Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

Report of the Twenty Fourth Meeting of the Scientific Committee

7 September 2019
Cape Town, South Africa

Report of the Twenty Fourth Meeting of the Scientific Committee
7 September 2019
Cape Town, South Africa

Agenda Item 1. Opening of meeting

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

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

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

Agenda Item 3. Other business

4. There was no other business.

Agenda Item 4. Adoption of report of meeting

5. The report of the Scientific Committee was adopted.

Agenda Item 5. Closure of meeting

6. The meeting was closed at 14:58 on 7 September 2019.

List of Appendices

Appendix

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

Appendix 1

List of Participants
The Twenty Fourth Meeting of the Scientific Committee

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
CHAIR								
Kevin	STOKES	Dr			NEW ZEALAND			kevin@stokes.net.nz
SCIENTIFIC ADVISORY PANEL								
Ana	PARMA	Dr		Centro Nacional Patagonico	Pueto Madryn, Chubut Argentina	54 2965 451024	54 2965 451543	parma@cenpat.edu.ar
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
Sean	COX	Dr	Professor and Director	School of Resource and Environmental Management, Simon Fraser University	8888 University Drive Burnaby, B.C. V5A 1S6, Canada	1 778 782 5778		spcox@sfu.ca
CONSULTANT								
Darcy	WEBBER	Dr	Fisheries Scientist	Quantifish	72 Haukore Street, Hairini, Tauranga 3112, New Zealand	64 21 0233 0163		darcy@quantifish.co.nz
EXPERTS FOR DISCUSSION ON FARM AND MARKET ANALYSIS								
Shelley	CLARKE	Dr		Sasama Consulting	Shizuoka, Japan	81 90 8550 5978	81 547 54 0275	scc@sasama.info
Ana	GORDOA EZQUERRA	Dr		Dpto. Ecología Marina, Centro de Estudios Avanzados de Blanes (CEAB-CSIC)	Acc. Cala St. Frances 14. 17300 Blanes. Girona. Spain	34 66609 4459		gordoa@ceab.csic.es

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
MEMBERS								
AUSTRALIA								
Bertie	HENNECKE	Dr	Assistant Secretary	Department of Agriculture & Water Resources	GPO Box 858, Canberra ACT 2601 Australia	61 2 6272 4277		bertie.hennecke@agriculture.gov.au
Heather	PATTERSON	Dr	Scientist	Department of Agriculture & Water Resources	GPO Box 858, Canberra ACT 2601 Australia	61 2 6272 4612		heather.patterson@agriculture.gov.au
Campbell	DAVIES	Dr	Senior Research Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 2 6232 5044		Campbell.Davies@csiro.au
Ann	PREECE	Ms	Fisheries Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 3 6232 5336		Ann.Preece@csiro.au
Rich	HILLARY	Dr	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	0419 840 299		austuna@bigpond.com
INDONESIA								
Zulkarnaen	FAHMI	Mr	Director	Research Institute for Tuna Fisheries	Jl. Mertasari 140, Sidakarya Denpasar, Bali - Indonesia	62 361 726201	62 361 8497447	fahmi.p4ksi@gmail.com
Satya	MARDI	Mr	Analyst	Directorate of Fish Resources Management	Jl. Medan Merdeka Timur 16 , Jakarta - Indonesia	62 21 3519070 (ext 1002)	62 21 3543008	satyamardi18@gmail.com

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
JAPAN								
Tomoyuki	ITOH	Dr	Group Chief	National Research Institute of Far Seas Fisheries	5-7-1 Orido, Shimizu, Shizuoka 424-8633, Japan	81 54 336 6000	81 543 35 9642	itou@fra.affrc.go.jp
Norio	TAKAHASHI	Dr	Senior Scientist	National Research Institute of Far Seas Fisheries	2-12-4 Fukuura, Yokohama, Kanagawa 236-8648, Japan	81 45 788 7501	81 45 788 5004	norio@fra.affrc.go.jp
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	Dr	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
Melissa	JACOBS	Ms		University of Cape Town	Dept Mathematics and Applied Mathematics, University of Cape Town, Rondebosch 7700	27 21 650 3655		JCBMEL009@myuct.ac.za
Yuki	MORITA	Mr	Deputy Director	Fisheries Agency of JAPAN	1-2-1 Kasumigaseki, Chiyoda-city, Tokyo	81 3 3591 1086		yuki_morita470@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
Nozomu	MIURA	Mr	Deputy Director	Japan Tuna Fisheries Cooperative Association	31-1, Eitai 2 Chome, Koto-ku, Tokyo 135-0034, Japan	81 3 5646 2382	81 3 5646 2652	miura@japantuna.or.jp
Rory	LAING	Mr	Student	University of Cape Town	58 Moss Street, Newlands, Cape Town,7700	27 78 041 3929		LNGROR001@myuct.ac.za

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
NEW ZEALAND								
Pamela	MACE	Dr.	Principle Advisor Fisheries Science	Fisheries New Zealand	PO Box 2526, Wellington 6140	0064 4 819 4266		pamela.mace@mpi.govt.nz
Dominic	VALLIÈRES	Mr.	Highly Migratory Species Manager	Fisheries New Zealand	PO Box 2526, Wellington 6140	0064 4 819 4654		dominic.vallieres@mpi.govt.nz
REPUBLIC OF KOREA								
Doo Nam	KIM	Dr.	Scientist	National Institute of Fisheries Science	216, Gijanghaean-ro, Gijang-eup, Gijang-gun, Busan, Rep. of Korea	82-51-720-2330	82-51-720-2337	doonam@korea.kr
Sung Il	LEE	Dr.	Scientist	National Institute of Fisheries Science	216, Gijanghaean-ro, Gijang-eup, Gijang-gun, Busan, Rep. of Korea	82-51-720-2331	82-51-720-2337	k.sungillee@gmail.com
SOUTH AFRICA								
Kim	PROCHAZKA	Dr	Acting Chief Director of Research	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			kim.prochazka@gmail.com
Saasa	PHEEHA	Mr	Acting Chief Director: Marine Resources Management	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000	27 214 023 037		saasap@daff.gov.za
Qayiso	MKETSU	Mr	Deputy Director Management Large Pelagic Fisheries	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000	27 214 023 037		QayisoMK@daff.gov.za
Sven	KERWATH	Dr	Specialist Scientist Finfish	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000	27 214 023 017		SvenK@daff.gov.za
Henning	WINKER	Dr	Scientist: Large Pelagic Fisheries	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000	27 214 023 515		HenningW@daff.gov.za

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
Vuyiseka	SIWUNDLA	Ms	Personal Assistant	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			vuyisekaS@daff.gov.za
Aphiwe	NONKENEZA	Mr	Senior Administrative Officer	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			AphiweN@daff.gov.za
Melissa	MEYER	Ms	Research Technician	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			MelissaM@daff.gov.za
Rabelani	NESAMVUNI	Ms	Intern	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			RabelaniN@daff.gov.za
OBSERVER								
FISHING ENTITY OF TAIWAN								
Ching-Ping	LU	Dr	Assistant Professor	National Taiwan Ocean University	2 Pei-Ning Road, Keelung 20224, Taiwan	886 2 2462 2192 ext 5035	886 2 2463 3920	michellecplu@gmail.com
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 Fourth Meeting of the Scientific Committee

2 – 7 September 2019
Cape Town, South Africa

Extended Scientific Committee
for the Twenty Fourth Meeting of the Scientific Committee
2 – 7 September 2019
Cape Town, South Africa

Agenda Item 1. Opening

1.1 Introduction of Participants

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

1.2 Administrative Arrangements

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

Agenda Item 2. Appointment of Rapporteurs

4. Australia, Japan, New Zealand and South Africa provided rapporteurs to produce and review the text of the substantive agenda items.

Agenda Item 3. Adoption of Agenda and Document List

5. The agreed agenda is provided at **Attachment 2**.
6. The agreed list of documents is provided at **Attachment 3**.

Agenda Item 4. Review of SBT Fisheries

4.1. Presentation of National Reports

7. Australia presented paper CCSBT-ESC/1909/SBT Fisheries-Australia. The 2017/18 Southern Bluefin Tuna (SBT) fishing season report summarises catches and fishing activities in the Australian Southern Bluefin Tuna Fishery up to and including the 2017/18 fishing season (December 2017 – November 2018). Australia’s allocation as agreed by the CCSBT was 6165t for the 2017/18 fishing season. However, this was adjusted to account for under-catch in the previous fishing season, so the effective TAC was 6528t. A total of 40 commercial fishing vessels landed SBT in Australian waters in the 2017/18 fishing season for a total catch of 6159t. A total of 83.2% of the catch was taken by purse seine with the remainder taken by longline, pole-and-line and rod-and-reel. Seven purse seiners fished off South Australia for the Australian farming operations during the 2017/18 fishing season, with live bait, pontoon-towing and feeding vessels also involved. Most of the purse seine fishing commenced in mid-December 2017 and

finished in late March 2018. 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 2017/18 was 93.4 cm. In the 2017/18 fishing season, observers monitored 20.9% of purse seine sets where fish were retained for the farm sector and 19.0% of the estimated SBT catch. In 2018, observers also monitored 11.5% 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 13.0% in 2018.

8. Indonesia presented paper CCSBT-ESC/1909/SBT Fisheries-Indonesia. Based on 2018 Catch Documentation Scheme (CDS), the number of active longline vessels was 139 and the number of landings was 434, with a catch of 1087t and 10946 individual SBT. The size (fork length) ranged from 67-220 cm, with an average of 170.2 cm in Statistical Area 1 (7517 SBT) while the size range in Area 2 was 100-198 cm with an average 148.2 cm (3424 SBT). The proportion of fish with size of less than 150 cm in Area 1 was 21.18%, 78.82% in Area 2, and 21.43% for the overall catch. Scientific observers were deployed for six trips in 2018, with days-at-sea ranging from 26-83 fishing days per trip. A total number of 262856 hooks were observed from 321 settings (hooks observed increased by 36.77% compared to 2017). The observer coverage was 4.32% in terms of total active vessels. Scientific observer trips were conducted in the fishing ground of Statistical Area 1 and 2. The dominant Ecologically Related Species (ERS) catches recorded were lancetfishes and escolar. The coverage (number of sampled vessels against number of landed vessels) in the regular port sampling program decreased from 75.05% (in 2017) to 53.69 % (in 2018). The length frequency data were collected from 1773 individuals with a range from 121-210 cm. ERS monitoring recorded 22 species dominated by *Prionace glauca*. Meanwhile for monitoring of the SBT Attributable Catch, there is still no source data and information from recreational fishing. The national CDS system is currently the main system for monitoring and recording SBT landed in fishing ports. SBT is currently being landed only in the port of Benoa.

9. Japan presented paper CCSBT-ESC/1909/SBT Fisheries-Japan that describes the Japanese longline SBT fishery in terms of the effort, nominal CPUE, length frequency and geographical distribution of the fishing operations. In 2018, 87 vessels caught 5945t and about 10700 individual SBT.

10. Japan presented paper CCSBT-ESC/1909/19, which summarised results of Japanese scientific observer program for SBT in 2018. Scientific observers were dispatched on seven vessels that operated in the main CCSBT Statistical Areas (Areas 4－9). Observer coverage was 8.1% in terms of the number of vessels, 6.4% in terms of the number of hooks used, and 6.1% in terms of the number of SBT caught. The length frequency distributions of SBT reported by the observers and those reported from all vessels in the Real Time Monitoring Program (RTMP) were generally consistent with each other. Observers collected various types of biological samples including otoliths from 126 SBT and muscle tissue from 123 SBT. Observers retrieved CCSBT conventional tags from eight individual SBT.

11. Korea presented paper CCSBT-ESC/1909/SBT Fisheries-Korea. In the 2018 calendar year, the SBT catch in the Korean tuna longline fishery was 1,268t (1,247t in fishing year) with 10 active vessels. The fishing vessels operated in the western Indian Ocean and the eastern Atlantic Ocean (Statistical Area 9) only. The nominal CPUE recorded was the highest at 7.8 (inds./1,000 hooks) in 2015 and second highest at 7.4 in 2018. Size composition data for SBT have been collected from the logbooks and the observer programs. The average of fork length in 2018 was 142 cm, which was similar to that of 2017, and the main mode was the 140 cm size class. Three observers were placed onboard three longline vessels targeting SBT. They observed a SBT catch of 243t and an effort of 573×103 hooks in 253 sets during 360 days in the fishing area. The observer coverage was estimated to be 21% of the fishing effort. In addition, since 2017 Korea has conducted a tagging program to investigate the post-release mortality of SBT. During the 2018 scientific observation, 10 pop-up tags (MiniPAT 2 and sPAT 8) were released by Korean observers, and no tagged SBT were recaptured. Since 2015 Korea has collected SBT otoliths and ovaries through the observer program in order to contribute to the Scientific Research Program (SRP) proposal for estimating size/age at maturity of SBT.

12. New Zealand presented a summary of paper CCSBT-ESC/1909/SBT Fisheries – New Zealand. New Zealand's country allocation for the year was 1,088t which was allocated within the various sectors in the following manner: 1,047t for commercial catch, 20t for the recreational sector, 20t for other sources of mortality including discards, and one tonne for the customary sector. Commercial catch for the year was 1,008t, which was a slight increase from previous years. Nominal CPUE for both Statistical Areas 5 and 6 was also slightly higher. The entirety of the commercial catch was taken by 33 domestic vessels. The majority of the catch for the year took place in Area 5. Commercial observer coverage levels reached 24% and 11% in terms of catch for Areas 5 and 6 respectively. When considering effort, 18% was observed in Area 5 while 19% was observed in Area 6. New Zealand's estimate of recreational catch was 12.3t based on a number of information sources that are defined in greater detail in the paper. There was no reported customary catch for the year, which may have been a consequence of the lack of constraints on the recreational fishery. New Zealand has recently introduced a limit of one southern bluefin tuna that can be retained by a recreational fisher on a given day, which may encourage greater use of customary fishing provisions in the future. There were also 62 observed discards by commercial operators, which amounts to 1445 fish when scaled up to the fleet; however, this scaling should only be taken as indicative given the different discarding rules that apply for observed and non-observed vessels.

13. South Africa presented paper CCSBT-ESC/1809/SBT Fisheries – South Africa. South Africa's tuna directed fishery is comprised of two fishing fleets, a bait-boat (pole and line) fleet of 151 vessels (164 fishing rights), and a longline fleet with a domestic (ZAD) together with a Japanese flagged joint venture (charter boat; ZAC) component of currently a total of 34 vessels (59 fishing rights). The pole fleet targets mainly albacore and yellowfin tuna, when available, and the longline fleet targets tuna species and swordfish. SBT have previously been caught only by the longline fleet but the tuna pole and line (bait boat) fleet has started catching SBT in small quantities since South Africa became a full Member of CCSBT in 2016. South Africa continues to develop its SBT directed performance

within its large pelagic directed fishing sectors. In the 2018/19 season, SBT directed effort exceeded 700 thousand hooks and the total annual SBT landings attained a new maximum of 207t. SBT was caught by 19 longline vessels (16 ZAD; 3 ZAC) and five tuna pole and line vessels. ZAD longline vessels landed 192.5t (N = 2765) and ZAC longline vessels landed 12.1t (N = 166). Contrary to the previous season with no SBT landings by tuna pole and line vessels, a small amount of landings of 2.4t of SBT were reported by this fleet in 2018/19. The longline fishery operates mostly within South Africa's EEZ from April to November; however the majority of SBT catch is typically taken over a three month period; June, July and August. There are notable differences in the distribution of catch and effort between the domestic and chartered longline vessels, with the latter operating exclusively east of Cape Agulhas (Statistical Area 14 and 9, >20° Longitude) in recent years. In contrast, the domestic fleet operates off both the east (Area 14) and west coast of South Africa (Area 15), out of the two fishing port cities of Cape Town and Richards Bay. In general, the range of the charter fleet appears to have been increasingly contracting closer inshore within South Africa's EEZ (Area 14) in recent years. Similar to the 2017/18, a large proportion of SBT catch by the domestic fleet remains to be caught along the west coast of South Africa (Area 15). Availability of observer size data has improved since 2013, particularly in Areas 9 and 14. In addition, the 2018/19 season provided also improved sample sizes for Area 15. The total number of SBT measurements taken by observers was N = 359, which equates to 12.2% of the total retained catch by longline vessels, and represents a further improvement compared to the 10.5% measured SBT during the 2017/18 season. Compared to 2017/18, the mean lengths in 2018/19 have decreased notably from a fork length of 163.3 cm to 148.8 cm in Area 9 and from 189.2 and 160.1 cm in Area 15 as a result of the presence of fish of 80-100 cm, which have been largely absent from sampled catches since 2013. In Area 14 the catch comprised mainly larger SBT (> 150 cm), so that the mean length changed only marginally from 174.8 cm to 174.0 cm. The effective observer coverage of SBT effort (number of hooks per sets with at least one SBT) during the 2018/19 fishing season was 30%. The observer coverage for joint-venture chartered vessels has continued with 100% of fishing trips observed. The observer coverage of SBT sets for domestic vessels was 15%, with a minimum of 11% in Area 9 and maximum coverage of 16% in Areas 14 and 15.

14. Taiwan presented paper CCSBT-ESC/1909/SBT Fisheries-Taiwan. A total of 77 fishing vessels were authorised to catch SBT, and the SBT catch was 1220t for calendar year and 1214t for the quota year. The catch was below Taiwan's allocated catch. The Taiwanese SBT longline fishery mainly operates in Statistical Areas 2, 14, 8 and 9 (after here: major Areas) seasonally. The nominal CPUE aggregated by the data from all Areas reached in the highest level in 2005, while the nominal CPUE aggregated over the data from major Areas reached the highest level in 2012. For 2018, fourteen observers were deployed on 14 fishing vessels authorised to target SBT seasonally and bycatch SBT. In this regard, the coverage rate comprised 18.2% by vessels in 2018, 12.7% by hooks and 10.2% by catch for the year.

15. Taiwan presented paper CCSBT-ESC/1909/34 which describes preparation of Taiwan's southern bluefin tuna catch and effort data submission for 2019. The data for E-logbooks were used to prepare the report of aggregated catch and

effort, non-retained catch, the catch at size and the catch at age. Catch certification data is compiled to prepare the total catch by fleet. All data will be cross-checked against VMS, fisheries observer reports, catch monitoring documentation scheme records and traders' sales records to ensure the accuracy.

16. In response to questions from participants and the advisory panel, the following information was provided:

- Indonesia clarified that sampling for close kin and otoliths was all from Statistical Area 1.
- Indonesia advised that the source of data for the length frequency figures in its national report is CDS data and is for all the reported catch. These data could be used as direct input for the OM if required. However, Indonesia still faced some difficulty to confirm whether some of the catches were being caught in Area 1 or Area 2 since some skippers did not fill the correct Area on the CDS form and fishing can be across both Areas.
- Japan clarified the problems it encountered with its observer data that were outlined in CCSBT Circular #2019/23. It had detected that some data had been modified for two trips in 2016, seven trips in 2017, and nine trips in 2018. It determined that the data from those trips were unreliable and deleted them from its submissions to the CCSBT. Japan has taken steps to send observer reports directly to the domestic Secretariat and to cross-check the data against other data to ensure that this doesn't happen in the future. These problems should not occur from 2019 onwards.
- New Zealand confirmed that tags have been recovered from both observed and non-observed commercial trips.
- The Secretariat confirmed that it provides updated tag return data as part of the annual data exchange. Few recaptures are now obtained from past tagging and the Secretariat was requested to provide summaries of these few recaptures in future years.
- South Africa advised that using its CPUE data could present challenges since its fishery is relatively new with a large variation in skill between operators. In addition, vessels can change strategy once their quota has been reached, with experienced skippers reaching their quota first.
- South Africa advised that fishing operations in Statistical Area 9 were offshore, both to the west and to the east, while operations in Statistical Area 15 comprised more inshore operations by the smaller domestic vessels.
- Taiwan confirmed that its unauthorised SBT vessels are not allowed to retain SBT in Statistical Areas 4 and 7 of the Tasman Sea, and that they are required to record and report discards.

17. The ESC noted that despite not being able to attend the meeting, the European Union submitted paper CCSBT-ESC/1909/SBT Fisheries-EU. There were no questions on the EU's report.

18. New Zealand noted that the Extended Commission (EC) has decided that Members are required to account for all sources of SBT mortality, but that there is inconsistency in how Members are providing this information. There is a need for a greater clarity in the requirements of Members' reports in relation to accounting for their Attributable SBT Catch, and New Zealand advised that it

will suggest some text to provide this clarity in a paper that it is preparing for the Compliance Committee.

4.2. Secretariat Review of Catches

19. The Secretariat presented paper CCSBT-ESC/1909/04. The estimated total catch for the 2018 calendar year was 18224t, an increase of 3364t or 23% from the 2017 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 399t for the 2018 fishing season.

20. Members suggested that a useful addition to the maps of non-Member effort would be to include SBT habitat maps. The Secretariat will follow this up with CSIRO and include these in next year's paper.

