Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

Report of the Twenty First Meeting of the Scientific Committee

10 September 2016

Report of the Twenty First Meeting of the Scientific Committee
10 September 2016

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**.
3. The Chair advised that, as agreed at CCSBT 22, the Twenty First meeting of the Scientific Committee (SC 21) is opened in Kaohsiung city, but report adoption and closing of SC 21 will be conducted electronically through the intersessional decision making process after Members have returned from the meeting.

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

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

Agenda Item 3. Other business

5. The next meeting of the Scientific Committee is proposed to be held on 2 September 2017, in Yogyakarta, Indonesia.

Agenda Item 4. Adoption of report of meeting

6. The report of the Scientific Committee was adopted.

Agenda Item 5. Closure of meeting

7. The meeting was closed on 13 September 2016 electronically through the intersessional decision making process.

List of Appendices

Appendix

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

Appendix 1

List of Participants
The Twenty First 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
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
MEMBERS								
AUSTRALIA								
Ilona	STOBUTZKI	Dr	Assistant Secretary	Department of Agriculture & Water Resources	GPO Box 858, Canberra ACT 2601 Australia	61 2 62724277		Ilona.Stobutzki@agriculture.gov.au
Belinda	BARNES	Dr	Senior Scientist	Department of Agriculture & Water Resources	GPO Box 858, Canberra ACT 2601 Australia	61 2 6272 5374		belindagb2@gmail.com
Campbell	DAVIES	Dr	Senior Principal 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	Principle Research Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 3 6232 5452		Rich.Hillary@csiro.au
Brian	JEFFRIESS	Mr	Chief Executive Officer	Australian SBT Industry Association	PO Box 416, Fullarton SA 5063, Australia	61 419 840 299		austuna@bigpond.com

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
INDONESIA								
Duto	NUGROHO	Mr	Fisheries Biologist	Center for Fisheries Resource and Development	Gedung Balitbang II, Jl. Pasir Putih II, Ancol Timur, Jakarta 14430	62 21 64700 928 ext 1132	62 21 64700 929	dutonugroho@gmail.com
Zulkarnaen	FAHMI	Mr	Scientist and also Head of Research Institute for Tuna Fisheries	Research Institute for Tuna Fisheries	Jl. Mertasari, No. 140, Sidakarya, Denpasar, Bali, 80224 Indonesia	62 361 72628 1	62 361 84974 47	fahmi_p4k8i@gmail.com
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
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
Yuichi	TSUDA	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	u1tsuda@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	ryo_omori330@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

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
Kojiro	GEMBA	Mr	Chief	Japan Tuna Fisheries Cooperative Association	31-1, EITAI 2-CHOME, KOTO-KU, TOKYO 135-0034 JAPAN	81 3 5646 2382	81 3 5646 2652	gyojyo@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 9633	81 3 3294 9607	mic-shimizu@zengyoren.jf-net.ne.jp
NEW ZEALAND								
Shelton	HARLEY	Dr.	Manager, Fisheries Science	Ministry for Primary Industries	25 The Terrace, Wellington, New Zealand	64 4 894 0857	N/A	shelton.harley@mpi.govt.nz
Dominic	VALLIÈRES	Mr.	Team Manager, Highly Migratory Species	Ministry for Primary Industries	25 The Terrace, Wellington, New Zealand	64 4 819 4654	N/A	dominic.vallieres@mpi.govt.nz
REPUBLIC OF KOREA								
Doo Nam	KIM	Dr.	Senior researcher	National Institute of Fisheries Science	216 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 46083, Rep. of Korea	82 51 720 2330	82 51 720 2337	doonam@korea.kr
Sung Il	LEE	Dr.	Researcher	National Institute of Fisheries Science	216 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 46083, Rep. of Korea	82 51 720 2331	82 51 720 2337	k.sungillee@gmail.com
Simon	HOYLE	Dr.	Scientist	Hoyle Consulting Ltd	14 Champion Terrace, Nelson 7011, New Zealand	64-22-5998846		simon.hoyle@gmail.com
OBSERVERS								
EUROPEAN UNION								
Hilario	MURUA	Dr	Principal Researcher	AZTI Marine Researh Division	Herrera Kaia, Portualdea z/g Pasaia Gipuzkoa 20110 Spain	34 667 174 433		hmurua@azti.es

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
FISHING ENTITY OF TAIWAN								
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
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
Shui-Kai	CHANG	Dr.	Professor	National Sun Yat-sen University	Institute of Marine Affairs, No. 70, Lienhai Rd., Kaohsiung 80424, Taiwan	886 7 52500 50	886 7 52500 50	skchang@faculty.nsysu.edu.tw
Nan-Jay	SU	Dr.	Assistant Professor	National Taiwan Ocean University	2 Pei-Ning Road, Keelung 20224, Taiwan (R.O.C.)	886 2 24622 192 ext 5046	886 2 24633 920	nanjay@ntou.edu.tw
Chien-Pang	CHIN	Mr.	Assistant Researcher Fellow	Fisheries Research Institute	199 Hou-Ih Road, Keelung, Taiwan 20246, ROC	886 2 24622 101ext 2413	886 2 24633 110	cpchin@mail.tfrin.gov.tw
Ren-Fen	WU	Mr.	Director	Overseas Fisheries Development Council	3F., No. 14 Wenshou St., Taipei, Taiwan	886 2 23680 889 ext118	886 2 23681 530	fan@ofdc.org.tw
Wei-Yang	LIU	Mr.	Secretary	Overseas Fisheries Development Council	3F, No.14, Wenzhou St., Taipei City, Taiwan	886 2 23680 889 ext 123	886 2 23686 418	weiyang@ofdc.org.tw
Yi-Te	HUANG	Mr.	Specialist	Overseas Fisheries Development Council	3F, No.14, Wenzhou St., Taipei City, Taiwan	886 2 23680 889 ext 135	886 2 23681 530	yite@ofdc.org.tw
Ching-Ping	LU	Dr.	Researcher	National Taiwan Ocean University	2 Pei-Ning Road, Keelung 20224, Taiwan	886 2 24622 192 ext 5028	886 2 24636 834	michellecplu@gmail.com
Chia-Ling	LEE	Ms.	Research Assistant	National Sun Yat-sen University	Institute of Marine Affairs, No. 70, Lienhai Rd., Kaohsiung 80424, Taiwan	886 7 52500 50	886 7 52500 50	leechialing8@gmail.com

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
Wei-Jen	WANG	Mr.	Fisheries Statistician	Overseas Fisheries Development Council	3F., No. 14 Wenshou St., Taipei, Taiwan	886 2 23680 889 ext143 3	886 2 23681 530	weijen@ofdc.org.tw
INTERPRETERS								
Kumi	KOIKE	Ms						
Yoko	YAMAKAGE	Ms						
Kaori	ASAKI	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

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 Twenty First Meeting of the Scientific Committee

5 - 10 September 2016
Kaohsiung, Taiwan

Extended Scientific Committee
for the Twenty First Meeting of the Scientific Committee
5 - 10 September 2016
Kaohsiung, Taiwan

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. The Deputy Director-General of the Fisheries Agency of Taiwan, Mr Hong-Yen Huang, delivered an opening statement to the ESC on behalf of the hosting Member, Taiwan.
3. Each delegation introduced its participants. The list of participants is provided at **Attachment 1**.

1.2 Administrative Arrangements

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

Agenda Item 2. Appointment of Rapporteurs

5. Australia, New Zealand, Japan and Korea provided rapporteurs to produce and review the text of the substantive agenda items.

Agenda Item 3. Adoption of Agenda and Document List

6. A modified agenda was agreed and is provided at **Attachment 2**.
7. The agreed document list is provided at **Attachment 3**.

Agenda Item 4. Review of SBT Fisheries

4.1. Presentation of National Reports

8. Australia presented CCSBT-ESC/1609/SBT fisheries – Australia. The 2014–15 SBT fishing season report summarises catches and fishing activities in the Australian Southern Bluefin Tuna Fishery up to and including the 2014–15 fishing season (December 2014 – November 2015) and some preliminary results of the 2015–16 season (December 2015 – November 2016). Australia's allocation as agreed by the CCSBT was 5665 t for the 2014–15 fishing season. However, this was adjusted to account for overcatch in the previous fishing season so the effective TAC was 5557 t. Twenty-seven commercial fishing vessels landed southern bluefin tuna (SBT) in Australian waters in the 2014–15

fishing season for a total catch of 5519 t. Purse seiners took 89.6% of the catch with the remainder taken by longline. Six purse seiners fished off South Australia for the Australian farming operations during the 2014–15 fishing season, with live bait, pontoon-towing and feeding vessels also involved. Most of the purse seine fishing commenced in early January 2015 and finished in late March 2015. 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 2015–16 was 92.5 cm. In the 2015–16 fishing season, observers monitored 18.9% of purse seine sets where fish were retained for the farm sector and 20.2% of the estimated SBT catch. In 2015, observers monitored 5.9% 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 7.2% in 2015

9. In response to a question on its report, Australia advised that its research project on automation of stereo video is still ongoing due to the workload of the scientists and that it expects that the draft report of this work will become available in late 2016. Australia also clarified that this project is developing semi-automation of the measurement system by using stereo video image. The current project design does not involve actual work at farming cages on the sea.

10. Korea presented CCSBT-ESC/1609/SBT fisheries – Korea. The SBT catch by the Korean longline fishery in its 2015 fishing season was 1051 t and there were 10 active vessels. Fishing effort in the 2015–16 fishing season was concentrated in the Atlantic Ocean between 10ºW-5ºE. SBT catch and effort were relatively higher in the western Indian Ocean (CCSBT statistical area 9), and the fishing season had finished earlier in September. The CPUE in 2015 was the highest of 7.81 and higher in area 9 than in areas 2 and 8. In 2015, 3 observers were placed on-board 3 longline vessels targeting SBT and the observer coverage was estimated to be 15% in fishing effort. Since 2013 Korea has conducted a sea trials to mitigate bycatch of seabird in the Korean longline fisheries in collaboration with BirdLife International, and is carrying out the work in 2016 as well. In addition, since 2015, Korea has collected SBT otoliths and ovaries through the observer program in order to contribute to the SRP proposal for estimating size/age at maturity of SBT.

11. Appreciation was expressed to Korea for the effort of its observer program to collect a large number of biological samples that will contribute to estimating the size and age at maturity of SBT.

12. Indonesia presented CCSBT-ESC/1609/SBT fisheries – Indonesia. Southern bluefin tuna (*Thunnus maccoyii*) is one of major tuna species seasonally caught by the Indonesian tuna longliner fleet operating in the Indian Ocean, particularly in CCSBT statistical area 1. Based on the 2015 CDS data, there were 112 active longline vessels relating to SBT in the port of Benoa, which is lower than in 2014 (190 vessels). The frequency of landing activities increased to 699 or 34% higher than 2014 (521). CDS data shows that the estimate catch in 2015 was about 5,944 individual SBT with a total weight of 593 t. 49.24% (292 t) of the catch landed by vessels in the size range from 14 to 180 GT were landed by vessel of 30 GT and below. The annual SBT landing estimates from port sampling by RITF

Benoa is still under consolidation process. The SBT size distribution ranged from 97 to 225 cm fork length (FL) with an average of 160 cm FL. The proportion of SBT with size of less than 150 cm FL was around 9%, which is much lower than the previous three consecutive years (17%, 32% and 51%). Limited data available on regular scientific observer from Benoa fishing vessel indicates that the highest hook rate estimated was 0.237/1000 hooks, from 61 fishing days with a total effort of 42,095 hooks operated on statistical area 1. Several ecological related species were incidentally caught. These were dominated by Lancet fish (NGA *Alopisaurus sp.*) 36%, Escolar (LEC *Lepidocybium flavobrunneum*) 24% and Pelagic stingray (DAV *Dasyatis violacoa*, *Pteropla*) 10%, and others 30%. Scientific port sampling and observer programs particularly based in Benoa landing site are still continued including gut weight ratio investigation. Otolith and close kin sample data collection is still continuing with the involvement of CSIRO-Australia experts.

13. It was noted that Indonesia's catch in 2015 had declined substantially despite having more vessels fishing. Indonesia advised that its current catch estimate is based on CDS data only and that there is ongoing reconciliation with other data and the estimates may be adjusted after the meeting.

14. There was some discussion of the small SBT that appeared in Indonesian length frequency data in 2013 and 2014. It appears that these fish were caught south of statistical area 1 (possibly 30-40ºS). It was also noted that the data for the very small sizes (below 60 cm) in 2014 should be double-checked to confirm that these are not data errors.

15. The EU presented CCSBT-ESC/1609/SBT fisheries – European Union. There is not an EU fishery targeting SBT and any incidental catches of SBT by EU vessels are taken as by-catch in the swordfish long-line fishery. The bycatch of SBT is mostly occurring in the IOTC Convention Area as the effort south of 35ºS is very low in the Atlantic and few vessels operate in the Pacific. A bycatch of 648 kg of SBT was presented in the EU National Report. Since 2000, except in 2004, the level of by-catches has been lower than the 10 t allocated to the EU under the CCSBT SBT TAC agreement. Since 2011 the level of SBT by-catches by the EU fleet has been very limited or close to zero. The sampling at sea program started at the beginning of the swordfish fishery in 1993. The observer coverage, in number of hooks observed, was 2.44 % for the whole fleet in 2015 (1.15 % for Spanish LL, 7.3 % for Portuguese and there were not observers in the UK LL fishery). After the submission of the EU National Report, the EU revised its bycatch figure to zero SBT because the 648 kg was determined to not be SBT.

16. In response to questions from other Members, the European Union (EU) advised that:

- There is an expectation that the EU, especially the Spanish fleet, will increase its observer coverage to approximately 5-10%;
- Its report only provides fishing effort information for the Indian Ocean, but there is a swordfish fishery in the Atlantic Ocean that could overlap with the SBT distribution. This has not yet been analysed, but the Atlantic SBT catch and effort is expected to be less than in the Indian Ocean. The EU will also investigate and report back on whether there were any SBT catches in the Western Pacific Ocean.

17. Taiwan presented CCSBT-ESC/1609/SBT fisheries – Taiwan. For the 2014 and 2015 calendar years, the catches of SBT accounted for 944 t and 1161 t respectively. The catches for the 2014 and 2015 quota years were 962 t and 1,143 t respectively. The catches for these two years were below Taiwan's allocated catch. As for the number of SBT longline fishing vessel, due to the lack of good catch rates for tropical tuna in tropical areas for 2014 and 2015, fishing vessels returned to engage in the SBT fishery and the number of vessels was stable at 71 and 72 respectively. The observer coverage rate increased substantially for SBT longline fishing vessels. The reason is that the threat of Somalia piracy still exists in the tropical Indian Ocean, so most of Taiwan's observers are deployed on fishing vessels that operate in the southern Indian Ocean for the reason of safety. For 2015, 13 observers were deployed on 13 fishing vessels authorised to seasonally target SBT. In this regard, the observer coverage rates were about 18.06% by vessel and 10.34% by hooks for that year.

18. Taiwan clarified that its national report includes the SBT catch from all of its fisheries.

19. New Zealand presented paper CCSBT-ESC/1609/SBT fisheries – New Zealand which describes its southern bluefin tuna fishery for 2015 and the 2014–15 fishing season. Commercial landings were 922 t for the period 1 October 2014 to 30 September 2015. There were 10 non-commercial SBT caught in 2015 based on reporting from recreational charter boat operators. Effort in the foreign charter fleet was similar to that seen in the previous year. There was a slight increase in the level of commercial domestic effort driven primarily by an increase in the East Coast North Island fishery. Both fleets have seen an increase in their CPUE with the domestic fleet CPUE reaching the highest level in recent history. Observer coverage rates for the entire New Zealand fishery was 25% for catch and 34% in terms of effort. All four foreign charter vessels were observed achieving coverage of 78% of catch and 80% of effort. For the commercial domestic fleet, the coverage was 7% in terms of catch and 10% for effort.

20. In response to a question from the meeting, New Zealand explained that there are no regulatory constraints on the domestic fleet in relation to where they chose to operate. New Zealand catch allocations apply across the entire New Zealand EEZ and beyond and therefore the decision to operate in a particular area is entirely commercially driven.

21. Japan presented paper CCSBT-ESC/1609/SBT Fisheries-Japan, which describes the Japanese commercial longline fishery for SBT in terms of catch, effort, nominal CPUE, length frequency, number of vessels and geographical distribution of fishing operations in 2015. In 2015, 90 vessels caught 4130 t and about 85,000 individuals of SBT. Scientific observers were deployed on 21 vessels and covered 18.0 % of the number of SBT caught by all vessels (CCSBT-ESC/1609/20). Otoliths were collected from 794 SBT from scientific observer program and the ages of 210 SBT were estimated (CCSBT-ESC/1609/25).

22. In response to questions, Japan advised that:

- With the increased TAC in 2015, the individual quota for Japan's vessels was increased instead of increasing the number of vessels permitted to fish for SBT.

- The number of vessels reported in Table 3 of paper CCSBT-ESC/1609/22 are all the vessels that have caught SBT for each year. The difference of one in the number of vessels reported in this paper and Japan's national report was queried.

23. Australia presented CCSBT-ESC/1609/11 describing the data preparation and validation for national reporting and data exchange. The aggregated catch and effort, catch by fleet, raised catch, catch at size, and non-retained catch data sets submitted to the CCSBT are compiled from a number of databases. The daily fishing logbooks, catch disposal records and fisheries observer reports, collected and managed by the Australian Fisheries Management Authority (AFMA), are the main data sources. The Australian catch of SBT from the surface (purse seine) fishery is also sampled by contracted field staff prior to release into farm cages. The sample data includes size and weight measurements that are used to calculate representative size distributions and average weights. Relational databases, spreadsheets and query scripts are used to integrate and process the source data sets and create the data files required for the CCSBT data exchange. The paper provides facsimiles of data collection forms, flow charts illustrating the data integration procedures and describes the data validation procedures.

24. Japan presented paper CCSBT-ESC/1609/20 which reported on Japanese scientific observer activities for southern bluefin tuna fishery in 2014 and 2015. The revised observer coverage for 2014 was 18.2% of effort, with the coverage for 2015 being 18.1% of effort. In response to a question, Japan advised that observers are allocated to individual vessels by a lottery system and that they go on different vessels each trip.

25. The meeting noted the improvement in the coverage of Japan's scientific observer program.

26. Taiwan presented CCSBT-ESC/1609/31, which provided the procedure for data preparation and verification by Taiwan for its annual data submission to the CCSBT. These data includes total catch by fleet, aggregated catch and effort, catch at size, catch at age and non-retained catch data. The main data sources of the data report were based on the logbook data including electronic and paper logs, weekly report data and catch certification data. The data of weekly reports were used to connect the logbook data for preparing the report of aggregated catch and effort, the catch at size and the catch at age. In addition, non-retained SBT catch information was acquired from the weekly data system. Catch certification data is compiled to prepare the total catch by fleet. All data will be cross-checked against VMS, fisheries observer report, catch monitoring documentation scheme records and traders' sales records to ensure the accuracy. All data submissions are cross-referenced to ensure accuracy of results. There were not substantial discrepancies in process of cross-checked.

27. Taiwan clarified that its weekly report data is the more detailed information and that it contains information on the weight and length of individual SBT from CDS data. The daily log book data contains the aggregated total catch by weight and number. Taiwan also confirmed that Kaohsiung is the only domestic port in which SBT may be landed at.

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

4.2. Secretariat Review of Catches

29. The Secretariat introduced paper CCSBT-ESC/1609/04. The reported SBT catch for the 2015 calendar year was 15,401 t, an increase of 2,664 t or 20.9% from the 2014 calendar year. The global reported SBT catch by flag is shown at **Attachment 4**. The paper also included comparisons of global adjusted TAC against reported catch by fishing season which showed that reported catch was less than the TAC by 503 t for the 2015 fishing season.

30. It was noted that the 2015 reported catch is below the global TAC, although the estimates are preliminary at this stage.

31. The meeting also noted that the number of active vessels for 2015 in the Secretariat's report for Indonesia and Japan is lower than the number of vessels reported by those Members as having caught SBT. The Secretariat noted that there had been some data entered since the report was written, and provided a revised version of its report with updated CDS data. A discrepancy remained, especially for Japan, which was due to data either having not been received or not entered by the Secretariat, which will be followed up after the meeting.

Agenda Item 5. Report from the OMMP meeting

32. The Chair of the Seventh Operating Model and Management Procedure Technical Meeting (OMMP 7) meeting, Dr Ana Parma, provided a report on the OMMP 7 technical meeting, 3-4 September 2016.

33. The OMMP 7 technical group had two main objectives:

    - To define the structure of the Operating Model (OM) for the stock assessment to be conducted in 2017; and
    - To initiate discussions about the design of a new Management Procedure (MP) to replace the current one which uses CPUE and the aerial survey index as a fishery independent index of recruitment.

34. In addition to addressing these two Terms of Reference, the meeting made progress in delineating the components of the work that needs to be conducted over the next few years in order to complete both the stock assessment and the design of a new MP.

35. The OMMP Chair summarised the technical group's work on these three items:

Stock Assessment

36. Much of the discussion revolved around the incorporation of new and updated series of data into the conditioning of the OM. These include:

    - Close kin data: two series of data will be available for the stock assessment, both of which provide information on the absolute size of the spawning stock for the period 2002-2013: the first expands the series of data on Parent-

Offspring pairs (POPs) used in previous assessments; the second is a new independent series of data based on the genetic screening of juveniles for the identification of half-siblings (HSPs). The inclusion of these two series may have potentially large effects on the assessment.

- Incorporation of unaccounted mortalities (UAM): initial scenarios for UAM were developed in 2014, which will be updated based on any new information that becomes available both in terms of the attributable catches of Members, as defined by the Extended Commission (EC), and on other sources of mortality not accounted as part of the former. The meeting agreed to reiterate its previous requests that relevant CDS and market data be made available to allow technical evaluation of catch assumptions to be used in the OM and MP testing process.

