process describes: (1) the process to determine whether exceptional circumstances exist; (2) the process for action; and (3) the principles for action.

99. Exceptional circumstances are events, or observations, that are outside the range for which the management procedure was tested and, therefore, indicate that application of the total allowable catch (TAC) generated by the management procedure (MP) may be inappropriate.

100. Japan presented paper CCSBT-ESC/1509/37. In this paper, values of the longline CPUE index were compared to projection results obtained from the OM. Recent observations for this index fall well within the 95% probability envelope predicted by the base case OM in 2011 (Figure 2). As regards the aerial survey (AS) index, the consequences of the non-availability of this index in 2015, and of a future reduction in the scale of the survey providing this index, were examined by conducting some projections. It was found that non-availability of the 2015 AS index and reduction of the scale of the associated survey have almost no impact on the performance of the MP with respect to achievement of the management goal, stock conservation, and predicted TAC values. Accordingly it was concluded that a declaration of the existence of Exceptional Circumstances is not essential at this time, and the authors proposed continuing the use of the current MP to recommend the TAC for 2018-20 fishing seasons in 2016. Regarding the TAC to be recommended for the 2016 season, it was concluded that no modification of the TAC value is required because no Exceptional Circumstances need to be declared and there seems to be no substantial sudden change observed in other indirect recruitment indices (such as CPUE for younger fish) for 2015.

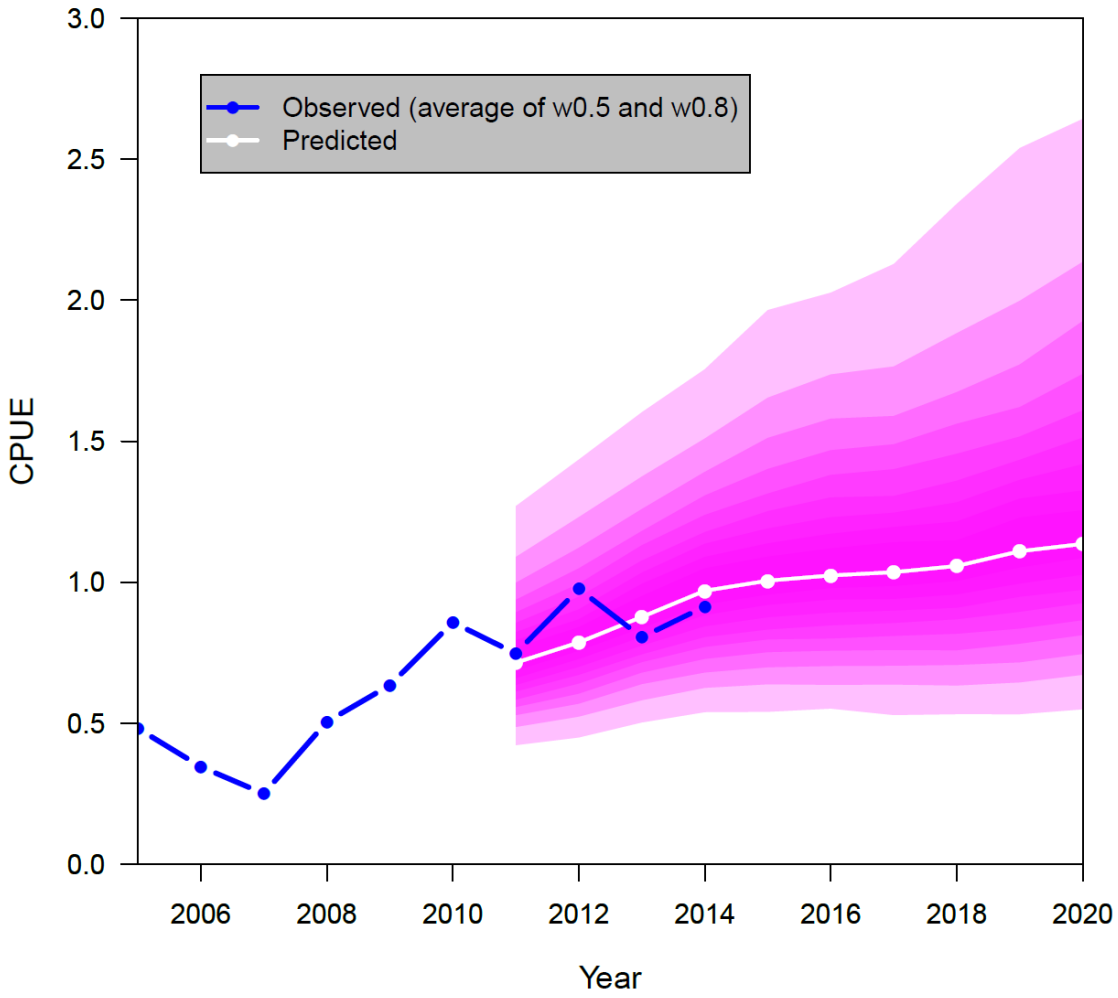


Figure 2. Longline CPUE series (2005-2014), as input to the MP and the future index as projected in 2011 for 2011 to 2020 for the "base case" scenario (reference set), where the white line with points is the median projected CPUE, and the purple shades represent percentiles from 2.5% to 97.5% in an increment of 5%.

101. The ESC agreed that the longline CPUE in 2014 was well within the range predicted in the testing of the MP. However, as there was no aerial survey in 2015 it was not possible to determine whether the 2015 aerial survey index was within expected bounds.

102. CCSBT-ESC/1509/12 noted that the MP Specifications and Meta-rules include the objectives and performance measures for the rebuilding of the stock; the detailed specification of the MP itself (monitoring series, analyses, harvest control rule and implementation); the schedule for TAC recommendations, periodic assessments of stock status, formal review of MP performance; and the process and criteria for identifying exceptional circumstances (i.e. circumstances/events outside the range for which the MP was tested during the Management Strategy Evaluation (MSE) phase of development). The paper reviewed the purpose and function of the Meta-rules with a particular focus on: i) the purpose of exceptional circumstances and the actions that may flow when they are identified in guiding the implementation and regular review of the MP. In addition to the implications of the request from the SFMWG, the 20th meeting

of the ESC will consider whether the following events represent exceptional circumstances under the meta-rules for the MP: i) The missing 2015 aerial survey data point; ii) the identification, but uncertain quantification, of un-accounted mortalities (UAM); iii) the shift in Indonesian size/age data (2013-2015). The first two items may constitute exceptional circumstances, however, the actions that should follow are different. The missing 2015 aerial survey data point can be accommodated within the "analysis and harvest control rule" component of the MP, and hence, it does not prevent the MP being used to recommend the 2018-2020 TAC in 2016, assuming the 2016 aerial survey index is available. In the case of the UAM, the MP testing assumed total removals were reported exactly. No allowance was provided for UAM beyond 2011. Hence, in principle, UAM is exceptional circumstances and, in practice, the work completed by OMMP Working Group and ESC in 2014 indicated that plausible ranges of UAM would compromise the predicted performance of the MP, if they were occurring at that level. The shift in Indonesian size/age data is yet to be fully considered by the ESC. However, CCSBT-ESC/1509/14 indicates a substantial difference that has implications for the impact of the Indonesian fleet on the stock. It also has implications for the use of these data in the OM and for Close-kin abundance estimation. Consideration of the implications of the aerial survey not to continue beyond 2016 is less straightforward in the context of exceptional circumstances, as it is a potential future event. However, were it to transpire, it would clearly represent exceptional circumstances as: i) it would not be possible to use the agreed MP to recommend future TACs, and; ii) there would be no recognised source of recruitment monitoring available to replace the survey index. Such a situation would require the development of new recruitment indices, new MPs and full MSE testing. This would entail considerable addition cost and time before a robust MP could be used to recommend TACs consistent with the Extended Commission's objectives for minimising the risk of future declines and rebuilding the spawning stock.

103. Based on this presentation, the ESC noted the following items to be considered in the context of exceptional circumstances in 2015 in addition to the consideration of longline CPUE (shown above):

- No 2015 aerial survey
- No other direct estimates of recruitment in 2015
- The scale of unaccounted mortality
- The shift in Indonesian size/age data (2013---2015)
- No aerial survey after 2016
- Reported overcatch of the TAC

11.1.1 No aerial survey in 2015 or other direct estimates of recruitment in 2015

104. The absence of an aerial survey in 2015 requires review of the implications for TAC recommendations, because these data are a requirement of the MP. The ESC has evaluated the consequences of no aerial survey in 2015 and found that there is no effect on the predicted performance of the MP (also see para 97 above), provided there is an aerial survey in 2016 and effective recruitment

monitoring in the future. In this case, the MP can be used to recommend TACs in 2016.

11.1.2 Unaccounted mortality (UAM)

105. At its previous meeting in 2014 the ESC expressed the following views:

106. The testing of the adopted MP did not include explicit allowance for catches to be greater than the TAC recommended by the MP. In this context, the ESC considered the extent to which the potential unaccounted mortality used in the sensitivity tests requested by the EC represents exceptional circumstances.

107. The ESC noted that the results of the unaccounted mortality sensitivity tests presented in papers (CCSBT-ESC/1409/15 and 38) indicated that the potential impact on current stock status was not substantial, relative to the results for the reference set for the current stock assessment. The potential impact on stock rebuilding and future TACs, however, was more substantial and varied among the sensitivity tests (Table 2 of CCSBT-ESC/1409/15). In particular, the ESC noted that the "Added Catch" sensitivity had the most substantial impact on the probability of the stock rebuilding to the EC's interim rebuilding target.

108. In considering whether the potential unaccounted sources of mortality should trigger action under the meta-rules process the ESC noted:

- The MP tuning assumed that catches adhere to TAC recommendations based on the MP, but it seems likely that this is not always the case.
- The rebuild probability from the "Added Catch" scenario falls to 49% from the 74% seen in the base case. This potential reduction in rebuilding probability is substantial, however, the rebuilding probability is comparable to the most pessimistic robustness trial ("Upq") considered during MP tuning (Table 1 of attachment 9, ESC Report 2011).
- The management procedure responds to reductions in biomass from additional catches being taken, though without compensating entirely.
- The spawning stock status has improved and the harvested component was currently benefitting from a recent series of high recruitments (Figure 3, from Paper CCSBT-ESC/1409/38). As a result, the expected stock trajectory is still positive (i.e., there should be rebuilding although at a slower rate) in spite of the potential level of unaccounted for mortality considered by the ESC.

109. Thus, it appears that significant levels of unaccounted mortality may have occurred which were not considered in the design of the MP. If these levels are indeed true, they would amount to exceptional circumstances because the probability of rebuilding under the MP will be well below what was intended by the EC.

110. The ESC also notes that continuing to follow the MP as proposed does lead to continued rebuilding in the short term even if the circumstances of the hypothesised additional unaccounted mortality are true. Hence, the ESC advises the EC to continue to follow the MP as formulated but, as a matter of urgency, to take steps to quantify all sources of unaccounted SBT mortality. If substantial levels of unaccounted mortality are confirmed, then there will be a need to retune the MP to achieve the EC's stated rebuilding objective. In addition, the ESC advises that the EC take steps to ensure adherence to its TACs.

111. In 2015, the ESC endorsed these views and considered additional information that had become available since the last meeting. Estimates of non-Member catches in the IOTC and WCPC fisheries were reported to the ESC, based on comparison with bycatch rates by CCSBT Member's vessels fishing in the same areas (CCSBT-ESC/1509/10 and CCSBT-ESC/1509/21). Total catch by non-Members was estimated to be low to moderate (120 to 580 t mean estimate for 2011-13, which represents 0.8% to 4% of the 2015 TAC) using the two different approaches. However, the estimates did not include potential catches in the South Atlantic or Eastern Pacific Oceans.

112. The ESC considered that the "Added Catch" sensitivity used in 2014 remains a plausible scenario for consideration of UAM. When the MP is revised in future the ESC agreed to incorporate all known or reasonably inferred sources of UAM. This will result in a more precautionary approach and will have the impact on TAC levels required to achieve the rebuilding target of the EC.

113. The ESC agreed that implications for the MP depend on the scale of the UAM. In the "Added catch" sensitivity referenced above, the probability of achieving the rebuilding target in 2035 is reduced to 49% from 74% (base). The review of UAM in 2015 has not changed the perception of ESC on the potential scale of UAM. The ESC also noted the workplan of EC related to this issue (EC2014 para. 53). Therefore the ESC reiterates the advice from 2014 to continue to follow the MP as formulated but, as a matter of urgency, to take steps to quantify all sources of unaccounted SBT mortality. If substantial levels of unaccounted mortality are confirmed, then there will be a need to retune the MP to achieve the EC's rebuilding objective. In addition, the ESC advises that the EC take steps to ensure adherence to its TACs.

11.1.3 Shift in Indonesian size/age data

114. Information presented to the ESC indicated that the smaller fish were taken in fishing grounds off the spawning area (Indonesian national report). Indonesia advised that they would make the CDS data available for analysis to establish, in the required detail, the catch location of the fish included in the Benoa monitoring (i.e. CCSBT-ESC/1509/#14,

115. Indonesian size/age paper) and characterise the catches from the spawning area. This analysis will be presented to the ESC in 2016. Assuming that this analysis confirms that the small fish are not being caught in the spawning area and the monitoring series is unaffected by a component of the Indonesian fleet fishing in areas 2 and 8, then there would be no need to modify the implementation of the MP.

11.1.4 No aerial survey after 2016

116. If there were no further aerial surveys after 2016 this would clearly represent exceptional circumstances. It was noted that if there is no AS after 2016, then the annual review of the TACs which will be set by the current MP up to 2020 will be lacking the essential information on recruitment from the AS. Furthermore, the continuity of the MP is important as it contributes to performance in that the feedback mechanism in the MP will correct future TACs. If there is no AS, i.e. recruitment monitoring, after 2016 and no MP in place, this will need to be considered at the 2016 ESC during deliberations about exceptional circumstances

and associated possible actions including possible changes in the TAC for 2017 and later years.

11.1.5 Reported overcatch of the TAC

117. The global TAC was exceeded by 485 t in 2013 and 354 t in 2014. Reported overcatch is included in the stock assessment but the assumption under which the MP was adopted is that TACs would not be exceeded in future years. The implications are similar to those described in 11.1.2 above (UAM); the cumulative effect of all catches above the TAC level must be considered.

118. The ESC noted the combination of the individual issues (UAM, over-catch, potential loss of recruitment monitoring) represent a serious concern in terms of the potential risks to the stock and the rebuilding performance of the MP. The ESC reiterated its previous advice on the priority for completing the Extended Commission's work program for UAM and the importance of the MP to meeting the Extended Commission's objective to rebuild the stock.

119. The ESC draws attention to the fact that decisions as to whether exceptional circumstances apply are only one step in the overall metarule process. The ESC emphasises that the important outcome from the annual review process is whether these circumstances are such that there is a need to apply a metarule to change the recommended TAC provided by the MP.

11.2. Summary of the SBT stock status

120. At its previous meeting in 2014 the ESC expressed the following views:

121. Based on the stock assessment results presented to the ESC in 2014, the following stock status advice for the reference set of operating models was compiled (Table 5). Two measures of the current spawning stock size are presented. The new method used in the operating model is presented as spawning stock biomass (SSB), and is based on a revised spawning potential estimate which has been introduced into the operating model along with incorporation of the close-kin data. The biomass aged 10 and older (B10+) is also presented, because this is the same measure used in previous stock assessments and therefore allows for comparisons.

122. The stock remains at a very low state estimated to be 9% (8-12 80% P.I.) of the initial SSB, and below the level to produce maximum sustainable yield (MSY), however there has been some improvement since the 2011 stock assessment and the fishing mortality rate is below the level associated with MSY. B10+ relative to initial is estimated to be 7% which is up from the estimate of 5% in 2011. The current TAC has been set following the recommendation from the management procedure adopted in 2011.

Table 5: Southern Bluefin Tuna Summary of 2014 Assessment of Stock Status

Southern Bluefin Tuna Summary of 2014 Assessment of Stock Status[2]	
Maximum sustainable yield	33,000t (30,000-36,000)
Reported 2013 catch	11,726 t
Current replacement yield	44,600t (35,500-53,600)
Current (2014) spawner biomass ($B10^{+}$)	83,000 (75,000-96,000)
Current depletion (Current relative to initial)	
SSB	0.09 (0.08-0.12)
B10+	0.07 (0.06-0.09)
Spawner biomass (2014) relative to SSB_{msy}	0.38 (0.26-0.70)
Fishing mortality (2013) relative to F_{msy}	0.66 (0.39-1.00)
Current management measures	Effective catch limit for Members and Cooperating Non-Members: 12449t in 2014, and 14647 t /yr for the years 2015-2017.

123. There were limited and mixed signals from the indicators in 2015 (**Attachment 6**). The overall results can be summarised as follows:

- No new information on recruitment was collected in 2015. The aerial survey, SAPUE and trolling surveys all ceased in 2015. The indicators information on recruitment from 2014 is unchanged.
- Longline CPUE indices for the Japanese fleet for age 5 to 7 are well above the historically lowest levels observed in the mid-2000s. The index for age 5 shows somewhat decreasing trends in recent years. The CPUE index for ages 8-11 have increased gradually in recent 4 years. The index for age 12+ decreased from 2008 to 2010 and has fluctuated around at a low level afterward. Where areas overlapped, Korean CPUE trends were in reasonable agreement with those of Japan.
- Recent decline in the mean length and age of fish on the spawning ground is related to the catch of small fish in the Indonesian fishery in 2013-2015. Information from Indonesia to the 2015 ESC indicates that these fish appear to have been caught in areas 2 and 8, and not on the spawning ground. Spawning ground length and age data will need to be re-summarised, if possible, to exclude area 8 and 2 fish. Therefore, there is no updated information on the spawning ground indicators at this time.