Agenda Item 5. Report from the CCSBT Maturity Workshop

21. CSIRO presented paper CCSBT-ESC/1909/7. This paper provides a summary of the CCSBT Maturity workshop that was held from 7-8 May 2019 at the Research Institute of Tuna Fisheries (RITF) in Bali, Indonesia. The workshop was attended by participants from 5 Members and was a mix of presentations and practical sessions. The Chair provided an overview of the Scientific Research Program (SRP) project proposal for estimating size/age at maturity of SBT. She highlighted the importance of sampling ovaries at targeted areas and times when immature and mature fish were mixed on their feeding grounds, soon after spawning is complete (April to August), but said that at that time of the year mature-regenerating females can be present and may be mistaken as immature. The proposed criteria to classify maturity status in SBT from ovary histology was presented. The workshop then reviewed the ovary sampling programs and reproductive classification methods used by Korea, Taiwan, New Zealand and Australia. Practical sessions viewing SBT ovary histology using microscopes was undertaken, and important structures were identified including "maturity markers" that can be used to identify mature-regenerating females. Many participants were unfamiliar with histological analysis of gonads so time was spent viewing ovary histology with participants individually and reviewing histological stages assigned prior to the workshop. As expected, the classifications were often correct for the smallest and largest fish, but were mixed for the more difficult "middle-sized" fish. The overall results of a 'calibration' exercise were good, suggesting that participants were able to classify fish into reproductive phases (mature or immature) by the end of the workshop. The proposed statistical methods to estimate the maturity ogive were presented and although the final set of data were not available for analysis at the workshop, logistic models were fit to the data available for a preliminary investigation of spatial differences between statistical areas. It was agreed that a manual including the agreed classification scheme for SBT should be developed by the Chair before classifications can be finalised in order to improve consistency.

22. The ESC thanked Jessica Farley for preparing and chairing the meeting.

Agenda Item 6. Report from the Ecologically Related Species Working Group (ERSWG) meeting

23. A summary of the Report of ERSWG 13 (CCSBT–ESC/1909/05) was presented by the Secretariat. Recommendations to the EC were presented briefly. These included a revised ERS Data Exchange template to provide higher resolution data and improved information on the usage of mitigation measures, an overall objective and five objectives for a CCSBT Multi-year Seabird strategy, and a revised "Resolution to Align CCSBT's Ecologically Related Species measures with those of other tuna RFMOs".

24. The Secretariat also summarised the advice which the ERSWG had provided to the EC including:

- The risk assessment for 2016 data found that for nine of the 25 albatross and petrel species the estimated annual incidental bycatch in surface longline fisheries exceeded the population productivity;
- Data from 2017 indicated lower total reported seabird mortality, but this was most likely to have resulted from inadequate and unrepresentative sampling, and not from improved mitigation;
- The potential for electronic monitoring (EM) to improve the reporting of the number of ERS interactions was noted;
- The ERSWG did not seek to amend its previous advice that the level of interaction between seabirds and SBT fisheries is still a significant level of concern;
- The ERSWG agreed that high-risk areas analysis should be incorporated into the southern hemisphere risk assessment analysis;
- ERSWG noted that the Agreement on the Conservation of Albatross and Petrels (ACAP) has confirmed the best practice approach to mitigate seabird bycatch to be the combined use of weighted branch lines, bird scaring lines and night setting. In addition, ACAP has since 2016 also endorsed the inclusion of a hook-shielding device as a standalone measure to replace the three combined recommended measures;
- The ERSWG will intersessionally develop a draft list of strategic actions under each of the specific objectives of the Multi-year Seabird Strategy; and
- The ERSWG confirmed its previously agreed advice for all shark species caught in SBT fisheries, that there were currently no specific concerns about shark bycatch that warranted additional mitigation requirements.

25. The ERSWG report indicated in-principle support for a joint proposal by Birdlife and the Secretariat, that had been requested by the Compliance Committee, for outreach and education to enhance ERS measures and to verify compliance with such measures.

26. A brief report back on relevant outcomes of the CITES meeting in Geneva was provided by New Zealand. Relevant in the CCSBT context is the listing of the shortfin mako shark on Appendix II. Appendix II species can still be traded internationally but the trade is closely monitored and regulated. Shortfin mako was listed along with longfin mako due to the difficulty in distinguishing the species. The measure will become effective 3 months after 28 August. After that

no export will be possible without non-detriment finding documents (NDFs) issued by the scientific authority of the exporting country and export permits issued by the associated management authority. NDFs are a means to ensure that international trade is not detrimental to the survival of species in the wild.

27. The Secretariat advised that a joint RFMO bycatch working group meeting focusing on sharks is to be held in December this year, but thus far no CCSBT Member has indicated an interest in attending.

28. The meeting noted that the ERSWG and ESC share expertise on sharks relevant to stock assessment and that close-kin genetic studies on several shark species are underway.

29. The ESC considered the mako shark Appendix II listing by CITES. The following broad options were outlined in relation to possibly assisting Members with NDFs:

- Each Member deal with this themselves;
- The ESC address it, likely by conducting a mako shark assessment for the ocean area which falls under CCSBT;
- CCSBT works on a bilateral basis with other pertinent RFMOs to (a) encourage their work on stock assessments of mako sharks as soon as possible, and/or (b) offers to assist or participate in their assessment processes; and
- The matter be referred by CCSBT to the grouping of all five tuna RFMOs to deal with together.

30. The Secretariat advised that the CCSBT does not have a mandate to issue quotas for mako sharks nor to facilitate catching of mako by CCSBT Members.

31. The utility of CCSBT mako bycatch data as an assessment input was queried given that ERS data are reported to the CCSBT only for sets that targeted or caught SBT.

32. In the absence of CCSBT participation at the December 2019 joint tuna RFMO bycatch meeting, it was noted that the CCSBT would have limited ability to shape the agenda of that meeting.

33. It was agreed that the CITES listing of mako sharks would be mentioned to the EC and that the EC would be requested to advise whether it wished the ESC or the ERSWG to progress any specific work in relation to mako sharks to facilitate NDF evaluations.

Agenda Item 7. Report from the Tenth Operating Model and Management Procedure (OMMP) Technical Meeting

34. The OMMP technical group started the work on evaluation of new Candidate Management Procedures (CMPs) in 2018 with the aim to finish the testing phase this year so that the ESC could make a recommendation to the EC at this meeting. The goal is that the EC can adopt a Management Procedure (MP) at their coming meeting and that the MP adopted is used in 2020 to specify the TAC for the period 2021-2023.

35. The MP work plan has progressed on schedule thanks to the hard work of the teams involved in developing and testing CMPs.

36. The Operating Model (OM) used for testing has been updated to include the most recent data, up to 2018, so that two more years of data were added to those used for the assessment conducted in 2017. The reconditioning of the OM resulted in a somewhat less depleted SSB (0.17 (0.15–0.21 90% CI) compared to the 2017 estimate of 0.13), but this was broadly in line with the projections carried out in 2017. Details of the updated conditioning of the operating models are provided in paper CCSBT-ESC/1909/17.

37. Two sets of tuning specifications have been used based on recommendations from last year's ESC, namely, to achieve:

- 30% of SSB_0 in 2035 and
- 35% of SSB_0 in 2040

in both cases with 50% probability. Because the update of the OM resulted in a somewhat less depleted stock status, at OMMP 10 the group reconsidered the range of tuning levels to be used for the final round of CMP testing. Specifically, the aim was to evaluate if faster stock rebuilding would be possible without reducing the TAC.

38. Results of constant-catch projections conducted using the updated OM and the current TAC (17,647t) indicated that in order to achieve 35% SSB_0 by 2035, TAC reductions would be required in the short-term. The group therefore agreed to maintain the focus on the 30% and 35% SSB_0 target levels to be achieved in 2035 and 2040 respectively. While the group is using a 50% probability of achieving these stock targets, it would continue to report the probability of meeting the interim rebuilding target of 20% SSB_0 in 2035, with the goal that the CMPs exceed a probability of 70% rebuilding as requested by the Strategy and Fisheries Management Working Group.

39. In summary, the results of the testing have been evaluated by the entire technical group over two OMMP workshops, as well as at the last ESC meeting. By comparing performance of the different CMPs, developers had been able to refine their procedures to produce the final set that was presented and evaluated at the ESC meeting. Overall, the procedures had some qualitative differences, but all showed adequate performance; they were all able to achieve the tuning levels specified while avoiding high inter-annual variability and without requiring short-term decreases in TAC when applied to the reference set of models. In addition, they all exceeded the interim rebuilding target specified by the Strategy and Fisheries Management Working Group for the reference set of OMs.

Agenda Item 8. Develop methodology for analysis of farming and market data

Discussion on Australian Farm Analysis

40. Japan presented paper CCSBT-ESC/1909/20, which provides an update of unaccounted catch mortality in the Australian SBT farming in the 2017/18 fishing season. Estimated growth rates based upon the 40/100 fish size sampling were 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 to reflect tuna growth rates. Using the SRP tagging growth rate, the annual amount of catch was estimated to be higher than reported by between 221 and 2,546t, with a best estimate of 1460t. As a proportion of the reported catch, this excess ranged from 4% to 56% with a best estimate of 30%. 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 the Secretariat. Furthermore 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 more reliable length data.

41. In response to a question from Australia, Japan replied that the reason for the decline in the estimate of catches for the past two years was unknown, although it was possible that a sampling error could have affected the estimate.

42. In relation to assertions made in the Japanese paper, Australia responded that there was no problem with the 100-fish sample.

43. Japan presented paper CCSBT-ESC/1909/22. In this document, in order to promote discussion on uncertainty related to the age composition and catch of Australian farmed SBT, six points that require clarification were presented. A new farming monitoring methodology was proposed. It consists of the 100-fish sampling, a tagging program to investigate the growth rate during farming, collection and analysis of individual fish size data in the CDS, and the implementation of a stereo-video camera system.

44. Australia commented on a number of points in the paper. These included that the 100-fish sample is for fish greater than 10 kg. Therefore, more than 100 fish might be sampled if there are many fish below 10kg. Furthermore, while it is true now that fish are all harvested in the same year they are captured, this was not always the case and a small number of small fish (~5%) were harvested in the year following capture around 2011 and 2012. Finally, it may be possible for fish to continue to grow in July and August, depending on the water temperature, so the assumption that there is no growth in these months may not always be true.

45. Dr Ana Gordoa, the Farm Expert for developing methodologies for estimating the weight of SBT transferred to Australian farms, after reviewing all the CCSBT documents related to this topic since 2006, presented paper CCSBT-ESC/ CCSBT-ESC/1909/43 in relation to the key recurrent issues on this topic and provided advice for future approaches. Regarding the representativeness of 40/100 sampling, a permanent issue of debate, the Farm Expert pointed out that the lack of specific studies prevents any conclusion. Accordingly, the Farm Expert suggested developing a specific study for the analysis of the minimum sampling size at which larger sample size doesn’t modify (for practical purposes) the length frequency (LF) distribution. However, the Farm Expert also highlighted that if the sampling technique displays some size selectivity, then this approach would not solve the uncertainty. Consequently, the Farm Expert’s advice was that video camera measurements be used to obtain a reliable LF and to estimate the potential bias of past sampling. On the topic of the tuna growth in farms, the estimates from different studies, previously cited in CCSBT documents, were compared and the following points were highlighted: (i) the consistent decrease in growth rate with the size of individual, and (ii) the extreme variability observed between the two studies carried out for SBT. All growth

estimates were contrasted with the average of annual ratios between harvested weight and reported catch (2.007) and this value was above most of the estimates of tuna growth in farms. Thus, the Farm Expert recommended carrying out a new tagging program to re-estimate the growth in farms of SBT, but also pointed out that more accurate estimation will not solve the issue. The presentation concluded that the key points to be resolved are the optimisation of the input (reported catch) and output data (harvested weight) and that any indirect estimation should be avoided because it would require assumptions that could always place the estimates in doubt. The necessary tool to reliably estimate input data would be the implementation of stereo video cameras and the optimal sample size (number of measurements) could be estimated by a pilot study. There are other potential tools such as CDS data and new tagging experiments that would provide additional information which was detailed in the presentation (e.g. length-weight relationship, new growth estimation for the corrections of past catch estimates). Nevertheless, CDS and tagging studies would only provide indirect estimation of the catch and they would not provide the accuracy of the stereo video camera measurements.

46. In answer to some questions about the catch-at-age data, Australia clarified that the catch-at-age data are estimated from the size data of the 100-fish sample, not from growth.

47. In response to questions about how SRP tag data could be used, the Farm Expert clarified that it is the size at capture that is important, and because more tag data recaptured from farmed fish were available, these data could also be analysed in addition to the 140 tags used in for the analyses of paper CCSBT-ESC/0909/31, to examine the catch-at-age structure of the purse-seine catch.

48. In responding to a question from the Chair, the Farm Expert agreed that given the narrow length range of the purse-seine catch, the sampling rate would likely be lower than 20%, which has been suggested by the Japanese proposal. The sampling rate required could be determined by comparing length-frequency results from different sampling rates (e.g., 20%, 15%, 10% and 5%). A lower sampling rate may lower the costs associated with non-automated stereo-video analysis.

49. New Zealand thanked the Farm Expert and Japan for their proposals on how to move forward on this issue. While both the proposals draw attention to the effectiveness of stereo-video, the Japanese proposal also offered a method where stereo-video was not used, and views from Australia were sought on this alternative and the wider issue of stereo-video implementation.

50. Australia responded that it had not changed its position on stereo-video, and its concerns such as the cost and need for automation remain. However, Australia was open to suggestions from the Farm Expert on potential ways to move forward. Australia reminded the ESC that any decision on how to move forward will need to be made by the EC, and will not be made at this meeting.

51. New Zealand agreed that the EC is the decision-making body, but noted there was an expectation that the ESC would review the options presented closely and provide recommendations.

52. Following the presentation by the Farm Expert, a number of specific recommendations were made.

53. The primary recommendation by the Farm Expert, which had also been made by the Scientific Advisory Panel in 2009, was that the implementation of stereo-video technology, which is the only direct method available, is the best method for estimating the weight of SBT transferred to Australian farms. This recommendation made by the Farm Expert was agreed by the ESC. The meeting noted that prior to implementation, a short study to establish the length-weight relationship of fish in the farms and detect any bias in the stereo-video camera measurements may be required.

54. The Farm Expert also made a secondary recommendation to explore methods that, in the absence of stereo video implementation, might provide a means of estimating potential maximum growth in farms, length frequency and length-weight relationships during captivity. This recommendation was agreed by the ESC.

55. New Zealand made a statement concerning progress with the farm and market issues for inclusion in the report of the meeting. This statement is provided at **Attachment 5**. Japan also made a statement, which is provided at **Attachment 6**.

Discussion on Japanese Market Analysis

56. Japan presented the CCSBT-ESC/1909/21, which provided information of Japanese market. Japan has conducted monthly monitoring and data collection for the major wholesale markets to validate the reported amounts of SBT catch from the Japanese longline fisheries. The information on total trading amounts, wild/farmed ratio, domestic/imported ratio of traded frozen wild SBT, and time-lag between catch and sale were collected respectively from the official market statistics, hearing investigation, monthly monitoring in the wholesale market, and observation of catch tags in the market. Based on the information above, Japan had estimated the domestic SBT catch amounts in 2004-2018 and compared these to the official catch amounts reported from the fisherman. Some assumptions and parameters such as no double-counting, the off-market selling rate and the market share may not reflect the current market, were used in the Japanese Market Review 2006, and therefore those assumptions were used again as part of this exercise. As estimated catches have been smaller than official catch since 2008, under-reporting of catch by fishermen has not been indicated through the market monitoring.

57. Japan presented the CCSBT-ESC/1909/23, which provided a proposal to use the Catch Document Scheme (CDS) data in addition to Japanese market data to verify the reported catch of SBT by all CCSBT Members. The use of CDS data is expected to validate the assumptions in the estimation method which was used the market data by the Japanese Market Review in 2006 (2006JMR) and improve the accuracy of the estimation. As an approach for verification of reported catch of SBT by the Members using the Japanese market and CDS data, implementation of monitoring the Japanese market using CDS data, validation of assumptions/parameter values and improvement of accuracy of the 2006JMR method, and verification of reported catch of all CCSBT Members using the Japanese market data and the CDS data was proposed.

58. Dr Shelley Clarke, the Market Expert, presented paper CCSBT-ESC/ CCSBT-ESC/1909/44 on reconciling Japanese market data and catch data for SBT. In line with the terms of reference for the work, the presentation aimed to provide ideas

and advice on how to link market data to the CDS data and how to update the market methodology. The current Japanese market estimation methodology dates from the 2006 Japanese Market Review by an independent panel of experts, and has been used since then to identify any discrepancies between SBT quantities in the Japanese market and Japan's domestic landings. The algorithm is anchored by reported quantities of frozen SBT in the Tokyo and Yaizu markets which are then expanded to represent other wholesale markets in Japan; factored to account for farmed, imported and double-counted frozen product; summed with fresh SBT quantities; and expanded to account for SBT which do not pass through Japan's market system. The resulting estimate is then summed with SBT exports, converted from processed to whole weight, and distributed among catch years based on observed lags between the time of catch and the time at which the fish appears on the market. Of the eleven parameters needed to produce the estimate, several have not been updated since 2006, and a total of seven were identified as being in need of additional work before any future estimates are produced. The Market Expert recommended that this work be done either by an independent party or by a team composed of CCSBT Members and that all assumptions, methods and data be fully disclosed. Furthermore, where possible more than one data source should be used for each parameter and uncertainties should be quantified and reported. However, even if the market estimates were improved through revising the methodology (e.g. to include uncertainties and tolerances) and updating the parameters, the Market Expert considered it likely that they would remain imprecise and might not be able to reliably identify anything but a large amount of overcatch. Instead, the Market Expert recommended that market data be used to cross-check and validate CDS data as the latter should record all catches, landings and trade of all Members. The Market Expert recommended further that the requirement to tag each SBT, possibly in combination with focused market screening to detect untagged fish, could assist in estimating the number of SBT that are not being captured by the CDS.

59. New Zealand supported the general conclusion that it would be better to develop a new methodology rather than trying to change the existing methodology. New Zealand also saw merit in improving the market estimates as CDS alone does not capture all potential sources of unaccounted mortality.

60. Specific findings and recommendations arising from the Market Expert's report were considered and accepted by the ESC.

(a) The market estimation methodology was developed and applied by an independent expert panel in 2006. At that time it was useful in identifying that there was a much higher quantity of SBT in the market than was being declared in catch records. The same algorithm has been used since 2006 with periodic updates to some parameters. However, many of the parameters are now outdated, poorly estimated or both, and the current methodology does not reflect the substantial uncertainty associated with the estimates. If this uncertainty were to be incorporated into the recent market estimates, given the lower reported market quantities of SBT in recent years, it is likely there would not be any clear signal of over-catch regardless of which parameters are used.

It was therefore recommended that to be useful for SBT management, the market estimation methodology would need to be re-visited to update key parameters, and re-designed to incorporate uncertainty and allow for catch verification of all Members.

(b) The CCSBT CDS is designed to track all catches, landings and trade of all Members, and is used by the Secretariat to provide annual summaries of Members' reported catch against CDS-reported quantities. The Secretariat also uses trade data (imports and exports) to cross-check CDS-reported quantities. There may be value in identifying how quantities reported in, or derived from, Japanese market data could assist in further validating the CDS. For example, fresh and frozen SBT quantities recorded in the major Japanese markets of Tokyo and Yaizu could be tallied annually and compared to CDS quantities for domestic landings and imports by Japan. The quantities would not be expected to be equivalent (Tokyo and Yaizu data are only a subset of Japanese markets), but changes from year to year in either data series, and changes in the relationship between the two series, beyond defined tolerances, could be flags for further investigation. Another possibility would be to continue collecting data on tagged SBT at Tokyo auctions to estimate the proportion of SBT that are landed domestically compared to imported. The relationship between this data series and similar ratios derived from the CDS could then be monitored on an annual basis.

It was recommended that the Secretariat, with input from CCSBT Members, should identify potential correspondences between Japanese market data and CDS quantities, and trial comparison of the market and CDS data series as a means of flagging discrepancies for further investigation. The results of the trial should be reported to the Compliance Committee to evaluate the practicality and usefulness of the comparisons.

(c) There are concerns about a number of ways that SBT mortalities may not be captured by the CDS. These include (i) discarding at sea; (ii) mislabelling of SBT as other species; (iii) catches by a CCSBT non-Member; and (iv) catches by CCSBT Members which do not comply with CDS requirements. Market data would not be expected to inform about discarding and mislabeling, but it might record catch by non-Members and SBT caught or traded by Members outside the CDS. However, given the uncertainties in market estimation, even if the existing methodology is substantially improved, it will be difficult to identify unaccounted mortalities if these quantities are small. Instead, it may be more practical to rely on the requirement under the CDS to tag all legally caught SBT to identify unaccounted SBT mortalities that appear in the market. Under the existing CDS Resolution tags are required to remain on the fish to the first point of sale for landings of domestic product, and tag retention on whole fish is encouraged thereafter. Recent observations in Tokyo auctions suggest that most SBT have retained their tags. If Members implement market or customs inspection programmes designed to check for untagged SBT, and if untagged SBT are required to produce traceability documents to establish legal provenance, reports of the proportion of illegal SBT observed in such inspections could inform an estimate of unaccounted mortalities.