37. The main results of these discussion were (i) agreement on the technical specifications for how to incorporate the new data in conditioning the OM, and (ii) development of an initial list of sensitivity tests to be conducted (Table 2 in OMMP 7 Report), which will be revised in 2017 based on conditioning results.

MP Development

38. New simple indices of abundance based on genetic data were proposed and accepted by the group as inputs to the new candidate MPs.

- Index of abundance of age 2 based on the new gene tagging project. The value of this index will increase over time as a time series builds up (only one such index point will be available to recondition the OM used for MP testing and two data points should be available for the first implementation of the new MP in 2019).
- Two simplified indices of spawning biomass derived respectively from the POPs and the HSPs data.

39. The meeting agreed on the merits of incorporating these new indices in addition to the CPUE index to provide information on three segments of the SBT population: recruitment, intermediate age range and spawning stock. The meeting had some initial discussions about possible MP structures, both empirical and model-based, that used these three indices.

Work plan

40. The meeting agreed that considering that substantial new data will be incorporated in the coming stock assessment, the work priorities for 2017 should focus on the evaluating performance of the OM conditioned to these new series of data, in addition to the regular updated series. This will involve standard model diagnostics, evaluation of consistency of the different data types and the weight assigned to each in conditioning, and identification of sensitivity runs. Completion of this step is required before the MP evaluation process can be initiated with actual tests of candidate MPs, so the initial MP tests will need to be postponed until after the ESC of 2017.

41. A proposed work plan developed by the meeting (Table 3 in OMMP 7 Report) will be offered for consideration of the ESC.

Agenda Item 6. Report from the CPUE modelling group

42. CCSBT-ESC/1609/39, the report of the CCSBT CPUE Modelling Group 17th (28/29th June 2016) Web Meeting was presented by the group's Chair (Professor John Pope). The main tasks of the meeting were:
    - To check and agree that the current core series continues to behave adequately. This was addressed by two papers (now CCSBT-ESC/1609/22 and CCSBT-ESC/1609/21, and further described under this agenda item). The former showed that the operational patterns of the Japanese longline fleet were largely unchanged and the latter provided updates of the base series and of monitoring series. The updated base CPUE series was broadly coherent with the other available CPUE series. Thus in the light of these papers the CPUE modelling group could recommend the base CPUE for continuing use by the OMMP group.
    - To look at improving or refining estimates of non-cooperating, Non-Member (NCNM) catch of SBT. This was addressed by a paper that described the methodology used to estimate NCNM catch by relating the fishing effort of NCNM fleets to the CPUE estimates of CCSBT Members. The group discussed the paper and its results. At that stage they considered it a work in progress. The paper has been subsequently revised to become CCSBT-ESC/1609/BGD02 and is considered under Agenda 7.1.
    - To develop and encourage new work on CPUE series. Two papers developed new CPUE series for the Korean and Taiwan fleets (now CCSBT-ESC/1609/34 and CCSBT-ESC/1609/33 that are described further under this Agenda item). The Korean paper provided a good overview of the fishery and the new series for areas 8 and 9 seems to be coherent with the Base CPUE series. The Taiwan results indicated that catchability may change annually due to the shift in targeting and standardising this CPUE series remains a work in progress until these can be resolved. The group suggested possible ways to help interpret this very complex data set. Two other papers (now CCSBT-ESC/1609/12 and CCSBT-ESC/1609/23 that are described further under this Agenda item) were concerned with alternative interpretations of the Japanese longline data. The first of these provided the GAMM based CPUE series that serves as a monitoring series for the Base CPUE series, and the latter showed progress on the use of age data to formulate a new CPUE series.
43. The meeting lasted two hours and its verbal and video records are available on the CCSBT website.
44. 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**.
45. Several papers were presented under the CPUE modelling agenda item.
46. Australia presented CCSBT-ESC/1609/12 which describes the estimation of a CPUE index using a generalised additive mixed model (GAMM) for SBT, ages 4 years and above. This has previously been agreed as a monitoring series for CPUE and is updated with 2015 data. The results show that the GAMM CPUE

index has been steadily increasing since 2008. The most recent index (2015) continued along this trend with the CPUE index being similar to early 1980 levels. The age frequency results indicate differences in age frequencies between years. Some years have a higher proportion of older/larger animal and other years (i.e. the more recent years) have fewer larger animals. The CPUE index however is numbers based, not weight based, and therefore relying solely on inter-annual trends in CPUE may mislead comparisons because the CPUE, does not take into account the size structure. In recent years there was an increase in numbers in the 4-10 age groups with the 0-3 age groups and the 11+ age groups (the spawning stock) being lower than in previous years (2006-2009).

47. Paper CCSBT-ESC/1609/12 described that the proportion of zero catches in the data was approximately 37%. There was a notable increase in the proportion of zero catches between the years 1989 to 1992. This change in zero catches suggest that the possibility that the time series be broken into two series: one prior to 1989 and another after 1990.

48. The proportions of zeroes were further considered in a small group meeting. An analysis of aggregated data did not identify an increase in the proportions of zeroes as described in the paper, and in the absence of the author the issue was referred back to Australia for further analysis.

49. It was suggested that the relatively high proportion of zeroes may be better modelled with a zero inflated model rather than the current approach involving an added constant.

50. Japan presented CCSBT-ESC/1609/21 which summarises the core vessel CPUE, an abundance index of SBT used for the MP. It describes data preparation, CPUE standardisation using GLM and area weighting. The data were updated up to 2015. The index values in 2015, W0.8 and W0.5 for the base GLM model, are higher than the average in the last 10 years, and much higher than those in 2014.

51. There was a discussion of the potential to revise the Base Series. It was noted in 2010 that the pre-1986 CPUE series is fixed. It was suggested that the CPUE WG should consider the implications of fixing the CPUE time series prior to 1986, and hinging off it.

52. New Zealand and Japan advised that no Japanese-flagged foreign charter vessels fished in the NZ SBT fishery in 2016, and therefore there would be no observations for Areas 5 and 6 in 2016 in the Core vessels data set.

53. CCSBT-ESC/1609/22 updates the monitoring of the Japanese longline operational pattern in 2015. The Japanese longline data have been used as the most important scientific data for the stock assessment and MP in CCSBT. No remarkable change was found in the 2015 operational pattern in comparison with previous 10 years in terms of 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 2015 represents the change of SBT stock abundance in consistently as in previous years. The increase of Japanese total catch was offset with high CPUE and then contributed lesser degree for the expansion of time and area of operation or increase in the number of operation.

54. A continuing pattern of increasing concentration in fewer cells was noted, particularly in areas 4, 7, and 8. Japan advised that there was concentration in fewer cells on the northeast margin of area 7 in recent years.

55. Japan advised that the shift in length frequency towards larger fish reflects the relative availabilities of fish in the population.

56. Japan clarified that discards and releases are not included in length frequency or CPUE data.

57. New Zealand noted that the length frequency patterns broadly reflect the patterns seen in catches from the foreign charter fleet operating in New Zealand.

58. Japan presented paper CCSBT-ESC/1609/23. Simple exploratory analyses of age-based CPUE were conducted ('age' used as a proxy of 'size'), concerning: 1) validation of the age aggregation and standardisation model used for age-based CPUE presented in CCSBT/CPUE2015/03; and 2) examination of effect of age on the year*area interaction in CPUE. Results from the analyses supported validation of the age aggregation and standardisation model used for the age-based CPUE. Simple GLM analysis suggested that inclusion of the quadric term of average age and its interaction with area into the current Base model for core vessels CPUE index was worth to be considered to cope with impact of age (or size) on CPUE standardisation. In the CPUE web meeting (June 2017), useful suggestions/comments were given to this paper. The authors will continue to further consider these suggestions/comments in future.

59. It was noted that this was not based on direct ageing data and that the size data, used to generate the ages via cohort slicing, are also used in the stock assessment, and it is problematic to use the same data twice.

60. It was suggested that incorporating age in the standardisation model may supersede the time-area interaction terms.

61. Korea presented paper CCSBT-ESC/1609/34. In this study SBT CPUE from Korean tuna longline fisheries (1996-2015) were standardised using Generalised Linear Models (GLM). The operational data on effort, fishing strategy and catch of all reported species were explored by area, and two separate areas identified in which Korean vessels have targeted SBT. SBT CPUE was standardised separately for each of these areas. Explanatory variables for the GLM analyses were year, month, vessel identifier, 5° cell, number of hooks, and moon phase. 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 subsequently followed an increasing trend. There was evidence for target change affecting the indices during some periods. There was also evidence for increasing fishing power through time.

62. It was suggested that the analysis of effort creep could be usefully applied to other indices, particularly those based on the Japanese dataset.

63. It was suggested that it would be useful to examine the mean sizes of fish by year in each area.

64. Taiwan presented paper CCSBT-ESC/1609/33. 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 general linear model. Although standardised CPUE series

reveal different trends for different areas, they roughly decreased for all areas in recent years and substantially increased for all areas in 2015. CPUE series for fish with ages of 3-5 years were much higher than other age groups, while obvious declining trends were observed in recent years for most age groups. Similarly, CPUE series substantially increased for all age groups in 2015.

65. Other points of interest to the CPUE modelling group were partially discussed in plenary but deserved further consideration in the CPUE Modelling group meeting. The report of their discussions is recorded at **Attachment 5**.

Agenda Item 7. Accounting for all sources of catch mortality

7.1. Improved estimates of Non-Member catch

66. In introducing this agenda item the Chair identified CCSBT-ESC/1609/36, CCSBT-ESC/1609/37 and CCSBT-ESC/1609/BGD02 (Rev.1) for presentation. He noted that both CCSBT-ESC/1609/36 and CCSBT-ESC/1609/37 were interim and that final reports would be submitted to the 2016 meetings of the CC and EC.

67. New Zealand and Australia presented background paper CCSBT-ESC/1609/BGD02 (Rev.1) on estimating SBT catches by Non-Members of CCSBT. This paper extended work presented in 2015 by New Zealand and Australia using different modelling methods: generalised linear modelling and random forest regression. Both modelling approaches used the same data and involved estimating the predicted catch rate from CCSBT-Member data and applying that catch rate to non-Member effort in order to predict potential unreported catch. Information on longline fishing effort in the Indian, Western Pacific, and Atlantic Oceans were obtained from the IOTC, WCPFC, and ICCAT. In order to obtain a sufficiently large dataset of CCSBT Member catch data, Japanese catches by number were converted to catches in weight, by modelling fish size patterns in space and time. To adjust for effort not reported to CCSBT, effort data provided by the CCSBT and other RFMO's were compared by stratum (month and 5° cell) and the higher value used as the effort. Catch rates (in weight per hook) were modelled to estimate expected catch rates by year, month, fleet, and 5° cell. Two alternative catchabilities were assumed, namely those of the Japanese and Taiwanese fleets, taken to represent targeted and non-targeted effort respectively. These expected catch rates were multiplied by reported non-Member fishing effort by year, month, and 5° cell, in order to predict expected catches. The resulting catch estimates were relatively similar between the Random Forests and GLM methods. Adjusting for effort not reported to CCSBT reduced the estimates considerably compared with estimates based on unadjusted data. The targeted and non-targeted estimates provided upper and lower bounds for the predicted catch.

68. In considering the information presented in CCSBT-ESC/1609/BGD02 (Rev.1) the ESC noted:

- The analyses addressed a number of the issues identified in the 2015 analysis and provide an improved basis on which to assess the potential for additional catches of SBT to be taken by non-Member longline effort.

- In particular, the ESC agreed the "adjusted effort" method provided the most appropriate basis available for constructing plausible scenarios of the potential scale of SBT catches non-Member longline effort. It was noted that these analyses are based on effort reported to the tuna RFMOs. Any effort not reported to these RFMOs is not included and, therefore, there is the potential for these to be under-estimates. In addition, the adjusted effort method may underestimate total NCNM effort in some strata in the Pacific and Atlantic Oceans, where the datasets used in the analysis may exclude some effort due to application of the 'three-vessel rule' to address confidentiality provisions in these Commissions.
- The estimates of potential catches from the two analysis methods (GLM and Random Forest Regression) are similar and the overall trends are the same, even though the analyses use different assumptions. The ESC agreed to present the results from one method (GLM) for clarity and ease of communication.
- The estimates were aggregated across the Pacific, Indian and Atlantic Oceans.
- One of the most influential factors in the analysis was whether the effort was assumed to be by-catch or targeted. Hence, the ESC agreed to present scenarios for both forms of assumed effort[1] (Table 1).

69. The ESC agreed that the scale of the potential catches from non-Member effort, particularly for the targeted effort scenario (Average for 2011-14 = 306t), were sufficient to require further attention by the EC.

Table 1: Scenarios for catches of SBT by year by non-Member longline effort assuming "targeted" and "bycatch" fishing based on analysis of publically available effort distributions and Member CPUE for SBT (CCSBT-ESC/1609/BDG02 Rev.1).

Year	Target (t)	Bycatch (t)
2007	81	10
2008	35	5
2009	224	75
2010	372	53
2011	246	28
2012	476	131
2013	293	54
2014	210	22

70. TRAFFIC presented an interim project report, Southern Bluefin Tuna market presence in China (CCSBT-ESC/1609/37). The presentation included the results from CCSBT-ESC/1609/36, which used genetic methods for species identification of tissue samples purchased from sushi restaurants in Beijing and Shanghai. Annual retention of southern bluefin tuna and other sashimi tuna were estimated based on the catch and trade data on sashimi tuna of main land China and Hong Kong recorded in official sources, e.g. Customs and UN. The ddRAD genotyping technique positively identified 26 out of 199 samples as Southern Bluefin Tuna (Table 2). Of the 26 SBT identified 25 were from Shanghai and one

[1] To generate the "bycatch" and "targeted" non-member catch scenarios presented in Table 1 the calculations use Taiwanese and Japanese longline CPUE data, respectively

from Beijing; in only one case was the product explicitly marketed as SBT at point of sale.

71. The ESC noted that the study described in CCSBT-ESC/1609/36 and CCSBT-ESC/1609/37 confirmed the ongoing presence of southern bluefin tuna within the Chinese sashimi market, and the specific conclusion of CCSBT-ESC/1609/37 that "for the period of the study it constituted ~25% of the sashimi grade tuna sold through sushi restaurants in Shanghai". The ESC noted that the final estimate will be included in the final report of the project to the Compliance Committee.

72. The ESC agreed that the genetic identification provided a powerful tool for species identification in markets. However, the information gathered is insufficient to develop quantitative estimates of the overall volume of southern Bluefin within the Chinese market or the amount that arises from unaccounted mortalities.

Table 2: Species identification of 199 sashimi samples purchased from restaurants in Shanghai and Beijing as part of survey of presence of SBT in Chinese sashimi market (CCSBT-ESC/1609/37).

SPECIES ID	COUNT	PROPORTION
Bigeye	70	0.35
Pacific bluefin	55	0.28
Atlantic bluefin	34	0.17
Southern bluefin	26	0.13
Yellowfin	14	0.07
Albacore	0	0.00
Blackfin	0	0.00
Longtail	0	0.00
Skipjack	0	0.00
Total	**199**	**1.00**

73. The ESC was concerned that there may be unreported catches contributing to the ongoing presence of SBT in the Chinese sashimi market.

74. The ESC noted that additional information was required to put the results of the trade analysis presented in CCSBT-ESC/1609/37 in context: i) Estimates of the total size of the Chinese sashimi tuna market, ii) confirmation by Members of the quantity of Member catches being traded through the Chinese markets (mainland and Hong Kong), and iii) the extent of re-export of SBT product from China. The ESC noted the difficulty in reconciling the amount of SBT imported, exported and retained in the Chinese sashimi market using publically available trade statistics (CCSBT-ESC/1609/37). The ESC agreed that the results of these analyses were unlikely to reflect the true scale of trade in SBT in the market.

75. The ESC noted a number of options that could potentially fill these data gaps, including, expanding the number of cities sampled, increasing the temporal coverage of restaurant sampling by including more months of the year, and provision of more detailed export and import data by Members. It was noted, however, that further restaurant sampling would involve a substantial study, which may be constrained by recent changes in administrative requirements for the conduct of such studies in China. In addition, the ESC noted that the main

information required to assess the potential impact is the scale of the market and the proportion of reported catches contributing to the market. The ESC considered that the estimates of the scale of the market and trade volumes included in the CCSBT-ESC/1609/37 could potentially be improved by TRAFFIC interviewing academic and professional experts in the Chinese tuna sashimi trade.

76. The ESC recommended that CCSBT-ESC/1609/BGD02 (Rev.1) be submitted to the Compliance Committee and EC to provide additional detail and transparency in the advice from the ESC on the potential NCNM UAM requested by the 2015 EC (Anon 2015, EC report, paragraph 74).

7.2. Advice on relative merits of the Direct Approach vs. the MP Approach for accounting for Non-Member catch

77. The EC requested the ESC provide advice on the relative merits of the ‘Direct Approach’ and the ‘MP Approach’ and how this might be influenced by, for example, increasing trend in catches by non-Member fleets, as the stock rebuilds, or for other reasons (EC 2015 report).

78. The ESC discussed the relative merits of the ‘Direct Approach’ and the ‘MP Approach’ for accounting for NCNM catches. The ESC agreed that the ‘MP approach’ was the preferred technical approach for accounting for the impact of additional catches on MP performance for development of a new MP. Future trends in additional catches can be incorporated in the tuning of the new MP. These decisions considered the advice from the OMMP working group (OMMP report). The ESC noted that all sources of fishing mortality, including NCNM, should be included in the MP testing and tuning.

79. In summary, the ‘Direct Approach’ does not include NCNM catches in the testing and tuning the MP. Hence, this approach operates outside of the MP context. In contrast, the ‘MP Approach’ would incorporate all the sources of fishing mortality, historical and into the future, into the testing and tuning a new MP. This is central to the scientific approach to decision-rule based management advice. The ‘MP Approach’ ensures, to the extent possible, that the MP selected and implemented is robust to the levels of catch occurring in the fishery (i.e. is likely to meet the rebuilding objective of the EC) and provides greater certainty and stability to Members on future TACs.

80. In terms of the 2018-20 TAC block, the ‘Direct Approach’ is a more precautionary implementation of the recommended TAC in the absence of re-tuning to account for additional mortality, compared with making no allowance for NCNM catches.

81. The question was asked whether the Direct Approach was likely to be the more precautionary of the two approaches for future TAC setting. In response, it was noted that if the range of UAM incorporated in the operating models used to test the MP were sufficiently broad then, in principle, the MP Approach will be robust to the UAM. However, for this to be the case, it does require that implementation of the MP includes regular monitoring of the level of all forms of mortality that may actually be occurring. If this monitoring indicates that the level of mortality exceeds that included in the MP testing, then this would constitute exceptional circumstances under the meta-rules for the MP, and

appropriate action would need to be taken. These tests and meta-rules do not apply to the direct approach as it does not incorporate UAM in the retuning of the MP. Under the current MP any catch above TAC triggers exceptional circumstances (see ESC 19).

82. It follows that an important consideration in the context of implementing the MP Approach is that:

- There is a basis for estimating, or constructing plausible scenarios, for all sources of mortality and that these are appropriately represented in the conditioning and projections of the operating models used to test candidate MPs;
- There are agreed methods for monitoring and estimating all sources of mortality for MP implementation; and
- The estimates of all forms of mortality are routinely compared to those assumed in MP testing during MP implementation, as part of the annual review of MP performance.

83. The ESC noted that the current method for constructing NMNC catch scenarios (agenda item 7.1) assumes that all the relevant effort is reported to the relevant tuna RFMO. It was suggested that the ESC and CC might want to consider additional ways to estimate total effort from other sources (e.g. AIS transponder system and other remote sensing technologies that are increasingly becoming available). These could potentially be used as monitoring series to indicate whether estimates of total mortality are within the bounds of those used in MP testing and, where appropriate, trigger exceptional circumstances.

84. In the context of the MP Approach, the ESC noted that there were two general ways in which the UAM can be accounted for in MP development and testing. These differ with respect to whether or not the UAM is included as part of the decision rule used to calculate the TAC for the MP.

85. In the first case, all sources of mortality are included in the operating models (both conditioning and projections), but the MP decision rule relates only to the TAC for Members and CNMs. The mortality resulting from other sources is accounted for in the MP testing by adding the extra catches to the MP-based TACs to simulate total removals. The estimated probability of rebuilding, and corresponding MP tuning parameters are, therefore, calculated conditional on these additional catches being included in the testing. This is consistent with the approach used to assess the impact of the “Added Catch” scenario on stock status and rebuilding for the 2014 stock assessment (Report of ESC 19). In this case the impact of additional catches is distributed proportional to Member allocations.

86. The second case is to include the additional catches as a component of the MP decision rule and deduct an estimate of additional mortalities from the TAC[2] recommended by the MP, based on an estimate of UAM. This approach would be somewhat analogous to the “Direct Approach”, but tested by management strategy evaluation as part of the development of a new MP. This second case theoretically provides scope to reduce the impact of unaccounted catches on the medium to long-term catch performance of the MP by providing an incentive to

[2] Note, in this second case, the TAC recommended by the MP is the total catch (Member & CNM TAC + UAM resulting from additional catches) that can be taken and still achieve the rebuilding objective. In the first case, the UAM is accounted for in the OMs, but not included in the decision rule of the MP.

reduce the additional sources of mortality over time. However, the performance of this option will be sensitive to the accuracy and precision of the method used to estimate and deduct UAM as part of the TAC setting rule.

87. It was noted that the second case may be preferable from a transparency perspective, as the additional catches are being taken into account directly as part of the TAC setting rule in the MP. In either of these cases, the plausible scenarios for additional catches included in the operating models for MP testing would need to be monitored and reported during implementation, which will provide transparency on the detail in these scenarios.