Agenda Item 12. Review of results of the Scientific Research Program and other inter-sessional scientific activities

12.1 Scientific research program (SRP)

Future use of Close-kin

124. CCSBT-ESC/1509/19 addresses options for future use of Close-Kin Mark-Recapture (CKMR) for SBT. CKMR provides a direct estimate of SSB status that is independent of CPUE, catch, or recruitment data, as well as information relevant to structural assumptions of the OM (e.g., fecundity-at-size); the data

[2] Values in parentheses are 10^{th} and 90^{th} percentiles.

can also be used directly in the OM, and potentially as a component of some future MP. The original 2012 CKMR results (e.g., CCSBT-ESC/1208/19) used samples collected from Indonesia and Australia between 2006 and2010. Sampling has continued in 2011-2015, with CCSBT support, with the expectation that they might be genotyped eventually for use by the ESC. This paper is an update of the scoping study in 2014 (CCSBT-ESC/1409/44), that considers various options for future sample sizes, and the pros and cons of changing to some newer genotyping technique to take advantage of rapid developments in genetics in the decade since CKMR for SBT began. The 2015 update has thoroughly tested a refined version of the 2014 genotyping technique (now called "HFS-Dart"), including re-genotyping of the known parent-offspring pairs to assess genotyping accuracy. HFS-Dart is shown to be substantially cheaper and more accurate than the old microsatellite technique used in 2012; it is also capable of finding Half-Sibling Pairs (HSPs) among juveniles as well as Parent-Offspring Pairs (POPs) (microsatellites can only find the latter) which provides extra information and robustness to assumptions. Switching to HFS-Dart is recommended. The old and new techniques are not comparable, so switching will incur a one-off cost to re-genotype the 8000 already-genotyped juveniles from 2006-2010, whose parents may still be found in the post-2010 samples (2006-2010 adults are not worth regenotyping because their 3yo progeny would already have been matched in the original study, and they cannot make more offspring because they are dead). However, because the unit cost of HFS-Dart is about half that of microsatellites, and there are 10000 samples in the 2011-2015 "back-catalogue" that will need to be genotyped once either with old or with new technique, switching will already save money overall by the time the back-catalogue is processed, even with the re-genotyping. As to future sample sizes, CCSBT-ESC/1509/19 examines various options and provisionally recommends genotyping 1000 juveniles and 1000 adults per year until 2018; smaller sample sizes would substantially diminish the precision of conclusions. Ongoing sample sizes will need to be revisited once the back-catalogue has been genotyped and analysed.

125. Because genotyping is a complex and specialised area, that is unfamiliar to the ESC, the ESC has previously requested external review (SC 19, 2014, para 131). CCSBT-ESC/1509/36 therefore provides external reviews of CCSBT-ESC/1509/19 by two international experts in relevant aspects of genetics. Both reviewers endorse the proposed switch to HFS-Dart, and the value of extending CKMR to HSPs as well as POPs.

126. The relatively low cost and high value of CKMR data for CCSBT has been noted previously by the ESC (e.g. SC19, 2014, para 132).

127. The ESC discussed the costs and benefits of genotyping the recently collected samples and the samples that have already been genotyped using micro-satellites methods. It was noted that the costs for genotyping the CK tissue samples collected from 2011-2015 will cost significantly less when using the new SNPS based genotyping method compared with the older micro-satellites technology. Only the samples from juveniles in 2006-2010, which have already been genotyped, will need to be re-genotyped using the new method, because the old and new genotype data cannot be matched and there may be adults in the newer samples that are matched to these juveniles.

128. The discussion also noted that there are additional advantages to the new genotyping method; it does not rely on a single "reader" or laboratory to get the same genotype information (as is the case with micro-satellites); the new method is robust to changes in technology in that the same genotype will get gathered regardless of the technique or laboratory that runs the test – so there would not be a commitment to a single company.

129. The timeline for processing has been adjusted to account for the new method. It is possible to process the 2011-2015 collection of samples in 2 years for potential use in the 2017 stock assessment. In 2018 it would be useful to review the sample sizes required, given the data collected and their use in models, and the level of precision of the abundance estimates that is required.

130. The half-sibling pairs (HSP) analysis that can be conducted using the new genotyping data can provide additional information, for example, fine-tuning estimates of selectivity or residency on the spawning ground, as well as key information on adult survival and abundance. The ESC noted that the CK data could also be used in future MPs in the longer term. CK does not provide recruitment monitoring information, but does provide direct information on the spawning stock.

131. The ESC suggested that it would be a high priority to get the "back-catalogue" of samples processed in time for the 2017 stock assessment.

Gene-tagging design study

132. Paper CCSBT/1509/18 presented the outcomes and recommendations from the Gene-tagging design study. Gene-tagging is similar to other tagging programs, and can provide highly informative data for use in stock assessment and management procedures on natural and fishing mortality, and on the absolute abundance of recruits. The key advantage is that gene-tagging resolves the reporting rates and tag loss problems that led to the cessation of the 2001-2006 CCSBT SRP conventional tagging project. The gene-tagging data are also fishery independent, and would help reduce reliance on CPUE. The objectives of this gene-tagging design study were to refine the experimental design of a pilot program and, using simulated data, demonstrate methods for integration of the data into the SBT OMs. The recommendation for the pilot study is to tag fish aged 2 in the Great Australian Bight and recapture at age 3 after 12 months to allow for mixing. Costs and precision estimates have been updated for the pilot study. The genetics techniques have been evaluated in the close-kin design project. Potential sources of uncertainty and bias, and methods to address these, have been considered. A method for integrating the gene-tagging abundance estimates in the SBT OM has been developed and demonstrated. A time series of the data from gene-tagging can also be used in future MPs, but a new MP will need to be developed and tested; these data cannot simply be added into the existing MP to replace the aerial survey recruitment index. Bi-annual data can be integrated into the SBT OM, but the performance of a future MP using only bi-annual data will need to be evaluated and the MP tuned to meet the Extended Commission's objectives.

133. Paper CCSBT-ESC/1509/40 provides an addendum to the gene-tagging design paper with updated cost estimates for the pilot gene-tagging project, based on a

more recent quote for genotyping samples. This substantially reduces costs for this component of the budget, by approximately AUD $100,000.

134. It was clarified that the costs in paper 40 are for a single abundance estimate of an age 2 cohort, and that the work is spread over 2 years (about 22 months from initial tagging to calculating the abundance estimate). Costs can be split over the 2 years of the project. The paper provides total costs, but it is likely that CSIRO would be willing to contribute to the costs of a pilot study. In future years, cost related efficiencies are likely to be found that will reduce costs for an on-going monitoring program.

135. Tagging protocols (established during the 2001 CCSBT SRP tagging program) will be used to distribute tags amongst as many schools and spatial and temporal areas as possible. A sampling tool that efficiently collects tissue sample and protects the sample from contamination has been developed.

136. The timing of the recapture sampling at harvest will delay the availability of the abundance estimate until about October of the second year of the project, after the ESC has met, and therefore cannot be used in the OM for the 2017 assessment or a new MP until the following year. That is, data from a release in 2016 (February) will be available in October 2017, and could be used at the 2018 ESC.

Other SRP considerations

137. New Zealand presented CCSBT-ESC/1509/20. The objective of the paper was to promote a discussion at ESC on an approach to monitoring recruitment of SBT that is affordable within the Extended Commission's budget and also effective in future management of the resource. The paper questioned the reliability of the aerial survey, trolling and SAPUE recruitment indices, and suggested that more cost-effective options were required. The aerial survey data did not appear to match well with the individual year class strengths estimated by the OM. CPUE at age (based on length) shows some promise as a cost effective recruitment index. The paper proposed a work plan (timeline) as a possible way forward so that the ESC can provide the information required for ongoing stock assessment and development of a new management procedure.

138. Paper CCSBT-ESC/1509/20 noted concern that in funding the aerial survey in 2016, other important elements of the SRP have been, or may need to be, deferred.

139. Paper CCSBT-ESC/1509/15 provides an update on SRP activities by Australia including progress on sampling for close-kin (CK) tissue and ovaries and otoliths for maturity estimation. A total of 3200 tissue samples for CK were collected in 2014-15 from fish caught by Indonesia (1600 adults) and Australia (1600 juveniles). Australia had collected ovaries from 19 SBT in 2014 and is anticipating the collection of more ovaries in 2015 if possible. New Zealand collected 122 ovary samples preserved in formalin from Area 6.

140. Paper CCSBT-ESC/1509/15 reiterated the requirements for ageing and maturity workshops, including the need for a pre-workshop inter-laboratory otolith exercises to estimate precision and bias. An inter-laboratory ovary exchange exercise was also recommended to allow laboratories to classify ovaries prior to discussion at a workshop.

141. Korea noted that they have also collected ovary samples (see Fisheries report).

12.2 Inter-sessional science work

142. Paper CCSBT-ESC/1509/13 provides an update on otolith sampling and ageing of SBT from the Australian surface fishery. A total of 133 otolith samples were collected from the fishery during the 2014-15 season, and age was estimated for 99 caught in the previous (2013-14) season. The proportions-at-age were estimated using three methods and compared with previous seasons. The results from applying the "M&B method with unknown growth" suggest that in the 2013/14 season there was a higher proportion of age 2 fish and smaller proportion of age 3 fish in the catches than in any previous season. Moreover, the mean length of age 2-4 fish was estimated to be higher in 2013/14 than in past seasons, most notably for age 3. Paper CCSBT-ESC/1509/13 notes that the current sampling protocol does not provide either a fixed number of otoliths from each length class or representative samples of otoliths from all length classes in the fishery. It is unknown if sufficient fish were sampled within each length class to estimate the age distribution of the surface fishery catch in the 2014/15 fishing season. Reliable estimates of catch-at-age are also dependent on measuring a representative sample of the catch.

143. Paper CCSBT-ESC/1509/14 was presented, updating previous analyses of the length and age distribution of SBT landings by the Indonesian longline fishery operating out of Benoa, Bali. Length-frequency data up to the 2015–15 season and age-frequency data to the 2013–14 spawning seasons were provided. It is clear that in the last three spawning seasons (2012/13 to 2014/15) there is a new mode of very small/young fish in the catch (140-155 cm/7-10 years). The proportion of fish aged <10 years increased from 5.8% in 2011/12 to 37.0% in 2012/13 and 22.5% in 2013/14 (the last year we have direct age data for). It is not known whether these small/young SBT landed were caught on or south of the SBT spawning ground, and whether they can be considered part of the SBT spawning population. The paper noted the importance of understanding where the small fish are being caught because of how these data are used in the SBT operating model.

144. The ESC noted that in 2012/13 the age-length key was not updated, and that this should be addressed in future. The otoliths were collected, but there was no funding in that year for ageing them. Ageing the archived otoliths is the preferred option.

145. Indonesia advised that the small fish observed in Indonesian catches in recent years are from areas off the spawning ground. Indonesia and Australia will work intersessionally to update analysis in this paper for the 2016 ESC.

146. Taiwan presented paper CCSBT-ESC/1509/22. In this study, the authors determined the ages of 1451 *Thunnus maccoyii* (SBT) by reading their otolith annuli collected by the observers in 2002-2013. An age-length-key (ALK) was generated based on these samples and ALK was used to convert fork length (FL) into age data. The mean FL measured by the observers was all slightly smaller than the logbook data with the largest difference of 10 cm in 2007-2008 followed by decrease to < 3 cm in recent years. The difference between logbook and observer's data may be due to the small cover rate of the latter, which

predominantly monitored the catch in the middle to lower latitudes in the central Indian Ocean. The estimated age compositions in 2006-2013 were highly consistent between logbook and observer's data with predominant catch of young SBT between ages 2-9. Age 4 occupied the highest percentage in the catch, followed by age 5 or age 3 then the other older age classes. These results were consistent to the age composition in 2002-2005 (Shiao et al. 2008), suggesting no obvious changes of fishing behaviours of the Taiwanese longliners targeting for the SBT.

147. The ESC discussed the Taiwanese size/age composition data and noted that one age-length key had been used for all years. For potential incorporation of these data in future it is important to use year dependent age-length keys, even if the data are sparse, and it was suggested that these data should be presented in that format in future.

148. Taiwan presented paper CCSBT-ESC/1509/24. In this study, the analysis for gonad samples of southern bluefin tuna was updated by incorporating samples collected from Taiwanese scientific observer program implemented in 2014. A total of 273 gonad samples were collected during April to September in year of 2010-2014. For both sexes, the gonado-somatic indices (GSIs) increased from April to July and then revealed decreasing trends. The sexual maturity stages were determined based on developmental stages of histological sections of gonad samples. Most samples were designated as immature stage and some samples were developing stage. Very few samples designated as mature but they were reproductively inactive. More mature female samples were regressed or regenerating stages during April to June. However, the results of histological analysis are still preliminary since the analysis was conducted based on part of samples.

149. The ESC noted that this work and the gonad collection would be useful for the maturity workshop in the SRP work plan schedule. The combination of small and large fish from different fisheries will, in combination, give better information on reproduction.

150. Japan presented paper CCSBT-ESC/1509/28 that described activities of collection of otoliths and age estimation. Otoliths were collected from 435 SBT individuals in 2014. Ages were estimated from 149 SBT individuals which were caught in 2014. The data were submitted to the CCSBT Secretariat in 2015. Age data of 4308 SBT individuals were analysed to show relationships between fork length and age estimated.

12.3 Scientific research priorities

Scientific research priorities for 2016-2018 and alternatives to the current MP

151. Australia presented aspects of paper CCSBT-ESC/109/12. The Meta-rules include a scheduled review of the MP in 2017. The timing of the review was based on several considerations, including development and testing of alternative monitoring series to allow for an orderly transition from the agreed MP to a modified/new MP if required. The recently reinstated CCSBT Scientific Research Plan (for 2014-2018) was developed and prioritised with this focus and schedule in mind and the Extended Commission and Members have funded some of the work required to achieve these goals. This paper outlines some of the

issues the ESC will need to consider at its 20th meeting in light of the decisions made by the Extended Commission in 2014 and the requests from the July 2015 meeting of the SFMWG.

MP related research priorities

152. In line with the current MP and previous ESC discussions the ESC's preferred research priorities would be to continue with the activities as prioritised and funded under the CCSBT SRP (Anon 2014).

153. If the Extended Commission decides to develop a new MP, then as discussed above (agenda item 7), this would have significant implications for the ESC work-plan and relative priorities for the SRP work program and therefore is discussed further here. In the absence of an AS after 2016 there will be a need to urgently develop a new MP.

154. In considering alternative MPs, the ESC addressed the following process and made the following agreements and recommendations:

1. Determine if a fishery-independent index of recruitment is needed in the future as input to the MP and OM.

155. The ESC agreed that a fishery-independent index of recruitment was necessary. Overall, the analyses conducted during OMMP6 emphasise the value of having a reliable index of juvenile abundance to detect possible recruitment failures, especially considering the possibility that future changes in catchability affect the ability of the CPUE to detect them.

2. What would the fishery independent index be?

156. The limitations and strengths of different recruitment indices were discussed at OMMP6 and the conclusion was that gene tagging would provide the most promising reliable recruitment index to be included both in the MP and OM.

3. If the AS is not continued after 2016-2017, what would the transition process be to develop a new MP?

157. The ESC considered whether interim transitioning MPs, with less informative information on recruitment, would be a potential approach while developing a longer times series of recruitment. However this was not considered a viable option as it would require the development of a short-term MP and followed by the development of the longer term MP, which would substantially increase the cost. Importantly, the ESC agreed there was not a suitable alternative recruitment index that could be used immediately in the place of the aerial survey. The ESC considered the most efficient and rapid MP development would be via adjustments to the current MP where possible.

158. The ESC discussed development of a new MP that could transition from using the AS data to gene-tagging data, through adjustments to the methods in the current MP. The gene-tagging data cannot simply be used in the existing MP. However adjustments to the current MP could be made to use a short time series of gene-tagging data and the existing recruitment AS index in the MP. Methods for doing this could be tested, along with using gene tagging as the only index of recruitment, when a longer series is available. The schedule of inter-sessional and ESC meetings required to develop a new MP are in table 4 (above, in agenda item 7). This would require a 3 year development period, including 2-3 additional

OMMP working group meetings and extra days for OMMP technical workshops along -side the annual ESC meeting. The timing of data collection and use in a new MP developed for use in 2019 for recommending TACs for 2021-2023 is shown below (table 6). The three options differ in the extent of overlap between the aerial survey and gene-tagging and the number of estimates of recruitment from gene-tagging available for the scheduled assessment and testing of a new MP in 2017. This extent of overlap between gene- tagging and the aerial survey is the main influence on difference in costs between the options. The ESC noted that the expected cost of routine gene-tagging would decrease from the current estimated cost for the pilot study and that the required level of releases and recovery effort would be explored as part of the MP testing.

159. Option A would provide AS data for use in 2016 MP TAC setting, AS data for stock assessment in 2017, 2017 AS data and two gene-tagging data points for use in 2019 MP TAC setting.

160. Option B would provide AS data for use in 2016 MP TAC setting, no 2017 AS data for use in 2017 stock assessment and OM for MP performance testing, two gene-tagging data points for use in 2019 MP TAC setting.

161. Option C would provide AS data for use in 2016 MP TAC setting, AS data for use in 2017 stock assessment and OM model updates for MP performance testing, one gene-tagging data point for use in 2019 TAC setting.

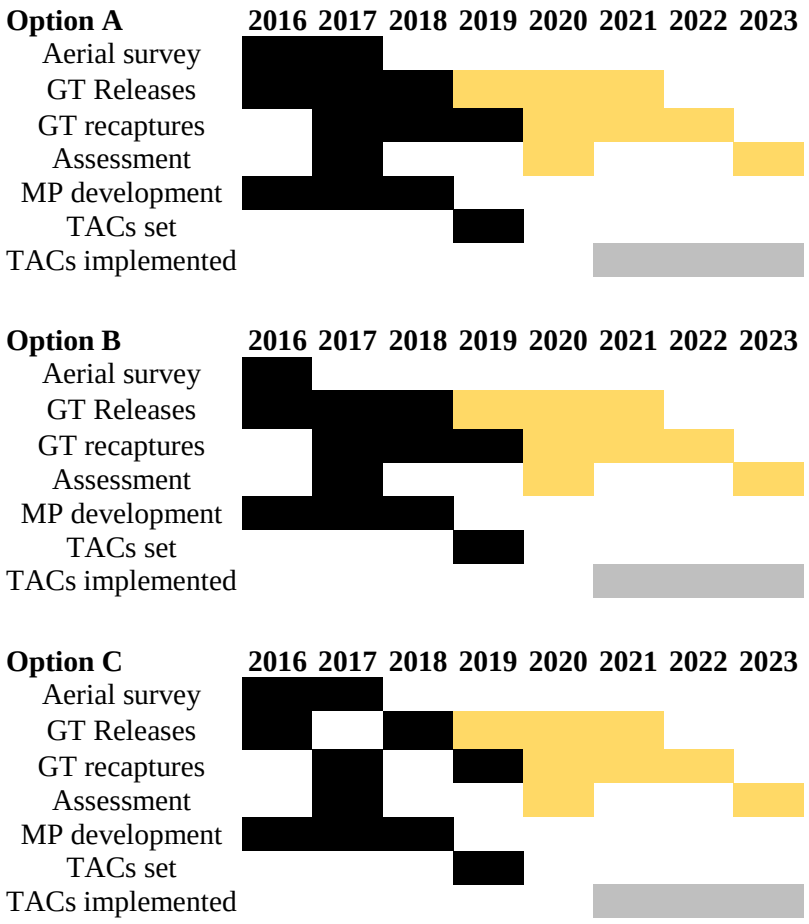
Table 6. Timing of data collection for use in an MP in 2019, for three options, and the strengths and weaknesses of these.