The ESC further recommended that CCSBT Members should establish programs to identify instances of illegal (untagged fish for which legal provenance cannot be established) SBT in markets and trade and report on the scope and results of the programmes to the Secretariat to inform estimates of unaccounted mortalities. To support this work, CCSBT Members should consider requiring tags to be retained on all SBT until the fish is no longer whole. Any barriers to this requirement, as well as ways of overcoming them, should be reported to the Secretariat.

Agenda Item 9. Review of results of the Scientific Research Program and other inter-sessional scientific activities

9.1. Results of scientific activities

61. CSIRO[1] presented paper CCSBT-ESC/1909/8. Muscle tissue samples were collected from SBT landed by the Indonesian longline fishery in Bali, Indonesia (adults; n=1500) and from harvested SBT at tuna processors in Port Lincoln, Australia (juveniles; n=1600) in 2018/19. Samples collected in Indonesia are stored at -20°C at the RIMF facility during the harvest season (Sep-Apr). They will be transported frozen to Hobart and held at -20°C until they are processed. Muscle samples from the 2017/18 season were subsampled and the DNA subsequently extracted. A portion of the DNA was sent to DArT for genotype sequencing. The remaining tissue and extracted DNA samples were moved to -80°C archive freezer, where they currently remain. DNA extracts from the 2016/17 muscle tissue samples selected for genotyping (Farley et al. 2018) were processed by DArT and the genotype data sent to CSIRO in early 2019. The kin-finding analyses to identify parent-offspring pairs (POPs) and half-sibling pairs (HSPs) were updated to include these data, and the identified POPs and HSPs were provided to the CCSBT in April 2019. Significant improvements were made this year to the procedures used for genotype calling and kin-finding to improve the consistency and accuracy of the genotype calls and to ensure that false-positive kin pairs do not become a problem in the future as sample sizes increase. To date, a total of 82 POPs and 167 “high confidence” HSPs have been identified, with the false negative rate for HSPs estimated to be 0.16. It was noted that there were few POPS corresponding to recent juvenile cohorts and thus there is less direct information about adult stock size in recent years. As the adult stock continues to rebuild, there will be even fewer “POPs per cohort per comparison” in future. Consequently, it may be necessary to increase annual sample sizes somewhat, in order to maintain robust and up-to-date information on adult stock size. It was suggested that it would be worthwhile increasing the annual number of genotypes for CKMR from current value of 2000 to around 3000, which is the number actually collected; the marginal cost of doing this should be quite small.

62. The impact of the false-negative on the population estimate was queried. The reason for having higher numbers of false-negatives is to reduce the probability of a false-positive to less than 1 fish. It was explained that the false-negative level acts as a direct scaling factor on the abundance estimate. The scaling factor is set to 1 in the model and there is no difference between the estimates of absolute abundance from using only POPs and only HSPs data.

---

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

63. The precision of the false-negative HSPs was reported as being very accurate. For the more complex detection of HSP, the research team has adopted stringent criteria for the quality of the genetic sequencing approach.

64. As the recent numbers of POPs detect has been low, it is proposed that the sample sizes are increased. Associated costs are small and are reflected in the workplan budget.

65. CSIRO[1] presented paper CCSBT-ESC/1909/9. This paper updated previous analyses of SBT length and age data from the Indonesian longline fishery operating out of the port of Benoa, Bali. Age frequency data were presented up to the 2017/18 season and length frequency data up to the 2018/19 season. The collection of SBT otoliths was conducted using the existing RITF-CSIRO monitoring program for the longline fishery and otoliths were collected from a total 1,500 SBT ranging from 134-209 cm fork length in 2017/18. This year, the Directorate General of Capture Fisheries (DGCF) provided new SBT length and weight data from the Catch Documentation Scheme for 2015/16 to 2018/19 (three most recent years). The DGCF identified vessels operating in CCSBT statistical areas 1 and 2 using vessel monitoring system (VMS) tracking information. Only SBT caught by vessels operating in area 1 (spawning ground) were included in the analysis. Preliminary examination of the data showed that a proportion of fish were measured to the nearest 10-cm length class, rather than 1 cm, which has the potential to bias estimates of the size distribution of the catch. Individual weight data are considered to be more likely to be accurate, since the data are used for export purposes, these data were used in the analysis, rather than the 10 cm binned data. Weight was converted to length using a weight-length relationship derived from SBT in the Benoa monitoring program over the same time period. The new size data for fish from area 1 showed a clear a shift towards larger fish in the catch in the two most recent spawning seasons, compared to results presented previously. The pulse of SBT that was first observed in the spawning ground catches in 2012/13 appears to have moved through the fishery on an annual time step. Given the importance of these size and age data to the monitoring and assessment of the SBT spawning stock, further work to refine and improve the quality control of the monitoring program is a high priority.

66. It was noted that the increased size of fish on the spawning ground would not correlate with the very strong 2013 cohort, as these fish are not yet of this size. The changes to the Indonesian data will need to be discussed by the technical group prior to updating the stock assessment in 2020.

67. CSIRO[1] presented CCSBT-ESC/1909/10 on the CCSBT gene-tagging program. The gene-tagging program uses DNA as the tag to identify a released and recaptured fish. It provides an estimate of absolute abundance of age 2 fish, which will be used in stock assessment models and a new management procedure. Four seasons of at-sea tag and release of fish have been completed. The 2019 tagging was successful with over 4600 fish tagged and released. Tissue samples have been collected during three seasons of harvesting from farms in Port Lincoln. DNA has been extracted and sent for genotyping for ~20,000 samples per year. Length ranges were revised following direct ageing of vertebrae. No spatial temporal patterns or trends were detected in the tagging and harvest sampling data from the 2017 program. GT abundance estimate for 2016

revised and 2017 provided to the CCSBT scientific data exchange. The next juvenile abundance estimate from 2018 tagging and 2019 harvest will be available in early 2020.

68. Selection of fish for sampling was clarified. A random sample is taken from the fish processed from the farms, with selection from across the entire harvesting period, and across farms and cages. A very specific subset of the length range is specified so it is not dependent on the size selection of the whole catch. The over-dispersion factor included in the operating models will capture any additional uncertainty in representativeness of the lengths and sampling, but a longer time series of estimates of abundance from gene-tagging will be needed to estimate the over-dispersion parameter.

69. CSIRO[1] presented CCSBT-ESC/1909/11 describing a trial to assess the feasibility of estimating ages from vertebrae using tail stalks collected during gene-tagging sampling. Age estimates were made from vertebrae collected from tail stalks and the efficiency of collection, preparation and ageing method was considered. Following this trial, a larger sample of vertebrae were examined to assist in refinement of the length classes to use in the gene-tagging program. This study has shown that estimating ages from vertebrae using tail stalks is feasible and vertebrae increments are clear and readable. The timing of the narrow, darkly-stained band appears to be equivalent to the narrow zone that forms annually on SBT otoliths during the austral winter (Clear et al. 2000, Gunn et al. 2008) and the age estimates from vertebrae are reliable as they have been verified by otolith ages from the same fish. The vertebrae age estimates have been used to refine the length classes for 2-year old fish at the time of tagging.

70. The potential for automated reading of vertebrae and age estimation was raised. It was noted that vertebrae ageing was only reliable up to age 10, whereas for otoliths this is not a constraint. Automation of otolith ageing was likely to be more difficult because of manual shifts in microscope focus that are usually required. Reader differences are detected via double reading of otoliths and vertebrae. The vertebrae analysis did note that cone radius and fish length have a very clear relationship which would be helpful in the future for tracking the distribution of size-at-age over time.

71. Japan presented paper CCSBT-ESC/1909/24, which reported on Japan's otolith collection in 2018. Japan collected otoliths from 210 SBT individuals in 2018. Age data in a total of 4907 SBT individuals by Japan were analysed to show relationships between fork length and age estimated.

72. The distribution of the collection of otoliths was discussed. It was noted that the allocation of observers to vessels is random and the fish are randomly selected for otoliths. To enable use of the direct ageing data, otolith collection across the areas and months fished will need to be discussed further as collection is highly concentrated. This could be considered in the next SRP.

73. Japan presented paper CCSBT-ESC/1909/25, which reported the trolling survey in 2018. The trolling survey that provides the data for recruitment index of age-1 SBT was carried out in January and February 2019. In the survey, a chartered Australian vessel went forwards and back on the same straight line (piston-line) off Bremer Bay on the southern coast of Western Australia (WA) using trolling for a total of 8 lines. The adjacent area of the piston-line and the area between

Albany and Esperance were also surveyed. During the survey, a total of 150 SBT individuals were caught. Among them, 76 fish were implemented archival tags and released.

74. Japan presented paper CCSBT-ESC/1909/26, which provided two recruitment indices of age-1 SBT using trolling catch data in two surveys in the southwestern coast of Australia, the acoustic survey from 1996 to 2006 and the trolling survey from 2006 to 2014, and from 2016 to 2019. One index is the piston-line trolling index (TRP) which has been reported to CCSBT. The other is the grid-type trolling index (TRG) which utilises all of the trolling data that aggregated the trolling effort and the number of southern bluefin tuna schools caught by date, hour, area type, and 0.1 degrees square in latitude and longitude. Dataset included about 55,506 km total distance searched with 904 schools. GLM of the delta-lognormal method was applied for CPUE standardisation because of a high percentage of zero catch data. Medium term trends of TRG in 22 years were agreed to those of recruitment estimates from the operating model and both age-4 CPUE and age-5 CPUE from Japanese longline. TRG and TRP are expected to contribute to the CCBST stock assessment.

75. It was noted that the TRG index has two parts: probability of encountering a fish, and then a GLM for the model of when there is a positive catch of fish. The year effects in the two models were different; almost all were significant for the probability of encountering a fish, but only one year effect was significant for positive catch. Japan was asked whether it thought that meant the TRG was more informative on a presence/absence basis given there was little apparent information on the year trend when you caught fish. Japan responded that the probability model was more informative on the TRG index although the index contained both parts.

76. It was noted that the over the years of the trolling survey that a large number of archival tags have been successfully deployed on small fish in WA, and that the results from the returned tags may provide important additional information on the migration and behaviour patterns of these fish while small and as they age. Japan advised that thirty archival tags from fish tagged at ages 1-2 have been returned, and data are currently being analysed. Results may provide additional information on the dynamics of fish entering the Great Australian Bight which is important to the gene-tagging program.

77. The question was asked whether a tissue sampling collection program during the trolling survey could provide useful additional information for the gene-tagging program, however the sample sizes would be too small.

78. Taiwan presented CCSBT-ESC/1909/35. In 2018 (ESC23), Taiwan reported the preliminary otolith ageing data for the SBT collected in 2017. In this document, it updated more information of direct otolith aging data and the estimated age composition of the SBT caught by Taiwanese longliners in 2017. Also, the preliminary ageing data for the SBT caught in 2018 are updated. Scientific observers collected otoliths from 23 SBT individuals in 2017 and there are 307 SBT otoliths collected from the tuna processing factories in Kaohsiung, Taiwan. The ages of samples were determined according to ageing manual (Attachment E of the Report of the 2002 CCSBT Direct Age Estimation Workshop). The SBT sampled for the otoliths by the observers were skewed toward small-sized fish with ages between 1-3 years. On the other hand, the SBT sampled in the factories

showed bimodal distribution between 90 to 170 cm with relatively fewer samples between 130-140 cm. Approximately 70% of the samples are between 3-5 years. The aged samples were used to construct an age-length key, which was used to covert the length frequency data to age composition of the total catch in 2017. The estimated age compositions ranged from 1-25 years, with approximately 75% catches between 3-5 years. The 4-year-old fish was the most abundant age class followed by 3 and 5-year-old fish. In 2018, scientific observers collected 30 pairs of SBT otoliths. The ages of the fish ranged from 2-4 years. They also collected 132 pairs of SBT otoliths from the factories. The ages of these samples ranged from 2-11 years with the most abundant fish of 3 years, followed by the 4 and 2 years. Taiwan will enlarge the sample size and update the information in the next meeting.

79. Taiwan presented paper CCSBT-ESC/1909/36. A total of 590 gonad samples of SBT were processed and analysed in this study. All the samples were collected by the Taiwanese scientific observer project from April to September in the year of 2010-2018. The fork length of samples concentrated between 90 and 150 cm. The GSIs of females showed the increasing trend from April to July and then revealed a decline. And the GSIs of males reached the maximum value in May and then decreased gradually. The sexual maturity stages were determined based on the developmental stages of histological sections of 502 gonad samples collected in 2010-2017. Most samples were designated as immature stage, and about 16% samples designated as mature but they were reproductively inactive. More mature female samples were regressed or regenerating stages during April to June, while most of male samples were regenerating stages during June to August.

80. Indonesia presented paper CCSBT-ESC/1909/38 on preliminary results of data validation process to confirm the location where SBT with size less than 160 cm were caught by longline vessels in Indonesia. Data analysis had been conducted by utilising many data sources, particularly VMS tracking as the main data, observer program and logbook. Data classification primarily based on VMS tracking, where if number of tracking/coordinate vessel more than 70% from all tracking data operated in area 1. Size frequency of SBT less than 160 cmFL confirmed caught in area 1 ranged between 100-155 cmFL in 2015, 120-155 cmFL in 2106, 75-155 cmFL in 2017 and 67-159 cmFL respectively. Meanwhile the proportion from total catches of SBT less than 160 cmFL originating caught in area 1 were 4.76% (214 fishes) in 2015, 7.79% (350 fishes) in 2016, 13.82% (621 fishes) in 2017 and 6.41% (701 fishes) in 2018 respectively.

81. Korea presented CCSBT-ESC/1909/40. To investigate the age and growth of SBT it collected 127 otolith samples in 2018, totally 571 otoliths since 2015. The fork length and weight were measured onboard for each specimen by sex, and the age was determined from annuli in otolith, based on the CCSBT manual. The relationship between fork length and total weight was TW = 3E-05 x FL2.8857 (R2 = 0.9183). The von Bertalanffy growth's parameters estimated were $L\infty$ = 176.8 cm, K = 0.165/year, t0 = -1.936 years. In addition, it also has collected 443 ovary samples of SBT by observers since 2015, and are analysing the gonadosomatic index (GSI), maturity stages and fecundity.

82. Korea presented CCSBT-ESC/1909/41. Maturity of SBT was investigated based on the samples collected by scientific observer program of Korean tuna longline

fisheries from 2015 to 2017. A total of 365 ovaries of SBT have been collected by Korean scientific observer program. The SBT ovary samples were collected from April to September during 2015-2017. The fork length and weight were measured onboard for each specimen by sex, and the histological analyses were conducted at laboratory. Korea also analysed maturity stage, gonadosomatic index (GSI) and fecundity of SBT. Annual reproductive cycles of SBT in this study could be divided into four successive stages in females; immature, maturing, mature and spent stage. For female, immature and maturing stages appeared from April to September and mature and spent stages appeared in September. As for the GSI, both females and males showed the highest value in May but all the individuals were immature stage. The fecundity of SBT ranged from 44,083,229 eggs (135 cm in FL) to 344,882,853 eggs (144 cm in FL), which was proportional to length.

83. Indonesia presented paper CCSBT-ESC/1909/42. This paper provides information about reproductive studies of SBT being undertaken in Indonesia. The standard reproductive classification was used to assess the ovaries of 30 females collected by the Indonesian scientific observer program. Samples were collected from two trips conducted in December 2017 (n=25 samples) and January 2018 (n=3 samples) from area 2 of CCSBT statistical areas, and one trip in April 2018 (n=3 samples) from area 1. The length of SBT caught ranged between 136 and 185 cm fork length. All gonad samples were frozen during the fishing trip and were thawed in the laboratory before the fixation process. Gonad samples were fixed in 10% buffered formalin and then embedded in paraffin and standard histological sections were prepared (cut to 5 µm and stained with H&E). Histological sections were classified using criteria of southern bluefin tuna (Farley & Davis, 1999) and south Pacific albacore tuna (Farley et al., 2013). The development class of SBT ovaries collected in area 2 were identified as spawning capable, regressing-potentially reproductive, regressed 1 and regressed 2, while ovaries from area 1 were identified as regressed 1 and regressed 2. Further ovary samples are required (and are currently being collected) from statistical areas 1 and 2 to further examine the reproductive activity of SBT.

84. The value of collecting gonads from fish from the spawning grounds for estimating fecundity, spawning frequency and total egg production was noted. Indonesia stated that they plan to continue to collect these data as part of its scientific observer program from RITF, but its ability to do so depended on the placement of observers on suitable vessels and whether the vessel is operating in Area 1.

9.2. Updated analysis of SBT catch by non-Members

85. New Zealand presented CCSBT-ESC/1909/33 on estimates of SBT catch by CCSBT non-cooperating non-Member States between 2007 and 2017. The document is an update of a similar one presented in 2016 (CCSBT-ESC/1909/BGD03). As in the previous report, two different modelling approaches were applied: a GLM approach and a Random Forest approach, parameterised with the same data. Both approaches required estimation of the catch rate from CCSBT data and application of that catch rate to non-Member effort in order to predict potential unreported catch. Both methods are considered to be equally valid. As in the previous analysis, two alternative catchabilities

were assumed: those relating to the Japanese and Taiwanese fleets, the first of which represents targeted fishing and the second of which represents bycatch fishing. These provide upper and lower bounds for the predicted catch, which is obtained by estimating effort per area and CPUE per area, multiplying the two together and adding areas together. In the previous (2016) analysis, the estimates for the targeted effort scenario gave an average for 2011-14 of 306 t, which the EC believed to be sufficient to warrant further attention. Numbers for the 2019 analysis are substantially higher than for comparable years in the 2016 analysis and have further increased for the 2016 and 2017 estimates.

86. It was clarified that the effort used in the paper is adjusted effort, which has the areas with zero catches of SBT included as was agreed as the preferred method by the ESC in 2016.

87. The coefficients associated with the flag for targeted and bycatch fisheries were provided to Japan on request.

88. Taiwan noted that because Taiwanese vessels have various fishing strategies for targeting SBT, albacore and oilfish, that it is not appropriate to estimate SBT bycatch for other fleets using Taiwanese data. Other fleets have their own fishing strategies that are quite different from Taiwan’s. In future, comparisons could be made between fleets (for target and bycatch) and spatial and temporal scales should be considered. It was noted that the purpose of applying the Japanese and Taiwanese estimates was to bracket the likely range of estimates.

89. The average of the non-Member catch estimates from 2011-2014 from the 2016 paper was 306t and this has almost doubled to 607t in the new analysis. The changes to the method that have contributed to this increase are: (i) revision to input data which led to a reduction in the Japanese catch rates; (ii) revision to the WCPFC data which led to increases in effort and a change in spatial distribution; and (iii) a correction to the IOTC effort data, which resulted in a shift south for effort data into regions with higher catch rates thereby increasing the predicted non-Member catches. The changes to the IOTC data are likely to have had the most impact on the increase in the catch estimates.

90. The ESC discussed the impact of including the weight of the discards (18kg) in the calculation of average weight of a fish, under the assumption that non-reporting non-Members would not have an incentive to discard. The impact was anticipated to decrease average weight of a fish and therefore the non-Member UAM would be overestimated, although the magnitude of the over-estimate is currently unknown.

91. The ESC was reminded that in 2016 there was compelling evidence that there had been substantial catch from non-Members detected and reported to the Compliance Committee. The ESC was advised that there has been no recent detection of non-Member catches, however, the likelihood of detection is low. The ESC was advised that China had introduced management measures to avoid catching and landing SBT, with prohibitions on SBT retention, area closures, transhipment and reporting requirements.

92. The ESC agreed that the UAM1 scenario being used in testing of CMPs is sufficient to account for the range of estimates reported in the paper for non-Member catch.

93. The non-Member catch estimates are noted for further discussion in preparation for the stock assessment in 2020.

94. The authors of the paper were thanked for providing additional information to the meeting. The ESC requested that in a re-analysis of the results or new analysis that the following be considered for inclusion: (i) a quantitative evaluation of the relative impacts of the three main data changes on the results, (ii) include the weight of small discarded fish on the estimate of average weight of a fish in the method, and (iii) if new data (after 2017) are included, examine the effects on catch estimates of China's fisheries closures. The first two of these refinements, and the third one when possible, were requested by late May as input for the upcoming assessment meeting in June 2020.