88. The second case has the potential disadvantage of every year requiring agreement to be reached on the sizes of the additional catches to be subtracted directly from the TAC. Given that the ESC does not currently have either the data, or an agreed method, for estimating future total mortalities to include in the development and testing of candidate MPs, it is not likely to be practical to test and implement this second case option in the short-term.

89. The ESC noted that, in principle, neither case of the MP Approach was a priori likely to be more precautionary. This would need to be determined by MP testing.

90. The ESC agreed that in conducting the annual review of MP implementation, as part of the meta-rules consideration of exceptional circumstances, the distribution of assumed additional catches used in MP testing would need to be compared directly with the "real world" estimates.

91. The ESC recommended that the MP approach should be used for future TAC recommendations beyond the 2018-2020 block, and that the first case, as described above, should be used to account for UAM in the MP testing and in implementation. This new MP would provide TAC advice to the EC for Members' and Cooperating Non-Members' (CNMs) attributable catches that would be robust to the additional catches included in testing and tuning of the MP.

7.3. Other sources of mortality

Japanese market anomaly

92. Australia presented CCSBT-ESC/1609/13 on the Japan Market Update 2016. The paper outlines the history of the apparent anomalies evident from the SBT market data in Japan. The paper notes this anomaly has been highlighted from 2001, but was not seen as plausible by Scientific Committee Members at that time. However, the 2006 Japan Market Review (JMR) had detailed the large anomaly. Since then, Japan and Australia had regularly submitted updates to the CCSBT – mainly to the Compliance Committee. The paper noted that the conclusions in Japan's papers were not consistent with the conclusions of the JMR – and that this may be a misunderstanding of the complex marketing system in Japan. For example, until 2014, Japan's papers estimated that Australian farmed frozen SBT had increased its share of the Tsukiji auction market from the 6.5% share in 2005 in the JMR study to 35.6% by 2008, and that it remained around that level. Japan's position was amended in 2014 to recognize that Australian farmed frozen SBT was rarely sold at auction at Tsukiji. The paper noted that using the JMR

Case Two core market assumptions, the same as used by the ESC in the Operating Model, suggested continuing anomalies of 2009 (4,104 tonnes); 2010 (3,998 tonnes); 2011 (2,195 tonnes); 2012 (2,256 tonnes); 2013 (2,570 tonnes); 2014 (2,261 tonnes); and 2015 (1,640). The paper requested that Japan provide the following existing information held in Japan (and supplied to the JMR) to start to clarify the extent of the apparent overcatch identified in this paper: (1) An exact break-down of the SBT data supplied to the JFA by the five Tsukiji auctioneers into auctioned and sold outside the auction, which is farmed and non-farmed, and the source country of the auctioned and non-auctioned frozen SBT. (2) From the Tokyo Metropolitan Government (TMG), the source country of frozen SBT auctioned at Tsukiji market. These raw data are held by TMG. (3) The source country of frozen SBT auctioned at Yaizu. (4) Currently, Japan's submissions are Confidential The paper requests that the Confidential status be removed on CCSBT-CC/1410/19 and CCSBT-ESC/1208/31, and on the data in (1) to (3) above.

93. Japan explained that Australia's view expressed in CCSBT-ESC/1609/13 was primarily based on some misunderstanding of the following: i) As a result of the catch quota reduction and the anomaly elimination for the wild caught SBT, it is natural that Australian farmed frozen SBT had increased its share of the Tsukiji auction market and that the total auction sales at Tsukiji market had reduced significantly; and ii) The ratio between imported SBT and domestic SBT in the live auction at Tsukiji market fluctuates largely depending on season as clarified by the Japan's long-term monthly monitoring and a one-day observation reported in paper CCSBT-ESC/1609/13 is not enough to understand the tendency of market.

94. Japan also presented paper CCSBT-ESC/1609/BGD07 which explained the characteristic and structure of the Japanese fish market and possible data source relating to SBT trade in Japan. The distribution channel of SBT in Japan is complex, thus any statistics of wholesale markets are only partly covered the SBT trade. For this reason, many assumptions of trade parameters are required for the analysis of market anomaly. On the other hand, CDS which started in 2010 covers all landing, import and export of SBT. The analysis of CDS data should be useful to examine the market trades, and it may be an alternative way to verify the accuracy of reported catch using trade information.

95. Japan presented paper CSBT-ESC/1609/BGD08 about monthly monitoring and collection of information of the Japanese market. Based on the information for the parameters of SBT trade, as estimated catches by the Japanese fleet has been smaller than official catch since 2008, under-reporting of catch by fishermen has not been indicated through the market monitoring.

96. In discussion of the potential for continuation of an anomaly in the Japanese market data, Japan noted the CCSBT-ESC/1609/BGD07 answered some of these queries regarding the Japanese market operations: The quota decrease in Japan has explained the anomaly seen in the market previously, and it is only natural that the proportion of farmed-fish seen in the Japanese market has increased.

97. Australia noted that the market analysis is an important source of information. This type of analysis is important for understanding trade in different markets as also demonstrated by the Chinese market study. Japan noted that they will continue to monitor the market and report results.

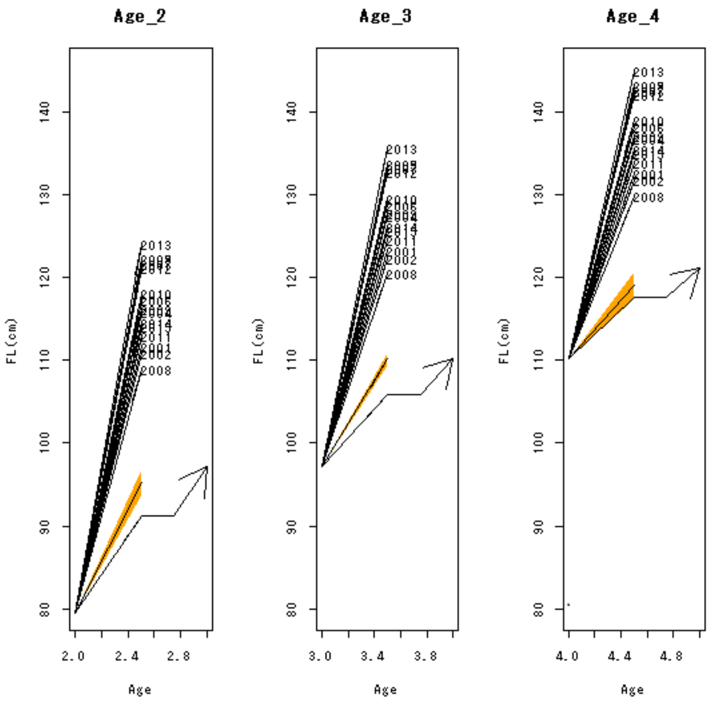
98. As noted in paper CCSBT-ESC/1609/BGD07, CDS data could provide more information, and the question was raised whether the CDS tags were tracked though the market. Japan noted that the CDS obligations with respect to tags only related to the first step but that it was possible to follow CDS tags through further steps for whole fish, as the tags usually remained attached. Japan noted that the sales data at Tsukiji are monitored by twice monthly visits to the market with the authorities from the Fisheries Agency of Japan and staffs from a contracted NGO, and interviews with traders.

99. There was a query regarding monitoring at other markets, such as Yaizu. Japan noted that tuna sales at Yaizu had been monitored in the past but not in the same regular, systematic fashion as Tsukiji. Japan offered to report on this historical monitoring when the data was analysed. In response to further question from Australia, Japan also noted that tissue sampling and DNA analysis of imported fish at landing site is continuing.

Australian farm anomaly

100. Japan presented paper CCSBT-ESC/1609/24, which provides an updated of unaccounted catch mortality in Australian SBT farming in the 2014/2015 fishing season. 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 (see Figure 1, which is included at Japan’s request). 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 1,650 tons. As a proportion of the reported catch, this excess ranged from 14% to 56% with a best estimate of 34.4%. The authors suggested that it is 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.

Figure 1: Estimated growth of farmed SBT from the SRP tagging and from the 40/100 fish sampling (CCSBT-ESC/1609/24), which is included here at Japan’s request. Black lines are growth rates which explains the difference between estimated total weight at the onset of farming based on the 40/100 fish sampling and the total weight at harvest by fishing year. Orange polygons denote growth estimated from the CCSBT SRP tagging data of mean with 1 standard error. Black arrows denote growth of wild SBT used in CCSBT, assuming no growth in winter three months.



101. Australia presented paper CCSBT-ESC/1609/14 - An Updated Review of Tuna Growth Performance in Ranching and Farming Operations. The paper reviews the large range of literature on farming of Bluefin Tunas in the Mediterranean, Mexico, Japan and in Australia. The biological and other scientific analyses in the literature do not support any hypothesis of unaccounted catch in the Australian farm sampling. The paper provides a large amount of literature showing that the growth rate of farmed Bluefins is higher in farms than in the wild (e.g. SRP). The paper provides the growth data for the major research trials in Japan in 2013 and 2014 of growing out 9-16 kg Pacific Bluefin Tuna (PBT) for 6 months. The results were almost exactly the same as for Australian farmed SBT – a doubling of whole weight in the 6 months, and a Feed Conversion Ratio (FCR) of about 10:1 (10kg of wet feed for one kg of whole weight growth in the tuna). Basic tests of Japan’s hypothesis show it is not plausible. For example, Japan’s hypothesis is that the average weight of Australia’s catch of 245,000 SBT pa was 27kg in 2011 and 2013. However, such fish are rare on the Australian fishing grounds. Another test is that Japan’s hypothesis is that the Australian FCR is 17:1, when all the literature and public data shows it is ~10:1. The Australian sampling system is totally controlled by the government, is transparent, is fit-for-purpose for the Australian quota management, catching pattern and fish size, and is supported by the QAR. It takes the actual length/weight of ~3,000 SBT pa by a method which the literature shows biases the sample upwards. The paper noted that in 2015 Japan “changed the estimate

method to use growth rate in fork length." (ESC/1609/BDG09). Up until 2014, Japan's hypothesis was based on the length/weight data from 420,000 Australian farmed fish, with the data supplied by Japanese importers. The paper again requests Japan supply this data to validate it.

102. Australia did not agree with the validity of the results of paper 24 and Figure 1 and noted that these were the same issues raised with the analysis when it was presented previously. It is also not clear if data derived from sampling in the market are used, the analysis relies on particular growth rate parameters, and no sensitivity tests have been completed for the assumed parameter values in the analysis. Australia noted that CCSBT-ESC/1609/14 provides detailed information on growth in farms.

103. Japan noted that most concerns with the Japanese analyses raised by Australia in CCSBT-ESC/1609/14 had already been addressed last year in the paper CCSBT-ESC/1609/BGD09. Japan also advised that the economics test in the CCSBT-ESC/1609/14 did not provide any suggestion of appropriate growth rate, and the calculation was very sensitive to two parameters.

104. Australia and Japan noted that monitoring of the numbers of fish transferred into the Australian farms is robust and, unlike farm monitoring in other parts of the world, it is conducted by a government official. Japan's queries are only in respect to the size of fish in the farms. Japan noted that stereo video monitoring has become compulsory in the Mediterranean in ICCAT and management of SBT in CCSBT is now lagging behind. Japan requested the length and weight data from samples in the Australian fishery, if the length-weight relationship is different from the one used in Japanese analysis.

105. The Advisory panel was asked for their view on this issue. The panel noted that their position remains that the implementation of stereo video monitoring would resolve the issue.

106. Australia and Japan met to clarify their technical concerns raised in relation to papers CCSBT-ESC/1609/24 and CCSBT-ESC/1609/14. **Attachment 6** is provided as a summary of technical concerns and initial responses to facilitate further work and discussion on this topic.

Mortality from discards

107. Australian presented CCSBT-OMMP/1609/Info01 (CCSBT-ESC/1609/BGD01) a review of literature available on life status at the time of hauling and post-release survival rates in tuna and tuna-like (i.e. billfish) species to inform the discussion. This paper updates the 2014 paper (CCSBT-ESC/1409/14) with additional studies, including a study specifically on post-release survival of SBT caught recreationally. The results from these studies were compared to the recent estimates of post-release survival obtained for southern bluefin tuna from the Japanese longline fishery using pop up satellite archival tags (PSATs). This comparison indicated that while the level of post-release survival in tuna and tuna-like species might be relatively high, the results from the Japanese study are more optimistic than the other studies reviewed. This is likely due to the handling techniques the Japanese study used, which do not appear to be representative of day-to-day longline fishing operations and the selection of fish for PSATs. Thus, the real level of post-release survival is likely lower. There is a need for research to understand the life status at hauling, the factors that influence this (such as

soak time and temperature) and post-release survival. In the absence of these conservative scenarios of mortality should be used in sensitive analyses.

108. Different views were expressed on appropriateness of assumptions used to estimate the potential mortality of fish released alive from longline fishing operations. Australia noted that research experiments involving electronic tagging conducted to examine this issue often differ from the fishing and handling conditions experienced by fish in commercial operations and recreational fishing and suggests these may overestimate post-release survival. Japan noted that the Japanese experiment using pop-up archival tag (PSAT) was the best available information of survival of released fish from Japanese longline so far, because the experiment was conducted in the usual Japanese longline operations for SBT, which was in lower SST than experiments in literatures of other tuna and highly migratory species. Japan noted that the SBT implemented PSAT can be said to be selected random with difficulties for the researcher to judge fish vigorous condition accurately and under the condition of unknown number of expected SBT in the day.

109. It was noted that the survival rate of released SBT were relatively high in both experiments in recreational fishing and Japanese longline. The ESC noted it would welcome experimental designs for projects that address this issue in a more representative manner, though noted that the cost vs benefit of the experiment should be considered. It was also noted that examination of the uncertainty in post-release survivorship could be a candidate of Robustness tests in future MP testing.

Agenda Item 8. Review of results of the Scientific Research Program and other inter-sessional scientific activities

110. CSIRO[3] presented paper CCSBT-ESC/1609/07 on progress in the CCSBT pilot gene-tagging project which commenced in 2016, as part of the CCSBT scientific research program. The aim of the pilot project is to test the logistics and feasibility of large scale gene-tagging for recruitment monitoring. The gene-tagging program is designed to provide an estimate of absolute abundance of a juvenile cohort. If successful, the data collected from a long-term gene-tagging program are planned to be used in a new management procedure being developed for the CCSBT (Anon 2015). The fieldwork commenced in February 2016. A total of 3,768 SBT were tagged, in 20 days at sea. The tagging equipment worked well, with fish out of the water for a brief period of time. Tagging using the gene-tagging tool was quicker, and appears to be less invasive, than conventional tagging or archival tagging methods. Phase 1 of the pilot study did not reach the target number of fish (5000) because of difficulties finding fish in windy weather, however, the number tagged is sufficient to continue with the pilot tagging program as additional samples can be collected at the catch sampling stage to maintain a similar expected CV. Genotyping is planned for the remained of 2016, until all samples have been processed. Phase 2 involves taking tissue samples during harvest in June-August 2017 and initial scoping of the logistics for this phase has been completed with co-operation and advice from Australian Industry

[3] As the contractor to the CCSBT for this project.

members. The pilot study will provide an estimate of abundance of 2 year old SBT on completion in early 2018.

111. The ESC sought clarification on when a decision was required as to funding of the long-term gene tagging work. The Secretariat responded that a decision would be required at CCSBT 23 in 2016 and that it was currently included in the indicative budget. The Executive Secretary further noted that Australia and the European Union have indicated that they will make voluntary contributions for gene tagging in 2017 and that funding is currently provided by CCSBT and CSIRO.

112. It was asked whether CCSBT Members would have access to genetic data from the gene tagging and close-kin genetics work, e.g., genotyping data and archived DNA samples. CSIRO[3] noted that as these activities were undertaken as part of CCSBT-funded activities under the SRP, that access to the DNA archive and data agreements had been formalised to provide access to the data and samples for the purposes of the CCSBT. The genotype datasets are very large and arrangements for the management and secure archiving of these data are being arranged with the commercial company and CSIRO. The ESC noted that Members and CNMs may use the archived DNA samples and genotype data from the gene-tagging pilot project and CCSBT funded Close-kin project to serve the purposes of the Convention for the Conservation of Southern Bluefin Tuna, including for the decision making, management, science activities, projects and meetings of the CCSBT.

113. Japan presented paper CCSBT-ESC/1609/25 that described activities of collection of otoliths and age estimation. In 2015, otoliths were collected from 794 SBT individuals and ages were estimated for 210 SBT individuals which were caught in 2014. The data were submitted to the CCSBT Secretariat in 2016.

114. Japan presented paper CCSBT-ESC/1609/26 of the 2015/2016 trolling survey that provides the data for recruitment index of age-1 SBT. In January and February 2016, the survey was carried out in similar manner since 2006. A chartered Australian vessel goes and back on the same straight line (piston-line) off Bremer Bay in the southern coast of Western Australia using trolling for a total of 14 lines. The adjacent area of the piston-line and the area between Esperance and Albany were also surveyed. During the survey, a total of 319 SBT individuals were caught. Among them, 51 fish were implemented archival tags and released.

115. Japan presented paper CCSBT-ESC/1609/27 which provides two recruitment indices of age-1 SBT using trolling catch data in two surveys on the south western coast of Australia, the acoustic survey from 1996 to 2006 and the trolling survey from 2006 to 2014, and 2016. One index is the piston-line trolling index (PTI), which has been reported to CCSBT. The other index is grid-type trolling index (GTI) was developed in 2014, which utilised all of the trolling data that aggregated the trolling effort and the number of SBT schools caught by date, hour, area type and 0.1 degrees square in latitude and longitude. Dataset included about 50,900 km total distance searched with 873 tuna schools. GLM of delta-lognormal method was applied for CPUE standardisation because of high percentage of zero catch. Year trend of GTI in 20 years were agreed to those of recruitment estimates from operating model, age-4 standardised CPUE of Japanese longline and commercial aerial spotting index. Trends of GTI and PTI

were similar to each other. GTI and PTI are expected to contribute to the CCBST stock assessment.

116. During OMMP 6 suggestions for improvements to potential monitoring indicators, including this survey, were proposed including reviewing the spatial and temporal coverage, the standardisation and a design study. The question was asked if any of this had yet been considered. Japan responded that it was their intention to make further improvements, but that work had not yet been completed.

117. Taiwan presented paper CCSBT-ESC/1609/32. This study analysed 356 gonad samples of southern bluefin tuna collected during April to September in year of 2010-2015. The fork length of samples concentrated between 100 and 135 cm. For both sexes, 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, while all of male samples were regenerating stages during June to August.

118. In response to a question from Taiwan, Australia indicated that they would be interested in collaborating with Taiwan and other interested parties on efforts to combine all available maturity information on SBT.

119. CSIRO[3] presented CCSBT-ESC/1609/08 which provided an update on the length and age distribution of SBT in the Indonesian longline catch and close-kin tissue sampling and processing undertaken as part of the agreed CCSBT work. In 2015/16, otoliths and muscle tissue samples were collected from SBT landed by the Indonesian longline fishery in Bali. Muscle tissue samples were also collected from harvested SBT at tuna processors in Port Lincoln, South Australia. Genotyping of muscle samples from the 2014/15 season is also currently underway for use in future close-kin mark-recapture estimates of spawning stock biomass. Length and age frequency data from the Indonesian longline fishery shows that since the 2012/13 spawning season, the proportion of small/young SBT (<160 cm FL/12 years old) in the catch landed in Bali has increased substantially compared to previous years. Investigations have shown that SBT caught by Indonesia have occurred in CCSBT statistical areas 1, 2 and 8, so it is plausible that the small/young SBT in the monitoring series were caught south of the SBT spawning ground. Efforts to clarify which fish in the monitoring series were actually caught on the spawning ground (as opposed to, for example, targeted fishing for SBT to the in areas 2 and 8) are ongoing. At this stage it is not possible to identify the catch location of individual SBT sampled as part of the regular the catch monitoring program. An age calibration/estimation workshop continues to be a priority for consideration in 2017. Indonesia’s Research Institute for Tuna Fisheries (RITF) in Bali was identified to host the workshop. Significant progress has been made at RITF to establish an otolith preparation laboratory for ongoing capacity development in tuna ageing methods.

120. A question was asked whether it might be possible to determine where these small fish observed in the Indonesian fishery catch monitoring program had come from. CSIRO noted that there is some evidence that some of these fish were caught in areas 2 and 8 in addition to the spawning grounds. While some attempts

have been made, so far there has been little success in linking port monitoring and sampling data to catch locations and it is possible that this will not be resolved for the historical samples.

121. A further question was asked whether the smaller fish might have an impact on the close-kin abundance estimation. CSIRO indicated that the implications are greater for the selectivity assumptions in the OM and less of a problem for the close-kin analysis because the model takes account of small fish having less reproductive output.

122. Australia presented paper CCSBT-ESC/1609/15 on the SBT otolith and ovary collection activities in Australia over the past year (2015/16 fishing season) and estimates of proportion at-age of the Australian surface (purse seine) fishery catches for the 2014/15 fishing season. Otoliths from 171 SBT (60-122 cm fork length) caught in the Great Australian Bight were archived into the CSIRO hard-parts collection during the 2015/16 season. In addition, samples of ovaries from 158 SBT (105 to 195 cm FL) caught off southeast Australia were collected and archived. Age was estimated for 100 SBT from the 2014/15 season and the proportions-at-age were estimated using standard age-length-keys and by applying the method developed by Morton and Bravington (2003) (M&B method) to the combined age-length data and length frequency data obtained from the catch sampling program. For the 2014/15 season, the proportion at age estimates from the M&B method with unknown growth are 73% age 2 and 20% age 3. These estimates are very similar to the 2013/14 season, but suggest a larger proportion of age 2 and smaller proportion of age 3 fish in the catches than in any of the previous seasons.