Year	Option A	Option B	Option C
2016	AS occurs GT releases start Recommend TACs (Bali MP) through 2018-2020 OMMP (2-day) with ESC to focus on OM structure	AS occurs GT releases start Recommend TACs (Bali MP) through 2018-2020 OMMP (2-day) with ESC to focus on OM structure	AS occurs GT releases start Recommend TACs (Bali MP) through 2018-2020 OMMP (2-day) with ESC to focus on OM structure
2017	AS occurs GT release 2, recap 1 in June Stock assessment Inter-sessional MP workshop Current recruitment estimates in assessment	No AS GT release 2, recap 1 in June Stock assessment Inter-sessional MP workshop No current recruitment estimate	As in Opt A but no GT releases
2018	1st GT estimate ~2yr olds release 3, recap 2 in June Inter-sessional MP workshop	1st GT estimate ~2yr olds, release 3, recap 2 in June, Inter-sessional MP workshop	1st GT estimate ~2yr olds release 2 Inter-sessional MP workshop
2019	GT release 4, recap 3 in June, Revised MP run Recommend TACs 2021-2023	GT release 4, recap 3 in June Revised MP run Recommend TACs 2021-2023	GT release 3, recap 2 in June, Revised MP run Recommend TACs set 2021-2023 (noting less recruitment information for MP)

Year	Option A	Option B	Option C
Strengths	2017 recruitment index available for OM, continuity of Bali MP if required Not stopping Bali MP until high degree of certainty of new recruitment index for MP GT provides 2 recruitment index points for revised MP	Reduced cost compared to options A and C GT provides 2 recruitment index points for revised MP	Reduced cost compared to option A 2017 recruitment index available for OM, continuity of Bali MP if required Not stopping Bali MP until high degree of certainty of new recruitment index for MP
Limitations	Budget, requires resourcing for AS and GT release in 2017	Bali MP stops in 2016, with no 2017 recruitment index Unlikely to be able to recommence Bali MP if needed	Only 1 GT recruitment index for revised MP due to slower commencement of GT.

162. The timing of data collection and MP scheduled events is in table 7.

Table 7. Data collection and MP schedule of activities for transition to a new MP. Black blocks indicate activities required in the short term (in preparation for the TAC recommendation). Light blocks indicate the longer term work.



163. The ESC agreed that Option A is the preferred option, should the EC decide not to continue with the aerial survey and the current MP before 2018. The 2017 AS

in Option A provides a recruitment index for the 2017 stock assessment. This allows for continuity of the current MP if there are any issues with the gene-tagging index and provides a smooth transition to a new MP if required. The ESC agreed that if the preferred Option A was not supported by the commission, Option B was preferred over Option C.

Other research priorities

1. Close-kin genotyping for SSB

164. The ESC agreed it was a high priority to genotype the existing collection of close-kin tissue samples for data for inclusion in the 2017 full stock assessment, and reconditioned OMs for the 2017 review of the MP, or alternatively, development of a new MP. These data are highly informative in the OM and the only direct, fishery independent estimate of abundance and trends in the spawning stock.

165. Continued collection of CK samples remains as high priority and was included in the 2014 SRP 3 year budget and plan. It was recommended that if only the continued collection of close-kin samples could be funded, this would need to include their genotyping so that the back log of samples does not keep accumulating.

2. Gene-tagging

166. The ESC recommends that gene-tagging pilot study should commence in 2016, to develop a fishery independent juvenile abundance estimate that will provide new data for use in the OM and potentially in future MPs.

3. Resolution of the Indonesian small fish issue

167. As discussed above (Agenda 10) analysis of Indonesian CDS data should be undertaken to resolve how to treat the reported catches of small fish in the OM. This will involve re-summarising spawning ground length and age data to, if possible, exclude area 8 and area 2 fish. While this is reflected in the work plan there are no budget implications for the CCSBT.

4. Maturity workshop

168. The maturity workshop is a higher priority than the age validation workshop, because these data are used to inform the close-kin estimates and in the stock assessment OMs. Data collection by Members has commenced. It was suggested that this could be considered for 2016 or early 2017, dependent on other sources of funding between Members.

5. Age-validation workshop

169. The ESC agreed that the age-validation is not as urgent as other SRP activities, but remains a high priority, and therefore may be delayed relative to the 2014 agreed SRP schedule. If there are other sources of funding available it could be completed sooner. The ESC recommend it is considered for 2017.

6. Indonesian otolith collection, ageing and archiving

170. The collection, ageing and archiving of Indonesian otoliths remains a high priority as it is an essential input to the stock assessment and interpretation of close-kin data. It is recommended to proceed in 2016 with support from CCSBT.

12.4 Recommendations

171. The above recommendations have been reflected in the ESC work-plan at **Attachment 7**. Some, as discussed above, are dependent on the EC22 decisions.

Agenda Item 13. SBT Management Advice

172. At its Eighteenth annual meeting in 2011, the CCSBT agreed that a Management Procedure (MP) would be used to guide the setting of the SBT global total allowable catch (TAC) to provide a probability of 0.70 of achieving the interim rebuilding target of 20% of the original spawning stock biomass by 2035. In adopting the MP, the CCSBT emphasised the need to take a precautionary approach to increase the likelihood of the spawning stock rebuilding in the short term and to provide industry with more stability in the TAC (i.e. to reduce the probability of future TAC decreases).

Stock status from 2014 assessment

173. In 2014 the stock remained at a very low state estimated to be 9% (8-12, 80% PI) of the initial SSB, and below the level to produce maximum sustainable yield (MSY), however there has been some improvement since the 2011 stock assessment and fishing mortality is below the level associated with MSY. B10+ relative to initial is estimated to be 7% which is up from the estimate of 5% in 2011.

Implications from 2015 review of indicators

174. The review of stock indicators (agenda item 10) did not suggest any need for major change to the conclusions drawn from the 2014 assessment. Only limited new information on UAM became available (agenda item 9); obtaining substantially improved information on UAM remains a priority.

Review of MP implementation in 2013

175. In 2013 the Advisory Panel formally ran the MP on behalf of the CCSBT Secretariat for the TAC recommendation. The recommended annual TAC for the years 2015-2017 is 14,647.4 t. This is a 2198.4t increase from 12,449 t TAC (18%) in 2014, which is less than the maximum step of 3000t allowed under the MP.

Current TAC

176. For the three-year TAC setting period (2015-2017) 21st EC adopted TAC values shown below.

Year	2015	2016	2017
TAC (t)	14,647	14,647	14,647

Annual Review of implementation of current MP

177. In 2015 the ESC has evaluated whether there are events, or observations, that are outside the range for which the management procedure was tested and the implications of this for TAC setting. The scope of this evaluation covered input data to the MP (CPUE and aerial survey data), the question of unaccounted mortality, reported catch and future recruitment monitoring.

178. The ESC agreed that the longline CPUE in 2014 was within the range predicted in the testing of the MP. However, there was no aerial survey in 2015, or other direct recruitment indices, available to determine if recruitment in 2015 is within the expected bounds.

179. The absence of an aerial survey in 2015 requires review of the implications for TAC recommendations, because these data are a requirement of the MP. The ESC has evaluated the consequences of no aerial survey in 2015 and found that there is virtually no effect on the predicted performance of the MP for the Reference Set. Provided there is an aerial survey in 2016, and effective recruitment monitoring in the future, the MP can be used to recommend 2018-2020 TACs in 2016.

180. The review of UAM in 2015 has not changed the perception of ESC on the potential scale of UAM. The ESC also noted the workplan of EC related to this issue (EC2014 para. 53). The ESC advises that the EC take steps to ensure adherence to its TACs and as a matter of urgency, to take steps to quantify all sources of unaccounted SBT mortality. If substantial levels of unaccounted mortality are confirmed, then there will be a need to retune the MP to achieve the EC's rebuilding objective.

Response to SFMWG Request

181. The ESC provided the following in response to the requests from the fourth meeting of the Strategy and Fisheries Management Working Group (shown in italics).

1) The ESC's relative research priorities for 2016 to 2018 inclusive, noting that the research budget is limited;

- Research recommendations were formulated by assigning the highest priority to the two elements considered essential for the rebuilding strategy: (i) the continued monitoring of recruitment through a fishery-independent index, and (ii) the availability of a fully tested MP for TAC-setting.
- If the EC decides to continue with the current MP, then it is essential for the AS to continue annually, while an alternative recruitment index is developed to supersede it.
- In the event that the EC decides not to continue with the aerial survey, the ESC recommends that the transition to a new MP that uses gene tagging as input be brought forward. In this case, the AS 2016 must occur and the gene tagging should be fast-tracked for 2016.
- Gene tagging is recommended as the most cost-effective approach for recruitment monitoring. It is, therefore, a priority for transitioning to the new MP. The first estimate of recruitment from gene tagging could be available in 2018.

2) The costs and benefits of continuing with the current MP including conducting the aerial survey from 2017 to 2019; and 3) Any preliminary consideration of alternatives to the current MP approach including an indication of their relative costs and benefits if possible.

- The ESC notes that the current MP requires the aerial survey to be conducted from 2017 to 2019 for the TAC-setting in 2019.
- Retention of the current MP would provide continuity in the rebuilding strategy and greater certainty of outcomes throughout the transition to a new MP, which will be required in the short-term (3-5 years), given the increasing logistic vulnerability of the aerial survey.
- In the event that the aerial survey is discontinued and the current MP can no longer be used, three options (A, B and C in paragraphs 157-163) were developed for fast-tracking the transition to a new MP.
- Their strengths and limitations were considered and the ESC preferred option A to provide overlap between the two indices of recruitment during the transition period. Recognising budget issues, and weighing the relative benefits of the other two options, Option B was preferred over Option C.

MP TAC Recommendations

182. Based on the results of the MP operation for 2015-17 in 2013 and the outcome of the review of exceptional circumstances in Agenda Item 11.1, the ESC recommended that there is no need to revise the EC's 2013 TAC decision regarding the TACs for 2016-17. The recommended annual TAC for the years 2016-2017 is 14,647.4 t.

Other Advice

183. The ESC recommends to the EC that an allocation of 7.7 t in 2016 be made to cover mortality associated with approved research projects.

184. The ESC updated the annual report on biology, stock status and management of SBT that it prepares for provision to FAO and the other tuna RFMOs. The updated report is at **Attachment 8**.

Agenda Item 14. Requirements for MP review in 2017

185. Australia presented an extract (Section 4) from paper CCSBT-ESC/1509/12. The Meta-rules include a scheduled review of the MP in 2017, which will follow completion of three TAC decisions (2011; 2013 and 2016). The paper provides initial suggestions for the terms of reference in preparation for the scheduled 2017 MP review. It includes a review of the input and output data series, and performance for stock rebuilding relative to what the MP was designed to achieve.

186. Japan presented paper CCSBT-ESC/1509/38. This paper provided some initial considerations for a review of the current MP scheduled in 2017. This review must include an examination of indices that are essential for the MP, the stock level to be attained by 2017 and trends in regard to meeting the rebuilding target.

Especially the future availability of the indices is very important to consider in regard to the continuing use of the current MP. Several alternatives to the current MP are considered in terms of data quality, the cost of these alternative indices, the future availability of data, the development cost and the time required.

187. It was noted that the AS data are a requirement of the current MP (Attachment 10, Report of ESC18). If the AS is cancelled after 2016, then the current MP cannot be used to set TACs and the ESC expects the EC would request the development of a new MP. If a new MP is to be developed there would be no need for the scheduled review of the Bali MP in 2017. There would, however, be the need for a similar scale meeting as part of the development of a new MP.

Agenda Item 15. Requirements for Data Exchange in 2016

188. The Secretariat presented paper CCSBT-ESC/1509/05. The requirements for the 2016 data exchange were discussed and agreed in the margins of the meeting. These requirements were endorsed by the ESC and are provided in **Attachment 9**.

Agenda Item 16. Research Mortality Allowance (RMA)

189. Japan presented paper CCSBT-ESC/1509/34, in which Japan requested 1.0 t of RMA for the 2015/2016 trolling research survey.

190. Australia presented paper CCSBT-ESC/1509/17, in which Australia requested 6.7 t of RMA to cover possible incidental mortality for four projects in 2016. Four tonnes of the request is conditional upon the pilot gene tagging proceeding as recommended by the ESC. Australia also advised that as of 1 July 2015, it had used 400kg of the 5.95 t of RMA approved for 2015.

191. The ESC endorsed both Japan's and Australia's proposals and their requests for RMA.

Agenda Item 17. Report of the Ecologically Related Species Working Group

192. The Secretariat presented paper CCSBT-ESC/1509/06, which summarised the report from the March 2015 meeting of the Ecologically Related Species Working Group (ERSWG), particularly in relation to the ERSWG's revision of the Scientific Observer Program Standards (SOPS).

193. The ESC endorsed the revised SOPS in the report of ESRWG 11.

Agenda Item 18. Performance Review of the CCSBT

194. The Secretariat introduced paper CCSBT-ESC/1509/07 which listed the recommendations from the CCSBT's 2014 Performance Review that are relevant to the ESC. The Secretariat requested feedback from the ESC on these

recommendations that the Extended Commission will in turn utilise in its revision of the Five Year Strategic Plan.

195. The ESC noted that a substantial number of the recommended actions, and completed actions in the performance review were contingent on the adoption and implementation of a scientifically tested rebuilding plan.

196. The ESC considered the recommendations from the Performance Review of relevance to its work and the group's advice in relation to these recommendations is provided at **Attachment 10**. Although many of the recommendations from the initial performance review remained valid, the group found that a number of the new recommendations were too general and of less relevance, when considered within the context of CCSBT, than the priorities specified within the ESC's Scientific Research Plan.

Agenda Item 19. Workplan, Timetable and Research Budget for 2016

19.1. Overview, time schedule and budgetary implications of proposed 2016 research activities and implications of Scientific Research Program for the work plan and budget

197. The ESC has prepared a three-year indicative workplan for projects to be funded by the CCSBT. This is provided at **Attachment 7** and was developed on the assumption that the EC decides to commence the transition from the Bali MP to a new MP in 2016.

19.2. Timing, length and structure of next meeting

198. The next ESC meeting is proposed to be held from 5-10 September 2016, in Kaohsiung, Taiwan.

199. Assuming that the EC decides to commence the transition to a new MP from 2016, a 2 day OMMP meeting is proposed to be held prior to the ESC, also in Kaohsiung, Taiwan. A decision on whether or not to have a one day break between the OMMP and ESC meetings will be made intersessionally.

Agenda Item 20. Other Matters

20.1. Scientific Advisory Panel

200. The ESC discussed the need to appoint a new panel member to the Scientific Advisory Panel following the resignation of Professor Hilborn. It was agreed that there is a need to appoint a new panel member to allow for overlap prior to succession amongst the remaining three panel members, which is likely to occur within the next two years.

201. The recommended qualifications for the new panel member are provided at **Attachment 11**.

20.2. Other

202. The CCSBT ESC expresses their sincere appreciation to Ibu Retno "Poppy" Andamari for her contribution to research, catch monitoring and capability development for SBT in Indonesia over two decades. In particular, the ESC wishes to commend her excellent service as the CCSBT Tag Collection Office in Indonesia over the past 14 years, which has contributed to the return of many hundreds of tags and a substantial increase in the understanding of SBT biology.

203. In addition, Bu Poppy has been an essential contributor to the development of the catch monitoring program for SBT, which has grown from a small, short-term project into a national research institute for tuna research in Indonesia. She is a dear friend, mentor and colleague to many who has made an outstanding contribution to the knowledge of tuna biology and fishery in Indonesia and beyond.