Agenda Item 10. Evaluation of Fisheries Indicators

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

- Two indicators of juvenile (age 1–2) SBT abundance were provided in 2019; the trolling index (piston-line index) remained at zero, for the second year in a row, and the gene-tagging abundance estimate decreased.
- The Japanese longline CPUE indicators suggest that the current stock levels for 4, 5, 6 & 7, and 8-11 age groups are well above the historically lowest levels observed in the late 1980s or the mid-2000s.
- The Japanese longline CPUE indices for age 5, 6 & 7, and 8-11 classes show increasing trends in recent years, while the indices for age 4 have fluctuated around the recent past 5-year mean.
- The indices for age class 12+ have declined gradually since 2011. This decline may relate to the very low cohorts of 1999 to 2001.
- The newly developed close-kin mark recapture index of abundance increased for the latest year for which it was calculated (2014).
- The standardised CPUEs for Korea for both areas described have shown an increasing trend since the mid-2000s.
- For the Taiwanese CPUE standardisations, the CPUEs for the area east of 60 degrees east have shown an increasing trend since 2016.
- The New Zealand CPUE has been substantially higher over the past three years compared to historical levels, with all three years similar.

96. Australia presented paper CCSBT-ESC/1909/13 on fisheries indicators. The 2018/19 update of fishery indicators for the SBT stock summarises indicators in two groups: (i) indicators unaffected by the unreported catch identified by the 2006 Japanese Market Review and Australian Farm Review; and (ii) 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 indicators of juvenile (age 1–4) SBT abundance were provided in 2019; the trolling index remained at

zero while the gene-tagging abundance estimate decreased. Indicators of age 4+ SBT exhibited mixed trends. The newly developed close-kin mark recapture index of abundance increased for the latest year it was calculated (2014). The empirical close-kin mark recapture index described in the paper (Figure 3) is not included in **Attachment 7** as the years of the index (2004-2014) do not match the years presented in the attachment. The values of the index over the past three years are: 2.84 (2014), 1.27 (2013) and 1.42 (2012). The catch per unit effort (CPUE) from the New Zealand domestic longline fishery decreased slightly while the Japanese longline nominal CPUE increased in 2018. Similarly, the Japanese standardised, normalised CPUE series for core vessels increased substantially, but this increase was not evident for all vessels. The mean length of SBT caught by Indonesia has generally decreased since 2011, and further decreased slightly in 2019. There remains a strong need to understand the location of the small SBT catches. The median age of SBT increased in 2018.

97. The meeting asked why the New Zealand nominal CPUE reported in the indicators paper was slightly different to that in the New Zealand annual report. Australia commented that this was likely because of the interim data used or because New Zealand does not include non-targeted effort in their calculation. However, it was agreed that the general trend is the same in both series, and that the CPUE is high and has changed little over the past three years. Australia committed to updating the format of the paper for next year and agreed to work with New Zealand to ensure consistency.

98. Japan presented paper CCSBT-ESC/1909/27. In this paper, fisheries indicators along with fishery-independent indices were examined to provide information for overviewing the current stock status of SBT. The Japanese longline CPUE indicators suggest that the current stock levels for 4, 5, 6 & 7, and 8-11 age groups are well above the historically lowest levels observed in the late 1980s or the mid-2000s. CPUE indices for age 5, 6 & 7, and 8-11 classes show increasing trends in recent years while the indices for age 4 have fluctuated around the recent past 5-year mean. The indices for age class 12+ have declined gradually since 2011. This decline may relate to very low cohorts of 1999 to 2001. The current index levels for this older age group are still low although similar to some past observations. Other age-aggregated (age 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. It should be noted that the grid-type trolling recruitment index (TRG) shows a somewhat decreasing trend from 2011 to 2019 and the piston line trolling recruitment index (TRP) records zero values in 2018 and 2019, suggesting some concern regarding possible low recruitment in recent years. The high recruitment level for the 2013 cohort estimated from the OM in the 2017 stock assessment (directly pertaining the high value of the 2016 aerial survey index) is not supported by longline CPUE indices by age (4 and 5 years old) obtained in 2017 and 2018, and is also not supported by the TRG value in 2014.

99. Paper CCSBT-ESC/1909/27 plotted Korean and Japanese (core vessel) CPUE indices. For both areas 8 and 9, the overall trends of the Korean CPUE series

appeared similar to those of the Japanese core vessels CPUE series and the consistency between the trends seemed reasonable, although there were some differences in trend between two series, especially for Area 8 in recent years.

100. For intersessional work, the ESC recommended that the CPUE working group examine issues related to the differences (e.g. evaluating the Korean data on the same scale as the Japanese presentation and vice versa), in addition to the work recommended at OMMP 10 to further investigate the high Japanese longline CPUE estimate in 2018. Additionally, in preparation for the planned stock assessment to be developed by June 2020, the ESC's CPUE working group will organise some web-meetings to further improve, evaluate, and develop CPUE analysis including contributions from Taiwan and South Africa.

101. Taiwan presented paper CCSBT-ESC/1909/37. CPUE standardisation analyses were conducted using data from Taiwanese longline fleets which operated in the waters to the south of 20°S in the Indian Ocean for the period from 2002 to 2018. The SBT fishing ground is divided into the central-eastern area (Area E) and western area (Area W) based on the previous results (Wang et. al. 2015). A cluster analysis was used to explore the targeting of fishing operations and also to produce the data filter for selecting the data for the CPUE standardisations. For the results of Area E, Cluster 1 consisted mainly of Albacore (ALB) and Bigeye tuna (BET) operations; operations with lower proportions including Yellowfin tuna (YFT), SBT, Swordfish (SWO) and other species (OTH) were also parts of components in Cluster 1. The operations grouping in Cluster 2 belonged mainly to the ALB operations, but also contained the operations for BET, SBT and OTH. The major operation in Cluster 3 was also the ALB operations. Cluster 4 mainly comprised the SBT operation. For Area W, Cluster 1 comprised mainly ALB operations; Cluster 2 consisted mainly of the ALB operations but also contained the operations for BET, YFT, SWO and OTH; and Cluster 3 consisted of operations for OTH (mainly for oilfish). Most SBT catches were contained in Cluster 2 and Cluster 3, and Cluster 1 contained very few SBT catches. For the spatial distribution of the SBT catch proportions, the SBT proportion of Cluster 2 was higher than others. Following the CPUE standardisation, the pattern of CPUE trends in both area E and W did not change greatly. First, for Area E, the standardised CPUEs gradually increased before 2007, with a decreasing trend from 2007 to 2011, a substantial increase in 2012, a gradual decrease until 2015, and a further increase in the most recent three years (2016-2018). For Area W, the standardised CPUE series generally exhibited a decreasing but fluctuating trend from 2002 - 2013, and a stable low pattern until now. For the results of retrospect analysis, the influence of including the updated data on the CPUE standardisation was negligible for Area E, while including updated data changed the standardised CPUE series for Area W although the trends were similar.

102. Korea presented paper CCSBT-ESC/1909/39. In this study SBT CPUE from Korean tuna longline fisheries (1996-2018) was standardised using Generalised Linear Models (GLMs) with set by set data. The data used for the GLMs were catch (number), effort (number of hooks), number of hooks between floats (HBF), fishing location (5° cell), and vessel identifier by year, quarter and area. The CPUE was explored by area and standardised for Area 8 and 9 in which Korean vessels have targeted SBT. Two approaches were applied to address target change through time which can affect CPUE indices. The first approach is data selection that removed effort considered unlikely to have targeted SBT, and

the second applied cluster analysis of species composition to separate effort into groups that may have used different targeting methods. CPUE standardisation was carried out using the lognormal constant GLM approach. GLM results for each Area suggested that location, year, targeting, and month effects were the principal factors affecting the nominal CPUE. The standardised CPUEs for both Areas decreased until the mid-2000s, but have subsequently shown an increasing trend.

103. The meeting noted that the Korean and Taiwanese CPUE series have shown a consistent increase over the past 5-10 years.

Agenda Item 11. SBT stock status

11.1. Evaluation of meta-rules and exceptional circumstances

104. In 2011, the CCSBT adopted the meta-rule process as the method for dealing with exceptional circumstances in the SBT fishery (ESC 18). The meta-rule process describes: (i) The process to determine whether exceptional circumstances exist; (ii) The process for action; and (iii) The principles for action. 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 generated by the MP may be inappropriate.

105. Australia presented paper CCSBT-ESC/1909/14. It examines the meta-rules in relation to the TAC set for 2020 which was recommended at the 2016 meeting of the ESC. Five potential exceptional circumstances are identified: (i) The very high longline CPUE estimate in the timeseries for 2018; (ii) the planned absence of the index of recruitment from the scientific aerial survey in 2018 and 2019; (iii) changes in estimates of the population dynamics and productivity of the stock identified in 2017 through the updated stock assessment; (iv) some years of unresolved shift in size distribution, towards small fish, in the Indonesian spawning ground fishery since 2013; and (v) the potential for total catches (Members and Non-Members) to be greater than the TAC (either annually or over the 3 year quota block). These issues, and their cumulative impacts, are considered. As part of the recommendation of a new MP in 2019, the ESC will need to consider adopting meta-rules that will provide a schedule of activities and a safety-net around the MP TAC recommendations for circumstances or events not included in the CMP testing. The meta-rules schedule of activities should include the frequency of evaluation of exceptional circumstances, TAC setting, assessment of stock status and MP review. The meta-rules are an essential component of the MP that provides structure and confidence for CCSBT Members and stakeholders and transparency in the TAC decisions of the CCSBT.

106. Japan presented paper CCSBT-ESC/1909/28. In this paper, values of the core vessels' longline CPUE index (one of the series required for input to the Bali MP) are compared to projection results obtained using the Base case OM. Recent observations for this index fall well within the 95% probability envelope predicted using the Base case OM in 2011. The aerial survey (AS) index (the other input required for the MP) is not available from 2018 onwards. Therefore, to evaluate this year's recruitment level and consider the possible occurrence of

Exceptional Circumstances in the absence of the 2019 AS index, information on the estimates from the gene-tagging (GT) project and from the grid-type trolling index (TRG) was examined. The recruitment estimates from the GT project and from the TRG lead to the inference that the recruitment levels for 2016 and 2017 – the cohorts which would have been observed by the 2019 AS - are not notably low and probably fall within the range predicted by the projections made in 2011 under the Base case OM. Accordingly, in regard to a decision on implementation of the recommended TAC (calculated by the Bali MP in 2016 for the 2018-2020 fishing seasons) for the 2020 season, it follows that no modification of the value of this TAC is required because: (i) there is no conclusive evidence to support a declaration of Exceptional Circumstances from the viewpoints of a check of the OM predictions and other potential reasons (the Indonesian small/young fish catch, the extent to which the total reported global catch exceeds the TAC and the scale of unaccounted mortality); and (ii) no unexpected change has been detected in the fisheries' indicators examined.

107. Given the information presented, the ESC concluded there was no reason to take action to modify the 2020 TAC recommendation in relation to its review of exceptional circumstances.

11.2. Summary of the SBT stock status

108. A stock assessment was conducted in 2017. The 2017 stock assessment results indicated that there were substantial differences in the rebuilding timeframe and estimates of stock productivity from the 2011 operating model results used to test and tune the current MP. The most recent years showed an improvement in stock status, with a SSB depletion estimated at 0.13 (80% confidence interval 0.11-0.17) for the final assessment year 2016. This suggested the potential for much earlier rebuilding to the interim target (70% probability of rebuilding to 20%SSB_0 by 2035). Fishing mortality for 2016 was estimated to be about half F_{MSY}. Additional sensitivity tests identified that recent high aerial survey results (2014 and 2016) were the most influential factors in the change in population dynamics.

109. Australia presented paper CCSBT-ESC/1909/17, which provided new estimates for SSB/SSB_0 for 2018 in conjunction with the 2019 reconditioning of the SBT operating models (OMs) for testing of candidate MPs. The results indicate a higher estimate for SSB depletion of 0.17 (0.15–0.21) for 2018 compared to the 2017 stock assessment estimate for 2016, which is consistent with the projections done in both 2017 and 2018. Fishing mortality relative to MSY levels had slightly increased to F/F_{MSY} = 0.55 (0.41 – 0.74) given the updated 2018 catch input. A notable difference between the 2017 stock assessment and the 2019 reconditioning of the OMs is that an additional model scenario (UAM1 – unaccounted mortality scenario) was included in the reference set of models for reconditioning the OMs, but evaluations in 2017 indicated that this did not affect SSB depletion estimates. The estimated trends in SSB and recruitment and the fits to abundance indices for the 2019 reconditioned OMs are provided in **Attachment 8**.

110. The ESC also decided to tabulate SSB in 2018 relative to SSB in the year 2009, where biomass was at its lowest (SSB_{min}), and B10+ in 2018 relative to B10+ in

2009. These metrics indicate an increase in SSB of about +79% and an increase in B10+ of about +57% since 2009. This demonstrates the extent to which stock rebuilding has occurred.

Table 1: Southern bluefin tuna stock status estimates for 2016 from the 2017 stock assessment and for 2018 from the 2019 reconditioning of the SBT operating model (OMs). Uncertainty is presented in brackets as 80% confidence intervals.

Variable	2016 Status	2018 Status
SSB (TRO) depletion	0.13 (0.11-0.17)	0.17 (0.15-0.21)
B10+ depletion	0.11(0.09-0.13)	0.14 (0.12-0.17)
F relative to F_{MSY}	0.50 (0.38-0.66)	0.55 (0.41-0.74)
SSB relative to SSB_{MSY}	0.49 (0.38-0.69)	0.64 (0.47-0.91)
SSB relative to SSB_{min} in 2009		1.79 (1.63–1.93)
B10+ relative to B10+ in 2009		1.57 (1.45-1.72)

Report on biology, stock status and management of SBT

111. 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 9**.

Agenda Item 12. SBT Management Advice

112. 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 2017 assessment and 2019 reconditioned Operating Model used for testing Candidate Management Procedures

113. According to the 2017 stock assessment, the stock remains at a low state, estimated to be 13% in 2016 of the initial SSB, and below the level to produce maximum sustainable yield (MSY). Fishing mortality is about half the level associated with MSY.

114. Indications of stock status based on reconditioning of the operating models (OMs) in 2019 for testing of CMPs suggest that the SSB in 2018 was 0.17 [0.15–0.21] of initial SSB, with an increase in SSB of 79% since 2009.

Implications from 2019 review of indicators

115. The review of indicators (agenda item 10) suggested that recruitment for the most recent year may have been lower, as evidenced by a reduction in (i) the gene tagging absolute abundance estimate, and (ii) the trolling survey index (piston-

line index of age 1) remaining at zero for a second year in a row. It should be noted that current OM estimates of average recruitment are above the expected level. There are some consistent positive trends in the age-based longline CPUE estimates for a number of Members including the Japanese (core vessels) and Korean fleets (**Attachment 7**). For the first time, the ESC noted an increased spawning stock biomass as evidenced by a consistent increase in the close-kin mark recapture (CKMR) empirical index of spawning stock abundance from 2008 to 2014.

Annual Review of implementation of current MP

116. In 2019 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 (i) the very high longline CPUE estimate in 2018; (ii) the pre-arranged absence of aerial survey data for 2018 and 2019; (iii) changes in estimates of the population dynamics and productivity of the stock since the tuning and implementation of the MP in 2011; (iv) the shift in size distribution towards small fish in the Indonesian spawning ground fishery since 2013; and (v) the potential for fishing mortality (from Members and non-Members) to be greater than the TAC recommended by the MP. Following the meta-rule review of exceptional circumstances, the ESC concluded there was no reason to take action to modify the MP's 2019 TAC recommendation.

Non-Member catches

117. Estimates of SBT catch by non-Members provided in agenda item 9.2 are uncertain and subject to further analysis. Even the highest estimates are smaller than those used in sensitivity tests conducted as part of the 2017 stock assessment. Those sensitivity tests indicated that even with these high unaccounted catches, the objectives of the current MP would be met (i.e. the interim rebuilding target of 20%SSB_0 by 2035 would be achieved with a probability of 70% or more). This means that to achieve the objectives of the current MP, there is no requirement for the EC to change the amount of the TAC that it has set aside to account for IUU catch by Non-Members.

Current TAC

118. For the three-year TAC setting period (2018-2020) the 23rd EC adopted TAC the values shown below (the recommended TAC from the MP).

Year	2018	2019	2020
TAC (t)	17,647	17,647	17,647

MP TAC Recommendations

119. Based on the annual review of the exceptional circumstances and fishery indicators, the ESC recommended that there is no need to revise the EC's 2016 decision regarding the TAC for 2018-20. Therefore, the recommended TAC for 2020 and the 2018-20 quota block remains 17,647t.

Agenda Item 13. Development of new MP

13.1. Review Candidate Management Procedures (CMPs)

120. CCSBT-ESC/1909/17 details the updating of the CCSBT OM for the 2019 MP testing. Both updated data sources (catches, age/size composition, Japanese LL CPUE, CKMR) and new data (gene tagging data from the 2016 and 2017 release events) were successfully included in the OM. The relative TRO (adult abundance) has increased since the full stock assessment in 2017, but within the bounds predicted in 2017 for 2019 levels. The 2010-2014 year-classes were all above average – in particular 2013 – but the 2015 estimate (informed primarily by the 2017 gene tagging release data) was below average. The conclusion of the paper was that the reconditioned OM was deemed satisfactory for use in MP testing. The paper also explored how informative the LL1 size composition data are likely to be in relation to confirming (or otherwise) the relative size of the 2013 year-class. It was shown that, despite no obvious peaks at the mean lengths of 4 year-olds in 2017 and 5 year-olds in 2018 (when this 2013 year class would first be moving into the LL1 usual size range), that the very large year class estimated in 2013 would still be a major fraction (almost 25%) of the current LL1 catches. This was because of the increasing level of variability in size-at-age of fish aged 4+. The point was made that the current LL1 data are consistent with the large 2013 year-class, but that only direct ageing could really confirm (or refute) this.

121. CCSBT-ESC/1909/16 describes the performance of the RH13 candidate management procedure (CMP). This CMP is a revised version of the RH12 CMP presented at OMMP10 (CCSBT-OMMP/1906/5). The OMMP identified that RH12 had a high probability of increasing the TAC in the first two decision years and then decreasing it in the third (a negative trait) relative to other CMPs. Subsequently the developers rectified this problem by replacing the CPUE trend part of the harvest control rule with a kind of target/buffer-zone term, which reduced this probability to near zero for the reference set of OMs. The performance of the revised CMP across the various robustness tests was satisfactory – it reacted promptly to the low recruitment scenario in particular – though it did struggle on the absolute rebuilding targets for the variable squares CPUE test (cpuew0). This was because of the notably lower starting level of SSB/SSB_0 for this robustness test, relative to the others (0.1 vs. 0.17). The CMP did, however, manage to increase the relative SSB by the largest factor (relative to the starting value) for this robustness test. In terms of tuning differences, the qualitative behaviour of the CMP was consistent across tuning objectives for the various robustness tests, though the 35% by 2040 tuning objective is clearly somewhat more conservative (in terms of average TACs and possible increase trajectories) than the 30% by 2035 tuning objective. We also explored the 30% by 2040 tuning objective (not explicitly ruled out by the EC) and found it very similar to the 30% by 2035 option, with a slightly larger average TAC over the tuning period. There was little obvious difference (on the reference set of OMs) for either the 2000t or 4000t alternatives maximum TAC change settings.

122. CCSBT-ESC/1909/15 explores the performance of an MP which is reliant on fishery-independent data only. This candidate MP uses data from the gene-tagging and close-kin mark-recapture programs, and no CPUE data. The rationale for this is that these fishery-independent data sets are from scientific monitoring

programs designed to provide data with specific precision and for which the design process has examined the possible sources of bias. In contrast, for CPUE data there are uncertainties in the time series of catch and effort data used in CPUE standardisation, and the ability of CPUE indices to reflect population abundance. The close-kin and gene-tagging data monitor two important aspects of the fishery. The close-kin program monitors adult abundance, which we are aiming to rebuild, whereas the gene-tagging program monitors juvenile abundance, which provides an early warning of periods of low recruitment that will affect future adult abundance. It also recognises periods of higher recruitment that a feedback MP can take advantage of to increase TAC. This candidate MP provides robust advice for rebuilding the SBT stock towards a new target level to be decided by the EC and for maintaining the SSB above the interim rebuilding objective of 20% SSB_0 with a high probability. TACs are likely to increase steadily as the stock continues to rebuild, with low variability and low likelihood of TACs below the current level for the base set of operating models and many of the robustness tests.

123. Japan presented paper CCSBT-ESC/1909/29. This paper provides results of final improvement and performance evaluation of a CMP for southern bluefin tuna. The CMP considered is simple empirical one, called “NT4”. NT4 utilises CPUE, estimates from gene-tagging, and a close-kin mark recapture parent-offspring pairs (POP) index. Basic characteristics of NT4 are: (i) until the tuning year of achieving the stock level target, NT4 suppresses increase of TAC, and after the tuning year, it tries to increase TAC as possible; (ii) if recruitment level becomes declining to a very low level, then NT4 reduces TAC accordingly to avoid decrease of the stock. Comparisons of results between the reference set and associated robustness tests are presented. While projected median trends of both TAC and relative total reproductive output (TRO) under most of robustness scenarios tested are similar to ones for the reference set, median TAC and TRO trends under “reclow5” (also its combinations with “as2016” or “cpuew0”) and “cpuew0” scenarios are different from the ones for the reference set reflecting reaction to assumptions of low recruitment or low productivity of stock.