123. CSIRO[3] presented paper CCSBT-ESC/1609/09 on the 2016 aerial survey, methods and results for all survey years. The estimate of relative abundance of juveniles from the 2016 scientific aerial survey is significantly higher than for any previous year. There was no survey in 2015. A new spotter flew in the 2016 survey and his school size estimates and ability to sight SBT were calibrated with an experienced (already calibrated into the survey) spotter pilot's estimates. The environmental conditions during the 2016 survey were average for the most part, except that the swell height and sea shadow were higher than usual. Most sightings were made inshore in the eastern half of the survey area. The unusually high percentage of schools comprised of small fish (<8 kg) that were seen in 2009-2013 were not observed this year. The data analysis methods are unchanged from previous years. Methods to account for uncertainty in the observer effect for the sightings per nautical mile of transect line (SpM) model have yet to be implemented; hence, the CVs for the relative abundance indices do not yet include uncertainty in the observer effects for the SpM model and are slightly too narrow as a result.

124. The aerial survey flew over the gene-tagging operations on only 2 days, and assisted the gene-tagging field research team to find schools of the right sized fish to tag.

125. There were several questions relating to the level of confidence CSIRO had in the estimates for 2016 including: confidence in very different estimates of patch size[4] obtained from the 2016 aerial survey operation; including whether the

---

[4] Patch size refers to an estimate of the abundance of fish in a SBT school sighted on the survey.

standardisation might have ‘over-corrected’ given the larger patch sizes impact, the calibration of the new spotter, and any oceanographic variables that might have affected either visibility of patches or the behaviours of the fish (e.g., made them more likely to be found in surface schools).

126. CSIRO responded that the very high estimate obtained is at least partially corroborated by anecdotal information for the fishery in 2016. It was noted that given fish availability in the east, commercial operations were almost completely outside of the aerial survey area in 2016. It was also noted that results are more uncertain because there was no aerial survey in 2015. This break in the time series can make it more difficult to understand possible drivers of the year to year ‘availability’ of patches to the aerial survey. CSIRO noted that in terms of variables included in the standardisation, both sea shadow and swell height were above average and both of these conditions are typically associated with it being more difficult to detect patches. In terms of other variables not included, CSIRO noted that we are just coming to the end of one of the strongest El Ninos on record and it is unknown if there is some related impact – further work is needed there. In terms of the new spotter used in 2016, CSIRO noted that the only issue found during the calibration was in relation to fish size as described in the paper (CCSBT-ESC/1609/09) and there was no difference encountered with respect to patch size, which was the primary contributor to the high estimate for 2016.

127. There were several questions in relation to further diagnostics that could aid interpretation of the standardisation results, including results for individual sub-models. CSIRO noted that the some of the more commonly used diagnostics were difficult to apply to this analysis due the ‘two-component’ nature of the approach used (i.e., models for the number of patches and patch size) and the use of random effects. Attempts would be made to provide further details on this analysis.

128. The meeting noted the deviations from the assumed distributions in the residuals of both parts of the aerial survey model. The models are used to estimate abundance by summing predictions across multiple strata, and predictions can be biased when there is a lack of fit. It would be useful to explore alternative transformations, link functions and modelling approaches that may improve the fit of the models to the data and potentially change the estimates. For the biomass per sighting (BpS) model, a power transformation or alternative link function (e.g. inverse for the gamma distribution assumed) might work better. The odd residual pattern in the distribution of sightings-per-mile (SpM) is probably linked to how the model is dealing with zeroes. This might be resolved by using a delta model, or a zero inflated model such as ZINB (zero inflated negative binominal), or a more flexible member of Tweedie family of likelihoods.

129. It was noted that as part of the MP specification, the form of analysis of the input data to the MP is pre-specified. Further analysis would depend on the work-plan priorities of the ESC. CSIRO confirmed that it would not be possible to respond to requests of the meeting for further analysis of the aerial survey within this meeting, rather these suggestions could be implemented in the analysis of the 2017 aerial survey data.

130. The meeting noted that further consideration of the impact of aerial survey abundance estimate for 2016 would be covered in agenda items 9 and 10.1 covering indicators and meta-rules.

131. The ESC noted that currently there is no aerial survey planned for 2018 and that the first gene-tagging abundance estimate (and test of feasibility and logistics from the pilot gene-tagging program) will not be available until 2018. The ESC agreed to make the potential implications of this clear to the EC.

<u>Agenda Item 9. Evaluation of Fisheries Indicators</u>

132. The ESC considered the updated indicators (**Attachment 7**). The overall results were summarised as follows:

- In terms of recruitment indicators, the fact that there was no information on recruitment collected in 2015 needs to be noted. The 2016 aerial survey (an index of age 2-4 relative abundance) was the highest on record, following the high 2014 index. A substantial increase in the patch size observed (about 2.6 times higher than the average from previous surveys) contributed to the higher value in 2016. The CV associated with the 2016 index was similar to previous years. The 2016 trolling survey index was higher than the 2014 index and slightly above the average value 2006-2016. Preliminary analysis of 2016 CDS data from NZ shows a very strong mode of fish around 20kgs (processed weight), which has not been seen in previous years, and possibly reflects strong recruitment consistent with the 2016 aerial survey (paragraphs 137 and 138).
- Recent longline CPUE index values for the Japanese fleet for ages 5 to 7 were well above the historically lowest levels observed in the mid-2000s. The index for these ages showed an increasing trend in recent years. The CPUE index for ages 8-11 has increased since 2011. The index for age 12+ has fluctuated around a low level. The Korean standardised CPUE series also showed an increasing trend over recent years. The time-series of direct ageing distribution data available from the New Zealand foreign charter fishery indicated relatively strong cohorts now about to enter the spawning component of the stock.
- The monitoring of length and age of Indonesian catches on the spawning ground indicate a substantial increase in the frequency of smaller and younger size and age classes since 2012. Information presented to the meeting indicates that the unusually small size classes may have been caught outside the spawning ground (in areas 2 and 8) and that, if this is the case, these fish should be excluded from the monitoring series. Once this is resolved the spawning ground indicator related to mean estimated age of all fish can be re-considered.

133. Overall there are signs of higher recruitment in recent years and there are some consistent positive trends in the longline CPUE. This suggests that some relatively strong cohorts are moving through the fishery, although these have yet to contribute to the spawning stock. The ESC noted that increased recruitment is of itself not necessarily indicative of increased spawning stock biomass.

134. Australia presented paper CCSBT-ESC/1609/16. This provides the 2015–16 update of fishery indicators for the SBT stock. It summarises indicators in two groups: (1) indicators unaffected by the unreported catch identified by the 2006 Japanese Market Review and Australian Farm Review; and (2) indicators that

may be affected by the unreported catch. Data collected in the longline fisheries after 2006 are unlikely to be affected by unreported catches because of the catch documentation activities that have been undertaken by CCSBT Members, and therefore only the historical data and some standardised indicators are possibly affected. In this paper, interpretation of indicators is limited to subset 1, and recent trends in some indices from subset 2. Two of the three indicators of juvenile (age 1–4) SBT abundance (i.e. scientific aerial survey index and the trolling index) were undertaken in 2016; the SAPUE/commercial spotting index was not updated. Both the scientific aerial survey and trolling index increased since the last update. Indicators of age 4+ SBT exhibited mixed trends with the catch per unit effort (CPUE) from both the New Zealand joint venture fishery and the New Zealand domestic longline fishery increasing in 2015. Similarly, the Japanese longline nominal CPUE for ages 4+ increased. The median length class of SBT on the spawning ground decreased in 2015–16 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 2014–15 while the median remained the same. The author noted that the paper used Taiwanese data that had subsequently been updated and therefore the results of the relevant analysis needed to be treated with caution.

135. In producing **Attachment 7** the updated Taiwanese data have been used.

136. New Zealand described preliminary 2016 CDS data available from New Zealand. The data showed a very strong mode of fish around 20kg (processed weight), which has not been seen in previous years, and possibly reflects strong recruitment consistent with the aerial survey estimate.

137. In response to questions from the meeting, New Zealand confirmed that the preliminary data for 2016 represented complete data for quarter 1 and near complete data for quarter 2 and data for both the domestic and foreign charter fleets were combined. Further, New Zealand explained that no foreign charter vessels fished in 2016, but that there was no information to suggest that the areas or seasons fished this year were any different to previous years. Based on the sizes of these fish, it was likely that they would be 3-4 years old.

138. Japan presented paper CCSBT-ESC/1609/28. In this paper, fisheries indicators along with fishery-independent indices were examined to provide additional information for overviewing the current status of southern 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 5 and 6&7classes show increasing trends in recent years while the indices for age 4 has fluctuated around recent past 5-year mean. The CPUE indices for age 8-11 group have increased since 2011. The indices for age class 12+ have fluctuated around at a low level in recent six years. The current index levels for these older age groups are still low similar to ones observed in past. Other age-aggregated (4+ group) CPUE indices that have been used in the operating model and/or management procedure show increasing trends in recent years. The current levels of these indices are well above the historically 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) but the levels of recruitment have varied from year to year.

Agenda Item 10. SBT stock status

10.1. Evaluation of meta-rules and exceptional circumstances

139. At its Eighteenth annual meeting in 2011, the CCSBT agreed that a 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.

140. 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 MP may be inappropriate.

141. Based on the review of fishery indicators (paragraph 133) and papers (CCSBT-ESC/1609/17, 29), the ESC noted that the following three issues needed consideration in the context of the meta-rules for the current TAC for 2017 and the TAC recommendation for the 2018-2020 quota block:

- The high 2016 scientific aerial survey index
- The small/young fish in Indonesian size/age data (2012/13 to 2014/15 seasons)
- The potential scale of unaccounted mortalities

2016 scientific aerial survey index

142. The ESC noted that the 2016 aerial survey index, while outside the bounds of projections used in the MP testing, is outside these bounds in a positive direction. This may be indicative of especially high recruitment. This exceptional circumstance triggered action to examine the impact of the high aerial survey point on the operation of the MP (see agenda item 11 for more details). These investigations concluded that the high AS point was not unduly influencing the TAC recommendation from the MP, and that the model in the MP was able to fit the data adequately; therefore that the MP could be operated as tested. The ESC concluded there was no reason to take action to modify the 2017 TAC or the 2018-20 TAC recommendation in relation to this exceptional circumstance. However, the impact of the 2016 index value will be investigated further as part of the 2017 stock assessment.

Indonesian size/age data

143. The increase in the frequency of smaller and younger size and age classes in the spawning ground catch monitoring was reviewed (paragraph 133)

144. The ESC considers that this remains a priority issue to resolve for the monitoring of the spawning stock and conditioning the OMs for the 2017 stock assessment. However, it is not an issue for the operation of the MP because the MP does not use these data directly. Hence, the ESC concluded there was no reason to take action to modify the 2017 TAC or the 2018-20 TAC recommendation in relation to this exception circumstance.

Unaccounted mortality

145. The ESC provided the following advice from the meeting in 2014:

> 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.
>
> 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.
>
> 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[5].
> - 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 since the adoption of the current MP 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.
>
> 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.
>
> 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

---

[5] Members discussed whether this particular statement should be reworded with New Zealand expressing the view that in recent year the global TAC had been consistently exceeded and this had in fact become the norm rather than a potential scenario

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.

146. The ESC reaffirmed these views and considered additional information that had become available.

147. The additional information considered by the ESC included estimates of potential non-cooperating non-Member (NCNM) longline catches in the Pacific, Indian and Atlantic oceans (CCSBT-ESC/1609/BGD02). The estimated mean total catch by NCNM ranged between 59 to 306 t annually (2011-14), depending on the assumption about whether the effort was bycatch or targeted (paragraph 70, Table 1). These estimates are somewhat lower than those presented in 2015 and remain uncertain. If current levels of NCNM effort remain and stock size increases, levels of NCNM catch will likely increase.

148. The draft report on the Chinese market study (CCSBT-ESC/1609/36 and 37) was the other additional information considered (paragraph 73). That report confirmed the ongoing presence of SBT within the Chinese sashimi market (particularly in Shanghai). Additional information is required to assess the scale and proportion of reported catches in this market.

149. Given the high uncertainty associated with the available information the ESC considered that the "Added Catch" sensitivity used in 2014 could not be ruled out as a plausible scenario for consideration of unaccounted mortalities.

150. With regard to the 2018-20 TAC recommendation, the ESC noted the EC's workplan related to this issue (EC2014 para. 53 and EC2015 para 73). In particular, given the decisions of the EC to make a direct allowance for NCNM catch by deducting this from the 2018-20 TAC, and that Members would account for attributable catches by 2018, the ESC concluded there was no reason to take action to modify the 2018-20 TAC in relation to this exceptional circumstance.

151. With regard to the 2017 TAC recommendation, given:

- The EC's intention to take account of NCNM catches and the agreed common definition of attributable catch (EC2014 para. 53) in the 2018-20 TAC block and longer term;
- The intention to develop a new MP that is robust to plausible UAM scenarios; and
- Noting the 2014 analysis indicated that continuing to follow the MP as proposed leads to continued rebuilding in the short term even if the circumstances of the hypothesised additional unaccounted mortality are true;

therefore, the ESC concluded there was no reason to take action to modify the 2017 TAC in relation to this exceptional circumstance.

152. Overall, the ESC concluded that there was no reason to take action to modify the 2017 TAC or the 2018-20 TAC recommendation in relation to these three exception circumstances.

153. The ESC also reiterated the need to take urgent steps to quantify all sources of unaccounted mortalities, as well as the request to Members, the CC and EC to provide information that will assist the ESC in quantifying estimates of these mortalities.

10.2. Summary of the SBT stock status

154. At its previous meeting in 2015 the ESC expressed the following views:

- 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 3). 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.
- 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 3: Southern Bluefin Tuna Summary of 2014 Assessment of Stock Status

Southern Bluefin Tuna Summary of 2014 Assessment of Stock Status[6]	
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** **B10+**	 0.09 (0.08-0.12) 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.

155. The stock assessment is scheduled to be updated in 2017 and will provide estimates of recent trends in spawning stock biomass.

156. The ESC considered the updated indicators (**Attachment 7**). The overall results were summarised as follows:

- In terms of recruitment indicators, the fact that there was no information on recruitment collected in 2015 needs to be noted. The 2016 aerial survey (an index of age 2-4 relative abundance) was the highest on record, following the high 2014 index. A substantial increase in the patch size[7] observed (about 2.6 times higher than the average from previous surveys) contributed to the higher

[6] Values in parentheses are 10^{th} and 90^{th} percentiles.
[7] Patch size refers to an estimate of the abundance of fish in a SBT school sighted on the survey.

value in 2016. The CV associated with the 2016 index was similar to previous years. The 2016 trolling survey index was higher than the 2014 index and slightly above the average median value 2006-2016. Preliminary analysis of 2016 CDS data from NZ shows a very strong mode of fish around 20kgs (processed weight), which has not been seen in previous years, and possibly reflects strong recruitment consistent with the 2016 aerial survey (paragraphs 137 and 138).

- Recent longline CPUE index values for the Japanese fleet for ages 5 to 7 were well above the historically lowest levels observed in the mid-2000s. The index for these ages showed an increasing trend in recent years. The CPUE index for ages 8-11 has increased since 2011. The index for age 12+ has fluctuated around a low level. The Korean standardised CPUE series also showed an increasing trend over recent years. The time-series of direct ageing distribution data available from the New Zealand foreign charter fishery indicated relatively strong cohorts now about to enter the spawning component of the stock.
- The monitoring of length and age of Indonesian catches on the spawning ground indicate a substantial increase in the frequency of smaller and younger size and age classes since 2012. Information presented to the meeting indicates that the unusually small size classes may have been caught outside the spawning ground (in areas 2 and 8) and that, if this is the case, these fish should be excluded from the monitoring series. Once this is resolved the spawning ground indicator related to mean estimated age of all fish can be re-considered.

157. Overall there are signs of higher recruitment in recent years and there are some consistent positive trends in the longline CPUE. This suggests that some relatively strong cohorts are moving through the fishery, though have yet to contribute to the spawning stock. The ESC noted that increased recruitment is of itself not necessarily indicative of increased spawning stock biomass.

Report on biology, stock status and management of SBT

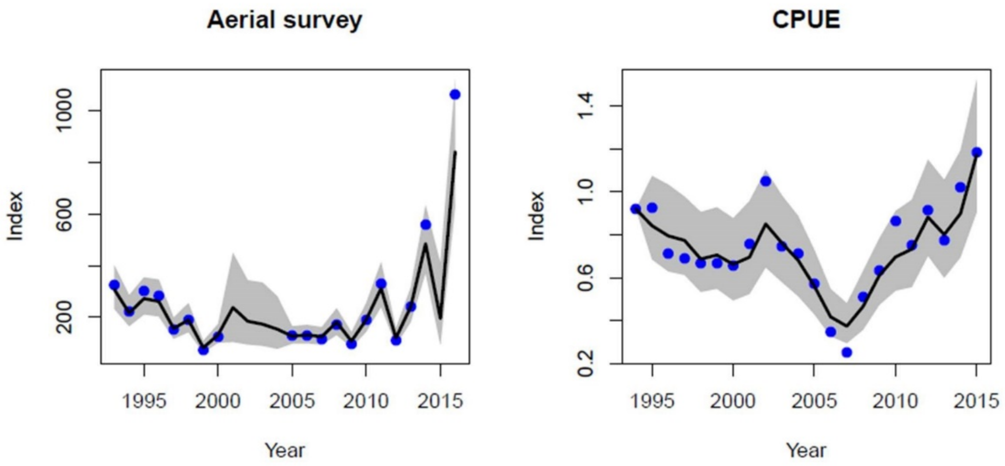
158. The ESC updated the annual report on biology, stock status and management of SBT that it prepares for provision to FAO and the other tuna RFMOs. The updated report is at **Attachment 8**.

Agenda Item 11. Operation of MP to produce recommended TACs for 2018 – 2020

159. Australia presented paper CCSBT-ESC/1609/18. The underlying estimation model and harvest control rule was outlined, and how key model input parameters have been updated for the most recent input data. The performance of the estimation model was detailed given updated scientific aerial survey and long-line CPUE data (see Figure 2), and the model was found to predict both data sources well. The recommended TAC was outlined to the group and a detailed breakdown of how each component of the MP (specifically relating to each of the input data sources) contributed to the actual recommended TAC outcome. It was explained that it is overwhelmingly both the recent trend in, and current level of,

the long-line CPUE data driving the TAC increase, not the last two high aerial survey points.

Figure 2: Fits to aerial survey (left) and CPUE (right) indices (observed, circles; predicted median (full) and 95% credible interval (dotted lines)) (CCSBT-ESC/1609/18)



160. As noted in the meta-rules section (agenda item 10.1, paragraph 144), the high aerial survey data point triggered investigation of the impact of the data on the operation of the MP. In addition to the work described in paper CCSBT-ESC/1609/18, the impact of alternative values of the aerial survey on the MP was explored (see appendix 1 of paper CCSBT-ESC/1609/17). Results demonstrated that for alternative values of the 2016 aerial survey data point, there is no change in the TAC recommendation (because there is a cap in place in the MP at 3000 t) until the value is reduced to < 10% of the aerial survey value observed in 2016. The ESC noted that none of the questions that were raised with respect to the analysis of the aerial survey data would lead to an estimate that low for the 2016 index. Given this, the ESC is confident that use of the MP to recommend the TAC for 2018-2020 remains appropriate.

161. The recommended annual TAC, from the MP, for the years 2018-2020 is 17,647t.

162. The recommended TAC increase is 3000t from 14,647t TAC (20%) in 2017, which is the maximum increase allowed under the MP. The increase in TAC calculated using the MP is a result of the positive trend in the CPUE data since 2007 and higher average aerial survey indices for the past 5 years relative to the average of the series. The MP model uses the CPUE and aerial survey indices to estimate relative biomass and recruitment over time (see Attachment 10 of ESC 20: Anon 2013). The TAC is calculated in the MP by adjusting the previous TAC based on the trend in relative biomass, the most recent biomass estimate relative to a target level, and the most recent five year average recruitment relative to the historical average.

163. Currently, the CPUE component of the MP is primarily responsible for the increase in the recommended TAC increase. The aerial survey component is having a positive, but considerably smaller, effect. This is because the MP has been designed to be conservative, with respect to changes in recruitment, by reacting slowly to recruitment levels higher than the historical average (which is the current situation), and reacting strongly to signals of low recruitment. The combination of the CPUE and aerial survey data in this way in the MP model led

to better performance outcomes than other candidate MPs during testing in 2011, and also in 2015 when the value of a fishery independent recruitment index in the MP was assessed relative to CPUE only MP models (OMMP 6 (Anon 2015)).

164. The updated data file used to run the MP in 2016 is provided in **Attachment 9** (and in the appendix to paper CCSBT-ESC/1609/18).

Agenda Item 12. SBT Management Advice

165. 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

166. 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 2016 review of indicators

167. The review of indicators (agenda item 9) did not suggest any need for major change to the conclusions drawn from the 2014 assessment. Overall there are signs of higher recruitment in recent years and there are some consistent positive trends in the longline CPUE. This suggests that some relatively strong cohorts are moving through the fishery, though have yet to contribute to the spawning stock. The ESC noted that increased recruitment is of itself not necessarily indicative of increased spawning stock biomass.

168. Only limited new information on UAM became available (agenda item 9); obtaining substantially improved information on UAM remains a priority. Given the high uncertainty associated with the available information the ESC considered that the “Added Catch” sensitivity used in 2014 could not be ruled out as a plausible scenario for consideration of unaccounted mortalities.

Current TAC

169. For the three-year TAC setting period (2015-2017) the 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

170. In 2016 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 length and age of Indonesian catches on the spawning ground. The ESC concluded there was no reason to take action to modify the 2017 TAC recommendation in relation to its review of exceptional circumstances.