Agenda Item 21. Adoption of Meeting Report

204. The report was adopted.

Agenda Item 22. Close of meeting

205. The meeting closed at 5:54 pm on 5 September 2015.

List of Attachments

Attachments

Attachment 1

List of Participants
Extended Scientific Committee Meeting
of the Twentieth Meeting of the Scientific Committee

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
CHAIR								
John	ANNALA	Dr			NEW ZEALAND			annala@snap.net.nz
COMMISSION CHAIR								
Hyun-Wook	KWON	Ms	Director, Quarantine and Inspection Division	National Fishery Products Quality Management Service, Ministry of Oceans and Fisheries	337, Haeyang-ro, Yeongdo-gu, Busan, Korea	82 51 400 5710		6103kwon@naver.com
ADVISORY PANEL								
Ana	PARMA	Dr		Centro Nacional Patagonico	Pueto Madryn, Chubut Argentina	54 2965 451024	54 2965 451543	parma@cenpat.edu.ar
John	POPE	Professor			The Old Rectory Burgh St Peter Norfolk, NR34 0BT UK	44 1502 677377	44 1502 677377	popeJG@aol.com
James	IANELLI	Dr		REFM Division, Alaska Fisheries Science Centre	7600 Sand Pt Way NE Seattle, WA 98115 USA	1 206 526 6510	1 206 526 6723	jim.ianelli@noaa.gov
CONSULTANT								
Mark	BRAVINGTON	Dr	Research Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 3 6232 5118	61 3 6232 5000	Mark.Bravington@csiro.au

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
MEMBERS								
AUSTRALIA								
Ilona	STOBUTZKI	Dr	Assistant Secretary	Department of Agriculture	GPO Box 858, Canberra ACT 2601, Australia	61 2 6272 4277		ilona.stobutzki@agriculture.gov.au
Belinda	BARNES	Dr	Senior Scientist	Department of Agriculture	GPO Box 858, Canberra ACT 2601, Australia	61 2 6272 5374		belinda.barnes@agriculture.gov.au
Campbell	DAVIES	Dr	Senior Research Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 2 6232 5044		Campbell.Davies@csiro.au
Ann	PREECE	Ms	Fisheries Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 3 6232 5336		Ann.Preece@csiro.au
Rich	HILLARY	Dr	Senior Ecological Modeller	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 3 6232 5452		Rich.Hillary@csiro.au
Matt	DANIEL	Mr	Southern Bluefin Tuna Fishery Manager	Australian Fisheries Management Authority	GPO Box 7051, Canberra, ACT 2601, Australia	61 2 6225 5338		Matthew.Daniel@afma.gov.au
Brian	JEFFRIESS	Mr	Chief Executive Officer	Australian SBT Industry Association	PO Box 416, Fullarton SA 5063, Australia	61 4 1984 0299		austuna@bigpond.com
FISHING ENTITY OF TAIWAN								
Sheng-Ping	WANG	Dr	Professor	National Taiwan Ocean University	2 Pei-Ning Road, Keelung 20224, Taiwan (R.O.C.)	886 2 24622 192 ext 5028	886 2 24636 834	wsp@mail.ntou.edu.tw
I-Lu	LAI	Ms	Specialist	Fisheries Agency of Taiwan	8F., No.100, Sec. 2, Heping W. Rd., Zhongzheng Dist., Taipei City 100, Taiwan (R.O.C.)	886 2 23835 895	886 2 89987 395	ilu@ms1.fa.gov.tw

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
INDONESIA								
Saut	TAMPUBOLON	Mr	Deputy Director for Fisheries Resource in Indonesia EEZ and High Seas	Ministry of Marine Affairs and Fisheries	Jln. Medan Merdeka Timur No. 16, Gedung Mina Bahari II, Lantai 10, Jakarta Pusat, 10110 Indonesia	62 21 35190 70 ext. 1002		s.tampubolon@yahoo.com and sdi.djpt@yahoo.com
	ILHAM	Mr	Senior Officer of Directorate for Fisheries Resources Management	Ministry of Marine Affairs and Fisheries	Jln. Medan Merdeka Timur No. 16, Gedung Mina Bahari II, Lantai 10, Jakarta Pusat, 10110 Indonesia	62 21 35190 70 ext. 1002		
JAPAN								
Tomoyuki	ITOH	Dr	Group Chief	National Research Institute of Far Seas Fisheries	5-7-1 Orido, Shimizu, Shizuoka 424-8633, Japan	81 54 336 6000	81 543 35 9642	itou@fra.affrc.go.jp
Norio	TAKAHASHI	Dr	Senior Scientist	National Research Institute of Far Seas Fisheries	2-12-4 Fukuura, Yokohama, Kanagawa 236-8648, Japan	81 45 788 7501	81 45 788 5004	norio@fra.affrc.go.jp
Hiroyuki	KUROTA	Dr	Senior Scientist	Seikai National Fisheries Research Institute	1551-8 Tairamachi, Nagasaki 851-2213, Japan	81 95 860 1600	81 95 850 7767	kurota@fra.affrc.go.jp
Osamu	SAKAI	Dr	Researcher	National Research Institute of Far Seas Fisheries	5-7-1 Orido, Shimizu, Shizuoka 424-8633, Japan	81 54 336 6000	81 543 35 9642	sakaios@fra.affrc.go.jp
Izumi	YAMASAKI	Dr	Researcher	National Research Institute of Far Seas Fisheries	5-7-1 Orido, Shimizu, Shizuoka 424-8633, Japan	81 54 336 6000	81 543 35 9642	izyam@fra.affrc.go.jp
Doug	BUTTERWORTH	Professor		Dept of Maths & Applied Maths, University of Cape Town	Rondebosch 7701, South Africa	27 21 650 2343	27 21 650 2334	Doug.Butterworth@uct.ac.za
Ryo	OMORI	Mr	Assistant Director	Fisheries Agency	1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8907, Japan	81 3 3502 8459	81 3 3502 0571	ryou_oomori@nm.maff.go.jp
Yuji	UOZUMI	Dr	Advisor	Japan Tuna Fisheries Cooperative Association	31-1, Eitai 2 Chome, Koto-ku, Tokyo 135-0034, Japan	81 3 5646 2382	81 3 5646 2652	uozumi@japantuna.or.jp
Michio	SHIMIZU	Mr	Executive Secretary	National Ocean Tuna Fishery Association	1-1-12 Uchikanda, Chiyoda-ku, Tokyo 101-8503, Japan	81 3 3294 9634	81 3 3294 9607	ms-shimizu@zengyoren.jf-net.ne.jp

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
NEW ZEALAND								
Kevin	SULLIVAN	Dr	Team Manager Fisheries Stock Assessment	Ministry for Primary Industries	PO Box 2526, Wellington, New Zealand	64 4 819 4264	N/A	Kevin.Sullivan@mpi.govt.nz
Dominic	VALLIÈRES	Mr	Senior Fisheries Analyst	Ministry for Primary Industries	PO Box 2526, Wellington, New Zealand	64 4 819 4654	N/A	Dominic.Vallieres@mpi.govt.nz
Simon	HOYLE	Dr	Fisheries Scientist	National Institute of Water and Atmospheric Research (NIWA)	217 Akersten Street, Port Nelson 7010, PO Box 893, Nelson, New Zealand	64 3 548 1715	N/A	simon.hoyle@niwa.co.nz
REPUBLIC OF KOREA								
Doo Nam	KIM	Dr.	Senior Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2334	82-51-720-2337	doonam@korea.kr
Sung Il	LEE	Dr.	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2325	82-51-720-2337	k.sungillee@gmail.com
Mi Kyung	LEE	Ms.	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2338	82-51-720-2337	cc.mklee@gmail.com
Hee Won	PARK	Dr.	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2332	82-51-720-2337	heewon81@gmail.com
Ari	SHIN	Ms	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2336	82-51-720-2337	arishin8@gmail.com
Jeong Eun	KU	Ms	Researcher	National Fisheries Research and Development Institute	210 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 617-705, Korea	82-51-720-2338	82-51-720-2337	red1594@gmail.com

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
INTERPRETERS								
Saemi	BABA	Ms						
Kumi	KOIKE	Ms						
Yoko	YAMAKAGE	Ms						
CCSBT SECRETARIAT								
Robert	KENNEDY	Mr	Executive Secretary		PO Box 37, Deakin West ACT 2600 AUSTRALIA	61 2 6282 8396	61 2 6282 8407	rkennedy@ccsbt.org
Akira	SOMA	Mr	Deputy Executive Secretary					asoma@ccsbt.org
Colin	MILLAR	Mr	Database Manager					CMillar@ccsbt.org
Glen	Hong	Mr	Assistant					GHong@ccsbt.org

Attachment 2

Agenda
Extended Scientific Committee for the Twentieth Meeting of the Scientific Committee
Incheon, South Korea
1 – 5 September, 2015

1. **Opening**
   - 1.1. Introduction of Participants
   - 1.2. Administrative Arrangements
2. **Appointment of Rapporteurs**
3. **Adoption of Agenda and Document List**
4. **Review of SBT Fisheries**
   - 4.1. Presentation of National Reports
   - 4.2. Secretariat Review of Catches
5. **Report from the SFMWG meeting**
6. **Report from the OMMP meeting**
   - 6.1. Technical implications of changes to the scientific aerial survey
   - 6.2. Reconsideration of OM structure
   - 6.3. Other issues
7. **Implications of changes in the scientific aerial survey on the MP process**
8. **Report from the CPUE modelling group**
9. **Estimation of all sources of unaccounted catch mortality**
10. **Evaluation of Fisheries Indicators**
11. **SBT stock status**
    - 11.1. Assessment of exceptional circumstances
    - 11.2. Summary of the SBT stock status
12. **Review of results of the Scientific Research Program and other inter-sessional scientific activities**
13. **SBT Management Advice**
14. **Requirements for MP review in 2017**

15. Requirements for Data Exchange in 2016

16. Research Mortality Allowance

17. Report of the Ecologically Related Species Working Group

18. Performance Review of the CCSBT

19. Workplan, Timetable and Research Budget for 2016

19.1. Overview, time schedule and budgetary implications of proposed 2016 research activities and implications of Scientific Research Program for the work plan and budget

19.2. Timing, length and structure of next meeting

20. Other Matters

20.1. Scientific Advisory Panel

20.2. Other

21. Adoption of Meeting Report

22. Close of Meeting

Attachment 3

List of Documents
Extended Scientific Committee
for the Twentieth Meeting of the Scientific Committee

(CCSBT-ESC/1509/)

1. Provisional Agenda
2. List of Participants
3. List of Documents
4. (Secretariat) Secretariat review of catches (ESC agenda item 4.2)
5. (Secretariat) Data Exchange (ESC agenda item 15)
6. (Secretariat) Report from the Eleventh Meeting of the Ecologically Related Species Working Group (ESC Agenda Item 17)
7. (Secretariat) Performance Review of the CCSBT (ESC agenda item 18)
8. (Australia) Preparation of Australia's southern bluefin tuna catch and effort data submission for 2015 (ESC agenda item 4.1)
9. (Australia) Implications of cessation of the aerial survey for the MP and TAC setting (ESC agenda item 7)
10. (Australia and New Zealand) Estimates of non-member catch of SBT in the Indian and Pacific Oceans (ESC agenda item 9)
11. (Australia) Fisheries indicators for the southern bluefin tuna stock 2014–15 (ESC agenda item 10)
12. (Australia) Meta-rules for implementation of CCSBT management Procedure and consideration of exceptional circumstances and 2017 scheduled review of MP (ESC agenda item 11.1)
13. (Australia) An update on Australian otolith collection activities, direct ageing and length at age keys for the Australian surface fishery (ESC agenda item 12)
14. (Australia) Update on the length and age distribution of SBT in the Indonesian longline catch (ESC agenda item 12)
15. (Australia) Update on Scientific Research Program activities (ESC agenda item 12)
17. (Australia) Research mortality allowance: Proposed allowance for 2016 and 2015 usage report (ESC agenda item 16)
18. (CCSBT) Report on gene-tagging design study (ESC Agenda Item 12)
19. (CCSBT) SBT Close-Kin Mark-Recapture: options for the medium term (ESC Agenda Item 12)
20. (New Zealand) Discussion paper on future Scientific Research Programme (ESC Agenda Item 12)

21. (New Zealand and Australia) Estimating southern bluefin tuna catches by CCSBT non-members (ESC Agenda Item 9)
22. (Taiwan) Size and age composition of the SBT caught by Taiwanese longliners in 2006-2013 (ESC Agenda Item 12)
23. (Taiwan) CPUE standardization for southern bluefin tuna caught by Taiwanese longline fishery (ESC Agenda Item 10)
24. (Taiwan) Updated analysis for gonad samples of southern bluefin tuna collected by Taiwanese scientific observer program (ESC Agenda Item 12)
26. (Korea) Data Exploration and CPUE Standardization for the Korean Southern Bluefin Tuna Longline Fishery (1996-2014) (ESC Agenda Item 8 and 10)
27. (Japan) Report of Japanese scientific observer activities for southern bluefin tuna fishery in 2013 and 2014 (ESC Agenda Item 4.1)
28. (Japan) Activities of southern bluefin tuna otolith collection and age estimation and analysis of the age data by Japan in 2014 (ESC Agenda Item 12)
29. (Japan) Summary of Fisheries Indicators of Southern Bluefin Tuna Stock in 2015 (ESC Agenda Item 10)
30. (Japan) Change in operation pattern of Japanese southern bluefin tuna longliners in the 2014 fishing season (ESC Agenda Item 4.1 and 10)
31. (Japan) Update of the core vessel data and CPUE for southern bluefin tuna in 2015 (ESC Agenda Item 10)
32. (Japan) Update of unaccounted catch mortality in Australian SBT farming in 2015 (Rev.1) (ESC Agenda Item 9)
34. (Japan) Proposal for RMA in the 2016 Japanese research (ESC Agenda Item 16)
35. (Australia) Update of Tuna Growth performance in Ranching and Farming Operations (ESC Agenda Item 9)
36. (CCSBT) Reviews of CCSBT-ESC/1509/19: “SBT CKMR: Options for the Medium Term” (ESC Agenda Item 12)
37. (Japan) A Check of Operating Model Predictions with Discussion of Aerial Survey Index Issues Related to Continuing Use of the Bali Management Procedure (ESC Agenda Item 11.1)
38. (Japan) Some initial considerations for the review of the Bali Management Procedure in 2017 (ESC Agenda Item 14)
39. (CPUE Chair) Report of the 16th /17th June 2015 CPUE Web Meeting of the CCSBT CPUE Modelling Group (ESC Agenda Item 8)
40. (CCSBT) Updated cost of pilot gene-tagging: Addendum to CCSBT-ESC/1509/18 Report on gene-tagging design study (ESC Agenda Item 12)

(CCSBT- ESC/1509/BGD)

1. (Australia) Post-release survival of tuna and tuna-like species in longline fisheries (*Previously* **CCSBT-ESC/1409/14**) (ESC agenda item 9)

(CCSBT-ESC/1509/SBT Fisheries -)

Australia	Australia's 2013–14 southern bluefin tuna fishing season (Rev.1)
Indonesia	Indonesia Southern Bluefin Tuna Fisheries - A National Report Year 2014
Japan	Review of Japanese Southern Bluefin Tuna Fisheries in 2014
Korea	2015 Annual National Report of Korean SBT Fishery
New Zealand	Annual Review of National SBT Fisheries – New Zealand
Taiwan	Review of Taiwan SBT Fishery of 2013/2014
EU	2015 Annual Review of SBT Fisheries for the Extended Scientific Committee

(CCSBT-ESC/1509/Info)

1. (Australia) Spawning Dynamics and Size Related Trends in Reproductive Parameters of Southern Bluefin Tuna, *Thunnus maccoyii*. (ESC Agenda Item 12)
2. (Australia) Demographic Structure, Sex Ratio and Growth Rates of Southern Bluefin Tuna (*Thunnus maccoyii*) on the Spawning Ground (ESC Agenda Item 12)
3. (Australia) A Standardised Abundance Index from Commercial Spotting Data of Southern Bluefin Tuna (*Thunnus maccoyii*): Random Effects to the Rescue (ESC Agenda Item 12)

(CCSBT-ESC/1509/Rep)

1. Report of the Fourth Meeting of the Strategy and Fisheries Management Working Group (July 2015)
2. Report of the Eleventh Meeting of the Ecologically Related Species Working Group (March 2015)
3. Report of the Effectiveness of Seabird Mitigation Measures Technical Group (November 2014)
4. Report of the Twenty First Annual Meeting of the Commission (October 2014)
5. Report of the Ninth Meeting of the Compliance Committee (October 2014)
6. Report of the Nineteenth Meeting of the Scientific Committee (September 2014)
7. Report of the Fifth Operating Model and Management Procedure Technical Meeting (June 2014)
8. Report of the Twentieth Annual Meeting of the Commission (October 2013)

9. Report of the Eighteenth Meeting of the Scientific Committee (September 2013)
10. Report of the Fourth Operating Model and Management Procedure Technical Meeting (July 2013)
11. Report of the Seventeenth Meeting of the Scientific Committee (August 2012)
12. Report of the Special Meeting of the Commission (August 2011)
13. Report of the Sixteenth Meeting of the Scientific Committee (July 2011)

Global Reported Catch By Flag

Reviews of southern bluefin tuna data presented to a special meeting of the Commission in 2006 suggested that the catches may have been substanstially under-reported over the previous 10 to 20 years. The data presented here do not include estimates for this unreported catch.

All shaded figures are subject to change as they are either preliminary figures or they have yet to be finalised.

Blank cells are unknown catch (many would be zero).

	Australia			New Zealand									
Calendar Year	Commercial	Amateur	Japan	Commercial	Amateur	Korea	Taiwan	Philippines	Indonesia	South Africa	European Union	Miscellaneous	Research & Other
1952	264		565	0		0	0	0	0	0	0	0	
1953	509		3,890	0		0	0	0	0	0	0	0	
1954	424		2,447	0		0	0	0	0	0	0	0	
1955	322		1,964	0		0	0	0	0	0	0	0	
1956	964		9,603	0		0	0	0	0	0	0	0	
1957	1,264		22,908	0		0	0	0	0	0	0	0	
1958	2,322		12,462	0		0	0	0	0	0	0	0	
1959	2,486		61,892	0		0	0	0	0	0	0	0	
1960	3,545		75,826	0		0	0	0	0	0	0	0	
1961	3,678		77,927	0		0	0	0	0	145	0	0	
1962	4,636		40,397	0		0	0	0	0	724	0	0	
1963	6,199		59,724	0		0	0	0	0	398	0	0	
1964	6,832		42,838	0		0	0	0	0	197	0	0	
1965	6,876		40,689	0		0	0	0	0	2	0	0	
1966	8,008		39,644	0		0	0	0	0	4	0	0	
1967	6,357		59,281	0		0	0	0	0	5	0	0	
1968	8,737		49,657	0		0	0	0	0	0	0	0	
1969	8,679		49,769	0		0	80	0	0	0	0	0	
1970	7,097		40,929	0		0	130	0	0	0	0	0	
1971	6,969		38,149	0		0	30	0	0	0	0	0	
1972	12,397		39,458	0		0	70	0	0	0	0	0	
1973	9,890		31,225	0		0	90	0	0	0	0	0	
1974	12,672		34,005	0		0	100	0	0	0	0	0	
1975	8,833		24,134	0		0	15	0	0	0	0	0	
1976	8,383		34,099	0		0	15	0	12	0	0	0	
1977	12,569		29,600	0		0	5	0	4	0	0	0	
1978	12,190		23,632	0		0	80	0	6	0	0	0	
1979	10,783		27,828	0		0	53	0	5	0	0	4	
1980	11,195		33,653	130		0	64	0	5	0	0	7	
1981	16,843		27,981	173		0	92	0	1	0	0	14	
1982	21,501		20,789	305		0	182	0	2	0	0	9	
1983	17,695		24,881	132		0	161	0	5	0	0	7	
1984	13,411		23,328	93		0	244	0	11	0	0	3	
1985	12,589		20,396	94		0	241	0	3	0	0	2	
1986	12,531		15,182	82		0	514	0	7	0	0	3	
1987	10,821		13,964	59		0	710	0	14	0	0	7	
1988	10,591		11,422	94		0	856	0	180	0	0	2	
1989	6,118		9,222	437		0	1,395	0	568	0	0	103	
1990	4,586		7,056	529		0	1,177	0	517	0	0	4	
1991	4,489		6,477	164		246	1,460	0	759	0	0	97	
1992	5,248		6,121	279		41	1,222	0	1,232	0	0	73	
1993	5,373		6,318	217		92	958	0	1,370	0	0	15	
1994	4,700		6,063	277		137	1,020	0	904	0	0	54	
1995	4,508		5,867	436		365	1,431	0	829	0	0	201	296
1996	5,128		6,392	139		1,320	1,467	0	1,614	0	0	295	290
1997	5,316		5,588	334		1,424	872	0	2,210	0	0	333	
1998	4,897		7,500	337		1,796	1,446	5	1,324	1	0	471	
1999	5,552		7,554	461		1,462	1,513	80	2,504	1	0	403	
2000	5,257		6,000	380		1,135	1,448	17	1,203	4	0	31	
2001	4,853		6,674	358		845	1,580	43	1,632	1	0	41	4
2002	4,711		6,192	450		746	1,137	82	1,701	18	0	203	17
2003	5,827		5,770	390		254	1,128	68	565	15	3	40	17
2004	5,062		5,846	393		131	1,298	80	633	19	23	2	17
2005	5,244		7,855	264		38	941	53	1,726	24	0	0	5

2006	5,635		4,207	238		150	846	50	598	9	3	0	5
2007	4,813		2,840	379	4	521	841	46	1,077	41	18	0	3
2008	5,033		2,952	319	0	1,134	913	45	926	45	14	4	10
2009	5,108		2,659	419	0	1,117	921	47	641	32	2	0	0
2010	4,200		2,223	501	0	867	1,208	43	636	34	11	0	0
2011	4,200		2,518	547	0	705	533	45	842	49	3	0	1
2012	4,503		2,528	776	0	922	494	46	910	77	4	0	0
2013	4,902		2,694	756	1	918	1,004	46	1,383	66	0	0	0
2014	4,559		3,371	826	0	1,044	952	45	1,063	50	0	0	1

European Union: From 2006, estimates are from EU reports to the CCSBT. Earlier catches were reported by Spain and the IOTC.