124. CCSBT-ESC/1909/30 considers simple target-type CMPs for SBT, first developed in 2018, which use CPUE, close kin mark recapture (CKMR) and gene tagging (GT) information. These are further refined and tuned to median recovery of 30% and 35% of the pristine TRO in 2035 and 2040 respectively for the operating models as finalised for 2019. These tunings are carried out for each information type separately, and then selections are made amongst differently weighted combinations of the resultant three CMPs. Particular importance is placed on attempting to achieve larger values for the lower percentile for SSB depletion in the tuning year (i.e. less resource risk), especially for the robustness test involving future low recruitment, which is best achieved by the GT index-based CMP. For that reason, the preferred combined CMP gives 60% weight to the GT-based CMP, with 20% to each of the other two.

125. The main design features of the four final CMPs are described below:

- **DMRM** (labelled DMRcomb2 in figures) sets TACs as the weighted average of the TACs output by three separate formulae, each of which adjusts the previous TAC based on only CKMR, CPUE or GT index respectively. These adjustments are positive if the index is above, and negative if below its target level. The adjustments are given by the product of the difference between the value of the index and its target level and a “gain” parameter value; this “gain” parameter is larger if the value is below its target level, for greater precaution in response to an indication that the size of the population is falling.

- **RH13** uses gene tagging, CPUE and both forms of CKMR data (POPs and HSPs). If recent mean CPUE is within a given range, do not change the TAC; if it is above/below this range then we increase/decrease the TAC. The CKMR data are used in a simple model that aims to achieve a minimum rate of rebuilding to the SSB target. Before the rebuilding target, if the trend in the adult population is below a minimum positive value the TAC will be decreased; if above this minimum it may increase. When the target is reached, if the trend is positive/negative the TAC can be increased/decreased. If the recent mean estimate of 2 year olds from the gene tagging is below a certain level the TAC is **strongly** decreased; if above this level it is **weakly** increased; if it is within these upper and lower levels the TAC is unchanged. The CPUE and CKMR parts of the MP are more reactive before reaching the target, and less reactive after reaching it. For the gene tagging the MP is **always** reactive.
- **AAA** uses the gene-tagging data and both forms of CKMR data (POPs and HSPs). It does not use CPUE data because of the uncertainty in the relationship between CPUE in abundance. The gene-tagging estimates of age 2 abundance are used as an indicator of recent recruitment. The MP acts smoothly and asymmetrically to strongly reduce TAC when recent (5 year) average recruitment is below a lower threshold, and less strongly to increase TACs when above an upper threshold to take advantage of strong cohorts. The lower threshold is informed by the estimates of age 2 abundance for the very poor recruitments in 1999-2002. The CKMR component uses a relatively simple model to estimate an index of SSB. This index is used to rebuild the SSB to the target level, by adjusting the TAC if the rate of rebuilding is in the wrong direction or not fast enough, and then to maintain adult abundance around the specified rebuilding SSB level.
- **NT4** Before the tuning year, NT4 calculates TAC corresponding to trend of longline CPUE. After the tuning year, if the empirical CKMR POP index (SSB indicator) is higher than the pre-specified SSB target value, NT4 increases TAC more aggressively based on CPUE trend, but if not, NT4 sets TAC as same as it does before the tuning year. As a safety net, NT4 takes a minimum of either the CPUE-derived TAC or TAC calculated from difference between the pre-specified historical lowest recruitment level and the estimate from the gene-tagging.

Review of comparative performance of CMPs

126. The four final CMPs have some qualitative differences but, overall, all show adequate performance under the reference set of models. They are all able to meet the two tuning levels, without requiring short-term decreases in TAC. In addition, they all exceed the interim rebuilding target specified by the Strategy and Fisheries Management Working Group, achieving a probability of SSB_{2035} > 20% SSB_0 substantially higher than 70% under the reference set of models.

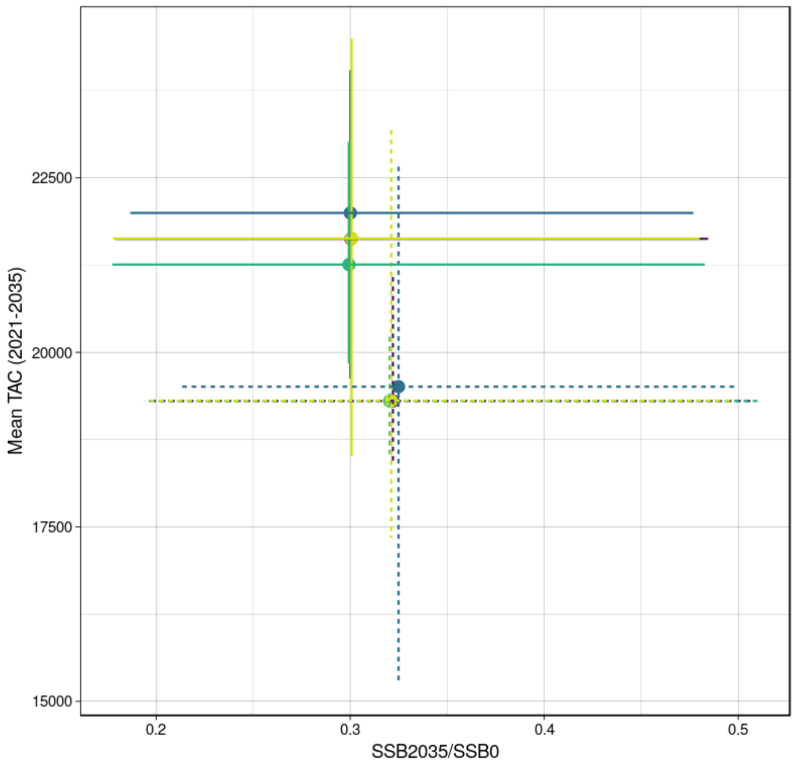
127. For each tuning, median SSB trajectory, rebuilding statistics (SSB_{2035}/SSB_0, median and range) and the probability of meeting the interim rebuilding target are similar across the CMPs for the reference set of models (base18).

128. The interim rebuilding target is also exceeded in most robustness trials, except for the most pessimistic ones.

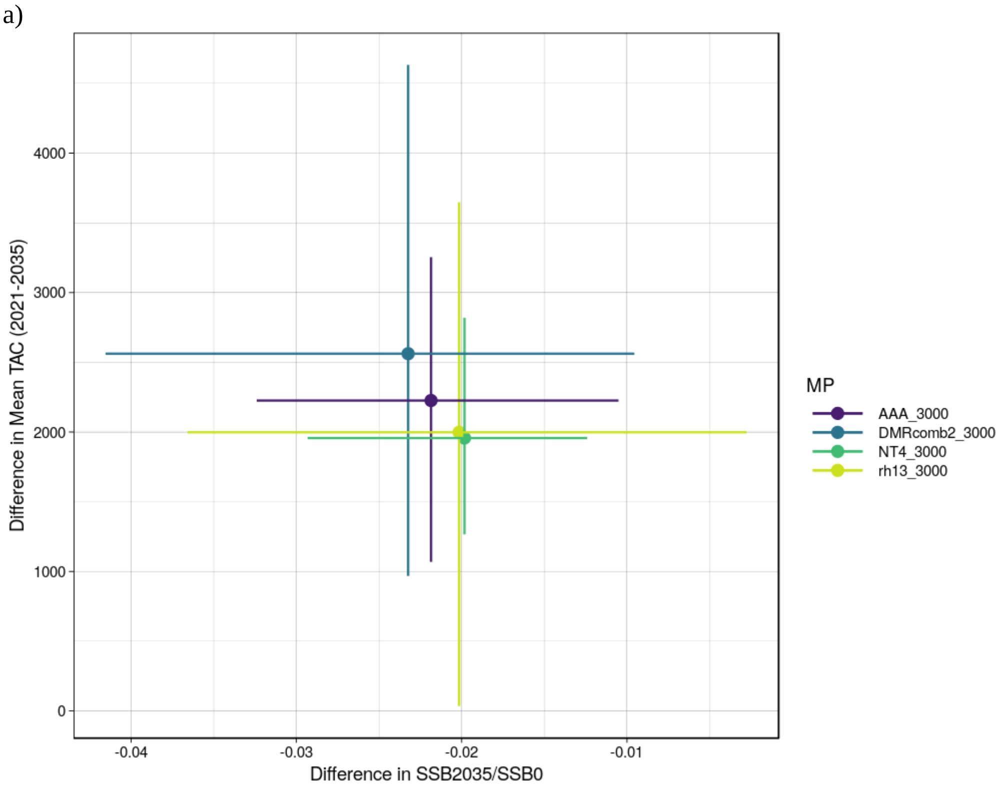
129. The probability of having initial increases in TACs for the first two TAC changes followed by a decrease (P2up/1down) is low for the reference set of models. This probability is higher for robustness tests that involve low future recruitment, but that is a desirable feature in those tests in order to reduce stock risks in the face of persistent low recruitment.

Effects of alternative tuning levels

130. The two tuning levels examined lead to markedly different TAC trajectories. The more conservative 35% SSB_0 at 2040 tuning results in median cumulative TACs over 2021-2035 that are about 30,000-36,000 tonnes lower than obtained under the 30% at 2035 tuning. The lower TACs for the 35% at 2040 tuning result in an increase of around 2% in median SSB_{2035}/SSB_0 (from 30% achieved with the 2035 tuning to 32%) (Figure 1).



a)



b)

Figure 1: Comparison of SSB_{2035}/SSB_0 versus mean TAC from 2021-2035 for the two tuning levels evaluated: 30% by 2035 and 35% by 2040 (top, a). The lower figure (b) shows the difference in mean TAC and SSB ratios between tuning levels.

Effects of alternative maximum TAC change

131. The Strategy and Fisheries Management Working Group requested that the impact of alternative levels of maximum TAC change (to the default 3000t used

in the Bali Procedure) on CMP performance be investigated. Maximum TAC changes of 2000t and 4000t were investigated for the reference set for the 30% by 2035 tuning. For the 2000t case, average TACs for 2021–2035 are around 500t less than for the 3000t default level, but were very similar for the 4000t level. As might be expected, a larger maximum TAC change results in larger AAV, but AAV does not exceed 13% even for 4000t. Minimum SSB levels are very similar across the three levels of maximum TAC change. There is an increase in P(2up/1down) as the maximum change is increased, but it never exceeds 0.05 for the levels examined (Fig. A10[2]/18).

132. An additional run was completed at ESC 24 for the cpuew0 and reclow5 robustness tests to investigate whether the relatively small impacts on performance for the reference set were similar for a robustness test that required greater responsiveness (Fig. A10[2]/18). The results for this run are similar to those for the reference set: an increase in AAV and decrease in the P(2up/1down) between 2000t, 3000t and 4000t maximum TAC change. There was a slightly better performance in SSB risk for the 4000t level, while the SSB risk for 2000t change was slightly higher as it reduces the responsiveness of the CMP to negative signals. The group recommended no alteration to the current maximum TAC change of 3000t.

Tuning to 30%SSB$_0$ at 2035

133. Performance for the 30%SSB$_0$ at 2035 tuning level (Figs. A9[2]/1-6) is characterised first for the reference set of models and then for robustness tests.

134. Median TAC trends for the reference set of models show qualitative differences. While all four CMPs result in increasing median TACs over the tuning period, the magnitude of the overall increases and the trends differ. The RH13 and NT4 CMPs show earlier increases and then flatter median TACs before 2035 while DMRM and AAA have steadier increases throughout the tuning period (Figure 3). The overall increase in median TAC up to 2035 is largest for DMRM (Figure 2). Notwithstanding, the differences in median catch for the initial nine years (2021-2029) are negligible.

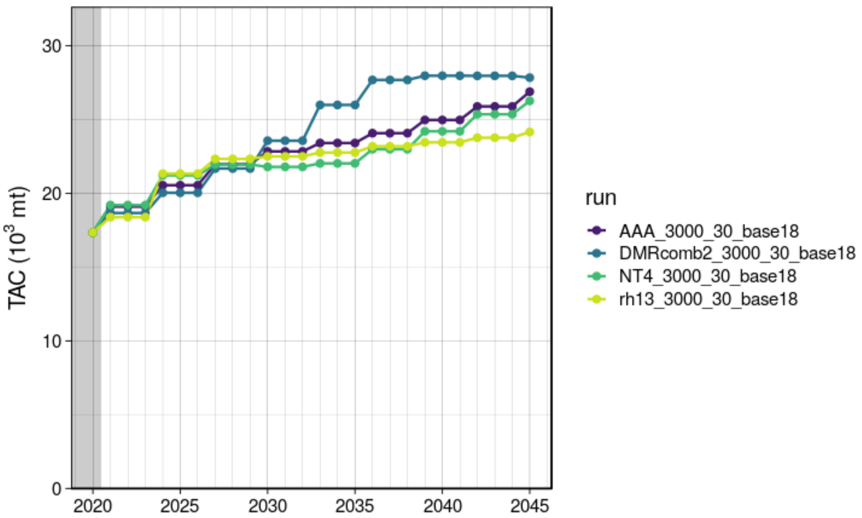


Figure 2: The median total allowable catch (TAC) for the 30% by 2035 tuning level for the four main MPs.

[2] References to “Fig. A10/##” are references to the numbered (##) figure in Attachment 10.

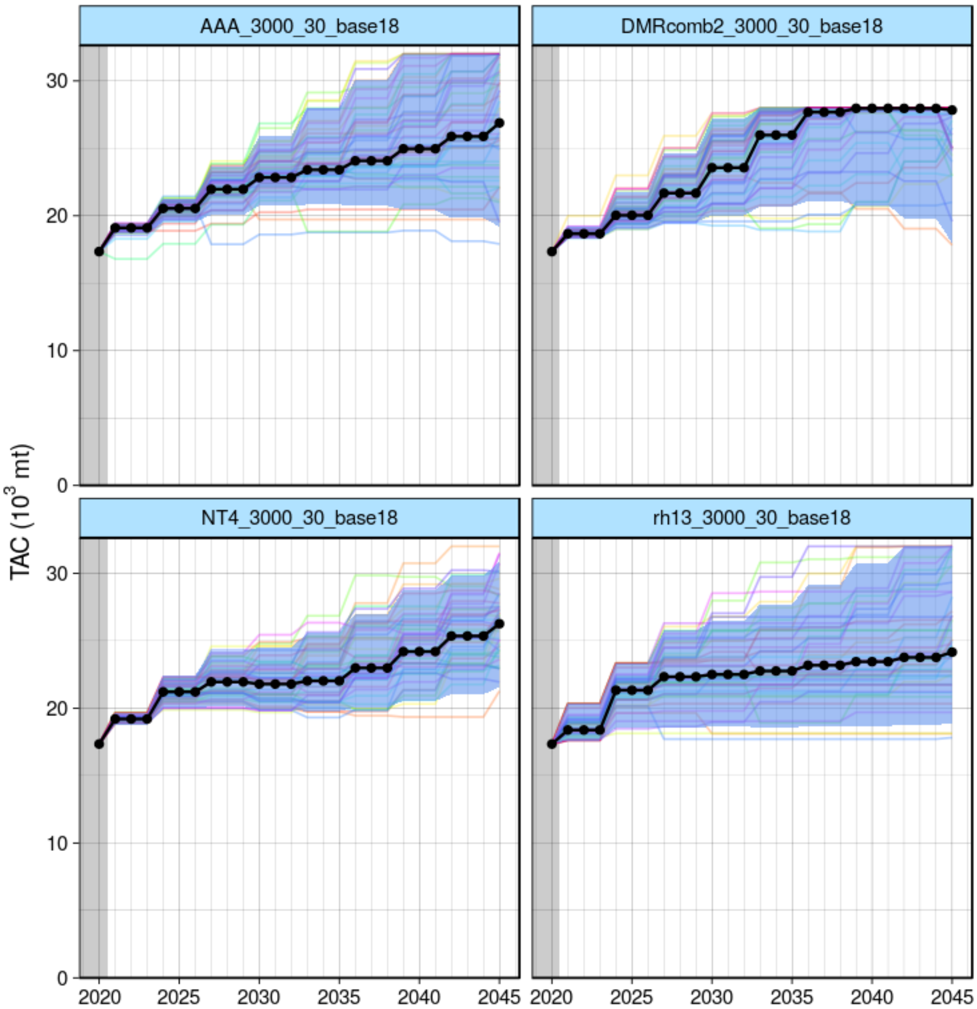


Figure 3: The TAC for the selected MPs showing 50 individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading).

135. At OMMP10, procedure RH12 had initial increases in TAC followed by a drop (high P(2up/1down)), as described in Circular #2019/045 sent to the EC requesting feedback on preferences. That problem was subsequently fixed in RH13 and P(2up/1down) for RH13 is now lowest of the CMPs for the reference set (base18).

136. The four CMPs showed similar risk performance under the reference set (Fig. A10^2/5; lower 5th percentile of SSB_{2035}/SSB_0), where all four CMPs were within 0.01 (depletion units) of the best-performing CMP (DMRM; Table 2), which had a lower 5th percentile of SSB_{2035}/SSB_0 equal to 0.187. It is noted that absolute differences in depletion units need to be considered in relation to the best value (e.g., an absolute difference of 0.01 is of less importance for a depletion of 0.20 than for a depletion of 0.10).

Table 2: Comparison of SSB risk performance on the lower 5th-percentile of spawning biomass depletion in 2035 (SSB_{2035}/SSB_0) under the reference set of models (base18; top row) and the seven selected robustness tests from OMMP10 **for the 30% SSB_0 by 2035 tuning**. Cell entries are absolute differences from the best-performing CMP in each row indicated by lighter shading with 0.000 entry. The actual best-value is given in the last column to provide an absolute scale.

Test	AAA	DMRM	NT4	RH13	Best value
base18	-0.008	0.000	-0.010	-0.009	**0.187**
as2016	-0.010	-0.002	-0.006	0.000	**0.159**
as2016cpue18	-0.013	-0.004	-0.008	0.000	**0.156**
as2016reclow5	-0.004	-0.008	-0.020	0.000	**0.130**
cpueom75	-0.007	0.000	-0.006	0.000	**0.194**
cpueupq	-0.008	0.000	-0.014	-0.014	**0.161**
cpuew0	-0.025	-0.022	-0.027	0.000	**0.102**
reclow5	0.000	-0.003	-0.018	-0.002	**0.153**

137. NT4 has a narrower probability range on TAC (Fig. A10^2/4), which is good for fishery predictability, but it implies that the rule is less responsive to new information on stock status, as discussed later when describing performance in robustness tests.

138. The four CMPs show more marked differences in long-term performance, beyond 2035. DMRM tends to have a high TAC in 2033-2035, which makes it difficult to achieve further SSB growth thereafter without reducing the TAC. After 2035 the DMRM TACs are frequently constrained by a cap set at 28,000 tonnes, which affects close to half of the trajectories. A noticeable number of TAC trajectories show decreases in the latter period for this CMP while trajectories are generally stable or increasing for RH13, NT4 and AAA (Figure 3). The trend in median SSB after 2035 tend to level off for NT4 and AAA, continue to increase slightly for RH13 and show a slight decrease for DMRM (Figs. A9^2/3 and A9^2/5).

139. As expected, there is more variation in risk performance across robustness tests than under the reference set of models (Table 2). Broadly speaking across most robustness tests, RH13 and DMRM result in lower stock risk (i.e., the lower 5th-percentiles for many SSB_{2035}/SSB_0 distributions are higher than for AAA and NT4; Table 2). The absolute differences in risk in some tests were less than 0.01 but larger in others (range from 0.01 to 0.03). Overall, RH13 is the lowest risk CMP under the robustness trials for this 30% SSB_0 by 2035 tuning.

140. The highest contrasts among procedures occur under the assumption of variable squares CPUE (cpuew0; Table 2, Fig. A10^2/1), a robustness test considered as an extreme (low plausibility) assumption. RH13 has the lowest stock risk under this test. It reduces the magnitude and frequency of the initial TAC increases, resulting in a zero probability of initial TAC increases followed by a decrease (P(2up/1down)=0). The other three CMPs have a high P(2up/1down), equal to 0.152 for DMRM, 0.317 for NT4, and 0.226 for AAA (Fig. A10^2/1).

141. In terms of P(2up/1down), AAA, RH13 and DMRM out-performed NT4 across the different robustness tests. NT4 shows the lowest P(2up/1down) in the low-recruitment test (reclow5), indicating low responsiveness to a future drop in recruitment, and the highest P(2up/1down) in other tests such as as2016,

cpueom75, cpuew0, and as2016cpue18 where a low P(2up/1down) is preferable as indicative of higher robustness (Fig. A10^2/1).

142. None of the CMPs meet the interim rebuilding target under the two most pessimistic tests, namely the variable-squares CPUE (cpuew0) and the low recruitment combined with removal of the 2016 aerial survey (as2016reclow5). NT4 also did not achieve the interim rebuilding target under the low recruitment scenario (reclow5).