Review of MP implementation in 2016 FOR 2018 - 2020

171. The recommended annual TAC, from the MP, for the years 2018-2020 is 17,647 t. The recommended TAC increase is 3000t from 14,647 t TAC (20%) in 2017, which is the maximum increase allowed under the MP. The increase in TAC calculated using the MP is a result of recent positive trends in the CPUE data and higher average aerial survey indices for the past 5 years relative to the average of the series (Figure 2). The ESC concluded there was no reason to take action to modify the 2018-20 TAC recommendation in relation to its review of exceptional circumstances.

MP TAC Recommendations

172. Based on the results of the MP operation for 2018 – 20 in Agenda Item 11 and the outcome of the review of exceptional circumstances in Agenda Item 10.1, the ESC recommended that there is no need to revise the Extended Commission’s 2014 TAC decision regarding the TAC for 2017. Therefore the recommended TAC for 2017 remains 14,647 t. The recommended annual TAC from the results of the MP for the years 2018-2020 is 17,647 t.

Agenda Item 13. Evaluation of new data sources and operating models to be used in 2017

173. CCSBT-ESC/1609/BGD04 was presented which addressed a number of structural changes to the current OM for: non-Member and attributable catch, new data sources, and changes to the projection code for the upcoming MP work. For non-Member catch it was suggested to follow the approach used in the non-Member catch work, which apportioned non-Member effort to have either Japanese or Taiwanese attributes like catchability and selectivity. For attributable catch the approach suggested was to either include them in fleets with similar attributes, or define new fleets with suitable selectivity relationships (assumed or fitted). In terms of new data sources there are gene tagging and close-kin half-sibling (HSP) data. The specific gene tagging estimator was outlined, accounting for uncertainty in age-at-length, and the recommended likelihood for the OM was the beta-binomial model to account for potential over-dispersion. The specifics of finding an HSP among two juveniles was outlined, and these data do seem sensibly modelled via the beta-binomial model. In terms of changes for the projection code the paper explored options for including robustness tests that look at mechanistic ways to include future variation in both growth and selectivity, based on potential drivers in the OM (most notably abundance) that caused them to vary in the past.

174. Technical discussion and response to this paper are summarised in the Report of OMMP 7. New data sources to be included into operating models are summarised in Table 4 (see Table 1 in OMMP 7 Report).

Table 4: Availability of new data for input to the 2017 assessment.

Data	Index for stock	Index for years	Years of data
Aerial survey	Ages 2-4	1993-2000, 2005-2014, 2016-2017	Same
Gene-tagging	Age 2	None available by 2017	
CPUE LL1	LL exploitable abundance, age 4+	1969-2016	Same
Close- kin POPs	Spawning stock	2002-2013	2005-2015/16
Close-kin HSPs	Spawning stock	2002-2013	2005-2015/16
UAM	Multiple ages (non-cooperative non-Member catch, Members' attributable catch)	Years appropriate to source	

Agenda Item 14. Requirements for new MP development in 2017

175. Paper CCSBT-ESC/1609/BGD06 was presented to the group. The paper detailed methods for generating the underlying gene tagging, parent-offspring (POP) and half-sibling (HSP) pair close-kin data. It also explored the potential for these data to be developed into informative indicators for the purposes of inputs to a candidate MP. For the gene tagging, with a sampling program concomitant with the gene tagging design study, a five year moving average of age 2 abundance performed well. It correlated with the true values at median values at the 0.9 level, and with a lower 10%ile above 0.75, even for scenarios where mean recruitment was increasing by around 50% over time. The incidence of zero recaptures was also very rare (less than 0.1%) across the scenarios explored. For the POP data empirical indices of relative spawner abundance were generated and were shown to correlate with true values at a level similar to a survey of spawner abundance with a 30% CV. For the HSP data a similar relative index was shown to perform at a level of a survey with a CV of somewhere between 20-25%. An additional HSP index of the trend in adult total mortality was explored, but seemed to work only with an increasing trend for the SBT example. This was driven by the low ratio of F to M on the adults, where there is little contrast in the HSPs for decreasing fishing mortality. Overall, the gene tagging showed promise in terms of generating a relative recruitment index that is both informative and likely robust to the current key mixing hypotheses. The POP and more so the HSP indices also correlated very promisingly with the spawner abundance, on a par with a hypothetical survey with a CV of around 25%.

176. Australia presented CCSBT-ESC/1609/BGD05, which provides some initial considerations on the process for development, testing and selection of a new MP for CCSBT. At its 2015 meeting the Extended Commission agreed to implement a new recruitment-monitoring program, using gene-tagging, to estimate absolute abundance of 2 year olds as a replacement for the scientific aerial survey

provides a relative abundance index for 2-4 year olds. As the aerial survey is used in combination with the standardised longline CPUE in the CCSBT “Bali Procedure”, the change in the recruitment monitoring method means it will be necessary to develop a revised/new MP for implementing the Extended Commission’s stock rebuilding plan. The work program for the development, testing, selection and implementation of a new MP is ambitious: commencing at the 2016 OMMP Technical Meeting with the aim of completion in time to recommend the 2021-2023 TAC block with a new MP in 2019. The paper summarises the process for developing and testing candidate MPs and selecting and implementing a final MP, and recaps on the objectives for the Extended Commission’s rebuilding plan, their technical specification in the current Bali Procedure and the operational constraints included in the decision rule to achieve the desired behavioural characteristics from the MP. An important aspect of the last MP development exercise was the development of a wide range of candidate MPs for initial testing, followed by an iterative selection process. This had many positive benefits and is considered an important aspect of the process for the ESC. The paper also provides an overview of the available monitoring series for each component of the SBT population (i.e. recruits, sub-adults and spawning adults) that may be considered appropriate for use in candidate MPs and the rationale behind the use of model and empirical decision rules in MPs. Finally, it gives some consideration to the “process”, both technical and engagement with the ESC and the EC, with a view of increasing engagement, understanding and collaboration.

177. The OMMP 7 chair summarised the proposed timeline for MP development in the OMMP 7 Report (provided at **Attachment 10**).

178. The meeting noted the proposed work program to provide a re-conditioned OM that includes new data sources for the ESC in 2017, and the subsequent development of a new MP for the EC Meeting in 2018, was extremely demanding. It was highlighted that, to provide a tested, agreed and adopted MP by October 2018, the process of technical development, analysis, recommendations, refinement and adoption through the CCSBT meeting framework would be challenging within the time allocated, and did not allow for iterative consultation with Members and the EC.

179. To achieve the technical requirements for the inclusion of new data sources into the OM and MP, and development of appropriate sensitivity tests and diagnostic tools, the meeting discussed that inter-sessional work, workshops and meetings would be required. The schedule is specified in **Attachment 10**. Technical support from the Panel was identified as an important part of achieving the objectives, and broad collaborative technical engagement between Member countries encouraged.

180. The ESC recommended that, following the ESC 22 meeting (2018), MP candidates are identified and developed, and that the recommendation and adoption process would be improved if practical examples of trade-offs are discussed with Commissioners so that MPs can be considered and refined before the Extended Commission Meeting in October 2018.

181. The ESC recommended that the EC consider dialogue between Commissioners and Scientists in their work plan, similar to that which occurred as part of the development and adoption of the Bali Procedure. It is proposed that MP concepts

and implications for the stock could be communicated to, and discussed with, Members and Commissioners prior to the scheduled EC Meeting in 2018. Engagement intersessionally in 2018 (between the OMMP meeting in June and the ESC meeting in September), which may require several iterations as candidate MPs are developed, would facilitate MP refinements to meet the EC's objectives and improve the adoption and implementation process. This would lead to MP adoption at the EC Meeting in 2018, and TAC setting in 2019, thus avoiding the potential risk of MP adoption and TAC setting in the same year (2019). This is regarded as undesirable as the outcome for the immediate TAC may then play an undue role in superseding long-term performance considerations in MP selection.

182. In the case TAC setting is delayed for a year, inter-sessional engagement between Commissioners and Scientists to ensure the MP meets the EC's objectives could occur in 2018-2019 (between the OMMP meeting in June 2018 and the ESC meeting in September 2019). This would avoid the potential risk of MP adoption and TAC setting in the same year with MP adoption at the EC Meeting in 2019, and the TAC set in 2020. This would require the EC's consideration of extending the 2018-2020 TAC to 2021 or there would be a reduced "lag" between TAC recommendations and implementation.

183. The meeting recognised that to achieve the proposed OM reconditioning for the 2017 stock assessment and MP development as scheduled, resources need careful consideration, and a small-group met to specify a more detailed work program (**Attachments 11** and **12**). The meeting recognised that the technical work required for OM re-conditioning for the 2017 stock assessment, and development and refinement of projection code for MP development and evaluation, will necessarily need to be carried out by ESC members. To support the technical process for MP development, the ESC recommended engagement of a consultant for inter-sessional work and attendance at OMMP meetings and the ESC, as occurred in previous MP development processes.

Agenda Item 15. Update of SRP

184. The Chair reminded the meeting that the CCSBT Scientific Research Programme (ESC report 19; Attachment 10) was reviewed in 2014 and the purpose of the discussion was to identify any additional activities that may be required given the EC recent decisions. Discussion of any resourcing requirements relating to SRP activities would be considered under agenda item 18.

185. The ESC had no substantive revision to the SRP.

186. The ESC noted the EC's funding decisions with respect to the aerial survey, close-kin genetics, gene tagging, and otolith collection from the Indonesian fishery and the fact these would contribute to the transition to a new MP.

Agenda Item 16. Requirements for Data Exchange in 2017

187. The Secretariat presented paper CCSBT-ESC/1609/05. The requirements for the 2017 data exchange were discussed and agreed in the margins of the meeting.

These requirements were endorsed by the ESC and are provided in **Attachment 13**.

188. The Secretariat also presented a proposal to document data provided by Members for the data exchange and to conduct a review of the data exchange for ESC 22. The review would consider the possibilities of harmonising submission formats and certain aspects of data preparation, for example the rules for selecting what effort is included. These were endorsed by the ESC and the data description templates are provided in **Attachment 14**.

Agenda Item 17. Research Mortality Allowance

189. CSIRO[3] presented paper CCSBT-ESC/1609/10, in which it requested 3 t of Research Mortality Allowance (RMA) to cover possible incidental mortality for CCSBT's gene tagging project in 2017. CSIRO advised that it had used less than 1 t of the 4 t of RMA approved for the CCSBT's pilot gene tagging project in 2016.

190. Australia presented paper CCSBT-ESC/1609/19, in which it requested 1.7 t of RMA to cover possible incidental mortality for two projects described in the paper. Australia had RMA granted for the two projects in 2015 but the allowance had not been used by one of the projects. The other project used 1.044t of the 1.2t for 2016 to date.

191. Japan presented paper CCSBT-ESC/1609/30 that reported 0.566 t out of the 1.0 t of RMA approved for 2016 was used in the 2015/2016 trolling survey. Japan requested 1.0 t of RMA for the 2016/2017 trolling survey.

192. The ESC endorsed all three requests for RMA.

Agenda Item 18. Workplan, Timetable and Research Budget for 2016

18.1. Overview, time schedule and budgetary implications of proposed 2017 research activities and implications of Scientific Research Program for the work plan and budget

193. The ESC's three-year workplan for 2017 to 2019 is provided at **Attachment 11**. With the exception of the recommendation in relation to the aerial survey, the workplan conforms with the decisions of CCSBT 22.

194. The ESC recommends that the EC consider conducting the scientific aerial survey in 2018. This is to mitigate the risk presented by stopping the current recruitment index (the aerial survey) before the new recruitment index (gene-tagging) is demonstrated to have been applied successfully. This reflects the fact that the first estimate from the gene-tagging pilot will be available in 2018 so that the ESC will be able to consider the demonstrated performance of gene-tagging for the first time only at the 2018 ESC. A related consideration is that if the aerial survey is not conducted in 2018, it is extremely unlikely that it will be able to be recommenced in 2019, if required. The logistical issues associated with continuation of the aerial survey, and in particular the major problems that will

arise with any break in the series, were documented in paper CCSBT-ESC/1509/09.

195. Resources required for the ESC's three-year workplan are provided at **Attachment 12**. The ESC noted that technical assistance with coding and producing results will be required at the OMMP and ESC meetings and in preparation for these meetings. Consequently the resources requested include a consultant to conduct this work. It was also identified that there will need to be significant involvement from Members scientists in both the assessment work and in developing candidate Management Procedures, and that Members will need to set aside resources for conducting this work.

196. It was agreed that a maturity workshop and an age-validation workshop should be conducted during 2017. Due to budget constraints it is proposed that these workshops be funded directly by the Members instead of through the CCSBT.

18.2. Timing, length and structure of next meeting

197. The next ESC meeting is proposed to be held from 28 August to 2 September 2017, in Yogyakarta, Indonesia.

198. In addition, a five-day intersessional OMMP meeting is planned to be held in Seattle, USA during June/July 2017 and a one-day informal OMMP meeting is scheduled to be held immediately prior to the 2017 ESC meeting.

Agenda Item 19. Other Matters

19.1. Consideration of candidates from the CCSBT to participate at the joint meeting of tuna RFMOs on the Implementation of Ecosystems Based Fisheries Management

199. The ESC noted that the ESC Chair (Dr John Annala) would be attending the Ecosystems Based Fisheries Management (EBFM) meeting for the WCPFC as the Chair of the WCPFC's Ecosystem and Bycatch Mitigation Theme. The ESC recommended that the ESC Chair also represent the CCSBT at the EBFM meeting and provide feedback to the CCSBT on outcomes from the meeting.

200. The ESC recommended that the Chair of the CCSBT ERSWG (Mr Alexander Morison) be the other CCSBT participant at the EBFM meeting and that the ERSWG Chair provide a report back to the ERSWG meeting being held in March 2017. A meeting of the joint tuna RFMO Bycatch Technical Working Group meeting may be held in conjunction with the EBFM meeting, which provides further reason for the ERSWG Chair to attend.

201. It was further noted that the European Union's representative at the ESC would be attending the EBFM meeting as the Chair of IOTC's Scientific Committee.

202. A comment was made that the terms EBFM and EAFM are often poorly defined with no clear picture of what these terms mean in practice. However, with tuna RFMOs it seems clear that EBFM would include bycatch. It is hoped the EBFM meeting will provide clarity on what EBFM should involve for tuna RFMOs.

19.2. Submission and Sharing of Data for figures in ESC Reports

203. Japan presented a proposal in which data should be provided for figures included in ESC reports. This would allow more flexible use of those figures by Members and others because the data would allow the figures to be presented in different ways. The ESC supported the proposal and recommended that it be approved by the Extended Commission. The proposal is provided at **Attachment 15**.

Agenda Item 20. Adoption of Meeting Report

204. The report was adopted.

Agenda Item 21. Close of meeting

205. The meeting closed at 1:58 pm on 10 September 2016.

List of Attachments

Attachments

1	List of Participants
2	Agenda
3	List of Documents
4	Global Reported Catch by Flag
5	Report of the CPUE Modeling Group
6	Summary of Australian and Japanese concerns and responses on farming papers
7	Attachment Indicators Recent trends in all indicators of the SBT stock
8	Report on Biology, Stock Status and Management of Southern Bluefin Tuna: 2016
9	Data input file used to run the MP in 2016
10	Proposed timeline for MP Development and assessment/OM refinements
11	ESC Workplan for 2017-2019
12	Resources required from the CCSBT for the ESC's three-year Workplan
13	Data Exchange Requirements for 2017
14	Data Description Templates for Data Exchange
15	Proposal for data file submission for figures in ESC Reports

Attachment 1

List of Participants
Extended Scientific Committee Meeting
of the Twenty First 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
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
MEMBERS								
AUSTRALIA								
Ilona	STOBUTZKI	Dr	Assistant Secretary	Department of Agriculture & Water Resources	GPO Box 858, Canberra ACT 2601 Australia	61 2 62724 277		Ilona.Stobutzki@agriculture.gov.au
Belinda	BARNES	Dr	Senior Scientist	Department of Agriculture & Water Resources	GPO Box 858, Canberra ACT 2601 Australia	61 2 6272 5374		belindagb2@gmail.com
Campbell	DAVIES	Dr	Senior Principal 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

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
Rich	HILLARY	Dr	Principle Research Scientist	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	61 419 840 299		austuna@bigpond.com
EUROPEAN UNION								
Hilario	MURUA	Dr	Principal Researcher	AZTI Marine Researh Division	Herrera Kaia, Portualdea z/g Pasaia Gipuzkoa 20110 Spain	34 667 174 433		hmurua@azti.es
FISHING ENTITY OF TAIWAN								
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
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
Shui-Kai	CHANG	Dr.	Professor	National Sun Yat-sen University	Institute of Marine Affairs, No. 70, Lienhai Rd., Kaohsiung 80424, Taiwan	886 7 52500 50	886 7 52500 50	skchang@faculty.nsysu.edu.tw
Chi-Lu	SUN	Dr.	Chair professor	National Taiwan Ocean University	PO Box 23-115, Taipei, Taiwan	886 93389 4426		chilu@ntu.edu.tw
Julia Hsiangwen	HUANG	Dr.	Professor	National Taiwan Ocean University	2 Pei-Ning Rd, Keelung, Taiwan	886 2 2462-2192 ext 5608	886 2 24633 986	Julia@ntou.edu.tw
Nan-Jay	SU	Dr.	Assistant Professor	National Taiwan Ocean University	2 Pei-Ning Road, Keelung 20224, Taiwan (R.O.C.)	886 2 24622 192 ext 5046	886 2 24633 920	nanjay@ntou.edu.tw

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
Hsin-Ming	YEH	Dr.	Chief	Fisheries Research Institute	199 Hou-Ih Road, Keelung, Taiwan 20246, ROC	886 2 24622 101ext 2401	886 2 24633 110	hmingyeh@gmail.com
Chien-Pang	CHIN	Mr.	Assistant Researcher Fellow	Fisheries Research Institute	199 Hou-Ih Road, Keelung, Taiwan 20246, ROC	886 2 24622 101ext 2413	886 2 24633 110	cpchin@mail.tfrin.gov.tw
Wei-Chuan (Riyar)	CHIANG	Dr.	Assistant Researcher	Eastern Marine Biology Research Center, Fisheries	96143 No. 22. Wu-Chuan Rd. Chenggong Township, Taitung County	886 8 98500 90 ext408	886 89850 092	wcchiang@mail.tfrin.gov.tw
Ren-Fen	WU	Mr.	Director	Overseas Fisheries Development Council	3F., No. 14 Wenshou St., Taipei, Taiwan	886 2 23680 889 ext118	886 2 23681 530	fan@ofdc.org.tw
Wei-Yang	LIU	Mr.	Secretary	Overseas Fisheries Development Council	3F, No.14, Wenzhou St., Taipei City, Taiwan	886 2 23680 889 ext 123	886 2 23686 418	weiyang@ofdc.org.tw
Yi-Te	HUANG	Mr.	Specialist	Overseas Fisheries Development Council	3F, No.14, Wenzhou St., Taipei City, Taiwan	886 2 23680 889 ext 135	886 2 23681 530	yite@ofdc.org.tw
Shu-Ting	CHANG	Ms.	Statistician	Overseas Fisheries Development Council	3F., No. 14 Wenshou St., Taipei, Taiwan	886 2 23680 889 ext133	886 2 23681 530	lisa@ofdc.org.tw
Ching-Ping	LU	Dr.	Researcher	National Taiwan Ocean University	2 Pei-Ning Road, Keelung 20224, Taiwan	886 2 24622 192 ext 5028	886 2 24636 834	michellecplu@gmail.com
Chia-Ling	LEE	Ms.	Research Assistant	National Sun Yat-sen University	Institute of Marine Affairs, No. 70, Lienhai Rd., Kaohsiung 80424, Taiwan	886 7 52500 50	886 7 52500 50	leechialing8@gmail.com

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
Wei-Jen	WANG	Mr.	Fisheries Statistician	Overseas Fisheries Development Council	3F., No. 14 Wenshou St., Taipei, Taiwan	886 2 23680 889 ext143 3	886 2 23681 530	weijen@ofdc.org.tw
Dorine	WEI	Ms.	Assistant	Fisheries Agency of Taiwan	No.1, Yugang N. 1st Rd., Qianzhen Dist., Kaohsiung City 80672, Taiwan (R.O.C.)	886 7 82397 33	886 7 81570 78	dungchu@ms1.fa.gov.tw
Giambi	WU	Mr.	Assistant	Fisheries Agency of Taiwan	No.1, Yugang N. 1st Rd., Qianzhen Dist., Kaohsiung City 80672, Taiwan (R.O.C.)	886 7 82397 31	886 7 81570 78	weichih@ms1.fa.gov.tw
INDONESIA								
Duto	NUGROHO	Mr	Fisheries Biologist	Center for Fisheries Resource and Development	Gedung Balitbang II, Jl. Pasir Putih II, Ancol Timur, Jakarta 14430	62 21 64700 928 ext 1132	62 21 64700 929	dutonugroho@gmail.com
Zulkarnaen	FAHMI	Mr	Scientist and also Head of Research Institute for Tuna Fisheries	Research Institute for Tuna Fisheries	Jl. Mertasari, No. 140, Sidakarya, Denpasar, Bali, 80224 Indonesia	62 361 72628 1	62 361 84974 47	fahmi_p4k8i@gmail.com
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
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
Yuichi	TSUDA	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	u1tsuda@fra.affrc.go.jp