Miscellaneous: Before 2004, these were from Japanese import statistics (JIS). From 2004, the higher value of JIS and CCSBT TIS was used combined with available information from flags in this category.

Research and other: Mortality of SBT from CCSBT research and other sources such as discarding practices in 1995/96.

Attachment 5

CPUE Modelling Groups Small Group Discussions

The Chair had summarised the results of the inter-sessional web meeting of the group in CCSBT-ESC/1509/39, presented under ESC agenda 8.

Other papers of interest to the CPUE modelling group were also presented and partially discussed in plenary but deserved further consideration in the CPUE Modelling group meeting. These were as follows.

1) Paper CCSBT-ESC/1509/23 on the Taiwanese longline CPUE standardisation was presented and discussed. The group appreciated the efforts of the authors to analyse and make sense of this complicated multispecies fisheries data set. They noted that considerable progress had been made in categorising the fleet's activity. They also noted however that there was no year class progression in the CPUE by age plots, suggesting year effects (catchability changes) were dominant. They considered that possibly too much data was included in the CPUE indices that was not SBT fishing. Hence a finer filter by season or target may help. There is potentially a very useful size based index obtainable from these data. The group considered that an appropriate area CPUE index was required rather than adherence to set CCSBT Statistical areas.

Suggestions to the authors for further analyses included:

- Plot catches by month or season spatially to see patterns in distribution
- Include more species in clustering (10 species rather than 4 species)
- Define fishing area more accurately (ignore statistical area boundaries)
- Focus on SBT fished areas
- Compare with distribution of Japanese and Taiwanese catches
- Use latitudinal bands (or 5 x 5 squares), longitude is less useful generally as a covariant.
- It was noted that it was not appropriate to use cohort slicing to generate ages from length data.

It was hoped that a further analysis could be discussed at the 2016 inter-sessional web meeting.

2) Paper CCSBT-ESC/1509/26 on the Korean longline CPUE was presented and discussed. The Korean data shows similar patterns to the Japanese CPUE in areas 8 and 9 with large increases in CPUE in the last 5 years (Figure 1). The Korean data offer an additional monitoring series. This is very valuable because it is independent from the Japanese CPUE. It is possible that area based CPUE may include some size related information on recruitment and this would be worth investigating. It was also suggested that a summary of the behaviour of the Korean fleet over time would be useful. Ideally this would be similar to the report (paper 30) produced routinely for the Japanese CPUE data.
3) Paper CCSBT-ESC/1509/30 presented information on the Japanese fleet behaviour over time. An interesting suggestion was made that the concentration indices shown might be related to the year*area interaction terms fitted in the GLM used to provide the Base CPUE series. While year interaction that reflect

changes in local abundance are useful in the paper it is important to check that they do not reflect catchability issues. Figure 7 in the paper suggests a systematic decrease in concentration in areas 6 and 7 after 2007. Table 2 shows that fishing spreads over more months over time. As month is included as an explanatory variable in the CPUE model, this is not a problem with respect to the area*year interaction. However, it would be worthwhile to investigate the extent that concentration may change within the model categorical variables and hence might influence the year*area interactions terms. This could be an interesting question to investigate inter-sessionally.

4) Paper CCSBT-ESC/1509/31 shows the results for the core CPUE series. Year-area interactions are evident for other areas relative to combined areas 5and 6. A possible link between these interaction terms in the GLM and the concentration index and or size compositions was proposed.
5) Papers CCSBT-ESC/1509/10 and CCSBT-ESC/1509/21 both provide estimates of non member catch based upon the catch and effort of CCSBT member states. The former gave higher estimates (up to about 800tonnes in 2012) than the later (up to about 200 tonnes in 2012). The results were contrasted (see Figure 1 of item 9) and some of the differences are explained by differences in the data sets and analysis approaches that were used in the two approaches. It was agreed that the authors should discuss and if possible reconcile their results inter-sessionally.

The chair reminded the group that size based CPUE modelling remained an important topic to pursue inter-sessionally. He also stressed the vital importance of the CPUE series to the SBT management process and the need for careful scrutiny of their quality. He proposed the following task list for inter-sessional work and for discussion at the web meeting. It was also agreed that a web meeting in late June, after data exchange is complete, is in general a better time for the web meeting than April.

Proposed Task List for 2016 Intersessional CPUE work

1. Continue work with Taiwan CPUE with emphasis on providing recruitment series
2. Continue/Update Korean CPUE plus quality control work similar to paper CCSBT-ESC/1509/30
3. Review all monitoring series (including Korean CPUE)
4. Update papers CCSBT-ESC/1509/30 and 31 plus investigate possible linkage between Year*Area interaction terms in GLM with concentration indices and/or size compositions.
5. More general investigation of role of size in CPUE calculations (N.B: possibly as monitoring series or ancillary information to assessment/MPs)
6. Reconciliation of CPUE estimates of non- member catch calculations (i.e. reconcile papers CCSBT-ESC/1509/10 and 21)

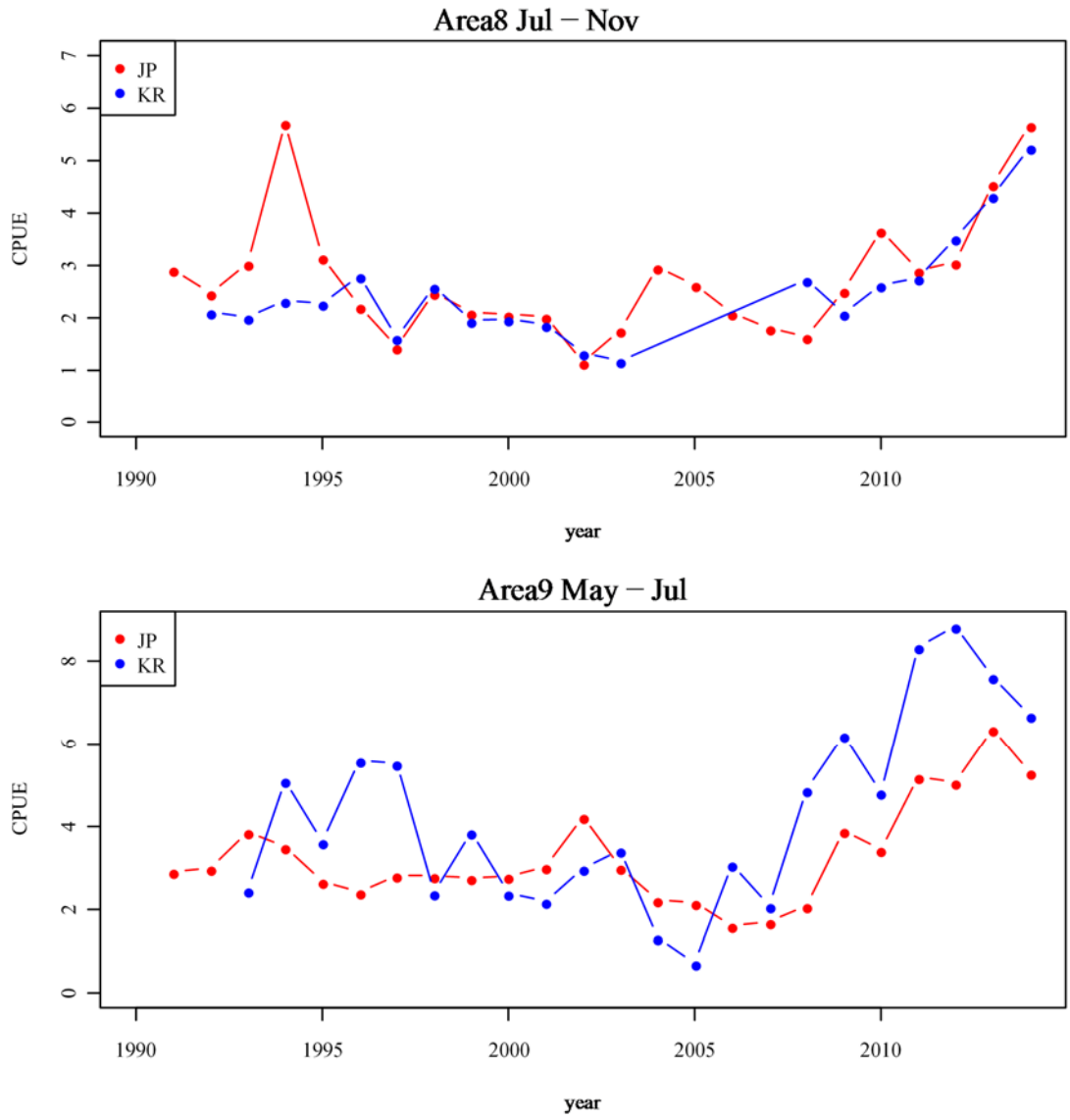


Figure 1 Nominal CPUE comparison between Japanese and Korean longline in Area 8 and Area 9.

Attachment 6

Trends in selected indicators of the SBT stock

Indicator	Period	Min.	Max.	2011	2012	2013	2014	2015	12 month trend
Scientific aerial survey	1993–2000 2005–14	0.34 (1999)	2.71 (2014)	1.61	0.52	1.15	2.71	na	-
SAPUE index	2003–14	0.38 (2003)	1.80 (2011)	1.80	0.58	0.95	1.52	na	-
Trolling index	1996–2003 2005–06 2006–14	2.82 (2006)	5.65 (2011)	5.65	1.55	3.48	3.18	na	-
NZ charter nominal CPUE (Areas 5+6)	1989–2014	1.339 (1991)	7.83 (2010)	6.39	7.33	6.49	6.10		↓
NZ domestic nominal CPUE	1989–2014	0.000 (1989)	5.42 (2014)	2.28	4.06	4.04	5.42		↑
NZ charter age/size composition (proportion age 0–5 SBT)*	1989–2014	0.001 (2005)	0.414 (1993)	0.11	0.19	0.15	0.28		↑
NZ domestic age/size composition (proportion age 0–5 SBT)*	1980–2014	0.001 (1985)	0.404 (1995)	0.15	0.21	0.03	0.20		↑
Indonesian median size class	1993–94 to 2014–15	162 (2012–13; 2013–14)	188 (1993–94)	170	168	162	162	162	-
Indonesian age composition: mean age on spawning ground, all SBT	1994–95 to 2013–14	13.24 (2012–13)	21.2 (1994–95)	16.8	16.0	13.2	13.9		↑
Indonesian age composition: mean age on spawning ground 20+	1994–95 to 2013–14	21.8 (2010–11)	25.3 (2003–04)	21.8	22.4	22.4	22.4		-
Indonesian age composition: median age on spawning ground	1994–95 to 2013–14	13 (2001–03; 2012–13)	21 (1994–95; 1996–97; 1998–99)	17	16	13	13		-

*derived from size data

na = not available

Indicator	Period	Min.	Max.	2011	2012	2013	2014	12 month trend
Reported global catch	1952–2014	829 t (1952)	81 750 t (1961)	9444 t	10 258 t	11 755	11 894	↑
Japanese nominal CPUE, age 4+	1969–2014	1.390 (2006)	22.143 (1965)	2.844	3.014	3.355	3.722	↑
Japanese standardised CPUE (W0.5, W0.8, Base w0.5, Base w0.8)	1969–2014	2007 (0.230–0.360)	1969 (2.284– 2.644)	0.635–0.968	0.824–1.149	0.588–0.937	0.769–1.059	↑
Korean nominal CPUE	1991–2014	0.118 (2005)	21.523 (1991)	3.621	5.553	6.163	6.511	↑
Taiwanese nominal CPUE, Areas 8+9	1981–2014	<0.001 (1985)	0.956 (1995)	0.305	0.155	0.128	0.126	↓
Taiwanese nominal CPUE, Areas 2+14+15	1981–2014	<0.001 (1985)	3.466 (2007)	0.994	2.244	2.230	1.703	↓
Japanese age comp, age 0–2*	1969–2014	0.004 (1966)	0.191 (1998)	0.071	0.025	0.020	0.001	↓
Japanese age comp, age 3*	1969–2014	0.015 (2003)	0.284 (2007)	0.130	0.096	0.039	0.035	↓
Japanese age comp, age 4*	1969–2014	0.052 (1969)	0.286 (1992)	0.169	0.141	0.120	0.114	↓
Japanese age comp, age 5*	1969–2014	0.079 (1986)	0.300 (2010)	0.214	0.159	0.161	0.169	↑
Taiwanese age/size comp, age 0–2*	1981–2014	<0.001 (1982)	0.251 (2001)	0.008	0.028	0.007	0.009	↑
Taiwanese age/size comp, age 3*	1981–2014	0.024 (1996)	0.349 (2001)	0.072	0.217	0.108	0.114	↑
Taiwanese age/size comp, age 4*	1981–2014	0.027 (1996)	0.502 (1999)	0.131	0.251	0.366	0.204	↓
Taiwanese age/size comp, age 5*	1981–2014	0.075 (1997)	0.371 (2009)	0.290	0.283	0.274	0.211	↓
Australia surface fishery median age composition	1964–2014	age 1 (1979–80)	age 3 (multiple years)	age 3	age 2	age 3	age 3	-
Standardised JP LL CPUE (age 3) w0.5	1969-2014	0.204 (2003)	2.970 (1972)	0.467	0.689	0.259	0.249	↓
w0.8		0.232 (2003)	2.764 (1972)	0.544	0.802	0.320	0.307	↓
Standardised JP LL CPUE (age 4) w0.5	1969-2014	0.263 (2006)	3.020 (1974)	0.767	0.806	0.579	0.562	↓
w0.8		0.290 (2006)	2.736 (2974)	0.946	1.008	0.754	0.729	↓
Standardised JP LL CPUE (age 5) w0.5	1969-2014	0.230 (2006)	2.649 (1972)	1.178	1.050	0.709	0.924	↑
w0.8		0.254 (2006)	2.443 (1972)	1.485	1.392	0.950	1.242	↑
Standardised JP LL CPUE (age 6&7) w0.5	1969-2014	0.201 (2007)	2.575 (1976)	1.073	1.471	0.709	0.966	↑
w0.8		0.234 (2007)	2.389 (1976)	1.429	1.966	0.941	1.303	↑
Standardised JP LL CPUE (age 8-11) w0.5	1969-2014	0.274 (2007)	3.677 (1969)	0.325	0.480	0.484	0.687	↑
w0.8		0.298 (1992)	3.341 (1969)	0.447	0.651	0.655	0.918	↑
Standardised JP LL CPUE (age 12+) w0.5	1969-2014	0.458 (2014)	3.217 (1970)	0.520	0.475	0.515	0.458	↓
w0.8		0.612 (2014)	2.869 (1970)	0.705	0.627	0.695	0.612	↓

Attachment 7

Three year workplan for meetings/projects to be funded by the CCSBT

(abbreviations: Sec=Secretariat Staff, Interp=Interpretation, IC=Independent ESC Chair, P=Independent Advisory Panel, C=Consultant, IE=Invited Expert, Cat=Catering only, FM=full meeting costs – venue & equipment hire etc., Contract=CCSBT contract with CSIRO)

Resources required for ESC meetings/projects to be funded by CCSBT			
	2016	2017	2018
OMMP Meeting *(before ESC, no Interp[1])*	2 days FM: IC, 3P, 2 Sec	2 days FM: IC, 3P, 2 Sec	2 days FM: IC, 3P, 2 Sec
ESC Meeting	6 days FM: IC, 4P, 3 Interp, 3 Sec	6 days FM: IC, 4P, 3 Interp, 3 Sec	6 days FM: IC, 4P, 3 Interp, 3 Sec
Intersessional OMMP Meeting in Seattle *(no Sec, no Interp)*	-	5 days Cat: 4P, C, Cat	5 days Cat: 4P, C, Cat
CPUE Webinar	3 Panel days	3 Panel days	3 Panel days
Routine OMMP Code Maintenance / Development	5 C days	5 C days	5 C days
Continued close-kin sample collection (~36K)	Contract	Contract	Contract
Continued aging of Indonesian otoliths (~15K)	Contract	Contract	Contract
Scientific Aerial Survey	Contract	Dependent on option. Occurs for options A & C, but not B	-
Pilot Gene Tagging Project	50% Contract 50% Members	50% Contract 50% Members	-
Long-term Gene Tagging	-	Dependent on option. Releases occur under Contract for options A & B, but not C	Contract. For option A&B, this is release and recapture, for option C, it is release only
Process the minimum required close-kin samples to produce estimates to use in the 2017 stock assessment[2]. If sufficient CCSBT funding is not available, process the close-kin samples collected in the same year to prevent the backlog accumulating.	Contract	Contract	Contract

Note the following:

- The gene tagging pilot requires co-funding from Members

[1] Interpretation is not required for 2016, but it may be required for 2017 and 2018 depending on the participants involved and the nature of discussions. This will be decided in 2016.