Tuning to 35% SSB_0 by 2040

143. The relative performance of the four CMPs under this tuning level has some qualitative differences compared to the previous tuning level.

- Tuning to 35% SSB_0 by 2040 requires more conservative TACs over the 2021-2035 time period, which means there is less flexibility as to when TAC increases can occur. For instance, median TAC trajectories under the reference set are initially more similar across CMPs than in the previous tuning level. Over the long-term, DMRM shows a steady increase in median TAC through the whole evaluation period (Figure 4).
- DMRM exhibits large fishery risk with a non-trivial proportion of TAC trajectories dropping below 15,000 tonnes (Figure 5), while AAA, NT4 and RH13 have a lower probability of TAC decreasing below current levels (see lower 5th percentile of TAC in Figure 5).
- Lower limits on catch trajectories under the reference set result in lower stock risk for DMRM (lower 5th percentile for $SSB_{2035}/SSB_0 = 0.213$) relative to the other three CMPs (lower 5th percentile for SSB_{2035}/SSB_0 in the range 0.194-0.199, Table 3). It is important to highlight that the good stock risk performance of DMRM across all tests comes at the expense of poor fishery performance as noted in the bullet above. This is an important trade-off that needs serious consideration under this tuning.
- Of the other three CMPs, NT4 is riskier overall across robustness tests (lowest 5th percentile SSB_{2035}/SSB_0), followed by AAA, and then by RH13 (Table 3).

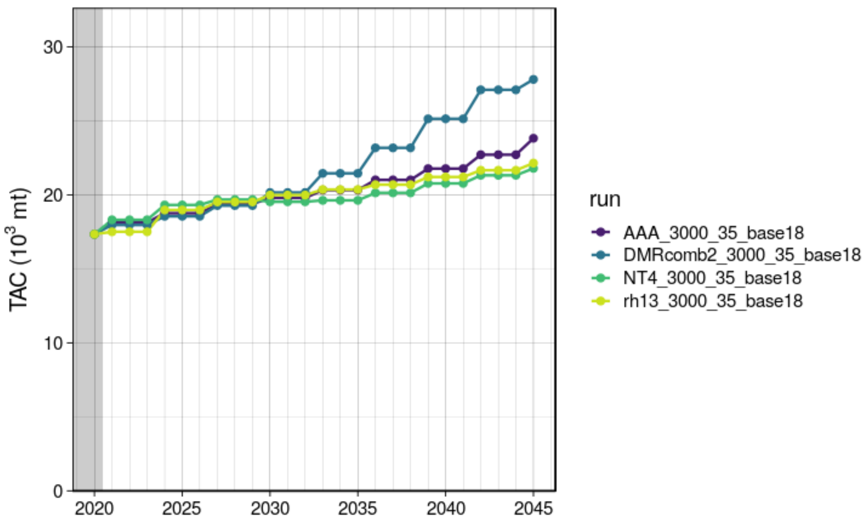


Figure 4: The median total allowable catch (TAC) for the 35% by 2040 tuning level for the four main MPs.

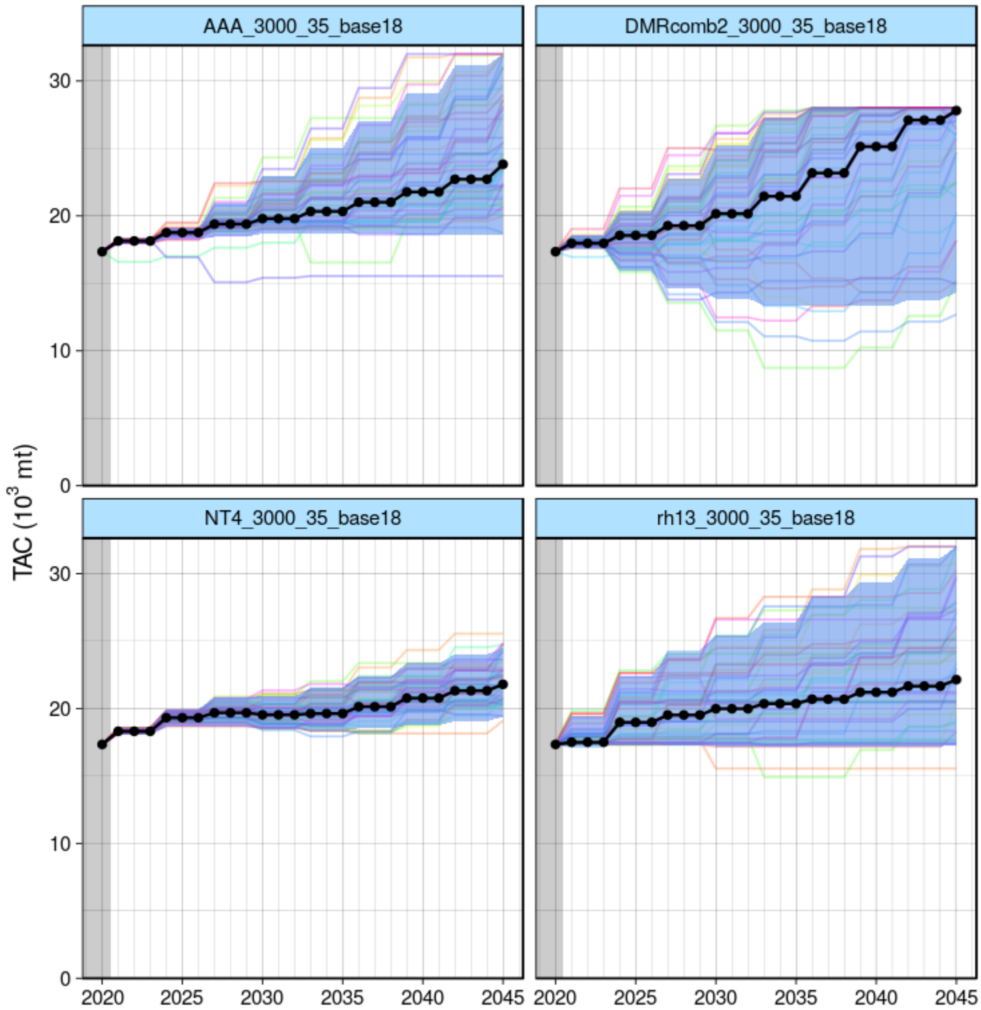


Figure 5: The TAC for the selected runs showing 50 individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading).

Table 3: Comparison of SSB risk performance on the lower 5th-percentile of spawning biomass depletion in 2035 (SSB_{2035}/SSB_0) under the reference set of models (base18; top row) and the seven selected robustness tests from OMMP10 **for the 35% SSB_0 by 2040 tuning**. Cell entries are absolute differences from the best-performing CMP in each row indicated by lighter shading with 0.000. The actual best-value is given in the last column to provide an absolute scale.

Test	AAA	DMRM	NT4	RH13	Best value
base18	-0.014	0.000	-0.019	-0.016	**0.213**
as2016	-0.017	0.000	-0.020	-0.010	**0.186**
as2016cpue18	-0.018	0.000	-0.021	-0.010	**0.181**
as2016reclow5	-0.014	0.000	-0.032	-0.007	**0.154**
cpueom75	-0.016	0.000	-0.019	-0.010	**0.221**
cpueupq	-0.016	0.000	-0.024	-0.022	**0.189**
cpuew0	-0.021	0.000	-0.035	-0.005	**0.114**
reclow5	-0.025	0.000	-0.033	-0.015	**0.182**

13.2 Other considerations for selection of CMPs

144. Japan presented paper CCSBT-ESC/1909/31. From eight years experiences of being involved SBT management using the current MP, we have learned about some operational issues of the MP. This paper summarises these issues to be

considered when selecting CMP(s) in the ESC and recommending it(them) to the EC. The main point is the importance of future data availability of the GT and CKMR.

145. The meeting noted the importance of the issues raised in CCSBT-ESC/1909/31 and the need to address them clearly in the ESCs advice to the EC on MP selection.

146. In terms of missing data it was noted that there were two potential forms of this category. The first is in the event of missing, or unusable, data in any one year, for example due to failure to obtain a gene-tagging or CKMR estimate due to freezer or technical failure in the tissue processing or, in the case of CPUE, an aberrant data point due to operational changes/unusual environmental conditions. Such a situation would trigger exceptional circumstances and the ESC would review the course of action and decide how to proceed. Notwithstanding this, given that most of the CMPs use the data from each of the series as averages, or trends, over a number of years, the impact of a single missing year of data for one of the monitoring series used in the CMPs is likely to be negligible (for example, see the operation of the Bali Procedure for the missing 2015 aerial survey). The second situation is the discontinuation of one of the MP data series, as was the case with the scientific aerial survey in 2017. Again, this would be addressed via the Meta-rules for the MP, and the outcome would depend on the specific circumstances at the time (i.e., when in the rebuilding period, the status of the stock at the time, which series was not available). As all of the CMPs use the gene-tagging and CKMR data, if one of these series was discontinued during the life of the adopted MP, it would trigger exceptional circumstances. Given this, the meeting noted the need to emphasise to the EC the importance of the continuity of the three data series and the funding resources that underpin them.

147. A related aspect of this consideration is the value of information provided by each of the series and the extent to which the cost associated with the fisheries independent data series will increase as the stock rebuilds. Figure 6 illustrates the value of the GT and CKMR data in terms of the greater catches to which they lead for the same perceived risk to the resource. The Figure shows the TAC probability envelopes for two CMPs, each tuned to a median SSB_{2035}/SSB_0 of 30% in 2035. For the first (DMRMcomb2), indices from all data types (CPUE, CKMR and GT) are used throughout the management period to 2050. For the second (DMRMcombcpue1), this same CMP provides the TAC in the first two years when TAC changes are made, but thereafter only CPUE indices are used in an amended formula that is applied to adjust the TAC. The key point of difference in these probability envelopes is that when all these data types are available throughout the period, the lower 5th percentile of the probability envelope continues to increase until 2038. However, without the CKMR and GT indices after the first five years, this envelope starts to decline soon after 2029. The difference between these two lower 5th percentile envelopes can reach about 5000t annually, which points to the considerable extra value in terms of greater catches that are achievable if the CKMR and GT data are available and used in the CMP.

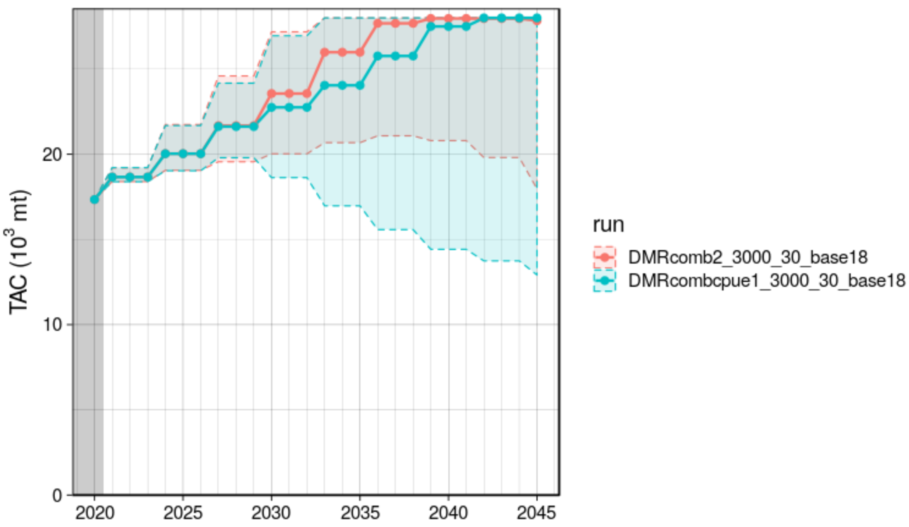


Figure 6: Probability envelopes (90%, i.e. 5th percentile to 95th percentile), together with medians, for the TAC trajectories for two CMPs, each tuned to reach 30% of SSB_0 by 2035 in median terms. The first (DMRcomb2) uses indices from all data types (CPUE, CKMR and GT) throughout the management period to 2050. For the second (DMRcombcpue1), this same CMP provides the TAC in the first two years when TAC changes are made, but thereafter only CPUE indices are used in an amended formula which is applied to adjust the TAC.

148. The final point on this topic raised in CCSBT-ESC/1909/31 is the potential for the costs of gene-tagging and CKMR to continue to increase in order to retain the same level of precision as the stock rebuilds. It was noted that one of the considerations in designing and adopting these genetic methods was their relatively high "value for information" relative to the alternatives and the potential for costs to reduce (in real terms) rather than increase. For example, gene-tagging provides an absolute estimate of abundance for a single year class (2 year-olds), whereas the scientific aerial survey provided a relative abundance index of a composite of year-classes (2-4 year-olds). The former is more informative for both stock assessment and MP implementation. Secondly, the real costs of tissue extraction and genotyping are declining and are likely to continue to do so, given the global investments in biomedical assay technology. It is also important to clarify the difference in overall cost of the two methods that use genetics, which relate to the differences in field logistics and required sample sizes. As described in CCSBT-ESC/1909/10, gene-tagging requires the biopsy and release of 2-year-olds at sea. This requires a minimum of 20 days at sea, which is a substantial fixed cost in the budget for gene-tagging. It also requires sample sizes of the order of 12-15,000 SBT each year. CKMR requires much smaller sample sizes (2000-3000/year) and these are collected from commercial processors (in Port Lincoln and Benoa) (CCSBT-ESC/1909/09), where the logistic costs are shared with existing monitoring programs. As a result, gene-tagging is ~3-4 times the cost of CKMR.

149. The meeting noted that the degree to which the costs of gene-tagging and CKMR would need to increase, or not, as the stock rebuilt would also depend to some extent on how the data are used in MPs and the desired level of performance required by the EC. It was noted that one of the benefits of the implementation of the Bali MP had been that it provided time for the ESC to focus on strategic issues and the necessary tools (OMs and CMPs) to investigate the implications of change in sample sizes, levels of precision and/or availability of different data

series into the future were available to do so, as demonstrated by the example provided in Figure 6. The ESC encouraged Members to give this issue further consideration in the context of potential projects for the next phase of the SRP that could examine these issues comprehensively. The population sizes examined in the gene-tagging design study cover the expected increases estimated in projections and therefore sample sizes would not need to increase.

150. In light of this discussion the ESC emphasised the importance of clarifying the role of the different data sources used in the CMPs in the advice to the EC and noted that isolated missing data for any of the MP input data series would not undermine their performance. The meeting noted that while the focus of CCSBT-ESC/1909/31 and this discussion was the importance of these data series for MP implementation, these data sets are also central to the current accuracy and stability of the OMs and assessment of stock status.

151. Given the importance of these data series for MP implementation and stock assessment, the ESC strongly recommended their continued collection for these purposes.

13.3. Provide advice to the Extended Commission (EC) on a set of CMPs

Recommendation on tuning level

152. In considering the overall performance of CMPs for the two tuning levels, the ESC noted:

- The advice of the SFMWG to test a range of SSB rebuilding targets by 2035 and that, in the case these were not achievable by 2035, to extend the rebuilding period to 2040;
- The trade-off between the level of rebuilding and the cumulative catch associated with the two tuning levels, which involves an increase of 0.02 in SSB/SSB_0 rebuilding under the most conservative tuning (35% SSB_0 at 2040) for a loss of about 30,000-36,000 tonnes in median cumulative TAC over the rebuilding period (Figure 1); and
- The desirability of providing the EC with clear advice on the selection of a new MP.

153. In light of these considerations, the ESC recommends that the 30% by 2035 tuning be used for the selection of a new MP.

Recommendation on CMP for a median SSB tuning target of 0.3 by 2035

154. The ESC commended the cooperative, open nature of the MP development and testing process and that this had resulted in considerable sharing of knowledge, data, code and learning. This had improved the performance of all MPs and the understanding of Members. All CMPs perform well, each with their own positive features, making the task of recommending a MP to the EC a challenging one, because generally the differences in performance statistics were quite small. There are, nevertheless, some important differences, and some CMPs perform better over a wider range of criteria and robustness tests than others.

155. The ESC therefore considered the CMP performance across a broad range of attributes: (i) Risk to SSB; (ii) Short term level of TAC; (iii) Probability of two

increases in TAC followed by a TAC drop; (iv) Longer term performance beyond 2035; (v) Nature of the TAC trajectory; (vi) Certainty of future TACs; and (vii) Incorporation of available data sources.

156. The ESC noted that there are important trade-offs between these attributes, which imply that they need to be considered simultaneously when evaluating the CMPs. The most important trade-off was between the degree of certainty about future catches and the degree of responsiveness and robustness to different uncertainties. The CMPs that resulted in higher certainty about future TACs (narrower range in future catches), also had higher risks to the stock and lower robustness over the range of scenarios evaluated.

157. Based on this consideration of overall performance, which is underpinned by the more detailed analysis summarised in 13.1, the ESC recommends the RH13 CMP to the EC for the 30% SSB_0 by 2035 tuning.

158. The ESC thanked all developers and OMMP technical group for the cooperative and collegial manner in which they had engaged in this important process.

Meta rules, MP specification and implementation schedule

159. The meeting noted that the Meta-rules developed for the Bali Procedure had provided an effective process for managing exceptional circumstances during MP implementation and that their general nature meant that they would remain a suitable basis, with appropriate review, for implementation of the new MP. The Meta-rules for the Bali Procedure are provided in section 4 of Attachment 10 of the report of ESC18. The attachment also fully specifies the elements (data series, analyses, decision rules and operational constraints) and implementation schedule for the Bali Procedure. The ESC agreed that the attachment should be updated to reflect the MP adopted by the EC, which would then be used as the basis for implementation of the new MP.

Agenda Item 14. Update of the Scientific Research Plan

160. The ESC proposed to review and revise the Scientific Research Program (SRP) plan for 2021-2025 by ESC 25. The proposed process involves individual Members providing, where appropriate: (i) a cursory performance review of the 2014-2018 SRP; (ii) proposed revisions to overarching research activities for both on-going scientific monitoring and longer-term strategic research; (iii) proposing general research themes under each overarching research activity; (iv) establishing, during the intersessional period, discussions and collaborations on research activities; and (v) delivering draft SRPs in working papers submitted to ESC 25.

161. The ESC proposed that time be allocated in OMMP 11 to review and discuss draft SRPs developed by Members.

162. It was noted that expanding the scope of OMMP 11 to consider the SRP would have budgetary implications because the ESC Chair as well as the Independent Advisory Panel should all attend the meeting.

163. The ESC encouraged all Members to be involved in the review and update of the SRP by submitting papers on this topic and participating at the meetings.

Agenda Item 15. Requirements for Data Exchange in 2020

164. The Secretariat presented paper CCSBT-ESC/1909/06. The requirements for the 2020 data exchange were discussed and agreed in the margins of the meeting. These requirements were endorsed by the ESC and are provided in **Attachment 11**.

Agenda Item 16. Research Mortality Allowance

165. CSIRO presented the relevant component of paper CCSBT-ESC/1909/10 on the gene-tagging juvenile abundance monitoring program. For the 2020 tagging component of the program, a research mortality allowance (RMA) of 2.0t was requested. Less than 0.5t of mortalities occurred in each previous year of the program. The 2t allowance will provide a buffer in case of unexpected conditions that result in an increase in mortalities.

166. Japan presented paper CCSBT-ESC/1909/32 on RMA utilisation during 2018/19 and an RMA usage application for 2019/20. During 2018/19, 236.3kg of RMA was used out of an allocation of 1t. For 2019/20, 1.1t of RMA was requested, this being:

- 0.1t for a trolling survey of age-0 SBT off northwest Australia; and
- 1.0t for a trolling survey of age-1 SBT off southwest Australia.

167. The ESC endorsed the above requests for RMA.

Agenda Item 17. Workplan, Timetable and Research Budget for 2020 (and beyond)

17.1. Overview, time schedule and budgetary implications of proposed 2020 research activities and implications of Scientific Research Program for the work plan and budget

168. The ESC's three-year workplan for 2020 to 2022 is provided at **Attachment 12**.

169. Resources required for the ESC's three-year workplan are provided at **Attachment 13**.

170. It was noted that the expanded scope of the June 2020 OMMP meeting to include consideration of the SRP will have a budgetary implication as the ESC Chair will need to attend in addition to the full advisory panel and consultant.

171. Similarly, the agreed expansion of sampling for the Close-kin work by 1,100 samples per year will add between $28,000 and $29,000 per year to the budget for 2020-2022.

17.2. Timing, length and structure of next meeting

172. The tentative date for the next ESC meeting is from 31 August to 5 September 2020, in Tokyo, Japan. There will not be a 1-day informal OMMP meeting prior to the 2020 ESC.

173. In addition, a five-day intersessional OMMP meeting is planned to be held in Seattle, USA during late June 2020. The specific dates for this meeting will be organised by the Executive Secretary in consultation with Member scientists and the Panel after the October 2020 annual meeting as per standard practice.