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
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
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	ryo_omori330@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
Kojiro	GEMBA	Mr	Chief	Japan Tuna Fisheries Cooperative Association	31-1, EITAI 2-CHOME, KOTO-KU, TOKYO 135-0034 JAPAN	81 3 5646 2382	81 3 5646 2652	gyojyo@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 9633	81 3 3294 9607	mic-shimizu@zengyoren.jf-net.ne.jp
NEW ZEALAND								
Shelton	HARLEY	Dr.	Manager, Fisheries Science	Ministry for Primary Industries	25 The Terrace, Wellington, New Zealand	64 4 894 0857	N/A	shelton.harley@mpi.govt.nz
Dominic	VALLIÈRES	Mr.	Team Manager, Highly Migratory Species	Ministry for Primary Industries	25 The Terrace, Wellington, New Zealand	64 4 819 4654	N/A	dominic.vallieres@mpi.govt.nz
REPUBLIC OF KOREA								
Doo Nam	KIM	Dr.	Senior researcher	National Institute of Fisheries Science	216 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 46083, Rep. of Korea	82 51 720 2330	82 51 720 2337	doonam@korea.kr
Sung Il	LEE	Dr.	Researcher	National Institute of Fisheries Science	216 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 46083, Rep. of Korea	82 51 720 2331	82 51 720 2337	k.sungillee@gmail.com

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
Simon	HOYLE	Dr.	Scientist	Hoyle Consulting Ltd	14 Champion Terrace, Nelson 7011, New Zealand	64-22-5998846		simon.hoyle@gmail.com
OBSERVERS								
TRAFFIC								
Joyce	WU	Ms	Senior Programme Officer	TRAFFIC	3F, No. 92, Lane 106, Section 3, Bade Road, Taipei 106, Taiwan	886 2 2579 5826	886 2 2576 6036	Joyce.Wu@traffic.org
INTERPRETERS								
Kumi	KOIKE	Ms						
Yoko	YAMAKAGE	Ms						
Kaori	ASAKI	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

Attachment 2

Agenda
Extended Scientific Committee
for the Twenty First Meeting of the Scientific Committee
Kaohsiung, Taiwan
5 – 10 September, 2016

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 OMMP meeting**
6. **Report from the CPUE modelling group**
7. **Accounting for all sources of catch mortality**
   7.1. Improved estimates of Non-Member catch
   7.2. Advice on relative merits of the Direct Approach vs. the MP Approach for accounting for Non-Member catch
   7.3. Other sources of catch mortality
8. **Review of results of the Scientific Research Program and other inter-sessional scientific activities**
9. **Evaluation of Fisheries Indicators**
10. **SBT stock status**
    10.1. Evaluation of meta-rules and exceptional circumstances
    10.2. Summary of the SBT stock status
11. **Operation of MP to produce recommended TACs for 2018 – 2020**
12. **SBT Management Advice**
13. **Evaluation of new data sources and operating models to be used in 2017**

14. Requirements for new MP development in 2017

15. Update of SRP

16. Requirements for Data Exchange in 2017

17. Research Mortality Allowance

18. Workplan, Timetable and Research Budget for 2017 (and beyond???)

18.1. Overview, time schedule and budgetary implications of proposed 2017 research activities and implications of Scientific Research Program for the work plan and budget

18.2. Timing, length and structure of next meeting

19. Other Matters

19.1. Consideration of candidates from the CCSBT to participate at the joint meeting of tuna RFMOs on the Implementation of Ecosystems Based Fisheries Management

19.2. Submission and Sharing of Data for Figures in ESC Reports

20. Adoption of Meeting Report

21. Close of Meeting

Attachment 3

List of Documents
Extended Scientific Committee
for the Twenty First Meeting of the Scientific Committee

(CCSBT-ESC/1609/)

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 16)
7. (CCSBT) Progress report on the pilot gene-tagging implementation in 2016 (ESC Agenda Item 8)
8. (CCSBT) Update on the length and age distribution of SBT in the Indonesian longline catch and close-kin tissue sampling and processing (ESC Agenda Item 8)
9. (CCSBT) The aerial survey index of abundance: 2016 updated results (ESC Agenda Item 8)
10. (CCSBT) Gene-tagging 2017 work plan and RMA request (ESC Agenda Item 17)
11. (Australia) Preparation of Australia’s southern bluefin tuna catch and effort data submission for 2016 (ESC agenda item 4.1)
12. (Australia) An updated CPUE index based on a GAMM (ESC agenda item 6)
13. (Australia) A review of SBT supplies in the Japanese domestic market (ESC Agenda Item 7.3)
14. (Australia) An update of tuna growth performance in ranching and farming operations (ESC Agenda Item 7.3)
15. (Australia) An update on Australian otolith and ovary collection activities, direct ageing and length at age keys for the Australian surface fishery (ESC Agenda Item 8)
16. (Australia) Fishery indicators for the southern bluefin tuna stock 2015–16 (ESC Agenda Item 9)
17. (Australia) Meta-rules and exceptional circumstances considerations (ESC Agenda Item 10.1)
18. (Australia) MP results and estimation performance relative to current input CPUE and aerial survey data (ESC Agenda Item 11)
19. (Australia) Research mortality allowance: Proposed allowance for 2017 and 2016 usage report (ESC Agenda Item 17)
20. (Japan) Report of Japanese scientific observer activities for southern bluefin tuna fishery in 2014 and 2015 (ESC Agenda Item 4.1)

21. (Japan) Update of the core vessel data and CPUE for southern bluefin tuna in 2016 (ESC Agenda Item 6)
22. (Japan) Change in operation pattern of Japanese southern bluefin tuna longliners in the 2015 fishing season (ESC Agenda Item 6)
23. (Japan) Some exploratory analyses on age-based longline CPUE of southern bluefin tuna (ESC Agenda Item 6)
24. (Japan) Update of estimation for the unaccounted catch mortality in Australian SBT farming in the 2015 fishing season (ESC agenda item 7.3)
25. (Japan) Activities of southern bluefin tuna otolith collection and age estimation and analysis of the age data by Japan in 2015 (ESC Agenda Item 8)
26. (Japan) Report of the piston-line trolling monitoring survey for the age-1 southern bluefin tuna recruitment index in 2015/2016 (ESC Agenda Item 8)
27. (Japan) Trolling indices for age-1 southern bluefin tuna: update of the piston line index and the grid type trolling index (ESC Agenda Item 8)
28. (Japan) Summary of fisheries indicators of southern bluefin tuna stock in 2016 (ESC Agenda Item 9)
29. (Japan) A check of operating model predictions from the viewpoint of the management procedure implementation in 2016 (ESC Agenda Item 10)
30. (Japan) Report of the 2015/2016 RMA utilization and application for the 2016/2017 RMA (ESC Agenda Item 17)
31. (Taiwan) Preparation of Taiwan’s Southern bluefin tuna catch and effort data submission for 2016 (ESC Agenda Item 4)
32. (Taiwan) Updated analysis for gonad samples of southern bluefin tuna collected by Taiwanese scientific observer program (ESC Agenda Item 8)
33. (Taiwan) CPUE standardization for southern bluefin tuna caught by Taiwanese longline fishery (ESC Agenda Item 6)
34. (Korea) Data exploration and CPUE standardization for the Korean Southern bluefin tuna longline fishery (1996-2015) (ESC Agenda Item 6)
35. (CPUE Chair) Report of the June 2016 CPUE Web Meeting (ESC Agenda Item 6)
36. (CCSBT) Draft interim report to CCSBT SBT retention in mainland China (ESC Agenda Item 7.1)
37. (CCSBT) Interim Report to the CCSBT and TRAFFIC International: Genetic species identification – SBT market presence in China (ESC Agenda Item 7.1)

(CCSBT- ESC/1609/BGD)

1. (Australia) Post-release survival in tuna and tuna-like species in longline fisheries: an update (*Previously* **CCSBT-OMMP/1609/Info 01**) (ESC agenda item 7.3)

2. (New Zealand and Australia) Updated estimates of southern bluefin tuna catch by CCSBT non-member states (Rev.1) (*Previously* **CCSBT-OMMP/1609/Info 02 (Rev.1)**) (ESC Agenda Item 7.1)
3. (Australia) Advice on incorporating UAM in stock assessment and MP evaluation and implementation (*Previously* **CCSBT-OMMP/1609/05**) (ESC agenda item 7.2)
4. (Australia) Reconsideration of OM structure and new data sources for 2017 reconditioning (*Previously* **CCSBT-OMMP/1609/04**) (ESC agenda item 13)
5. (Australia) Initial consideration of forms of candidate management procedures for SBT (*Previously* **CCSBT-OMMP/1609/06**) (ESC agenda item 14)
6. (Australia) Methods for data generation in projections (*Previously* **CCSBT-OMMP/1609/07**) (ESC agenda item 14)
7. (Japan) A review of Southern Bluefin Tuna trade and monitoring research in Japanese domestic markets (*Previously* **CCSBT-CC/1510/19**) (ESC agenda item 7.3)
8. (Japan) Monitoring of Southern Bluefin Tuna trading in the Japanese domestic markets: 2015 update (*Previously* **CCSBT-CC/1510/Info 04**) (ESC agenda item 7.3)
9. (Japan) Update of estimation for the unaccounted catch mortality in Australian SBT farming in 2015 (*Previously* **CCSBT-ESC/1509/32 (Rev.1)**) (ESC agenda item 7.3)

(CCSBT-ESC/1609/SBT Fisheries -)

Australia	Australia’s 2014–15 southern bluefin tuna fishing season
EU	Annual Review of SBT Fisheries for the Extended Scientific Committee
Indonesia	Indonesia Southern Bluefin Tuna Fisheries: A National Report Year 2015
Japan	Review of Japanese Southern Bluefin Tuna Fisheries in 2015
Korea	2016 Annual National Report of Korean SBT Fishery (Rev.1)
New Zealand	Annual Review of National SBT Fisheries – New Zealand
Taiwan	Review of Taiwan SBT Fishery of 2014/2015

(CCSBT-ESC/1609/Info)

1. (Australia) Capture induced physiological stress and post-release survival of recreationally caught southern bluefin tuna (ESC Agenda Item 7.3)

2. (Australia) Developing robust and cost-effective methods for estimating the national recreational catch of southern bluefin tuna in Australia (ESC Agenda Item 7.3)
3. (Secretariat) Joint Tuna RFMO Meeting on the Implementation of Ecosystems Based Fisheries Management (EBFM) (ESC Agenda Item 19)

(CCSBT-ESC/1609/Rep)

1. Report of the Seventh Operating Model and Management Procedure Technical Meeting (September 2016)
2. Report of the Twenty Second Annual Meeting of the Commission (October 2015)
3. Report of the Twentieth Meeting of the Scientific Committee (September 2015)
4. Report of the Sixth Operating Model and Management Procedure Technical Meeting (August 2015)
5. Report of the Twenty First Annual Meeting of the Commission (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 Eighteenth Meeting of the Scientific Committee (September 2013)
9. Report of the Fourth Operating Model and Management Procedure Technical Meeting (July 2013)
10. Report of the Special Meeting of the Commission (August 2011)
11. Report of the Sixteenth Meeting of the Scientific Committee (July 2011)

Attachment 4

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

	Australia		Japan	New Zealand		Korea	Taiwan	Philippines	Indonesia	South Africa	European Union	Miscellaneous	Research & Other
Calendar Year	Commercial	Amateur		Commercial	Amateur								
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	944	45	1,063	50	0	0	1
2015	5,824		4,745	922	1	1,051	1,161	0	593	53	0	0	0

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

Report of the CPUE Modelling Group

In the course of the ESC the CPUE modelling group met in the margins (5th, 6th and 8th of September) to discuss CPUE issues arising at the ESC and to plan ongoing work. The following issues were considered.
In response to the advice from New Zealand and Japan that no Japanese-flagged foreign charter vessels fished in the NZ SBT fishery in 2016, and therefore there would be no observations for Areas 5 and 6 in 2016 in the Core vessels data set, the group considered that there were two matters which needed to be considered. First, whether this would impact on the CPUE series to be used for the 2017 stock assessment; and second whether the potential continuation of this absence necessitated development of an alternative CPUE series for OM / MP development. The group considered that Areas 5 and 6 provide a relatively small part of the CPUE signal so it might suffice to standardise the CPUE series using the Base model (Base series) as usual except omitting Areas 5 and 6 from all years. Japan will undertake this analysis. If sufficient, this approach will address both matters mentioned above. The 2017 CPUE Web Meeting will consider these results and recommend alternative approaches if this is appropriate.

Additionally, the onset of new MP development in 2017 allows a short time window to consider alternative candidate CPUE series. However, any new CPUE series would need to be available a sufficient time in advance of OM conditioning planned for the OMMP meeting in June/July 2017, and formally adopted by the group no later than the 2017 ESC. Hence while the group encourages candidate CPUE series at the 2017 CPUE Web Meeting, in practice the Base series will likely be retained, modified if necessary by the omission of Areas 5 and 6 data. However, the group noted that the possibility of future divergence between Base CPUE series trends and trends from genetic estimates might result in data conflict in OM conditioning. This provides motivation for ensuring that Base CPUE series track relative abundance reliably. To be superior any new series would need to maintain the transparency of the existing Base series, and give a statistically superior fit to the catch and effort data. The group recommended the development of a discussion paper to be available early in 2017 that describes the timetables, criteria for changing the Base CPUE series, current CPUE approaches and options for improvement, and the potential benefits from refined abundance indices. The Chair undertook to coordinate this.

The groups discussed some possible candidate CPUE series, these included

- a delta lognormal version of the Base series, given the large number of zero catch strata;
- a model to deal with the by-catch problem by replacing the ‘other species’ catch terms with a clustering approach using aggregated data;

- a model fitting CPUE by weight rather than the numbers based approach of the base CPUE model;
- spatially-based CPUE series that select fish of different sizes, with the advantage that these could be included in the OM without the statistical problem of using size data twice; this series is of interest but may be difficult to incorporate in the OM.

The group have been asked to identify plausible CPUE series for sensitivity runs in the 2017 stock assessment and secondly suitable extreme (particularly pessimistic) CPUE series for MP robustness tests (OMMP report Table 2). Proposals will be finalized at the 2017 web meeting in time for the stock assessment. The CPUE series chosen for this purpose need to diverge systematically from the Base series (to have some influence on results) but remain broadly plausible. The past options of the Laslett (optimistic) and ST windows (pessimistic) are either no longer available or suitable. The series W0.5 and W0.8 will be considered for sensitivities for the stock assessment. A wider range of options will be considered for robustness tests for the Management Procedure. Options will be finalized at the 2017 Web Meeting.

The group discussed improving our understanding of the impact of size structure on CPUE series. Continued investigations of the extent to which age data or of other approaches that might explain the year-area and the year-latitude interactions used in fitting the Base series would be welcome as would any better understanding of the role of size or cohort size on the targeting behaviour of the fishery. However, while these issues remain an important long term concern of the group, they are of a lower priority than current assessment requirements. The group supported continuation of the Japanese age based work.

The above relates to Japanese longline data. The group discussed CPUE series based upon other Members data. The group encouraged continuation of the standardized Korea CPUE series, with consolidation of the two time-series into a single index, and additional work to address the effects of a period of target change. The group also encouraged further development of the Taiwanese time series, and group members undertook to provide recommendations. New Zealand indicated that in the future it may be possible to develop a CPUE index for its domestic fleet, but it would not be possible to develop this in time for the 2017 assessment. New Zealand noted that the changing composition of its domestic fleet may make it difficult to standardise those CPUE data satisfactorily.

The group recommended that the 2017 Web Meeting would be held in April given the MP timetable.

Attachment 6

Summary of Australian and Japanese concerns and responses on farming papers

This Appendix summarises the technical concerns and initial responses from Australia and Japan to facilitate further work and discussion on this topic.

A. Concerns raised by Japan

* *The growth rate of farmed fish indicated by fish tagged in the SRP is much less than that implied by Australian data on farmed fish.*

Australia: Your analysis of growth rates 'implied by Australian data' is based on the calculations in CCSBT-ESC/1609/24, with respect to this:

1. Bias in inferred weight-at-age (Eqn. 2). The change in weight-at-length as a fish ages from age a to a+1 will definitely not be linear (as implied in Eqn. 2) because of the effectively cubic relationship between length and weight. Using a simple linear approach like this one will always overestimate the weight-at-age at any point in the year as measured Jan 1st to Jan 1st. By over-estimating weight-at-age you will implicitly have to have a higher value for W.TIS.Catch.y to solve Eqn. 3. So, just from this issue alone, actual catch would HAVE to be higher than reported catch but driven only by a bias in the inferred weight-at-age.

2. The interaction of uncertainty in mean length-at-age, the nonlinear nature of in particular the length-weight relationship, and the various assumed and estimated parameters. If everything is linear, then using the expected values of all key parameters and relationships does not produce a bias. BUT because there are a number of nonlinearities and estimated quantities it is not at all clear what role these will have in biasing the estimates. The main point of the analysis is to try and estimate the potential bias in reported catch due to sampling issues. However, the main problem is that the sequential modelling approach is likely to have a number of unknown biases in it even if the data were correct, so how do we make any conclusions based upon it if the results cannot be demonstrated to be unbiased.

3. In addition, studies have demonstrated tagging impacts on growth, as discussed in CCSBT-ESC/1609/14.

* *The age composition of farmed fish indicated by length frequency of grown out fish is biased to older fish compare to the catch at age in Australian data.*

Australia: What is the source of the length frequency of the grown out fish? If this comes from the market sampling it raises the question of whether the sampling was representative and we reiterate the request to share these data to enable validation/checking.

How is the length frequency converted to age frequency? If this assumes the age/length relationship based on wild fish, this is unlikely to be representative of farmed fish.

** Referring to growth rate data for other tuna, including farmed Pacific bluefin and Atlantic bluefin, the growth rate implied by Australian data on farmed fish is much higher.*

Australia: As above, this is dependent on the calculations of the growth rates 'implied from the Australia data' so subject to the concerns above.

B. Concerns raised by Australia

(1) ***The average weight into farms****: The implications of Japan's hypothesis is that – for example – the differences between the sampled weights and actual weights are:*

	Sample		***Japan hypothesis***
	Sample size	***Av. Wt (kg)***	***Av. Wt (kg)***
2010/11	*2,471*	*16.7*	*27.2*
2012/13	*2,735*	*16.2*	*26.9*

Japan's hypothesis is that the SBT going into Australian farms are, on average, 4 year old SBT. Is Japan's hypothesis that there is so many 4-5 year olds on the Australian fishing grounds, and these could be targeted so well? Looking at 2013, the hypothesis is not supported by the SAPUE or the Transect Survey raw data. It is also not supported by the realities of tuna farming – that at-sea operations are relatively immobile because of the tow net, that fish of 15-16kg grow faster than SBT of 27kg, and that all SBT ≥21kg. (gg wt) bring a largely common price.

Japan: We need to check the average weights which have been associated here with the Japanese hypothesis, because the different growth rate by age should be considered. In the GAB, it is known where age 4 fish are distributed, as well as the age 5 fish. Purse seine fishermen can therefore select SBT size (age) that they want. Hence, the age distribution of the catch can be different from the age composition of the SBT distributed in GAB.

(2) ***Comparisons of PBT and SBT farm growth rates:*** *Australia has provided what we understand are the latest PBT research trials (Goto 2014) of comparable size fish which enter farms in Australia. These show almost exactly the same growth as SBT in Australian farms. Does Japan have data which contradicts these trials?*

Japan: The growth from PBF research trials (Goto 2014) is closer the growth rate for SBT from SRP tagging than is estimated from the 100 fish sampling; this is evident from consideration of the intrinsic growth difference of species by body length. The details of this have been reported in CCSBT-ESC/1609/BGD09 (case 4 in page 49), and are also evident from other growth data for tunas reported in the literature.

(3) ***Growth rates in the wild the wild and in farms**: Japan's hypothesis is that SBT tagged in the SRP program, and then subject to large migration, periods of starvation, and other deprivation, grow in length and weight the same as SBT in farms? Is this consistent with experience in other intensive livestock production? What is Japan's assessment of the impact of tagging in the wild on feeding and growth?*

Japan: From considering the literature referenced in Australian papers, including Hampton (1986), Hearn and Polacheck (2003), Itoh et al. (2003), we conclude that the influence of tag implantation on growth is not substantial. Associated details are provided in the discussion section of CCSBT-ESC/1609/BGD09 (page 22).

(4) ***Feed conversion ratio (FCR):** Australia has provided the extensive literature showing that the benchmark for FCR in farming of Bluefins (including SBT) is ~10:1. Japan's hypothesis rests on Australia's FCR being up to 17:1. Does Japan have information which contradicts the literature on FCR?*

Japan: We do not know what FCR value is appropriate for tuna. We welcome the information on actual observed FCR values for SBT from Australia, appreciating that this can vary with environmental conditions. The FCR values in Table 5 of CCSBT-ESC/1609/14 are based on the total amount of sardine used for food. These values may be larger than apply in reality to Bluefin alone because this food is also used to feed other species, or for other reasons.

(5) ***Length/weight data used by Japan prior to 2014:** The length/weight of 420,000 fish was used by Japan prior to 2014 to support the methodology used to estimate the size of SBT into farms. Australia has requested this data be supplied, with company names deleted, so we can test that methodology. Can we again request that the data be supplied for analysis?*

Japan: We see two possible uses for these data. The first is to compute the weight-length (WL) relationship of grown out fish. The parameter values calculated are already provided in CCSBT/ESC/1208/30. Thus Australia can already check whether this WL relationship for farmed fish is appropriate by comparing to the WL relationship they may have. If there is large difference, it would be useful for the Australian WL relationships to be provided. The second is use for length frequency in age decomposition analysis. There is a possibility that length frequency data aggregated by month could be shared, but we would first need to check the legal aspects of this in the context of the confidentiality rule.

(6) ***Japan's issues with the 100 + <10kg fish**: The current Australian sampling takes the actual length/weight of ~3,000 SBT over an extended fishing season. All the available literature, including from Japan, suggests this method of sampling, by excluding fish <10 kg biases upwards the fish size sampled. Does Japan have information which contradicts this?*

Japan: We accept this reasoning in regard to the exclusion of these low weight fish from the sampling. Our concern is that other sources of bias more than offset this effect.

Attachment 7

Recent trends in all indicators of the SBT stock. Minimum and maximum values in the time series are also shown. Japanese age composition refers to ages in statistical areas 4–9 for months 4–9 only.