[2] This is only processing the minimum required samples for the assessment. Further processing would need to be conducted in 2018 and 2019 in order to clear the backlog.

Attachment 8

Report on Biology, Stock Status and Management of Southern Bluefin Tuna: 2015

The CCSBT Extended Scientific Committee (ESC) conducted a review of fisheries indicators and updated the operating model in 2014 to provide updated information on the status of the stock. This report updates description of fisheries and the state of stock, and provides fishery and catch information.

1. Biology

Southern bluefin tuna (*Thunnus maccoyii*) are found in the southern hemisphere, mainly in waters between 30° and 50° S, but only rarely in the eastern Pacific. The only known spawning area is in the Indian Ocean, south-east of Java, Indonesia. Spawning takes place from September to April in warm waters south of Java and juvenile SBT migrate south down the west coast of Australia. During the summer months (December-April), they tend to congregate near the surface in the coastal waters off the southern coast of Australia and spend their winters in deeper, temperate oceanic waters. Results from recaptured conventional and archival tags show that young SBT migrate seasonally between the south coast of Australia and the central Indian Ocean. After age 5 SBT are seldom found in nearshore surface waters, and their distribution extends over the southern circumpolar area throughout the Pacific, Indian and Atlantic Oceans.

SBT can attain a length of over 2m and a weight of over 200kg. Direct ageing using otoliths indicates that a significant number of fish larger than 160cm are older than 25 years, and the maximum age obtained from otolith readings has been 42 years. Analysis of tag returns and otoliths indicate that, in comparison with the 1960s, growth rate has increased since about 1980 as the stock has been reduced. There is some uncertainty about the size and age when SBT mature, but available data indicate that SBT do not mature younger than 8 years (155cm fork length), and perhaps as old as 15 years. SBT exhibit age-specific natural mortality, with M being higher for young fish and lower for old fish, increasing again prior to senescence.

Given that SBT have only one known spawning ground, and that no morphological differences have been found between fish from different areas, SBT are considered to constitute a single stock for management purposes.

2. Description of Fisheries

Reported catches of SBT up to the end of 2014 are shown in Figures 1 - 3. However, a 2006 review of SBT data indicated that there may have been substantial under-reporting of SBT catches and surface fishery bias in the previous 10 - 20 year period and there is currently substantial uncertainty regarding the true levels of total SBT catch over this period. Historically, the SBT stock has been exploited for more than 50 years, with total catches peaking at 81,750 t in 1961 (Figures 1 - 3). Over the period 1952 - 2014, 77.3% of the reported catch was taken by longline and 22.7% using surface gears, primarily purse-seine and pole and line (Figure 1). The proportion of reported catch made by the surface fishery peaked at 50% in 1982, dropped to 11-12 % in 1992 and 1993 and increased again to average 36% since 1996 (Figure 1). The Japanese longline fishery (taking a wide age range of fish) recorded its peak catch of 77,927 t in 1961 and the Australian surface fishery catches of young

fish peaked at 21,501 t in 1982 (Figure 3). New Zealand, the Fishing Entity of Taiwan and Indonesia have also exploited southern bluefin tuna since the 1970s - 1980s, and Korea started a fishery in 1991.

On average 79.3% of the SBT catch has been made in the Indian Ocean, 16.5% in the Pacific Ocean and 4.2% in the Atlantic Ocean (Figure 2). The reported Atlantic Ocean catch has varied widely between about 18t and 8,200t since 1968 (Figure 2), averaging about 839t over the past two decades. This variation in catch is reflecting shifts in longline effort between the Atlantic and Indian Oceans. Fishing in the Atlantic occurs primarily off the southern tip of South Africa (Figure 4). Since 1968, the reported Indian Ocean catch has declined from about 45,000t to 8,000t, averaging about 19,200t, and the reported Pacific Ocean catch has ranged from about 800t to 19,000t, averaging about 5,200t, over the same periods (although SBT data analyses indicate that these catches may be under-estimated).

3. Summary of Stock Status

The 2014 assessment suggested that the SBT spawning biomass is at a very low fraction (9%) of its original biomass as well as below the level that could produce maximum sustainable yield. However, there has been some improvement since the 2011 stock assessment. The current TAC has been set using the management procedure adopted in 2011, which has a 70% probability of rebuilding to the interim target biomass level by 2035.

There were limited and mixed signals from the indicators in 2015.The overall results can be summarised as follows:

- No new information on recruitment was collected in 2015. The aerial survey, SAPUE and trolling surveys all ceased in 2015. The indicators information on recruitment from 2014 is unchanged.
- Longline CPUE indices for the Japanese fleet for age 5 to 7 are well above the historically lowest levels observed in the mid-2000s. The index for age 5 shows somewhat decreasing trends in recent years. The CPUE index for ages 8-11 have increased gradually in the most recent four years. The index for age 12+ decreased from 2008 to 2011 and has fluctuated around at a low level after that. Where areas overlapped, Korean CPUE trends were in reasonable agreement with those of Japan.
- Monitoring of length and age of Indonesian catches on the spawning ground indicate a substantial shift towards smaller and younger size and age classes since 2012. Information presented to the meeting indicates that the unusually small size classes have been caught off the spawning ground (areas 2 and 8) and that these fish should be excluded from the monitoring series. Therefore these is no updated trend on the spawning ground indicators at this meeting.

4. Current Management Measures

<u>Total Allowable Catch (TAC)</u>

The primary conservation measure for management of the southern bluefin tuna stock is the TAC.

At its eighteenth annual meeting, the CCSBT agreed that a Management Procedure (MP) would be used to guide the setting of the SBT global total allowable catch (TAC) to ensure that the SBT spawning stock biomass achieves the interim rebuilding target of 20% of the original spawning stock biomass. The CCSBT now sets the TAC based on the outcome of the MP, unless the CCSBT decides otherwise based on information that is not otherwise incorporated into the MP.

In adopting the MP, the CCSBT emphasised the need to take a precautionary approach to increase the likelihood of the spawning stock rebuilding in the short term and to provide industry with more stability in the TAC (i.e. to reduce the probability of future TAC decreases). Under the adopted MP, the TAC will be set in three year periods. For the first three-year TAC setting period (2012-2014), the TAC was set as follows:

- 2012: 10,449 tonnes;
- 2013: 10,949 tonnes; and
- 2014: 12,449 tonnes.

For the second three-year TAC setting period (2015-2017), the CCSBT has set the TAC to 14,647 tonnes per year.

The current allocations of the TAC to Members and Cooperating Non-Members of the CCSBT for 2014, 2015, and 2016-17 is summarised below. In addition, some flexibility is provided to Members for limited carry-forward of unfished allocations within the three year period.

Current Allocations to Members

	2014	2015	2016-17[1]
Japan	3,403	4,847	4,737
Australia	5,193	5,665	5,665
Republic of Korea	1,045	1,140	1,140
Fishing Entity of Taiwan	1,045	1,140	1,140
New Zealand	918	1,000	1,000
Indonesia	750	750	750

Current Allocations to Cooperating Non-Members

	2014	2015	2016-17
Philippines	45	45	45
South Africa	40	40	40[2]
European Community	10	10	10

[1] The allocations for 2016-17 assume that South Africa accedes to the Convention for the Conservation of Southern Bluefin Tuna in time for its allocation to be increased.

[2] The allocation for South Africa will increase to 150 tonnes if it accedes to the Convention by 31 May of the respective year.

Monitoring, Control and Surveillance

The CCSBT has adopted a Compliance Plan that supports its Strategic Plan and provides a framework for the CCSBT, Members and Cooperating Non-Members to improve compliance, and over time, achieve full compliance with CCSBT's conservation and management measures. The Compliance Plan also includes a three-year action plan to address priority compliance risks. The action plan will be reviewed, and confirmed or updated every year. The action plan is therefore a 'rolling' document and over time its emphasis will change.

The CCSBT has also adopted three Compliance Policy Guidelines, these being:

- Minimum performance requirements to meet CCSBT Obligations;
- Corrective actions policy; and
- MCS information collection and sharing

In addition, the CCSBT has implemented a Quality Assurance Review (QAR) program to provide independent reviews to help Members identify how well their management systems function with respect to their CCSBT obligations and to provide recommendations on areas where improvement is needed. It is further intended that QARs will:

- Benefit the reviewed Member by giving them confidence in the integrity and robustness of their own monitoring and reporting systems;
- Promote confidence among all Members as to the quality of individual Members' performance reporting; and
- Further demonstrate the credibility and international reputation of the CCSBT as a responsible Regional Fisheries Management Organisation.

Individual MCS measures that have been established by the CCSBT include:

Catch Documentation Scheme

The CCSBT Catch Documentation Scheme (CDS) came into effect on 1 January 2010 and replaced the Statistical Document Programme (Trade Information Scheme) which operated since 1 June 2000. The CDS provides for tracking and validation of legitimate SBT product flow from catch to the point of first sale on domestic or export markets. As part of the CDS, all transhipments, landings of domestic product, exports, imports and re-exports of SBT must be accompanied by the appropriate CCSBT CDS Document(s), which will include a Catch Monitoring Form and possibly a Re-Export/Export After Landing of Domestic Product Form. Similarly, transfers of SBT into and between farms must be documented on either a Farm Stocking Form or a Farm Transfer Form as appropriate. In addition, each whole SBT that is transhipped, landed as domestic product, exported, imported or re-exported must have a uniquely numbered tag attached to it and the tag numbers of all SBT (together with other details) will be recorded on a Catch Tagging Form. Copies of all documents issued and received will be provided to the CCSBT Secretariat on a quarterly basis for compiling to an electronic database, analysis, identification of discrepancies, reconciliation and reporting.

Monitoring of SBT Transhipments at Sea

The CCSBT program for monitoring transhipments at sea came into effect on 1 April 2009 and was revised in October 2014 to include requirements for monitoring transhipments in port. These come into effect from 1 January 2015.

Transhipments at sea from tuna longline fishing vessels with freezing capacity (referred to as "LSTLVs") require, amongst other things, carrier vessels that receive SBT transhipments at sea from LSTLVs to be authorised to receive such transhipments and for a CCSBT observer to be on board the carrier vessel during the transhipment. The CCSBT transhipment program is harmonised and operated in conjunction with those of ICCAT and IOTC to avoid duplication of the same measures. ICCAT or IOTC observers on a transhipment vessel that is authorised to receive SBT are deemed to be CCSBT observers provided that the CCSBT standards are met.

Transhipments in port must be to an authorised carrier vessel (container vessels are exempted) at designated foreign ports and, amongst other things, require prior notification to Port State authorities, notification to Flag States, and transmission of the CCSBT transhipment declaration to the Port State, the Flag State and the CCSBT Secretariat.

List of Approved Vessels and Farms

The CCSBT has established records for:

- Authorised SBT vessels;
- Authorised SBT carrier vessels; and
- Authorised SBT farms.

Members and Cooperating Non-Members of the CCSBT will not allow the landing or trade etc. of SBT caught by fishing vessels and farms, or transhipped to carrier vessels that are not on these lists.

List of Vessels Presumed to have carried out IUU Fishing Activities for SBT

The CCSBT has adopted a Resolution on Establishing a List of Vessels Presumed to have Carried Out Illegal, Unreported and Unregulated Fishing Activities For Southern Bluefin Tuna.

At each annual meeting, the CCSBT will identify those vessels which have engaged in fishing activities for SBT in a manner which has undermined the effectiveness of the Convention and the CCSBT measures in force.

Vessel Monitoring System

The CCSBT Vessel Monitoring System (VMS) came into effect immediately after the Fifteenth Annual Meeting of the Commission, on 17 October 2008. It requires CCSBT Members and Cooperating Non-Members to adopt and implement satellite-linked VMS for vessels fishing for SBT that complies with the IOTC, WCPFC, CCAMLR, or ICCAT VMS requirements according to the respective convention area in which the SBT fishing is being conducted. For fishing outside of these areas, the IOTC VMS requirements must be followed.

5. Scientific Advice

Based on the results of the MP operation for 2015-17 in 2013 and the outcome of the review of exceptional circumstances at its 2015 meeting, the ESC recommended that there is no need to revise the EC's 2013 TAC decision regarding the TACs for 2016-17. The recommended annual TAC for the years 2016-2017 is 14,647.4 t.

6. Biological State and Trends

The 2014 assessment suggested that the SBT spawning biomass is at a very low fraction (9%) of its original biomass as well as below the level that could produce maximum sustainable yield. However, there has been some improvement since the 2011 stock assessment and the fishing mortality rate is below the level associated with MSY. The current TAC has been set using the management procedure adopted in 2011, which has a 70% probability of rebuilding to the interim target biomass level by 2035.

Exploitation rate: Moderate (Below F_{MSY})
Exploitation state: Overexploited
Abundance level: Low abundance

SOUTHERN BLUEFIN TUNA SUMMARY FROM ESC in 2014 (global stock)	
Maximum Sustainable Yield	33,000 t (30,000-36,000t)
Reported (2013) Catch	11,726 t
Current Replacement Yield	44,600 t (35,500 – 53,600)
Current (2014) Spawner Biomass	83,000 t (75,000 – 96,000)
Current depletion (current relative to initial)	
SSB	0.09 (0.08 – 0.12)
B10+	0.07 (0.06 – 0. 09)
Spawner Biomass (2014) Relative to SSB_{msy}	0.38 (0.26 – 0.70)
Fishing Mortality (2013) Relative to F_{msy}	0.66 (0.39–1.00)
Current Management Measures	Effective Catch Limit for Members and Cooperating Non-Members: 12,449t in 2014 and 14,647t for the years 2015-2017

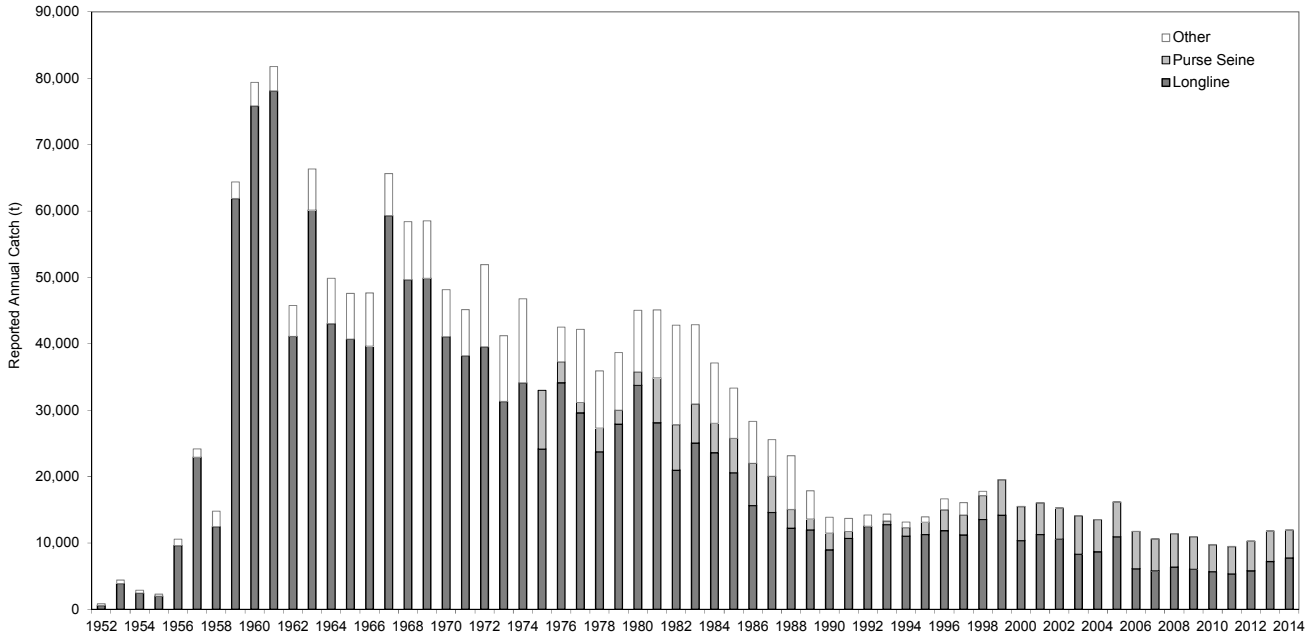


Figure 1: Reported southern bluefin tuna catches by fishing gear, 1952 to 2014. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

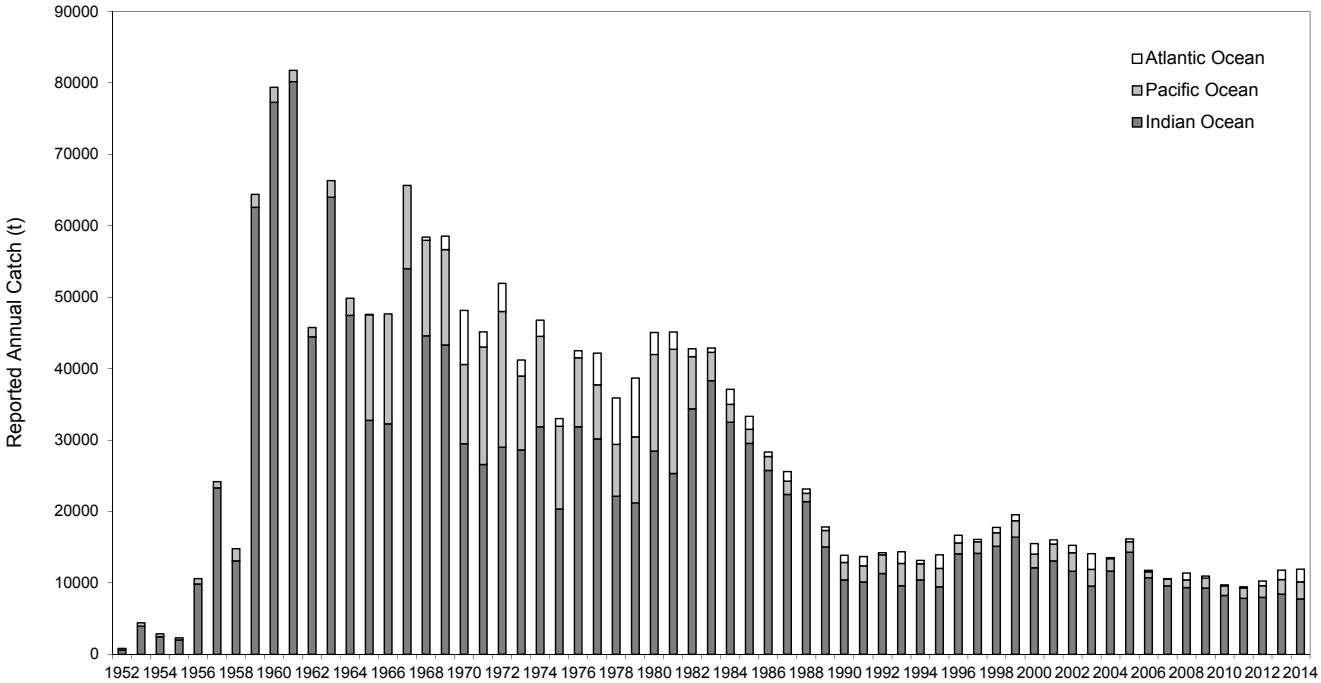


Figure 2: Reported southern bluefin tuna catches by ocean, 1952 to 2014. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