Agenda Item 18. Other Matters

South Atlantic Bluefin catches

174. The meeting discussed the possible species composition of high catches of bluefin tuna in the South Atlantic in the 1960s. A pulse of high catches (ranging up to 8777t) of bluefin tuna took place primarily in the 1960s in the South Atlantic, as recorded in ICCAT's database and is known as the "Brazilian catches". The meeting noted that the weights of the individual bluefin tuna caught ranged from 200 – 350 kg (though information on this was limited). Allocation of this catch to the western or to the eastern population of Atlantic bluefin tuna has considerable impact on the outcome of the assessment of the western population. However, a hypothesis has also been tabled that these catches may have comprised SBT. The meeting discussed this hypothesis and concluded that while it is possible that SBT could be found in small numbers in this area, the size of the fish are well above the known size range of SBT and therefore it is more likely the fish were Atlantic bluefin tuna.

ABNJ

175. Marine Areas Beyond National Jurisdiction (ABNJ) are those areas of ocean for which no one nation has sole responsibility for management. The five-year Common Oceans ABNJ Tuna Project is funded by the Global Environment Facility (GEF) with the Food and Agriculture Organisation of the United Nations (FAO) as the implementing agency. This project harnesses the efforts of a large and diverse array of partners, including the five tuna Regional Fisheries Management Organisations (RFMOs), governments, inter-governmental organisations, non-governmental organisations and private sector. The project aims to achieve responsible, efficient and sustainable tuna production and biodiversity conservation in the ABNJ. The meeting was informed that the current phase of the project is coming to an end and the next phase is about to begin. It was noted there may be opportunities for Members to access funds, as part of the second phase, for specific projects going forward.

IUCN

176. Southern bluefin tuna are currently classified by IUCN as Critically Endangered. Correspondence from IUCN indicates that the assessment conducted in 2009 that led to that classification is due for review in 2019. It is understood that that review will be conducted by the IUCN SSC Tuna and Billfish Specialist Group.

177. Given the wide impact that the outcome of a Red List assessment review may have, the meeting considered it essential that it be based on the best information available. Towards that end, the meeting requested the Secretariat to write to the IUCN in the near future to offer assistance in the form of information such as data, quantitative analyses (e.g. stock assessment reports) and technical advice relating to SBT to aid this review process.

Agenda Item 19. Adoption of Meeting Report

178. The report was adopted.

Agenda Item 20. Close of meeting

179. The meeting closed at 14:55 on 7 September 2019.

List of Attachments

Attachments

1	List of Participants
2	Agenda
3	List of Documents
4	Global Reported Catch by Flag
5	Statement by New Zealand regarding the Farm and Market Issues
6	Statement by Japan
7	Recent trends in all indicators of the SBT stock
8	Fits to abundance indices for 2019 reconditioned operating models and estimated trends in SSB and recruitment
9	Report on Biology, Stock Status and Management of Southern Bluefin Tuna: 2019
10	CMP Comparisons
11	Data Exchange Requirements for 2020
12	ESC Workplan for 2020-2022
13	Resources required from the CCSBT for the ESC’s three-year Workplan

Attachment 1

List of Participants
Extended Scientific Committee Meeting
of the Twenty Fourth Meeting of the Scientific Committee

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
CHAIR								
Kevin	STOKES	Dr			NEW ZEALAND			kevin@stokes.net.nz
SCIENTIFIC ADVISORY PANEL								
Ana	PARMA	Dr		Centro Nacional Patagonico	Pueto Madryn, Chubut Argentina	54 2965 451024	54 2965 451543	parma@cenpat.edu.ar
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
Sean	COX	Dr	Professor and Director	School of Resource and Environmental Management, Simon Fraser University	8888 University Drive Burnaby, B.C. V5A 1S6, Canada	1 778 782 5778		spcox@sfu.ca
CONSULTANT								
Darcy	WEBBER	Dr	Fisheries Scientist	Quantifish	72 Haukore Street, Hairini, Tauranga 3112, New Zealand	64 21 0233 0163		darcy@quantifish.co.nz
EXPERTS FOR DISCUSSION ON FARM AND MARKET ANALYSIS								
Shelley	CLARKE	Dr		Sasama Consulting	Shizuoka, Japan	81 90 8550 5978	81 547 54 0275	scc@sasama.info
Ana	GORDOA EZQUERRA	Dr		Dpto. Ecología Marina, Centro de Estudios Avanzados de Blanes (CEAB-CSIC)	Acc. Cala St. Frances 14. 17300 Blanes. Girona. Spain	34 666094459		gordoa@ceab.csic.es

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
MEMBERS								
AUSTRALIA								
Bertie	HENNECKE	Dr	Assistant Secretary	Department of Agriculture & Water Resources	GPO Box 858, Canberra ACT 2601 Australia	61 2 6272 4277		bertie.hennecke@agriculture.gov.au
Heather	PATTERSON	Dr	Scientist	Department of Agriculture & Water Resources	GPO Box 858, Canberra ACT 2601 Australia	61 2 6272 4612		heather.patterson@agriculture.gov.au
Campbell	DAVIES	Dr	Senior Research Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 2 6232 5044		Campbell.Davies@csiro.au
Ann	PREECE	Ms	Fisheries Scientist	CSIRO Marine and Atmospheric Research	GPO Box 1538, Hobart, Tasmania 7001, Australia	61 3 6232 5336		Ann.Preece@csiro.au
Rich	HILLARY	Dr	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	0419 840 299		austuna@bigpond.com
FISHING ENTITY OF TAIWAN								
Ching-Ping	LU	Dr	Assistant Professor	National Taiwan Ocean University	2 Pei-Ning Road, Keelung 20224, Taiwan	886 2 2462 2192 ext 5035	886 2 2463 3920	michellecplu@gmail.com
INDONESIA								
Zulkarnaen	FAHMI	Mr	Director	Research Institute for Tuna Fisheries	Jl. Mertasari 140, Sidakarya Denpasar, Bali - Indonesia	62 361 726201	62 361 8497447	fahmi.p4ksi@gmail.com
Satya	MARDI	Mr	Analyst	Directorate of Fish Resources Management	Jl. Medan Merdeka Timur 16 , Jakarta - Indonesia	62 21 3519070 (ext 1002)	62 21 3543008	satyamardi18@gmail.com

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
JAPAN								
Tomoyuki	ITOH	Dr	Group Chief	National Research Institute of Far Seas Fisheries	5-7-1 Orido, Shimizu, Shizuoka 424-8633, Japan	81 54 336 6000	81 543 35 9642	itou@fra.affrc.go.jp
Norio	TAKAHASHI	Dr	Senior Scientist	National Research Institute of Far Seas Fisheries	2-12-4 Fukuura, Yokohama, Kanagawa 236-8648, Japan	81 45 788 7501	81 45 788 5004	norio@fra.affrc.go.jp
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	Dr	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
Melissa	JACOBS	Ms		University of Cape Town	Dept Mathematics and Applied Mathematics, University of Cape Town, Rondebosch 7700	27 21 650 3655		JCBMEL009@myuct.ac.za
Yuki	MORITA	Mr	Deputy Director	Fisheries Agency of JAPAN	1-2-1 Kasumigaseki, Chiyoda-city, Tokyo	81 3 3591 1086		yuki_morita470@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
Nozomu	MIURA	Mr	Deputy Director	Japan Tuna Fisheries Cooperative Association	31-1, Eitai 2 Chome, Koto-ku, Tokyo 135-0034, Japan	81 3 5646 2382	81 3 5646 2652	miura@japantuna.or.jp
Rory	LAING	Mr	Student	University of Cape Town	58 Moss Street, Newlands, Cape Town,7700	27 78 041 3929		LNGROR001@myuct.ac.za

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
NEW ZEALAND								
Pamela	MACE	Dr.	Principle Advisor Fisheries Science	Fisheries New Zealand	PO Box 2526, Wellington 6140	0064 4 819 4266		pamela.mace@mpi.govt.nz
Dominic	VALLIÈRES	Mr.	Highly Migratory Species Manager	Fisheries New Zealand	PO Box 2526, Wellington 6140	0064 4 819 4654		dominic.vallieres@mpi.govt.nz
REPUBLIC OF KOREA								
Doo Nam	KIM	Dr.	Scientist	National Institute of Fisheries Science	216, Gijanghaean-ro, Gijang-eup, Gijang-gun, Busan, Rep. of Korea	82-51-720-2330	82-51-720-2337	doonam@korea.kr
Sung Il	LEE	Dr.	Scientist	National Institute of Fisheries Science	216, Gijanghaean-ro, Gijang-eup, Gijang-gun, Busan, Rep. of Korea	82-51-720-2331	82-51-720-2337	k.sungillee@gmail.com
SOUTH AFRICA								
Kim	PROCHAZKA	Dr	Acting Chief Director of Research	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			kim.prochazka@gmail.com
Saasa	PHEEHA	Mr	Acting Chief Director: Marine Resources Management	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000	27 214 023 037		saasap@daff.gov.za
Qayiso	MKETSU	Mr	Deputy Director Management Large Pelagic Fisheries	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000	27 214 023 037		QayisoMK@daff.gov.za
Sven	KERWATH	Dr	Specialist Scientist Finfish	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000	27 214 023 017		SvenK@daff.gov.za
Henning	WINKER	Dr	Scientist: Large Pelagic Fisheries	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000	27 214 023 515		HenningW@daff.gov.za

First name	Last name	Title	Position	Organisation	Postal address	Tel	Fax	Email
Vuyiseka	SIWUNDLA	Ms	Personal Assistant	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			vuyisekaS@daff.gov.za
Aphiwe	NONKENEZA	Mr	Senior Administrative Officer	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			AphiweN@daff.gov.za
Melissa	MEYER	Ms	Research Technician	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			MelissaM@daff.gov.za
Rabelani	NESAMVUNI	Ms	Intern	Department of Agriculture, Forestry & Fisheries	Foretrust Building, Martin Hammerschlag Way, Foreshore, Cape Town, 8000			RabelaniN@daff.gov.za
INTERPRETERS								
Kumi	KOIKE	Ms						
Yoko	YAMAKAGE	Ms						
Kaori	ASAKI	Ms						
CCSBT SECRETARIAT								
Robert	KENNEDY	Mr	Executive Secretary		PO Box 37, Deakin West ACT 2600 AUSTRALIA	61 2 6282 8396	61 2 6282 8407	rkennedy@ccsbt.org
Akira	SOMA	Mr	Deputy Executive Secretary		PO Box 37, Deakin West ACT 2600 AUSTRALIA	61 2 6282 8396	61 2 6282 8407	asoma@ccsbt.org
Colin	MILLAR	Mr	Database Manager		PO Box 37, Deakin West ACT 2600 AUSTRALIA	61 2 6282 8396	61 2 6282 8407	CMillar@ccsbt.org

Attachment 2

Agenda
Extended Scientific Committee for the Twenty Fourth Meeting of the Scientific Committee

Cape Town, South Africa
2 - 7 September 2019

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 CCSBT Maturity Workshop**

6. **Report from the Ecologically Related Species Working Group (ERSWG) meeting**

7. **Report from the Tenth Operating Model and Management Procedure (OMMP) Technical Meeting**

8. **Develop methodology for analysis of farming and market data**

9. **Review of results of the Scientific Research Plan and other inter-sessional scientific activities**
   9.1. Results of scientific activities
   9.2. Updated analysis of SBT catch by non-Members

10. **Evaluation of Fisheries Indicators**

11. **SBT stock status**
    11.1. Evaluation of meta-rules and exceptional circumstances
    11.2. Summary of the SBT stock status

12. **SBT Management Advice**

13. **Development of new MP**
    13.1. Review Candidate Management Procedures (CMPs)
    13.2. Provide advice to the Extended Commission (EC) on a set of CMPs

14. Update of the Scientific Research Plan

15. Requirements for Data Exchange in 2020

16. Research Mortality Allowance

17. Workplan, Timetable and Research Budget for 2020 (and beyond)

17.1. Overview, time schedule and budgetary implications of proposed 2020 research activities and implications of Scientific Research Plan for the work plan and budget

17.2. Timing, length and structure of next meeting

18. Other Matters

19. Adoption of Meeting Report

20. Close of Meeting

Attachment 3

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

(CCSBT-ESC/1909/)

1. Provisional Agenda
2. List of Participants
3. List of Documents
4. (Secretariat) Secretariat review of catches (ESC agenda item 4.2)
5. (Secretariat) Report from the Thirteenth Meeting of the Ecologically Related Species Working Group (ESC Agenda item 6)
6. (Secretariat) Data Exchange (Rev.1) (ESC agenda item 15)
7. (Maturity Workshop Chair) Chair’s report on the CCSBT Maturity Workshop (ESC Agenda item 5)
8. (CCSBT) Update on the SBT close-kin tissue sampling, processing, and kin finding (ESC Agenda item 9.1)
9. (CCSBT) Update on the length and age distribution of southern bluefin tuna (SBT) in the Indonesian longline catch (ESC Agenda item 9.1)
10. (CCSBT) Report on the gene- tagging juvenile abundance monitoring program: 2016- 2019 (ESC Agenda item 9.1)
11. (CCSBT) Update on SBT direct ageing using vertebrae, providing information on age classes targeted for gene tagging (ESC Agenda item 9.1)
12. (Australia) Preparation of Australia’s southern bluefin tuna catch and effort data submission for 2019 (ESC Agenda item 4.1)
13. (Australia) Fishery indicators for the southern bluefin tuna stock 2018–19 (ESC Agenda item 10)
14. (Australia) Meta-rules: consideration of exceptional circumstances in 2019 and meta-rules for the new MP (ESC Agenda item 11.1)
15. (Australia) A candidate MP that uses only fishery independent data (ESC Agenda item 13.1)
16. (Australia) Performance of a revised candidate MP using all 3 input data sources (ESC Agenda item 13.1)
17. (Australia) Updates to the SBT OM (ESC Agenda item 13.1)
18. ~~(Australia) SRP review and planning (ESC Agenda item 14)~~
19. (Japan) Report of Japanese scientific observer activities for southern bluefin tuna fishery in 2018 (ESC Agenda item 4)

20. (Japan) Update of estimation for the unaccounted catch mortality in Australian SBT farming in the 2018 fishing season (ESC Agenda item 8)
21. (Japan) Monitoring of Southern Bluefin Tuna trading in the Japanese domestic markets: 2019 update (ESC Agenda item 8)
22. (Japan) Proposal of new monitoring method for the uncertainty of Australian southern bluefin tuna catch used for farming (ESC Agenda item 8)
23. (Japan) Approach to the verification of reported catch of southern bluefin tuna by all CCSBT member countries using the market and Catch Document Scheme data (ESC Agenda item 8)
24. (Japan) Activities of southern bluefin tuna otolith collection and age estimation and analysis of the age data by Japan in 2018 (ESC Agenda item 9.1)
25. (Japan) Report of the piston-line tolling monitoring survey for the age-1 southern bluefin tuna recruitment index in 2018/2019 (ESC Agenda item 9.1)
26. (Japan) Trolling indices for age-1 southern bluefin tuna: update of the piston line index and the grid type trolling index (ESC Agenda item 9.1)
27. (Japan) Summary of Fisheries Indicators of Southern Bluefin Tuna Stock in 2019 (ESC Agenda item 10)
28. (Japan) A Check of Operating Model Predictions from the Viewpoint of the Management Procedure Implementation in 2019 (ESC Agenda item 11.1)
29. (Japan) Final improvement and performance evaluation of a candidate management procedure (“NT4”) for southern bluefin tuna (ESC Agenda item 13.1)
30. (Japan) Simple target-based CMPs for southern bluefin tuna (ESC Agenda item 13.1)
31. (Japan) Operational issues to be considered for MP selection (ESC Agenda item 13.2)
32. (Japan) Report of the 2017/2018 RMA utilization and application for the 2019/2020 RMA (ESC Agenda item 16)
33. (New Zealand) Estimates of SBT catch by CCSBT non-cooperating non-member states between 2007 and 2017 (ESC Agenda item 9.2)
34. (Taiwan) Preparation of Taiwan’s Southern bluefin tuna catch and effort data submission for 2019 (ESC Agenda item 4.1)
35. (Taiwan) Updated analysis of size and age composition of the SBT caught by Taiwanese longliners in 2017 and the preliminary ageing data in 2018 (ESC Agenda item 9)
36. (Taiwan) Updated analysis for gonad samples of southern bluefin tuna collected by Taiwanese scientific observer program (Rev.1) (ESC Agenda item 9)

37. (Taiwan) CPUE standardization for southern bluefin tuna caught by Taiwanese longline fishery for 2002-2018 (Rev.1) (ESC Agenda item 10)
38. (Indonesia) Preliminary Investigation of SBT catches in spawning area from Indonesia fleets (ESC Agenda item 9.1)
39. (Korea) Data exploration and CPUE standardization for the Korean southern bluefin tuna longline fishery (1996-2018) (ESC Agenda item 10)
40. (Korea) Korean SBT otolith and ovary collection activities in 2018 (ESC Agenda item 9.1)
41. (Korea) Korean research activities for ovary samples of southern bluefin tuna collected by scientific observer program (ESC Agenda item 9.1)
42. (Indonesia) Study of the Reproductive Activity of SBT Caught in Indonesian Tuna Fisheries (Rev.1) (ESC Agenda item 9.1)
43. (Farming Expert) External Advice to improve the verification of reported weights and for identifying the extent of unaccounted mortalities (ESC Agenda item 8)
44. (Market Expert) Reconciling Japan market Data and catch data for SBT (ESC Agenda item 8)

(CCSBT- ESC/1909/BGD)

1. (Australia) Measuring congruence between electronic monitoring and logbook data in Australian Commonwealth longline and gillnet fisheries (*Previously* CCSBT-ERS/1905/13) (ESC Agenda item 9.1)
2. (Australia) Changes in logbook reporting by commercial fishers following the implementation of electronic monitoring in Australian Commonwealth fisheries (*Previously* CCSBT-ERS/1905/14) (ESC Agenda item 9.1)
3. (New Zealand and Australia) Updated estimates of southern bluefin tuna catch by CCSBT non-member states (*Previously* CCSBT-ESC/1609/BGD 02) (ESC Agenda item 9.2)
4. (Japan) Change in operation pattern of Japanese southern bluefin tuna longliners in the 2018 fishing season (*Previously* CCSBT-OMMP/1906/08) (ESC Agenda item 4.1)
5. (Japan) Update of the core vessel data and CPUE for southern bluefin tuna in 2019 (*Previously* CCSBT-OMMP/1906/09) (ESC Agenda item 9.1)
6. (Japan) Further improvement and performance evaluation of a candidate management procedure ("NT4") for southern bluefin tuna (*Previously* CCSBT-OMMP/1906/10) (ESC Agenda item 13.1)
7. (Japan) Further improvement and performance evaluation of a candidate management procedure for southern bluefin tuna for DMM series (*Previously* CCSBT-OMMP/1906/11) (ESC Agenda item 13.1)

8. (Japan) Independent review of Australian SBT farming operations anomalies - CONFIDENTIAL (*Previously* CCSBT/0607/12) (ESC Agenda item 8)
9. (Japan) Follow-up analysis on age composition of southern bluefin tuna used for farming in 2007 (*Previously* CCSBT-ESC/0909/29) (ESC Agenda item 8)
10. (Japan) Analysis of age composition of southern bluefin tuna used for farming in 2008 (*Previously* CCSBT-ESC/0909/30) (ESC Agenda item 8)
11. (Japan) Analysis of age composition of southern bluefin tuna used for farming in 2009 (*Previously* CCSBT-ESC/1009/21) (ESC Agenda item 8)
12. (Japan) Analysis of age composition and catch amount of southern bluefin tuna used for farming in 2010 (*Previously* CCSBT-ESC/1107/26) (ESC Agenda item 8)
13. (Japan) Analyses on age composition, growth and catch amount of southern bluefin tuna used for farming in 2007-2010 (*Previously* CCSBT-ESC/1208/30) (ESC Agenda item 8)
14. (Japan) Unaccounted catch mortality in Australian SBT farming fishery between 2001 and 2013 estimated from information of TIS and CDS (*Previously* CCSBT-OMMP/1406/09 (Rev.1)) (ESC Agenda item 8)
15. (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 8)
16. (Japan) Update of estimation for the unaccounted catch mortality in Australian SBT farming in 2016 (*Previously* CCSBT-ESC/1609/24) (ESC Agenda item 8)
17. (Japan) Update of estimation for the unaccounted catch mortality in Australian SBT farming in the 2016 fishing season – CONFIDENTIAL (*Previously* CCSBT-OMMP/1706/10) (ESC Agenda item 8)
18. (Japan) Further responses from Japan to the Australian responses on farming papers in Attachment 6 of ESC 21 Report (*Previously* CCSBT-ESC/1708/20) (ESC Agenda item 8)
19. (Japan) Update of estimation for the unaccounted catch mortality in Australian SBT farming in the 2017 fishing season (*Previously* CCSBT-ESC/1809/28) (ESC Agenda item 8)
20. (Japan) Summary points of farm uncertainty relevant to size and total catch estimation of southern bluefin tuna, based on Attachment 7 in Report of ESC22 (*Previously* CCSBT-ESC/1809/29) (ESC Agenda item 8)
21. (Japan) Independent review of Japanese southern bluefin tuna market anomalies - CONFIDENTIAL (*Previously* CCSBT/0607/11) (ESC Agenda item 8)