Indicator	Period	Min.	Max.	2012	2013	2014	2015	2016	12 month trend
Scientific aerial survey	1993–2000 2005–15	0.34 (1999)	4.25 (2016)	0.44	0.96	2.23	na	4.25	↑**
SAPUE index	2003–14	0.38 (2003)	1.80 (2011)	0.58	0.95	1.52	na	na	-
Trolling index	1996–2003 2005–06 2006–15	2.82 (2006)	5.65 (2011)	1.62	3.70	2.86	na	3.94	↑**
NZ charter nominal CPUE (Areas 5+6)	1989–2015	1.339 (1991)	7.83 (2010)	7.33	6.49	6.10	6.74		↑
NZ domestic nominal CPUE	1989–2015	0.000 (1989)	6.16 (2015)	4.06	4.04	5.44	6.16		↑
NZ charter age/size composition (proportion age 0–5 SBT)*	1989–2015	0.001 (2005)	0.414 (1993)	0.19	0.15	0.28	0.13		↓
NZ domestic age/size composition (proportion age 0–5 SBT)*	1980–2015	0.001 (1985)	0.404 (1995)	0.21	0.03	0.20	0.10		↓
Indonesian median size class	1993–94 to 2014–15	162 (2012–13; 2013–14)	188 (1993–94)	168	162	162	162	158	↓
Indonesian age composition: mean age on spawning ground, all SBT	1994–95 to 2013–14	13.24 (2012–13)	21.2 (1994–95)	16.0	13.2	13.9	14.4		↑
Indonesian age composition: mean age on spawning ground 20+	1994–95 to 2013–14	21.8 (2010–11)	25.3 (2003–04)	22.4	22.4	22.4	22.9		↑
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)	16	13	13	13		-

Indicator	Period	Min.	Max.	2012	2013	2014	2015	12 month trend
Reported global catch	1952–2015	829 t (1952)	81 750 t (1961)	10 258	11 768	11 903	14 352	↑
Japanese nominal CPUE, age 4+	1969–2015	1.390 (2006)	22.143 (1965)	3.014	3.355	3.624	5.319	↑
Japanese standardised core vessels CPUE (Base w0.5, Base w0.8)	1969–2015	2007 (0.230–0.360)	1969 (2.284– 2.644)	0.767–1.134	0.583–0.901	0.754–1.179	1.011–1.495	↑
Korean nominal CPUE	1991–2015	0.118 (2005)	21.523 (1991)	5.553	6.163	6.511	8.169	↑
Korean standardized CPUE	1995-2015	0.206 (2005)	1.865 (2014)	1.233	1.398	1.865	1.174	↓
Taiwanese nominal CPUE, Areas 8+9	2002–2015	0.116 (2013)	0.783 (2015)	0.203	0.116	0.185	0.783	↑
Taiwanese nominal CPUE, Areas 2+14	2002–2015	0.738 (2003)	5.272 (2012)	5.272	2.640	1.909	2.010	↑
Japanese age comp, age 0–2*	1969–2015	0.004 (1966)	0.191 (1998)	0.025	0.020	0.001	0.002	↑
Japanese age comp, age 3*	1969–2015	0.015 (2003)	0.284 (2007)	0.096	0.039	0.035	0.011	↓
Japanese age comp, age 4*	1969–2015	0.052 (1969)	0.286 (1992)	0.141	0.120	0.114	0.121	↑
Japanese age comp, age 5*	1969–2015	0.079 (1986)	0.300 (2010)	0.159	0.161	0.169	0.204	↑
Taiwanese age/size comp, age 0–2*	2002–2015	0.021 (2010)	0.299 (2012)	0.299	0.064	0.048	0.065	↑
Taiwanese age/size comp, age 3*	2002–2015	0.134 (2010)	1.173 (2012)	1.173	0.692	0.251	0.363	↑
Taiwanese age/size comp, age 4*	2002–2015	0.205 (2003)	1.889 (2006)	1.222	1.337	0.618	0.825	↑
Taiwanese age/size comp, age 5*	2002–2015	0.233 (2003)	1.554 (2006)	0.950	0.813	0.508	1.149	↑
Australia surface fishery median age composition	1964–2015	age 1 (1979–80)	age 3 (multiple years)	age 2	age 3	age 3	age 2	-
Standardised JP LL CPUE (age 3) w0.5 w0.8	1969-2015	0.197 (2015) 0.235 (2003)	3.027 (1972) 2.815 (1972)	0.701 0.815	0.263 0.325	0.260 0.320	0.197 0.243	↓ ↓
Standardised JP LL CPUE (age 4) w0.5 w0.8	1969-2015	0.264 (2006) 0.289 (2006)	3.024 (1974) 2.728 (1974)	0.805 1.004	0.578 0.751	0.567 0.730	0.923 1.117	↑ ↑
Standardised JP LL CPUE (age 5) w0.5 w0.8	1969-2015	0.227 (2006) 0.249 (2006)	2.624 (1972) 2.399 (1972)	1.030 1.359	0.695 0.928	0.893 1.190	1.495 1.911	↑ ↑
Standardised JP LL CPUE (age 6&7) w0.5 w0.8	1969-2015	0.198 (2007) 0.230 (2007)	2.562 (1976) 2.356 (1976)	1.451 1.931	0.701 0.927	0.935 1.254	1.288 1.687	↑ ↑

Standardised JP LL CPUE (age 8-11) w0.5	1969-2015	0.274 (2007)	3.700 (1969)	0.480	0.484	0.677	0.842	↑
w0.8		0.297 (1992)	3.343 (1969)	0.649	0.655	0.903	1.097	↑
Standardised JP LL CPUE (age 12+) w0.5	1969-2015	0.452 (2014)	3.256 (1970)	0.478	0.519	0.452	0.576	↑
w0.8		0.605 (2014)	2.891 (1970)	0.630	0.699	0.605	0.760	↑

*derived from size data; ** change over 24 month period as survey not conducted in 2015; na = not available

Attachment 8

Report on Biology, Stock Status and Management of Southern Bluefin Tuna: 2016

The CCSBT Extended Scientific Committee (ESC) updated the stock assessment in 2014 and conducted a review of fisheries indicators in 2016 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 2015 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 - 2015, 77.2% of the reported catch was taken by longline and 22.8% 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 34% 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 79.2% of the SBT catch has been made in the Indian Ocean, 16.5% in the Pacific Ocean and 4.3% 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 900t 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 less than 9,000t, averaging about 19,000t, and the reported Pacific Ocean catch has ranged from about 800t to 19,000t, averaging about 5,100t, 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.

The results of the updated indicators are as follows:

- In terms of recruitment indicators, the fact that there was no information on recruitment collected in 2015 needs to be noted. The 2016 aerial survey (an index of age 2-4 relative abundance) was the highest on record, following the high 2014 index. A substantial increase in the patch size[1] observed (about 2.6 times higher than the average from previous surveys) contributed to the higher value in 2016. The CV associated with the 2016 index was similar to previous years. The 2016 trolling survey index was higher than the 2014 index and slightly above the average median value (2006-16). Preliminary analysis of 2016 CDS data from NZ shows a very strong mode of fish around 20kgs (processed weight), which has not been seen in previous years, and possibly reflects strong recruitment consistent with the 2016 aerial survey.
- Recent longline CPUE index values for the Japanese fleet for ages 5 to 7 were well above the historically lowest levels observed in the mid-2000s. The index for these ages showed an increasing trend in recent years. The CPUE index for ages 8-11 has increased since 2011. The index for age 12+ has fluctuated around a low level. The Korean standardised CPUE series also showed an increasing trend over recent years. The time-series of direct ageing distribution data available from the New Zealand foreign charter fishery indicated relatively strong cohorts now about to enter the spawning component of the stock.

---

[1] Patch size refers to an estimate of the abundance of fish in a SBT school sighted on the survey.

- The monitoring of length and age of Indonesian catches on the spawning ground indicate a substantial increase in the frequency of smaller and younger size and age classes since 2012. Information presented to the meeting indicates that the unusually small size classes may have been caught outside the spawning ground (in areas 2 and 8) and that, if this is the case, these fish should be excluded from the monitoring series. Once this is resolved the spawning ground indicator related to mean estimated age of all fish can be re-considered.

Overall there are signs of higher recruitment in recent years and there are some consistent positive trends in the longline CPUE. This suggests that some relatively strong cohorts are moving through the fishery, though have yet to contribute to the spawning stock. The ESC noted that increased recruitment is of itself not necessarily indicative of increased spawning stock biomass.

4. Current Management Measures

Total Allowable Catch (TAC)

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 is set in three year periods. The TAC for 2014 was 12,449 tonnes and the TAC for 2015 to 2017 is 14,647 tonnes.

The allocations of the TAC to Members and Cooperating Non-Members of the CCSBT for 2014, 2015 and 2016-2017 is summarised below. In addition, some flexibility is provided to Members for limited carry-forward of unfished allocations between quota years.

Current Allocations to Members

	2014	2015	2016-17
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
European Union	10	10	10

South Africa	40	40	150[2]

Current Allocations to Cooperating Non-Members

	2014	2015	2016-17
Philippines	45	45	45

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,

[2] The allocation for South Africa increased to 150 tonnes when it became a Member of the CCSBT on 15 February 2016.

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.

Port State Measures

The CCSBT adopted a Resolution for a CCSBT Scheme for Minimum Standards for Inspections in Port in October 2015. The Resolution enters into force on 1 January 2017. The scheme applies to foreign fishing vessels, including carrier vessels other than container vessels. Under this scheme, Members wishing to grant access to its ports to foreign fishing vessels shall, amongst other things:

- Designate a point of contact for the purposes of receiving notifications;
- Designate its ports to which foreign fishing vessels may request entry;
- Ensure that it has sufficient capacity to conduct inspections in every designated port;
- Require foreign fishing vessels seeking to use its ports for the purpose of landing and/or transhipment to provide certain required minimum information with a least 72 hours prior notification; and
- Inspect at least 5% of foreign fishing vessel landings in their designated ports each year.

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 2016 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 2017 is 14,647.4 t.

Based on the results of the MP operation for 2018-20 in 2016 and the outcome of the review of exceptional circumstances at its 2016 meeting, the ESC recommended that the TACs for 2018-20. The recommended annual TAC for is 17,647.4 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

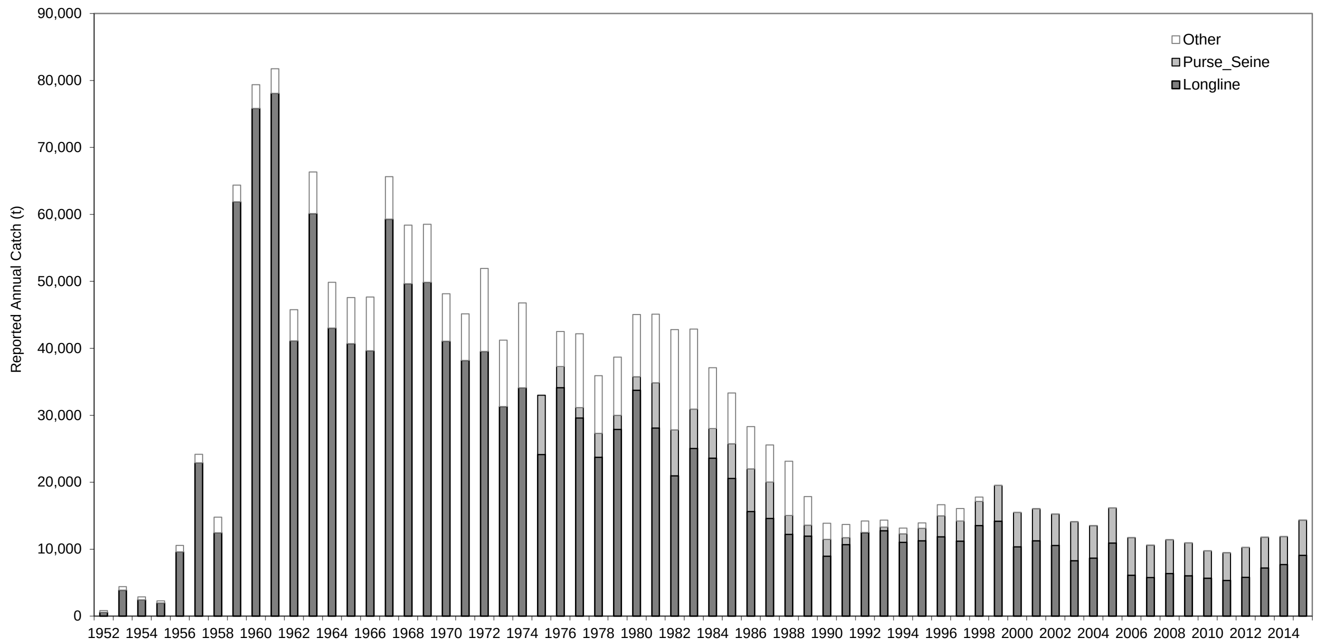


Figure 1: Reported southern bluefin tuna catches by fishing gear, 1952 to 2015. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

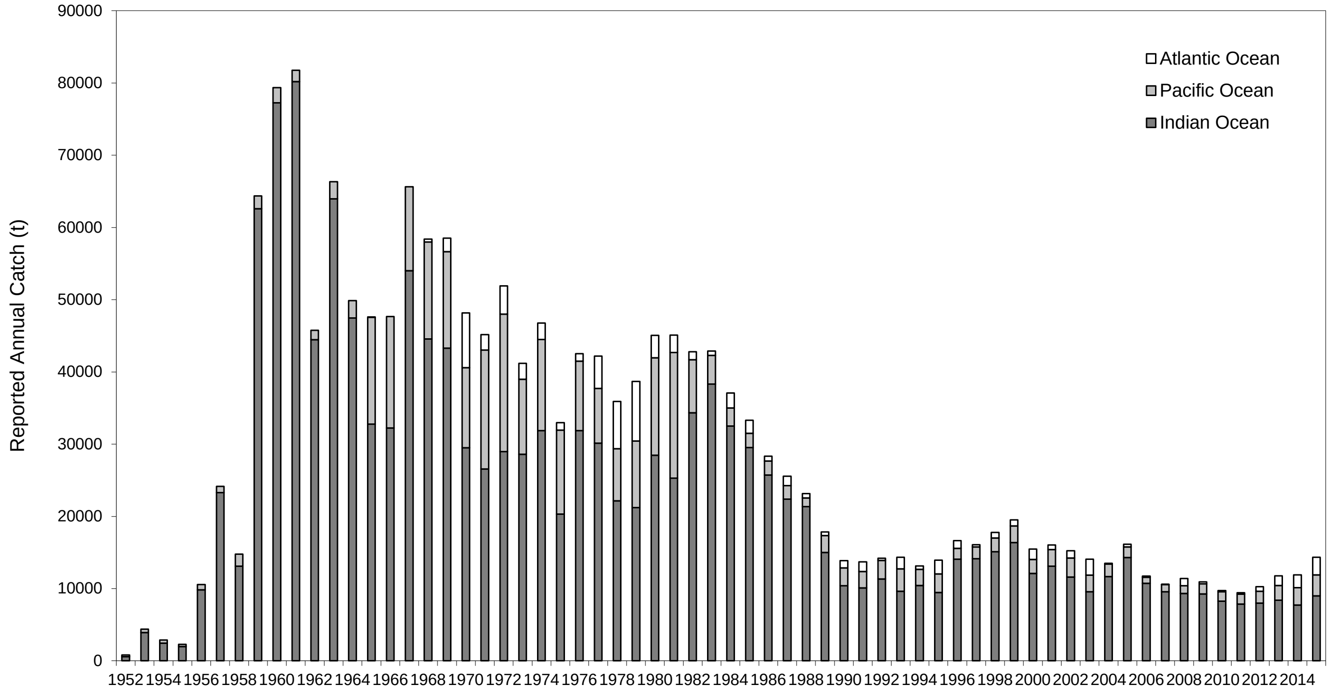


Figure 2: Reported southern bluefin tuna catches by ocean, 1952 to 2015. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

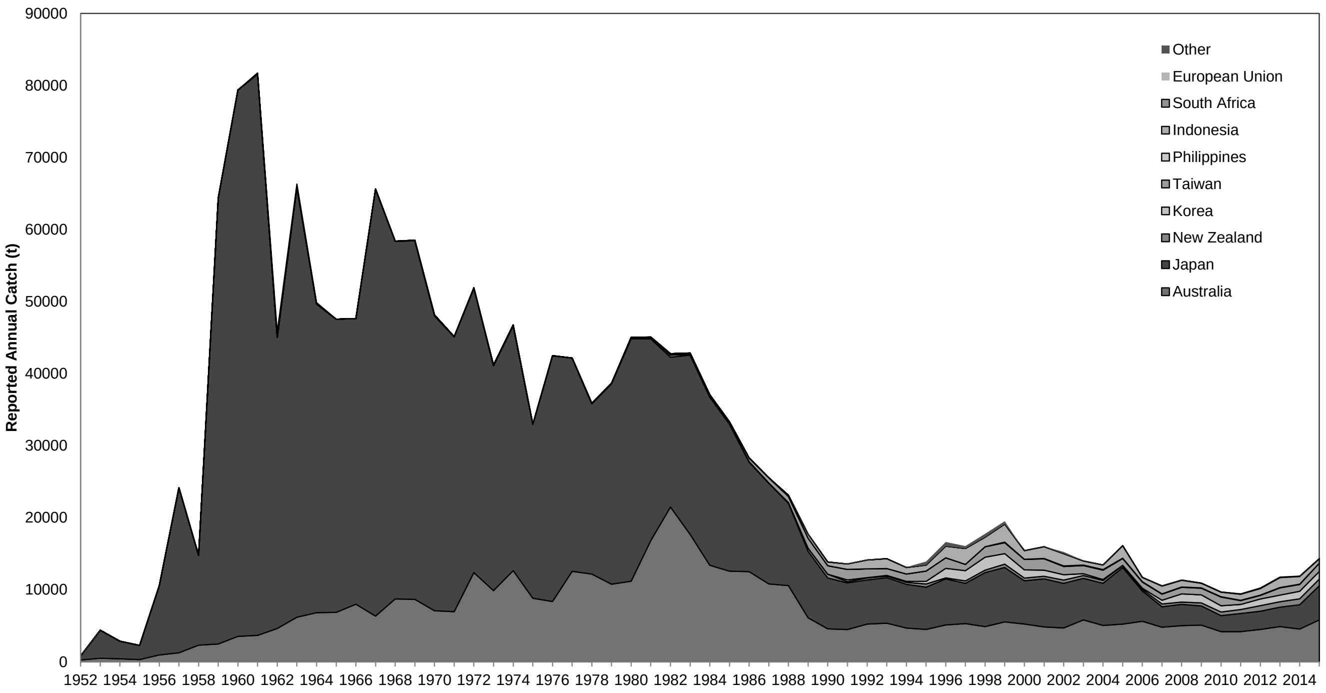


Figure 3: Reported southern bluefin tuna catches by flag, 1952 to 2015. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

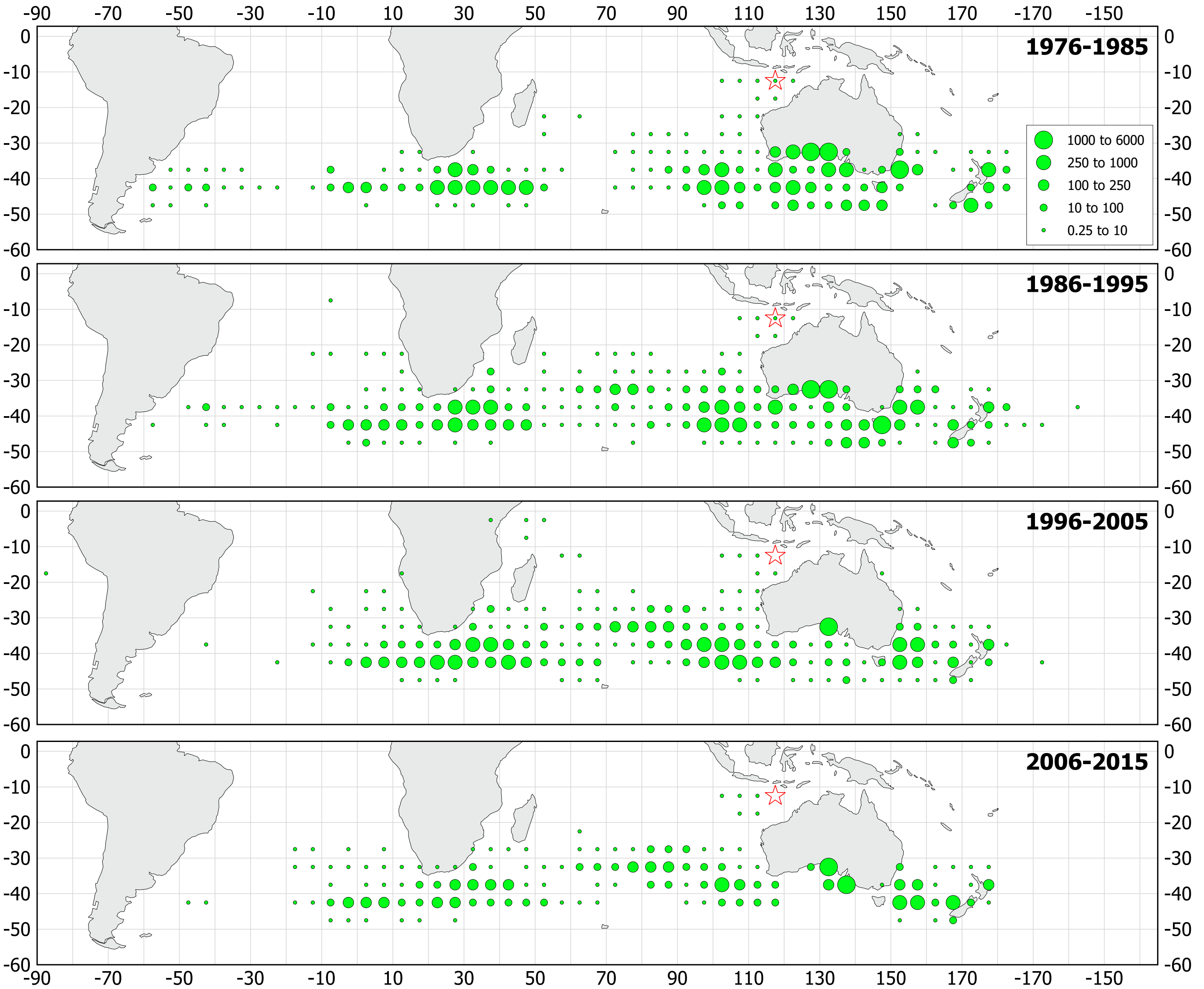


Figure 4: Geographical distribution of average annual southern bluefin tuna catches (t) by CCSBT members and cooperating non-members over the periods 1976-1985, 1986-1995, 1996-2005 and 2006-2015 per 5° block by oceanic region. The area marked with a star is an area of significant catch in the breeding 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.