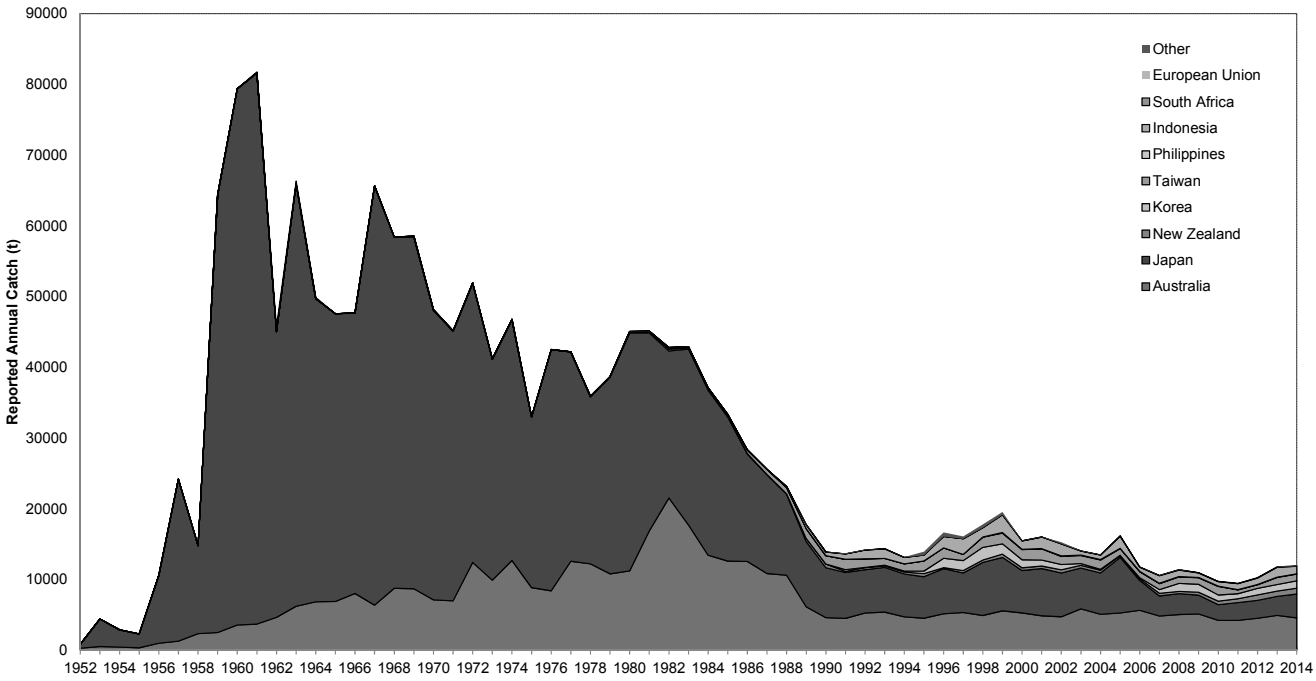


Figure 3: Reported southern bluefin tuna catches by flag, 1952 to 2014. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

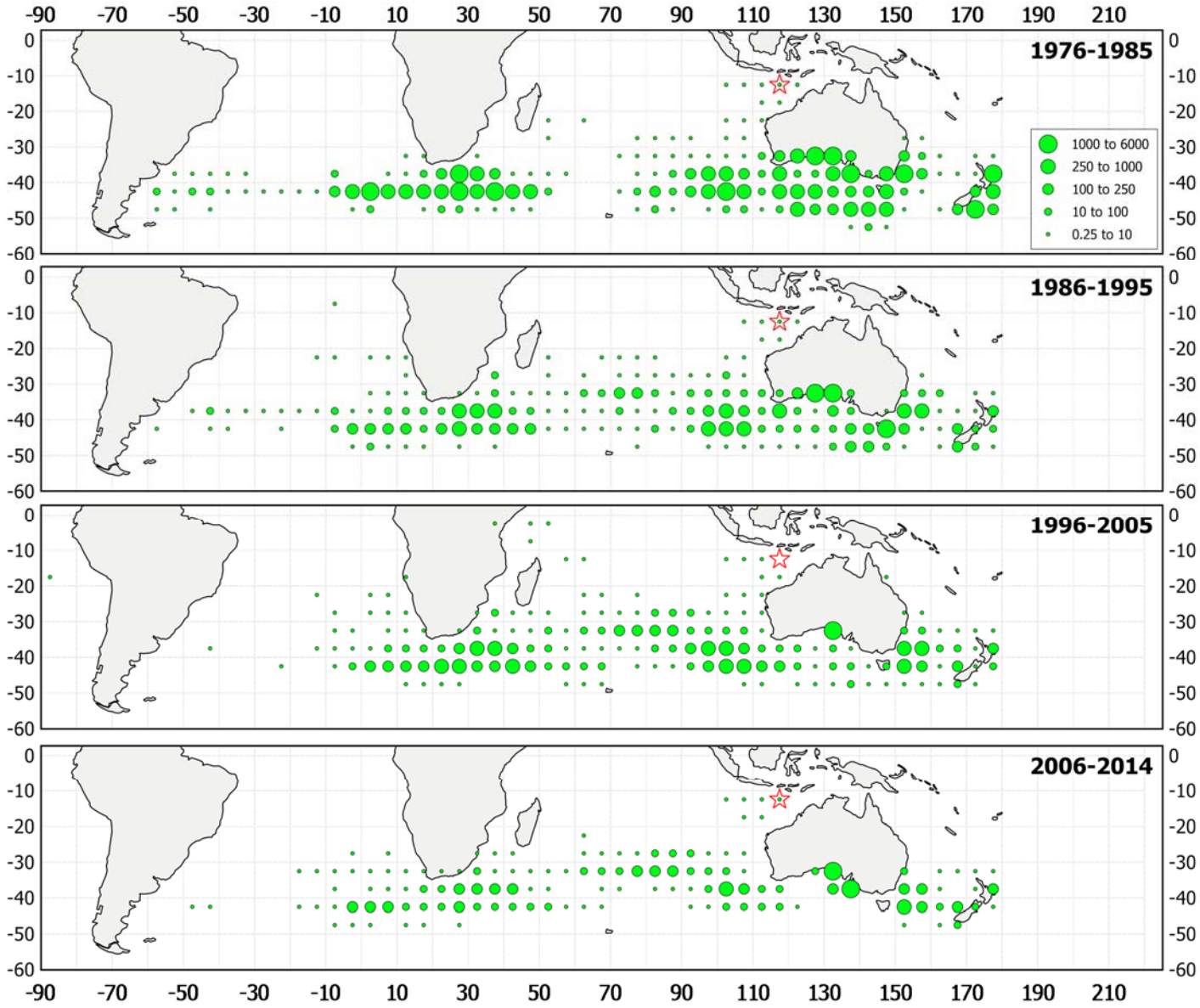


Figure 4: Geographical distribution of average annual southern bluefin tuna catches (t) by CCSBT members and cooperating non-members over the periods 1976-1985, 1986-1995, 1996-2005 and 2006-2014 per 5° block by oceanic region. The area marked with a star is an area of significant catch in the breeding ground. Block catches averaging less than 0.25 tons per year are not shown. Note: This figure may be affected by past anomalies in catch.

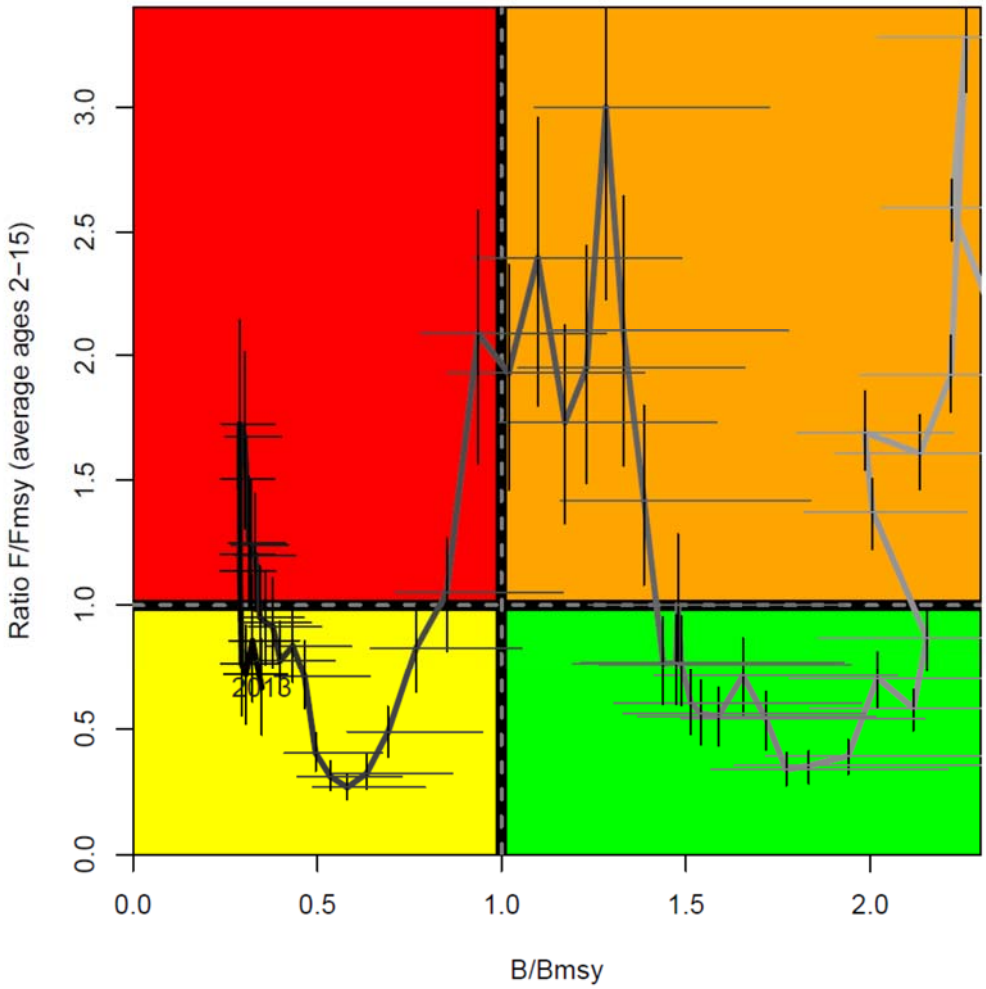


Figure 5. Time trajectory from 1952 to 2013 of median fishing mortality over the F_{msy} (for ages 2-15) versus spawning biomass (B) over B_{msy}. The fishing mortality rates are based on biomass-weighted values and the relative fishery catch composition and mean SBT body weights in each year. Vertical and horizontal lines represent 25th-75th percentiles from the operating model grid.

Attachment 9

Data Exchange Requirements for 2016

Introduction

Data exchange requirements for 2016 are provided in Annex A. The Annex shows the data that are to be provided during 2016 and the dates and responsibilities for the data provision.

Catch effort and size data should be provided in the identical format as were provided in 2015. If the format of the data provided by a member is changed, then the new format and some test data in that format should be provided to the Secretariat by 31 January 2016 to allow development of the necessary data loading routines.

Data listed in Attachment A should be provided for the complete 2015 calendar year plus any other year for which the data have changed. If changes to historic data are more than a routine update of the 2014 data or very minor corrections to older data, then the changed data will not be used until discussed at the next ESC meeting (unless there was specific agreement to the contrary). Changes to past data (apart from a routine update of 2014 data) must be accompanied by a detailed description of the changes.

Annex A

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
CCSBT Data CD	Secretariat	31 Jan 16	An update of the data (catch effort, catch at size, raised catch and tag-recapture) on the data CD to incorporate data provided in the 2015 data exchange and any additional data received since that time, including: • Tag/recapture data (*The Secretariat will provided additional updates of the tag-recapture data during 2016 on request from individual members*); • Update the unreported catch estimates using the revised scenario (S1L1) produced at SAG9,
New Zealand joint venture summary of observed trips	New Zealand	23 Apr 16	New Zealand to provide the secretariat with a summary of observed trips, by VesselID, for New Zealand joint venture vessels. *Secretariat Comment: These data are required so that the Secretariat can provide NZ with a summary of Observed catch and effort data, which is required for NZ preparation of joint venture shot by shot data.*
Total catch by Fleet	all Members and Cooperating Non-Members	30 Apr 16	Raised total catch (weight and number) and number of boats fishing by fleet and gear. These data need to be provided for both the calendar year and the quota year.
Recreational catch	all Members and Cooperating Non-Members that have recreational catches	30 April 16	Raised total catch (weight and number) of any recreationally caught SBT if data are available. A complete historic time series of recreation catch estimates should be provided (unless this has previously been provided). Where there is uncertainty in the recreational catch estimates, a description or estimate of the uncertainty should be provided.
SBT import statistics	Japan	30 Apr 16	Weight of SBT imported into Japan by country, fresh/frozen and month. These import statistics are used in estimating the catches of non-member countries.
Mortality allowance (RMA and SRP) usage	all Members (& Secretariat)	30 Apr 16	The mortality allowance (kilograms) that was used in the 2015 calendar year. Data is to be separated by RMA and SRP mortality allowance. If possible, data should also be separated by month and location.
Catch and Effort	all Members (& Secretariat)	23 Apr 16 (New Zealand)[2] 30 Apr 16 (other members, South Africa & Secretariat) 31 July 16 (Indonesia)	Catch (in numbers and weight) and effort data is to be provided as either shot by shot or as aggregated data (New Zealand provides fine scale shot by shot data which is aggregated and distributed by the Secretariat). The maximum level of aggregation is by year, month, fleet, gear, and 5x5 degree (longline fishery) or 1x1 degree for surface fishery. Indonesia will provide estimates based on either shot by shot or as aggregated data from the trial Scientific Observer Program.

[1] The text "**For MP/OM**" means that this data is used for both the Management Procedure and the Operating Model. If only one of these items appears (e.g. **For OM**), then the data is only required for the specified item.

[2] The earlier date specified for New Zealand is so that the Secretariat will be able to process the fine scale New Zealand data in time to provide aggregated and raised data to members by 30 April.

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
Non-retained catches	All Members	30 Apr 16 (most Members) 31 July 16 (Indonesia)	The following data concerning non retained catches will be provided by year, month, and 5*5 degree for each fishery: • Number of SBT reported (or observed) as being non-retained; • Raised number of non-retained SBT taking into consideration vessels and periods in which there was no reporting of non-retained SBT; • Estimated size frequency of non-retained SBT after raising; • Details of the fate and/or life status of non-retained fish. Indonesia will provide estimates based on either shot by shot or as aggregated data from the trial Scientific Observer Program.
RTMP catch and effort data	Japan	30 Apr 16	The catch and effort data from the real time monitoring program should be provided in the same format as the standard logbook data is provided.
NZ joint venture catch and effort data at 1*1 spatial resolution	Secretariat	30 Apr 16	Aggregated New Zealand catch and effort data, to 1*1 degrees of resolution instead of 5*5 degrees. The Secretariat will produce and provide these data to Japan only for use in the $W_{0.5}$ and $W_{0.8}$ CPUE indices produced by Japan. *Other members may request approval from New Zealand to be provided with access to these data for necessary analyses.*
NZ joint venture catch and effort with Observers	Secretariat	27 Apr 16	A summary of NZ joint venture catch and effort data, to be provided to New Zealand only, specifying which shots had an observer on board. *Secretariat Comment: These data are required so that New Zealand can provide shot by shot data for the NZ joint venture to Japan.*
New Zealand joint venture shot by shot data	New Zealand	30 Apr 16	Shot by shot data for New Zealand joint venture vessels in statistical areas 5 and 6 for 2015. These data should specify which shots had an observer on board. These data are only being provided to Japan and are for use in the new CPUE index.
Raised catch data for AU, NZ catches	Australia, Secretariat	30 Apr 16	Aggregated raised catch data should be provided at a similar resolution as the catch and effort data. Japan, Korea and Taiwan do not need to provide anything here because they provide raised catch and effort data. New Zealand does not need to provide anything here because the Secretariat produces New Zealand's raised catch data from the fine scale data provided by New Zealand.
Raised number of hooks data for NZ catches	Secretariat	30 Apr 16	Raised New Zealand number of hooks data, to be provided to NZ only, generated from NZ fine scale data by the Secretariat.
Observer length frequency data	New Zealand	30 Apr 16	Raw observer length frequency data as provided in previous years.