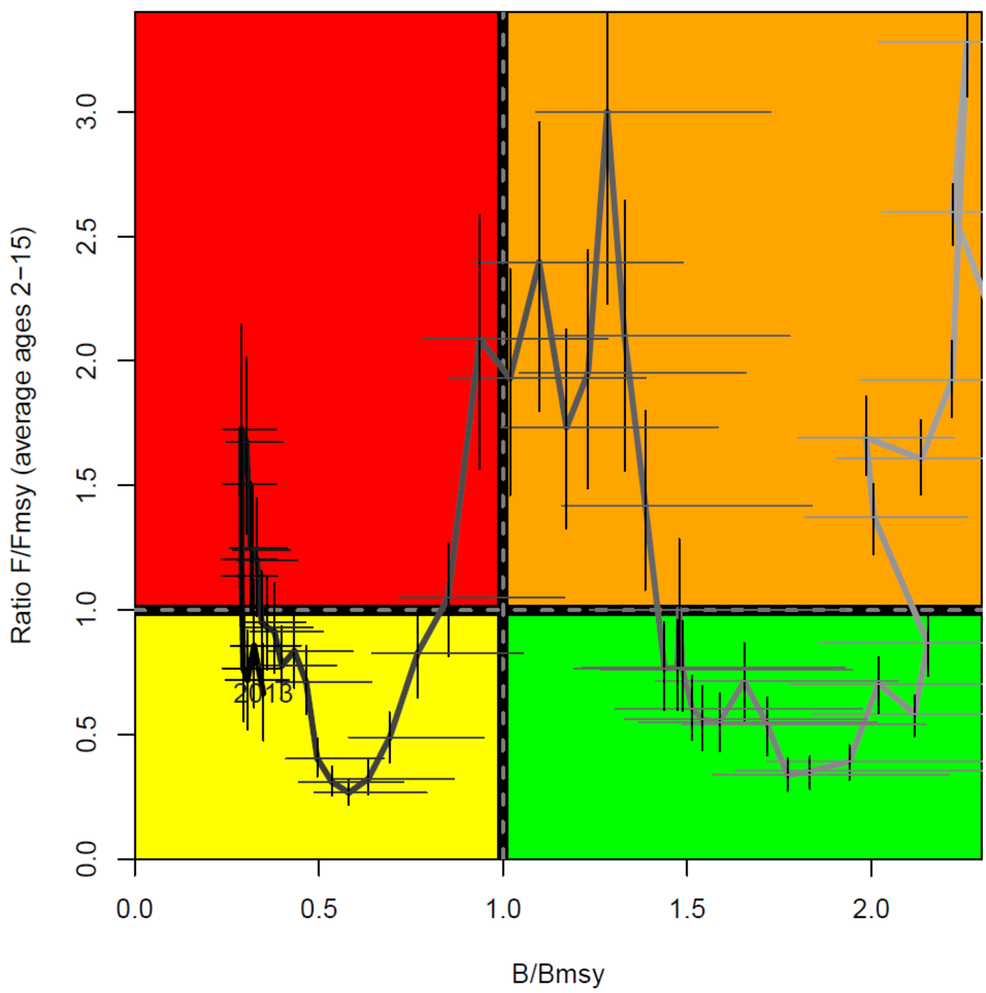


Figure 5. Time trajectory from 1952 to 2013 of median fishing mortality over the F_{msy} (for ages 2-15) versus spawning biomass (B) over B_{msy}. The fishing mortality rates are based on biomass-weighted values and the relative fishery catch composition and mean SBT body weights in each year. Vertical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

Attachment 9

Data input file used to run the MP in 2016

The following information is the data input file used in the Bali Procedure MP in 2016 to calculate the 2018-2020 TAC. This provides the CPUE series, the Aerial Survey series, the q ratio value, the last TAC year and last TAC set, which were used in the 2016 calculations.

BaliProc.dat

```
# Control file for SBT Bali Procedure - updated with data from
the 2016 data exchange.
# Last year TAC already set
2017
# TAC in that year
14647
# catchability ratio AS vs CPUE -updated 20/6/2016
#849.843 = 2013 qratio value
885.593
# CPUE series for MP (1969-2015) -ave of BASE w0.8 w0.5 x
overcatch multipliers -updated 15/6/2016
2.3887
2.3219
2.1354
2.1971
1.8767
1.9349
1.4765
1.8997
1.6703
1.4060
1.2015
1.3857
1.3010
1.0253
1.0165
1.0432
0.8720
0.6506
0.6491
0.5405
0.5815
0.6417
0.5278
0.5792
0.8127
0.9203
0.9251
0.7117
0.6897
0.6687
0.6661
0.6538
0.7542
```

1.0506
0.7460
0.7087
0.5682
0.3443
0.2496
0.5056
0.6329
0.8652
0.7491
0.9141
0.7722
1.0182
1.1843
#historical aerial survey (1993-2016) (-11.0 = missing data)
AS 16/6/2016
323.6244
221.814
299.876
281.26
148.5044
185.9542
69.2512
120.4431
-11.0
-11.0
-11.0
-11.0
125.8429
129.1713
110.7976
167.2365
95.7831
187.0467
328.5074
109.3264
240.4568
558.7715
-11.0
1065.5126

Attachment 10

Proposed timeline for MP Development and assessment/OM refinements

No.	Activity/Meeting	Purpose	Timing
1	ESC 21	Develop plan both stock assessment and future OM/MP	Sept 2016
1i	Intersessional preparatory work	**Code development** o Model to incorporate new data for stock assessment (HSP, CK POP, UAM changes) o R code for diagnostics for new data evaluation o Update OM data files including new data types (specifically POP and HSP) o Conditioning May June o Projections for MP evaluation (POP, HSP, and GT data generation)	Webinar before June/July OMMP 8
2	OMMP 8	**Stock assessment** o Define sensitivity tests for stock assessment o Finalise OM conditioning o Final OM structure, weights, review grid, diagnostics o R code for graphics and diagnostics **Candidate MP development** o Include data generation o Robustness tests for MP	June-July 2017 (Note June preferred)
2i		Final stock assessment for ESC 22	Aug
3	ESC 22	**Stock assessment** o Review CKMR results o Review stock assessment o Stock status **Candidate MP development** o Performance indicators o Plan for MP testing o Confirm technical specifications reflect rebuilding objectives	Sept 2017
3i	Intersessional work	**Candidate MP development** o Analysis and code changes for robustness test – e.g. selectivity, growth o New conditioning to include GT estimate o Changes to projection code to run candidate MPs o Develop and code candidate MPs (with tuning as necessary)	
4	OMMP 9	o Review of Candidate MP performance o Finalise robustness tests o Improve candidate MPs o Informal dialog with commissioners on preliminary results candidate MP	June-July 2018
4i	Intersessional	Refinements to MP candidates	
5	ESC 23	Overview of candidate MP performance Advice to Commission on MP performance	Sep 2018
6	Commission	Further consideration of MP performance	Oct 2018
6i	Intersessional		
7	OMMP 10	If needed…	Jun 2019
8	ESC		Sep 2019
9	Commission		Oct 2019

Attachment 11

ESC Workplan for 2017-2019

Activity	2017	2018	2019
Continuation of tag recovery efforts	Yes	Yes	Yes
Scientific aerial survey	Yes	tbd[1]	tbd
Gene tagging project	Release 2, Recap 1	1st GT estimate, Release 3, Recap 2	2nd GT estimate, Release 4, Recap 3
Continued collection of close-kin samples	Yes	Yes	Yes
Continued processing of close-kin samples to prevent backlog from accumulating	Yes	Yes	Yes
Continued aging of Indonesian otoliths	Yes	Yes	Yes
Maturity workshop	Yes[2]	-	-
Age-validation workshop	Yes[2]	-	-
Routine OMMP code maintenance and development	Yes	Yes	Yes
CPUE webinar	Yes	Yes	Yes
Standard Scientific Data Exchange	Yes	Yes	Yes
Inter-sessional OMMP meeting (June/July) • Inter-sessional MP development • Continue work on 2017 stock assessment • Incorporate "new" recruitment estimates in assessment and MP	Yes	Yes, minus work on 2017 assessment	Yes (if required)
Informal OMMP technical workshop • One day prior to ESC to provide time for conducting technical work prior to ESC. No meeting report will be produced.	Yes	Yes	Yes (if required)
ESC meeting 1. Stock assessment & Review of Close-kin estimates (2017) 2. Regular review of indicators 3. Evaluation of meta-rules and exceptional circumstances 4. Review results of SRP activities 5. New MP development	Yes	Yes	Yes
Provide SBT stock status report to other t-RFMOs	Yes	Yes	Yes

[1] To be determined.

[2] Due to budget constraints, these workshops will be funded directly by Members instead of through the CCSBT.

Attachment 12

Resources required from the CCSBT for the ESC's three-year Workplan

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

	2017	2018	2019
Intersessional (Jun/Jul) OMMP Meeting in Seattle *(no Sec, no Interp)*	5 days Cat: 2P, 1C + 3C Prep Days	5 days Cat: 2P, 1C + 3C Prep Days	If required: 5 days Cat: 2P, 1C + 3C Prep Days
Informal technical workshop (immediately prior to ESC, *no Interp*)	1 day FM: 2P, 1C, 2 Sec + 3C Prep Days	1 day FM: 2P, 1C, 2 Sec + 3C Prep Days	If required: 1 day FM: 2P, 1C, 2 Sec + 3C Prep Days
ESC Meeting	6 days FM: 1Ch, 3P, 1C, 3 Interp, 3 Sec	6 days FM: 1Ch, 3P, 1C, 3 Interp, 3 Sec	6 days FM: 1Ch, 3P, 1C, 3 Interp, 3 Sec
CPUE Webinar	3 Panel days	3 Panel days	3 Panel days
Routine OMMP Code Maintenance / Development	5 P days	5 P days	5 P days
Scientific Aerial Survey	Contracted	tbd	tbd
Continued close-kin sample collection & Processing	Contracted	Contracted	Contracted
Continued aging of Indonesian otoliths	Contracted	Contracted	Contracted
Pilot Gene Tagging Project	Contracted	-	-
Long-term Gene Tagging	Contracted	Contracted	Contracted

Attachment 13

Data Exchange Requirements for 2017

Introduction

Data exchange requirements for 2017 are provided in Annex A. The Annex shows the data that are to be provided during 2017 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 2016. 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 2017 to allow development of the necessary data loading routines.

Data listed in Attachment A should be provided for the complete 2016 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 2015 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 2015 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 17	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 2016 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 2017 on request from individual members*); • Update the unreported catch estimates using the revised scenario (S1L1) produced at SAG9,
Total catch by Fleet	all Members and Cooperating Non-Members	30 Apr 17	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 17	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 17	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 17	The mortality allowance (kilograms) that was used in the 2016 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 17 (New Zealand)[2] 30 Apr 17 (other members & Secretariat) 31 July 17 (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 "**<u>For MP/OM</u>**" means that this data is used for both the Management Procedure and the Operating Model. If only one of these items appears (e.g. **<u>For OM</u>**), 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 17 (all Members except Indonesia) 31 July 17 (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 17	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.
Raised catch data for AU, NZ catches	Australia, Secretariat	30 Apr 17	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 17	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 17	Raw observer length frequency data as provided in previous years.
Raised Length Data	Australia, Taiwan, Japan, New Zealand, Korea	30 Apr 17 (Australia, Taiwan, Japan, Korea) 7 May 17 (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.
Raw Length Frequencies	South Africa	30 Apr 17	Raw Length Frequency data from the South African Observer Program.
RTMP Length data	Japan	30 Apr 17	The length data from the real time monitoring program should be provided in the same format as the standard length data is provided.

[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.

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
Indonesian LL SBT age and size composition	Australia Indonesia	30 Apr 17	Estimates of both the age and size composition (in percent) is to be generated for the spawning season July 2015 to June 2016. Length frequency for the 2015 calendar year and age frequency for the 2015 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 except the EU	30 Apr 17	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 2014 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. It is planned that the Secretariat will provide the direct age estimates for Indonesia through a contract with CSIRO.
Trolling survey index	Japan	30 Apr 17	Estimates of the different trolling indices (piston-line index and grid-type trolling index (GTI)) for the 2016/17 season (ending 2017), including any estimates of uncertainty (e.g. CV).
Tag return summary data	Secretariat	30 Apr 17	Updated summary of the number tagged and recaptured per month and season.
Catch at age data	Australia, Taiwan, Japan, Secretariat	14 May 17	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.
Global SBT catch by flag and by gear	Secretariat	22 May 17	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. **<u>For OM</u>**	Australia	24 May 17[7]	These data will be provided for July 2015 to June 2016 in the same format as previously provided.

[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.
[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.

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
Raised catch-at-age for Indonesia spawning ground fisheries. **For OM**	Secretariat	24 May 17	These data will be provided for July 2015 to June 2016 in the same format as on the CCSBT Data CD.
Total catch per fishery and sub-fishery each year from 1952 to 2016. **For OM**	Secretariat	31 May 17	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 the Operating Model.
Catch-at-length (2 cm bins) and catch-at-age proportions. **For OM**	Secretariat	31 May 17	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 17	Calculate the total catch-at-age in 2016 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 17	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, Taiwan, Korea	15 Jun 17 (earlier if possible)[9]	8 CPUE series are to be provided for ages 4+, as specified below: • Nominal (Australia) • B-Ratio proxy (W0.5)[10] (Japan) • Geostat proxy (W0.8) (Japan) • GAM (Australia) • Shot x shot Base Model (Japan) • Reduced Base Model (Japan) • Taiwan Standardised CPUE (Taiwan) • Korean Standardised CPUE (Korea)
Core vessel CPUE series **for OM/MP**	Japan	15 Jun 17 (earlier if possible)	Provide both the w0.5 and w0.8 Core Vessel CPUE Series. The OM & MP use the average of these series.

[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 **for OM/MP**	Secretariat	31 Jul 17 (every attempt will be made to provide this at least 4 weeks earlier)	Estimate of the aerial survey index from the 2016/17 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.

Attachment 14

Data Description Templates for Data Exchange

Aggregated Catch and Effort Data Description Template

General Description	
Dataset	[E.g. Aggregated Catch and effort – Country / Fleet]
Data Exchange Requirement	Catch (in numbers and weight) and effort data is to be provided as either shot by shot or as aggregated data. The maximum level of aggregation is by year, month, fleet, gear, and 5x5 degree (longline fishery) or 1x1 degree for surface fishery.
Description	[Brief description of the dataset]
Fleet/Gear	[Fleets and gears included in this dataset]
Raised	[Yes / No]
Temporal resolution	[Calendar year / Month / Day]
Date coverage	[Date coverage of the dataset]
Spatial resolution	[5x5 / 1x1 / Other (describe)]
Species	[What species are included – SBT only, all species, commercial tuna and billfish, etc.]
Discards	[Are discards reported? Y/N – include time series differences, if any]
Details of Dataset	
Data Sources	[What data sources are used to generate this dataset]

Data Preparation	[Detailed description of how this dataset is prepared and generated. This will include:
	• The definition of the spatial grids (1x1, 5x5 etc.) and how positions are assigned to these.
	• If the data are raised to total catch:
	  o What is the raising procedure?
	  o How are missing data treated?
	  o What is the coverage of the data each year? (a separate table of coverage by year might be suitable)
	• Are there any differences in preparation of the data over the time series? If there are major differences then a new table should be prepared for each different time series]

Definition of effort	[Provide a detailed description of the rules for selecting fishing effort (e.g. all effort in CCSBT areas 4 to 9 and months 4 to 9 plus all effort for any 5*5*month cell outside this core area whenever one or more SBT are caught; or all effort were SBT were caught or targeted etc.)]
Other notes	[Any other relevant notes]
References	[A list of relevant references, e.g. documents that might describe any of the above]

Total Catch by Fleet Data Description Template

General Description	
Dataset	[E.g. Total catch by fleet – Country / Fleet]
Data Exchange Requirement	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.
Description	[Brief description of the dataset]
Fleet/Gear	[Fleets and gears included in this dataset]
Temporal resolution	[Calendar year / Quota year / Month. Also provide the quota year definition if applicable]
Date coverage	[Date coverage of the dataset]
Details of Dataset	
Data Sources	[What data sources are used to generate this dataset]
Data Preparation	[Detailed description of how this dataset is prepared and generated. This will include: • What is the raising procedure? • How are missing data treated? • What is the coverage of the source data each year? (a separate table of coverage by year might be suitable) • Are there any differences in preparation of the data over the time series? If there are major differences then a new table should be prepared for each different time series]
Other notes	[Any other relevant notes]
References	[A list of relevant references, e.g. documents that might describe any of the above]

Raised Length Data

General Description	
Dataset	[E.g. Raised Length Data – Country / Fleet]
Data Exchange Requirement	Raised length composition data should be provided 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.
Description	[Brief description of the dataset]
Fleet/Gear	[Fleets and gears included in this dataset]
Date coverage	[Date coverage of the dataset]
Spatial resolution	[5x5 / 1x1]
Details of Dataset	
Data Sources	[What data sources are used to generate this dataset]
Data Preparation	[Detailed description of how this dataset is prepared and generated. This will include: • What is the raising procedure? • How are missing data treated? • What is the coverage of the source data each year? (a separate table of coverage by year might be suitable) Are there any differences in preparation of the data over the time series? If there are major differences then a new table should be prepared for each different time series]
Other notes	[Any other relevant notes]
References	[A list of relevant references, e.g. documents that might describe any of the above]

Catch at Age

General Description	
Dataset	[E.g. Catch at Age – Country / Fleet]
Data Exchange Requirement	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.
Description	[Brief description of the dataset]
Fleet	[Fleets included in this dataset (longline only)]
Raised	[Yes / No]
Date coverage	[Date coverage of the dataset]
Spatial resolution	[5x5]
Details of Dataset	
Data Sources	[What data sources are used to generate this dataset]

Data Preparation	[Detailed description of how this dataset is prepared and generated. This will include:
	• The definition of the 5x5 spatial grids and how data are assigned to these.
	• How the age calculations are conducted.
	• If the data are raised to total catch:
	  o What is the raising procedure?
	  o How are missing data treated?
	  o What is the coverage of the data each year? (a separate table of coverage by year might be suitable)
	• Are there any differences in preparation of the data over the time series? If there are major differences then a new table should be prepared for each different time series]

Other notes	[Any other relevant notes]
References	[A list of relevant references, e.g. documents that might describe any of the above]

Non-retained catches

General Description	
Dataset	[E.g. Non-Retained Catches – Country / Fleet]
Data Exchange Requirement	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.
Description	[Brief description of the dataset]
Fleet/Gear	[Fleets and gears included in this dataset]
Date coverage	[Date coverage of the dataset]
Spatial resolution	[5x5]
Details of Dataset	
Data Sources	[What data sources are used to generate this dataset]
Data Preparation	[Description of how this dataset is prepared and generated. This will include how the raised numbers of non-retained SBT are estimated, and any differences in preparation of the data over the time series. If there are major differences then a new table should be prepared for each different time series]
Other notes	[Any other relevant notes]
References	[A list of relevant references, e.g. documents that might describe any of the above]

Attachment 15

Proposal for Data file submission for figures in ESC Reports

This working paper proposes a rule and process for handling of data files to draw figures ("data file") in ESC Reports.

Providing a data file is expected to have the followings advantages.
Member scientists can modify figures to be understood easily, such as using their own language or different aspect ratio or colour, when presenting it to other scientists, managers, industry, mass-media and the general public. It facilitates understanding of SBT stock and CCSBT. It is useful for the MP development process which requires understanding and participation of managers and industry.
Scientists outside of CCSBT get the opportunity to be interested and be involved in studying the SBT stock.

General rule is as follows:

- Wherever possible and practical, figures provided for use in the main text of ESC reports should be accompanied by the data used to draw those figures. Data for figures in attachments to the report should be provided if requested by the ESC.
- The data file will be available for the participants of the ESC meeting.
- As for the ESC Report, the data file is confidential until the adoption of the ESC Report in Commission meeting.
- The Secretariat will manage these data files and, subject to the previous point, provide them to Members and the general public etc. on request.

Detail points:

- The data will be limited to those required to draw the graph.
- The data to be provided can be simplified, e.g. omit data for outlier in boxplots, or reduce levels of gradation in colour chart.
- The author of the figure, or the ESC can choose to not provide the data.
- The data file should be submitted to be used in widely used software, e.g. EXCEL.
- The data file should be submitted in 10 working days after ESC finished.

Use of data:
When these data are used, full reference must be provided to the source of the figure and data (i.e., the relevant ESC report). If there is an intention to re-use the data or figure in a scientific publication or other report, approval must be obtained from the authors.