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
Raised Length Data	Australia, Taiwan, Japan, New Zealand, Korea	30 Apr 16 (Australia, Taiwan, Japan, Korea) 7 May 16 (New Zealand)[3]	Raised length composition data should be provided[4] at an aggregation of year, month, fleet, gear, and 5x5 degree for longline and 1x1 degree for other fisheries. Data should be provided in the finest possible size classes (1 cm). A template showing the required information is provided in Attachment C of CCSBT-ESC/0609/08. *Korea will be providing these data for the first time in 2016. Note that all Members may need to review their methods used to prepare these data since they were established some years ago and there are more recent sources of data that might be useful (e.g. CDS tagging data).*
Raw Length Frequencies	South Africa	30 Apr 16	Raw Length Frequency data from the South African Observer Program.
RTMP Length data	Japan	30 Apr 16	The length data from the real time monitoring program should be provided in the same format as the standard length data is provided.
Indonesian LL SBT age and size composition	Australia Indonesia	30 Apr 16	Estimates of both the age and size composition (in percent) is to be generated for the spawning season July 2014 to June 2015. Length frequency for the 2014 calendar year and age frequency for the 2014 calendar year is also to be provided. Indonesia will provide size composition in length and weight based on the Port-based Tuna Monitoring Program. Australia will provide age composition data according to current data exchange protocols.
Direct ageing data	All Members	30 Apr 16	Updated direct age estimates (and in some cases revised series due to a need to re-interpret the otoliths) from otolith collections. Data must be provided for at least the 2013 calendar year (see paragraph 95 of the 2003 ESC report). Members will provide more recent data if these are available. The format for each otolith is: Flag, Year, Month, Gear Code, Lat, Long, Location Resolution Code[5], Stat Area, Length, Otolith ID, Age estimate, Age Readability Code[6], Sex Code, Comments.
Trolling survey index	Japan	30 Apr 16	Estimates of the different trolling indices (piston-line index and grid-type trolling index (GTI)) for the 2015/16 season (ending 2016), including any estimates of uncertainty (e.g. CV).
Tag return summary data	Secretariat	30 Apr 16	Updated summary of the number tagged and recaptured per month and season.
Catch at age data	Australia, Taiwan, Japan, Secretariat	14 May 16	Catch at age (from catch at size) data by fleet, 5*5 degree, and month to be provided by each member for their longline fisheries. The Secretariat will produce the catch at age for New Zealand and Korea using the same routines it uses for the CPUE input data and the catch at age for the MP.

[3] The additional week provided for New Zealand is because New Zealand requires the raised catch data that the Secretariat is scheduled to provide on 30 April.
[4] The data should be prepared using the agreed CCSBT substitution principles where practicable. It is important that the complete method used for preparing the raised length data be fully documented.
[5] M1=1 minute, D1=1 degree, D5=5 degree.
[6] Scales (0-5) of readability and confidence for otolith sections as defined in the CCSBT age determination manual.

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
Global SBT catch by flag and by gear	Secretariat	22 May 16	Global SBT catch by flag and gear as provided in recent reports of the Scientific Committee.
Raised catch-at-age for the Australia surface fishery **For OM**	Australia	24 May 16[7]	These data will be provided for July 2014 to June 2015 in the same format as previously provided.
Raised catch-at-age for Indonesia spawning ground fisheries. **For OM**	Secretariat	24 May 16	These data will be provided for July 2014 to June 2015 in the same format as on the CCSBT Data CD.
Total catch per fishery and sub-fishery each year from 1952 to 2015. **For MP/OM**	Secretariat	31 May 16	The Secretariat will use the various data sets provided above together with previously agreed calculation methods to produce the necessary total catch by fishery and total catch by sub-fishery data required by both the Management Procedure and the Operating Model.
Catch-at-length (2 cm bins) and catch-at-age proportions **for OM**	Secretariat	31 May 16	The Secretariat will use the various catch at length and catch at age data sets provided above to produce the necessary length and age proportion data required by the operating model (for LL1, LL2, LL3, LL4 – separated by Japan and Indonesia, and the surface fishery). The Secretariat will also provide these catch at length data subdivided by sub fishery (e.g. the fisheries within LL1).
Global catch at age	Secretariat	31 May 16	Calculate the total catch-at-age in 2015 according to Attachment 7 of the MPWS4 report except that catch-at-age for Japan in areas 1 & 2 (LL4 and LL3) is to be prepared by fishing season instead of calendar year to better match the inputs to the operating model.
CPUE input data	Secretariat	31 May 16	Catch (number of SBT and number of SBT in each age class from 0-20+ using proportional aging) and effort (sets and hooks) data[8] by year, month, and 5*5 lat/long for use in CPUE analysis.
CPUE monitoring and quality assurance series.	Australia / Japan / Korea / Taiwan	15 Jun 16 (earlier if possible)[9]	8 CPUE series are to be provided, as specified below: • Nominal (Australia) • B-Ratio proxy (W0.5)[10] (Japan) • Geostat proxy (W0.8)[10] (Japan) • GAM (Australia) • Shot x shot Base Model (Japan) • Reduced Base Model (Japan) • Korean Standardised CPUE • Taiwan Standardised CPUE
Core vessel CPUE series **for OM/MP**	Japan	15-Jun-16 (earlier if possible)	Provide both the w0.5 and w0.8 Core Vessel CPUE Series. The OM & MP use the average of these series.

[7] The date is set 1 week before 1 June to provide sufficient time for the Secretariat to incorporate these data in the data set it provides for the OM on 1 June.
[8] Data restricted to months April to September, SBT statistical areas 4-9, and the Japanese, Australian joint venture and New Zealand joint venture fleets.
[9] When there are no complications, it is possible to calculate the CPUE series less than two weeks after the CPUE input data is provided. Therefore, if there are no complications, Members should attempt to provide the CPUE series earlier than 15 June.
[10] This series is based on the standardisation model by Nishida and Tsuji (1998) using all vessel data.

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
Aerial survey index	Secretariat	31 Jul 16 (every attempt will be made to provide this at least 4 weeks earlier)	Estimate of the aerial survey index from the 2015/16 fishing season, including any estimates of uncertainty (e.g. CV), if the aerial survey is conducted. The Secretariat will undertake a contract with CSIRO who will conduct the aerial survey and calculate the index.
Commercial spotting index	Australia	31 Jul 16	Estimate of the commercial spotting index from the 2015/16 season, including any estimates of uncertainty (e.g. CV), if the appropriate data are collected to generate this index.

Attachment 10

ESC's Recommendations to Relevant Recommendations from CCSBT's Performance Review 2014

Source of recommendation[1]	Original recommendation	2014 Performance review recommendation	ESC Recommendation
1. Conservation and management			
Status of living marine resources			
SA-2008-1	Support best endeavours of the ESC to recreate historical catch and catch per unit of effort series for the fishery but give maximum priority to accurate reporting and validation of future catch and effort.	**PR-2014-1:** The original recommendation remains valid and efforts should continue in the same direction. **PR-2014-2:** The compliance with and efficiency of the Data Verification procedures should be regularly checked.	**Done. These are ongoing processes of the Commission.**
PR-2008-1	Develop stock assessment methodologies that are robust to past underreporting.	**PR-2014-3:** The CCSBT ESC should undertake from time to time (e.g. every 5-6 years) an assessment of the robustness of the assessments, e.g. through retrospective analysis, comparing past forecasts with subsequent realizations.	**Low priority. Largely captured by the MP approach.**

[1] "SA-2008" refers to recommendations from CCSBT's 2008 Self-Assessment of Performance, "PR-2008" refers to recommendations from the Independent Review of the Self Assessment (undertaken by U.S. Ambassador Balton), "PR-2014" refers to recommendations from the 2014 Independent Review of the CCSBT's Performance.

PR-2008-2	Take a precautionary approach to management and lower the TAC as the uncertainty increases.	**PR-2014-4:** The recommendation, in its present form might be considered as fulfilled as long as the MP / Metarule "tandem" function properly (See PR-2008-3 on SBT stock rebuilding strategy). **PR-2014-5:** In the future, the CCSBT could undertake to test the robustness of the MP to climate change. It should also take every opportunity to give priority to stock rebuilding above increasing catch, when exceptional positive recruitment spikes occur above the variations against which the MP has been tested.	**Done. Assuming ongoing MP / meta rule application.** **Low priority. Existing robustness tests broadly cover this as well.**
PR-2008-3:	Determine management objectives and rebuild strategy consistent with UNFSA requirements to guide future scientific assessments. Set TACs at a level that will allow the stock to rebuild.	**PR-2014-6**: Every effort should be made to enhance (speed-up) the rebuilding trajectory in line with the precautionary approach to fisheries (cf. PR-2008-2). Special efforts should be made to identify additional measures (e.g. protected areas) to support spawning and recruitment and improve resilience to fishing and climate change.	**EC responsibility for first part of recommendation.** **Low priority. Efforts already being made within constraints of existing operating environment.**
SA-2008-2	Make the maximum effort to implement the items which have been identified and prioritised by the Extended Scientific Committee in the CCSBTs Scientific Research Program (Attachment 9 of the SC12 Report)	**PR-2014-7:** The CCSBT could consider the feasibility of a collaborative programme (between RFMOs and institutions competent in biodiversity conservation) to assess ex ante the likely impacts of climate change on the tuna ecosystems, the SBT, the ERS, their productivity, distribution and resilience. The outcome of this work would indicate which ocean parameters could be usefully monitored to better inform the Meta Rule of the MP Process.	**Low priority.**

Data collection and sharing			
SA-2008-5	Develop a strategy to collect and share data between CCSBT members and RFMOs.	**PR-2014-10:** Based on the above the original SA recommendation might be considered as completed. However the PR suggests maintaining it as a leading title under which for more specific recommendations might be nested as need arise, e.g. regarding the SBT catches in recreational and artisanal fisheries.	**Ongoing.**
SA-2008-6	Clear standards are to be set on the type of data and level of detail to be provided by members [and cooperating non-members], in order to ensure the science process has the information it requires.	**PR-2014-11:** More efforts need to be made to resolve the data confidentiality (regarding observers and operational fishery data) in order to improve the resolution and accuracy of the assessments and precision of the scientific advice.	**Access to data sets and operational data would appreciably enhance the work of the ESC, recognising nevertheless that commercial confidentiality concerns would need to be addressed by the Extended Commission.**
SA-2008-8	Commercial confidentiality should no longer limit the access to data within the CCSBT. Members should make every effort to ensure that domestic constraints on data provision will not undermine the conservation and management efforts by CCSBT. Members and Cooperating Non-Members fully comply with the confidentiality agreements and provisions within the CCSBT.	**PR-2014-13:** As long as the confidentiality problem will hamper the quality of the scientific assessment efforts CCSBT should continue to improve the accessibility of "confidential" data for this purpose, with appropriate safeguards. A time limit should be adopted in the data confidentiality rules, putting most if not all data in the public domain after a given period of time sufficient to reduce sufficiently or eliminate any risk from its broader use.	**EC to address.**

SAWG-2010 (Scientific Advice Working Group (of Kobe II))	Range of recommendations on data collection and sharing.	**PR-2014-14:** It is recommended that the SAWG recommendations be carefully examined and integrated in the data collection and sharing agenda.	**Ongoing.**
Quality and provision of scientific advice			
SA-2008-9	Achieve a better balance between the scientific efforts dedicated to SBT on the one hand and ERS on the other.	**PR-2014-15:** The above recommendation is important and is probably a long-term one with implications for research but also for management. However, because of the subjectivity of the concept of balance and its potential financial implications, it should be used as a "chapeau" and be complemented by more specific ones, related to specific species/areas requiring more attention.	**Ongoing. Support noted through progress of the ERSWG.**
SA-2008-11	In light of the requirement to focus on future information with which to assess the stock status of SBT, the number and skill sets of independent experts required in support of the scientific process should be reviewed.	**PR-2014-17:** Assess the eventual gaps in scientific skills and proceed to fill them through recruitment (including of new/ complementary profiles in the Independent Panel) and capacity building in partner countries.	**Ongoing. High priority in the case of the Independent Panel.**
Kobe III-1: Management Strategy Evaluation (MSE)	Contribute to a Joint Technical WG on MSE to facilitate the implementation the PA (Kobe III p.4 and Annex 3 § 1.3)	**PR-2014-19:** The CCSBT should continue to contribute to tuna RFMOs effort to develop MSE capacity and implementation. As the Joint WG now exists, more specific recommendations might be more useful in the future.	**Ongoing.**
SAWG-2010	- Regular large scale tagging programs (including archival tagging) to estimate natural mortality growth and movement patterns as well as tuna behavior and vulnerability.	**PR-2014-20:** Large scale tagging programmes do not seem to be undertaken anymore which means that the recommendation above is not fulfilled. It should be maintained or formally rejected by the ESC with an explicit rationale.	**Low priority. Focus is on gene tagging for absolute estimates of recruitment.**

SAWG-2010	- The study of spatial aspects of stock assessment to substantiate spatial management measures.	**PR-2014-21:** Efforts to gain information on the spatial structure and movements of the SBT stock and the fleets exploiting it should be continued as they are of paramount importance for management and conservation. **PR-2014-22:** A spatial, ecosystem-based framework could be developed as a strategic layer of assessment, added to the presently more tactical framework (imposed by the knowledge available as well as the need to deliver an undifferentiated TAC estimate), to be used every 5-10 years, perhaps in connection (not in synchrony) with the MP 6-yearly performance assessment, for obtaining a more realistic foresight.	**Low priority for additional work but some work already occurring.** **Low priority unless new evidence indicating stock structure becomes available.**
SAWG-2010	- The use of high-resolution spatial ecosystem models to better integrate biological features of tuna stocks and their environment. - Agree on a list of minimum standards for stock assessment	**PR-2014-23:** The recommendation is apparently being implemented across various activities. It should probably be maintained until a formal document is agreed and published on minimal stock assessment standards.	**Low priority for future work.**
SAWG-2010	- Develop research capacity in developing Members' countries	**PR-2014-24:** This subject is important for the future of the CCSBT decision making progress and legitimacy and should be elevated to a continuing recommendation. The direct role of CCSBT might be limited (by its funding and own capacity to train) but it could help identify needs, promote assistance and monitor capacity-building activities directly related to the fulfilment of its mandate.	**Ongoing. High priority.**
Adoption of conservation and management measures			

Kobe-1: Ecologically related species	Strengthen conservation and management measures to minimize harmful impacts of SBT fisheries on non-target populations and their ecosystems and ensure long-term sustainability, using the best scientific evidence available. In particular: Increase attention on sharks, seabirds, turtles and mammals (KIII.5.b.f), minimizing the impact of fishing (KI.I.10; KI.I.11). Assess and manage sharks (KI.I.11; KII.1f; KIII.5.b.d). Require the use of on-board observers to collect discards data (KIII.5.b.a);	**PR-2014-31:** There is obviously a trade-off in the use of the observers' time which affects the precision of the data (and ensuing assessments) of SBT and ERS respectively. Although the detailed data collected eventually by observers is not known, a minimal assessment of the state of the ERS (or contribution to such assessment in a collaborative framework) will probably require more ERS data to be collected. The use of video cameras might be a useful assistance to the observer.	**Refer to ERS**
Compatibility of management measures			
SA-2008-18	The CCSBT's arrangements in relation to catch limits and national allocations are compatible between high seas and in areas under national jurisdiction. The CCSBT should continue to ensure that measures are compatible.	**PR-2014-40.** Because of the central importance of spawning and recruitment for stock rebuilding, additional efforts should be made to develop, in Indonesian waters, spatio-temporal restrictions, equitable and compatible with the rest of the management strategy.	**Low priority. Refer to comments in 2014-6.**
2. Compliance and enforcement			
Monitoring, control and surveillance (MCS)			

SA-2008-23	Acknowledging the 2007 Kobe commitment to consistent ROP standards, the CCSBT should align its observer program with those of other RFMOs which also have an observer program such as CCAMLR and the IOTC.	**PR-2014-44:** The CCSBT should accelerate its efforts to strengthen its Scientific Observer Standards and ensure they are harmonized with those of neighbouring RFMOs with respect to ERS observer data. The CCSBT should also give serious consideration to the development of a ROP, perhaps through forging a relationship with the WCPFC to allow for mutual recognition or cross endorsement of observers, as the WCPFC and IATTC have done.	**Done. New observer standards endorsed by the ESC.** **Serious consideration has already been given to an ROP by the CC/EC. This is referred to CC/EC.**

3. International cooperation			
Cooperation with other RFMOs			
SA-2008-29 PR-2008	- There are significant opportunities for the CCSBT to work more closely with and to harmonise measures with other RFMOs, especially with the other tuna-RFMOs, and this should be a priority area for the CCSBT. - The CCSBT should add combating IUU fishing activities to the list of crosscutting issues affecting all tuna RFMOs, as well as monitoring and regulating transshipment, particularly given CCSBT's geographical overlap with the Indian Ocean Tuna Commission and the Western and Central Pacific Fisheries Commission.	**PR-2014-56:** Given the reliance of the CCSBT, in many ways, on cooperative relationships with other RFMOs for "harmonizing" with (and using directly) a number of those neighbouring RFMOs' measures, the work called for by the Kobe process and its 2010 workshops is particularly relevant. The CCSBT should look seriously for opportunities to re-invigorate discussions among its neighbouring RFMOs to work more closely to implement the Kobe recommendations. Key areas of collaboration include: more systematic exchange of data and information (interoperable databases); additional harmonization of measures; conducting more joint scientific workshops; increasing coordination of compliance work, particularly to combat IUU fishing and conserve and manage ERS; large-scale tagging programmes; ecosystem approach implementation; large scale ecosystem-based modelling; Management Strategy Evaluation; harmonisation of MCS systems; common formats for assessing compliance (with data reporting; infringements, etc.); capacity-building (e.g. training courses); and development of common positions at IUCN, CITES, CBD, and the UNGA.	**Ongoing. High priority on a case by case basis (e.g. exchanging data for estimates of unaccounted mortality).**

Attachment 11

PROCEDURAL ARRANGEMENTS AND TERMS OF REFERENCE FOR ADVISORY PANEL TO SCIENTIFIC PROCESS OF CCSBT

Procedural Arrangements

1. The Commission will appoint a group of 4-5 external scientists (Advisory Panel) for all Technical Working Group and Scientific Committee meetings for a 2-3 year period with at least 3 external scientists to attend meetings.

2. The Commission will review these Terms of Reference after 3 years.

Terms of Reference

- To participate in all meetings of the Technical Working Groups, SC and other scientific meetings such as Management Procedure Workshops, as requested by the Commission should they consider this appropriate.

- To help to consolidate parties' views to facilitate consensus.

- To incorporate their views in Technical Working Group/SC reports and provide to SC and CCSBT in the form of a report, their own views on stock assessment and other matters.

SELECTION CRITERIA FOR THE ADVISORY PANEL

Persons to be selected for the members of the Advisory Panel:

1. Should not be a national of the Parties nor have been a permanent resident or have worked for the Parties since 31/12/2010 except where Parties reach a consensus to choose the qualified individual;

2. Must have excellent technical ability in stock assessment;

3. Must have adequate working experience as a scientist involved in stock assessment and fisheries management at the international level;

4. Should ideally have working experience with large pelagic fish resources;

5. Should ideally have familiarity with assessment procedures; harvest strategy and management procedure development and operation; and scientific procedures used in international fishery commissions.

6. Should ideally have specialist skills and experience in CPUE modelling and analysis

External scientists contracted by CCSBT in the past are eligible for selection for the Advisory Panel if they meet the above qualification