22. (Japan) Report of the time lag of southern bluefin tuna caught by Japanese longline between catching and selling at Fish Market (*Previously* CCSBT-ESC/0809/40) (ESC Agenda item 8)
23. (Japan) Japan's preliminary analysis on CCSBT-CC/0810/12 - CONFIDENTIAL (*Previously* CCSBT-CC/0810/21) (ESC Agenda item 8)
24. (Japan) Monitoring on Japanese markets (*Previously* CCSBT-CC/0910/12) (ESC Agenda item 8)
25. (Japan) Monitoring on Japanese markets - CONFIDENTIAL (*Previously* CCSBT-ESC/0909/41) (ESC Agenda item 8)
26. (Japan) Monitoring on Japanese domestic markets: 2010 update - CONFIDENTIAL (*Previously* CCSBT-ESC/1009/32 (Rev)) (ESC Agenda item 8)
27. (Japan) Monitoring on Japanese domestic markets: 2011 update - CONFIDENTIAL (*Previously* CCSBT-ESC/1107/27) (ESC Agenda item 8)
28. (Japan) Monitoring on Japanese domestic markets: 2012 update - CONFIDENTIAL (*Previously* CCSBT-ESC/1208/31) (ESC Agenda item 8)
29. (Japan) Monitoring on Japanese domestic markets: 2014 update – CONFIDENTIAL (*Previously* CCSBT-CC/1410/19) (ESC Agenda item 8)
30. (Japan) A review of southern bluefin tuna trade and monitoring research in Japanese domestic markets - CONFIDENTIAL (*Previously* CCSBT-CC/1510/19) (ESC Agenda item 8)
31. (Japan) Monitoring of southern bluefin tuna trading in the Japanese domestic markets: 2015 update - CONFIDENTIAL (*Previously* CCSBT-CC/1510/Info04) (ESC Agenda item 8)
32. (Japan) Monitoring of southern bluefin tuna trading in the Japanese domestic markets: 2016 update - CONFIDENTIAL (*Previously* CCSBT-CC/1610/22) (ESC Agenda item 8)
33. (Japan) Monitoring of southern bluefin tuna trading in the Japanese domestic markets: 2017 update - CONFIDENTIAL (*Previously* CCSBT-ESC/1708/25) (ESC Agenda item 8)
34. (Japan) Monitoring of southern bluefin tuna trading in the Japanese domestic markets: 2018 update - CONFIDENTIAL (*Previously* CCSBT-ESC/1809/30) (ESC Agenda item 8)
35. (Japan) Summary points of market monitoring of southern bluefin tuna, based on Attachment 7 in report if ESC22 - CONFIDENTIAL (*Previously* CCSBT-ESC/1809/31) (ESC Agenda item 8)

(CCSBT-ESC/1909/SBT Fisheries -)

Australia	Australia’s 2017–18 southern bluefin tuna fishing season
European Union	Annual Review of National SBT Fisheries for the Extended Scientific Committee
Indonesia	Indonesia Southern Bluefin Tuna Fisheries: A National Report Year 2018
Japan	Review of Japanese Southern Bluefin Tuna Fisheries in 2018
Korea	2019 Annual National Report of Korean SBT Fishery
New Zealand	New Zealand Annual Report to the Extended Scientific Committee (Rev.1)
South Africa	South African National Report to the Extended Scientific Committee of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), 2019
Taiwan	Review of Taiwan SBT Fishery of 2017/2018 (Rev.1)

(CCSBT-ESC/1909/Info)

1. (Australia) Progress on the Australian recreational catch survey (ESC agenda item 9.1)
2. (Australia) Evaluation of SBT direct ageing requirements for the Australian longline fishery (ESC agenda item 9.1)
3. (Indonesia) Update on tuna monitoring program in Benoa port, Bali, Indonesia 2018 (ESC Agenda item 4.1)
4. (Indonesia) Indonesian scientific observer program activities in Indian Ocean from 2015-2018 (ESC Agenda item 4.1)

(CCSBT-ESC/1909/Rep)

1. Report of the Tenth Operating Model and Management Procedure Technical Meeting (June 2019)
2. Report of the Thirteenth Meeting of the Ecologically Related Species Working Group (May 2019)
3. Report of the Twenty Fifth Annual Meeting of the Commission (October 2018)
4. Report of the Twenty Third Meeting of the Scientific Committee (September 2018)
5. Report of the Ninth Operating Model and Management Procedure Technical Meeting (June 2018)
6. Report of the Fifth Meeting of the Strategy and Fisheries Management Working Group (March 2018)

7. Report of the Twenty Fourth Annual Meeting of the Commission (October 2017)
8. Report of the Twenty Second Meeting of the Scientific Committee (August – September 2017)
9. Report of the Eighth Operating Model and Management Procedure Technical Meeting (June 2017)
10. Report of the Special Meeting of the Commission (August 2011)
11. Report of the Sixteenth Meeting of the Scientific Committee (July 2011)

Global Reported Catch By Flag

Reviews of southern bluefin tuna data presented to a special meeting of the Commission in 2006 suggested that the catches may have been substanstially under-reported over the previous 10 to 20 years. The data presented here do not include estimates for this unreported catch.
All shaded figures are subject to change as they are either preliminary figures or they have yet to be finalised.
Blank cells are unknown catch (many would be zero).

	Australia			New Zealand									
Calendar Year	Commercial	Amateur	Japan	Commercial	Amateur	Korea	Taiwan	Philippines	Indonesia	South Africa	European Union	Miscellaneous	Research & Other
1952	264		565	0		0	0	0	0	0	0	0	
1953	509		3,890	0		0	0	0	0	0	0	0	
1954	424		2,447	0		0	0	0	0	0	0	0	
1955	322		1,964	0		0	0	0	0	0	0	0	
1956	964		9,603	0		0	0	0	0	0	0	0	
1957	1,264		22,908	0		0	0	0	0	0	0	0	
1958	2,322		12,462	0		0	0	0	0	0	0	0	
1959	2,486		61,892	0		0	0	0	0	0	0	0	
1960	3,545		75,826	0		0	0	0	0	0	0	0	
1961	3,678		77,927	0		0	0	0	0	145	0	0	
1962	4,636		40,397	0		0	0	0	0	724	0	0	
1963	6,199		59,724	0		0	0	0	0	398	0	0	
1964	6,832		42,838	0		0	0	0	0	197	0	0	
1965	6,876		40,689	0		0	0	0	0	2	0	0	
1966	8,008		39,644	0		0	0	0	0	4	0	0	
1967	6,357		59,281	0		0	0	0	0	5	0	0	
1968	8,737		49,657	0		0	0	0	0	0	0	0	
1969	8,679		49,769	0		0	80	0	0	0	0	0	
1970	7,097		40,929	0		0	130	0	0	0	0	0	
1971	6,969		38,149	0		0	30	0	0	0	0	0	
1972	12,397		39,458	0		0	70	0	0	0	0	0	
1973	9,890		31,225	0		0	90	0	0	0	0	0	
1974	12,672		34,005	0		0	100	0	0	0	0	0	
1975	8,833		24,134	0		0	15	0	0	0	0	0	
1976	8,383		34,099	0		0	15	0	12	0	0	0	
1977	12,569		29,600	0		0	5	0	4	0	0	0	
1978	12,190		23,632	0		0	80	0	6	0	0	0	
1979	10,783		27,828	0		0	53	0	5	0	0	4	
1980	11,195		33,653	130		0	64	0	5	0	0	7	
1981	16,843		27,981	173		0	92	0	1	0	0	14	
1982	21,501		20,789	305		0	182	0	2	0	0	9	
1983	17,695		24,881	132		0	161	0	5	0	0	7	
1984	13,411		23,328	93		0	244	0	11	0	0	3	
1985	12,589		20,396	94		0	241	0	3	0	0	2	
1986	12,531		15,182	82		0	514	0	7	0	0	3	
1987	10,821		13,964	59		0	710	0	14	0	0	7	
1988	10,591		11,422	94		0	856	0	180	0	0	2	
1989	6,118		9,222	437		0	1,395	0	568	0	0	103	
1990	4,586		7,056	529		0	1,177	0	517	0	0	4	
1991	4,489		6,477	164		246	1,460	0	759	0	0	97	
1992	5,248		6,121	279		41	1,222	0	1,232	0	0	73	
1993	5,373		6,318	217		92	958	0	1,370	0	0	15	
1994	4,700		6,063	277		137	1,020	0	904	0	0	54	
1995	4,508		5,867	436		365	1,431	0	829	0	0	201	296
1996	5,128		6,392	139		1,320	1,467	0	1,614	0	0	295	290
1997	5,316		5,588	334		1,424	872	0	2,210	0	0	333	
1998	4,897		7,500	337		1,796	1,446	5	1,324	1	0	471	
1999	5,552		7,554	461		1,462	1,513	80	2,504	1	0	403	
2000	5,257		6,000	380		1,135	1,448	17	1,203	4	0	31	
2001	4,853		6,674	358		845	1,580	43	1,632	1	0	41	4
2002	4,711		6,192	450		746	1,137	82	1,701	18	0	203	17
2003	5,827		5,770	390		254	1,128	68	565	15	3	40	17
2004	5,062		5,846	393		131	1,298	80	633	19	23	2	17
2005	5,244		7,855	264		38	941	53	1,726	29	0	0	5
2006	5,635		4,207	238		150	846	50	598	15	3	0	5
2007	4,813		2,840	379	4	521	841	46	1,077	58	18	0	3
2008	5,033		2,952	319	0	1,134	913	45	926	44	14	4	10
2009	5,108		2,659	419	0	1,117	921	47	641	40	2	0	0

	Australia			New Zealand									
Calendar Year	Commercial	Amateur	Japan	Commercial	Amateur	Korea	Taiwan	Philippines	Indonesia	South Africa	European Union	Miscellaneous	Research & Other
2010	4,200		2,223	501	0	867	1,208	43	636	54	11	0	0
2011	4,200		2,518	547	0	705	533	45	842	64	3	0	1
2012	4,503		2,528	776	0	922	494	46	910	110	4	0	0
2013	4,902		2,694	756	1	918	1,004	46	1,383	67	0	0	0
2014	4,559		3,371	826	0	1,044	944	45	1,063	56	0	0	1
2015	5,824		4,745	922	1	1,051	1,162	0	593	63	0	0	0
2016	5,962		4,721	951	1	1,121	1,023	0	601	64	0	0	2
2017	5,221		4,567	913	21	1,080	1,171	0	835	136	0	0	2
2018	6,401		5,945	1,008	12	1,268	1,220	0	1,087	207	0	0	2

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

Statement by New Zealand regarding the Farm and Market Issues

New Zealand thanked the two independent experts for their work and support to the ESC during the week.

New Zealand also wished to recognise the efforts of Japan in providing material and developing a proposed alternative to the existing market review methodology. New Zealand is encouraged by the constructive conversation had this week in relation to the Japanese market review and looks forward to ongoing dialogue with Japan and other Members on how best to progress the recommendations made at this year's ESC.

In contrast, the work of the Commission is being hampered by the lack of progress made this week towards resolving the issue of uncertainty in the Australian farming operations. We note that the independent expert's conclusions regarding the merits of stereo-video echo the advice previously given by our own scientific advisory panel.

New Zealand has previously stated that we would have difficulties in supporting the adoption of a new MP if we did not witness progress towards resolution of the two issues. This ESC and its inclusion of independent expertise was to provide an opportunity for such progress to be made and, in our view, that opportunity has been squandered in the case of the farming uncertainty.

We are therefore in the regrettable situation where, in spite of multiple assurances by Australia over the years, progress towards stereo-video continues to elude this Commission and consequently New Zealand's previously stated reservations with regards to a new MP very much remain.

Attachment 6

Statement by Japan

It should be stressed that the uncertainty relating to the size of the catches made for the Australian farms was factored into the CMP evaluation exercise, so that the MP recommended for adoption is scientifically quite satisfactory notwithstanding this concern. For this reason, lack of progress in stereo video should not lead to an inability to adopt the new MP.

The issue of uncertainty relating to Australian farming should be resolved without delay, regardless of the adoption of the new MP. In addition, resolving the farming uncertainty issue would strengthen the robustness of MP even further. Therefore, Japan shares New Zealand’s concern and requests Australia’s positive action on this issue.

Recent trends in all indicators of the SBT stock

Indicator	Period	Min.	Max.	2015	2016	2017	2018	2019	12 month trend	Main Ages	NOTES
Scientific aerial survey	1993–2000 2005–17	0.25 (1999)	4.85 (2016)	na	4.85	1.80	–	–	–	2-4	Discontinued
Trolling index (piston line)	1996–2003 2005–06 2006–19	0.00 (2018)	5.09 (2011)	na	3.94	1.71	0.00	0.00	–	1	
Trolling index (grid)	1996–2003 2005–06 2006–19	0.16 (2002)	2.03 (2011)	na	1.79	0.63	0.80	0.49	↓	1	
Gene tagging	2016–17	1.15 (2017)	2.27 (2016)	-	2.27	1.15	-		↓	2	
NZ domestic nominal CPUE	1989–2018	0.000 (1989)	9.18 (2017)	6.17	8.80	9.18	8.60		––	all	
NZ domestic age/size composition (proportion age 0–5 SBT)*	1980–2018	0.001 (1985)	0.48 (2017)	0.07	0.47	0.48	0.33		↓	2-5	Peripheral Area
Indonesian mean size class**	1993–94 to 2014–19	155 (2017)	188 (1994)	160	156	155	162	161	↓	spawners	
Indonesian age composition:** mean age on spawning ground, all SBT	1994–95 to 2013–18	12.5 (2016)	21.7 (1995)	13.8	12.5	13.0	13.6		↑	spawners	
Indonesian age composition:** mean age on spawning ground 20+	1994–95 to 2013–18	21.0 (2016)	25.3 (2004)	22.9	21.0	23.1	23.1		–	Older spawners	
Indonesian age composition:** median age on spawning ground	1994–95 to 2013–18	11.5 (2016, 2017)	21.5 (1994–95; 1996–97; 1998–99)	13.5	11.5	11.5	12.5		↑	spawners	

Indicator	Period	Min.	Max.	2015	2016	2017	2018	12 month trend	Main Ages	Notes
Japanese nominal CPUE, age 4+	1969–2018	1.338 (2006)	22.123 (1965)	5.052	4.210	5.271	6.012	↑	4+	
Japanese standardised CPUE (W0.5, W0.8, Base w0.5, Base w0.8)	1969–2018	2007 (0.259–0.358)	1969 (2.284– 2.697)	0.972–1.509	0.097–1.292	0.926–1.307	0.925–2.269	↑	4+	
Korean nominal CPUE	1991–2018	1.312 (2004)	21.523 (1991)	7.812	5.488	6.552	7.406	↑	4+	Bycatch effects
Korean standardised CPUE (selected data) Area 8	1996-2018	0.39 (2002)	2.45 (2016)	1.09	2.45	–	–	–	4+	
Area 9	1996-2018	0.25 (2005)	3.45 (2015)	3.45	1.54	1.74	2.35	↑		
Korean standardised CPUE (clustered) Area 8	1996-2018	0.43 (2002)	2.28 (2016)	1.03	2.28	–	–	–	4+	
Area 9	1996-2018	0.28 (2005)	3.56 (2015)	3.45	1.54	1.74	2.35	↑		
Taiwanese nominal CPUE, Areas 8+9	1981–2018	<0.001 (1985)	0.956 (1995)	0.920	0.203	0.156	0.217	↑	2+	Bycatch effects
Taiwanese nominal CPUE, Areas 2+14+15	1981–2018	<0.001 (1985)	3.672 (2007)	1.728	2.042	1.588	1.686	↓	2+	Bycatch effects
Taiwanese standardised CPUE (Area E)	2002-2018	0.163 (2004)	1.184 (2012)	0.474	0.771	0.689	0.778	↑	2+	In development
(Area W)	2002-2018	0.186 (2016)	0.913 (2002)	0.343	0.186	0.196	0.224	↑		Bycatch effects
Japanese age comp, age 0–2*	1969–2018	0.004 (1966)	0.192 (1998)	0.002	0.003	0.002	0.006	↑	2	Affected by release/discard
Japanese age comp, age 3*	1969–2018	0.011 (2015)	0.228 (2007)	0.011	0.033	0.044	0.047	↑	3	Affected by release/discards
Japanese age comp, age 4*	1969–2018	0.091 (1967)	0.300 (2010)	0.121	0.071	0.142	0.145	↑	4	
Japanese age comp, age 5*	1969–2018	0.072 (1986)	0.300 (2010)	0.204	0.160	0.126	0.123	↓	5	
Taiwanese age/size comp, age 0–2*	1981–2018	<0.001 (1982)	0.251 (2001)	0.011	0.004	0.002	0.009	↑	Mostly 2	
Taiwanese age/size comp, age 3*	1981–2018	0.024 (1996)	0.349 (2001)	0.116	0.118	0.121	0.123	↑	3	
Taiwanese age/size comp, age 4*	1981–2018	0.027 (1996)	0.502 (1999)	0.208	0.211	0.215	0.218	↑	4	
Taiwanese age/size comp, age 5*	1981–2018	0.075 (1997)	0.371 (2009)	0.213	0.216	0.217	0.219	↑	5	
Australia surface fishery median age composition	1964–2018	age 1 (1979–80)	age 3 (multiple years)	age 2	age 2	age 3	age 3	–	1-4	

Indicator		Period	Min.	Max.	2015	2016	2017	2018	12 month trend	Ages	Notes
Jpn LL standardised CPUE (age 3)	w0.5	1969–2018	0.232 (2003)	3.337 (1972)	0.241	0.426	0.432	0.641	↑	3	Affected by release/discard
	w0.8		0.264 (2003)	3.114 (1972)	0.308	0.568	0.574	0.856			
Jpn LL standardised CPUE (age 4)	w0.5	1969–2018	0.272 (2006)	2.946 (1974)	0.947	0.628	0.951	1.211	↑	4	
	w0.8		0.293 (2006)	2.629 (1974)	1.152	0.845	1.286	1.627			
Jpn LL standardised CPUE (age 5)	w0.5	1969–2018	0.229 (2006)	2.698 (1972)	1.241	1.234	0.887	0.936	↑	5	
	w0.8		0.249 (2006)	2.448 (1972)	1.567	1.585	1.169	1.216			
Jpn LL standardised CPUE (age 6&7)	w0.5	1969–2018	0.184 (2007)	2.486 (1976)	1.198	1.345	1.377	1.085	↓	6-7	
	w0.8		0.209 (2007)	2.239 (1976)	1.571	1.775	1.760	1.379			
Jpn LL standardised CPUE (age8-11)	w0.5	1969–2018	0.272 (2007)	3.805 (1969)	0.941	0.690	0.676	0.887	↑	8-11	
	w0.8		0.287 (1992)	3.378 (1969)	1.263	0.918	0.901	1.154			
Jpn LL standardised CPUE (age 12+)	w0.5	1969–2018	0.447 (2017)	3.365 (1970)	0.551	0.516	0.447	0.556	↑	12+	
	w0.8		0.588 (1997)	2.905 (1970)	0.736	0.691	0.593	0.738			

*derived from size data; ** Indonesian catch not restricted to just the spawning grounds since 2012–13; na = not available

Note that the close kin mark recapture index is not provided in this table as the years for which the index is available do not match the years covered in the table. See the text in agenda item 10 for information on the index.

Fits to abundance indices for the 2019 reconditioned Operating Models and estimated trends in SSB and recruitment.

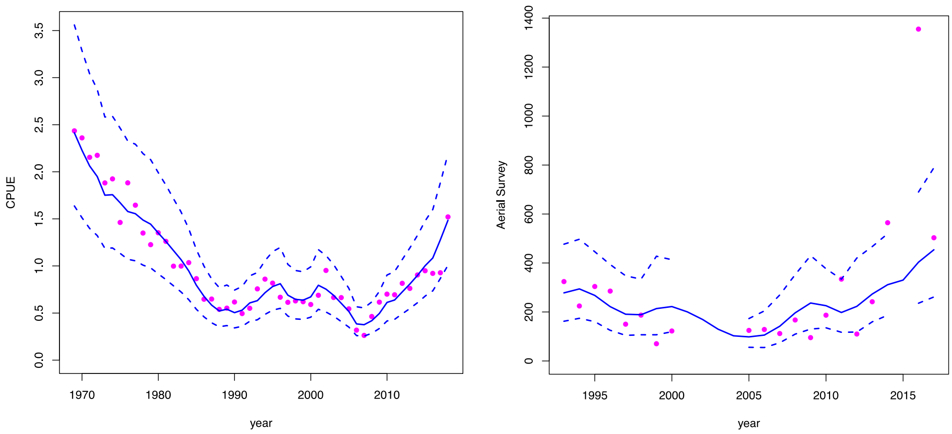


Figure 1: Observed (magenta) and predicted median and 95% CI (blue) for the Japanese longline CPUE (left) and aerial survey (right) indices.

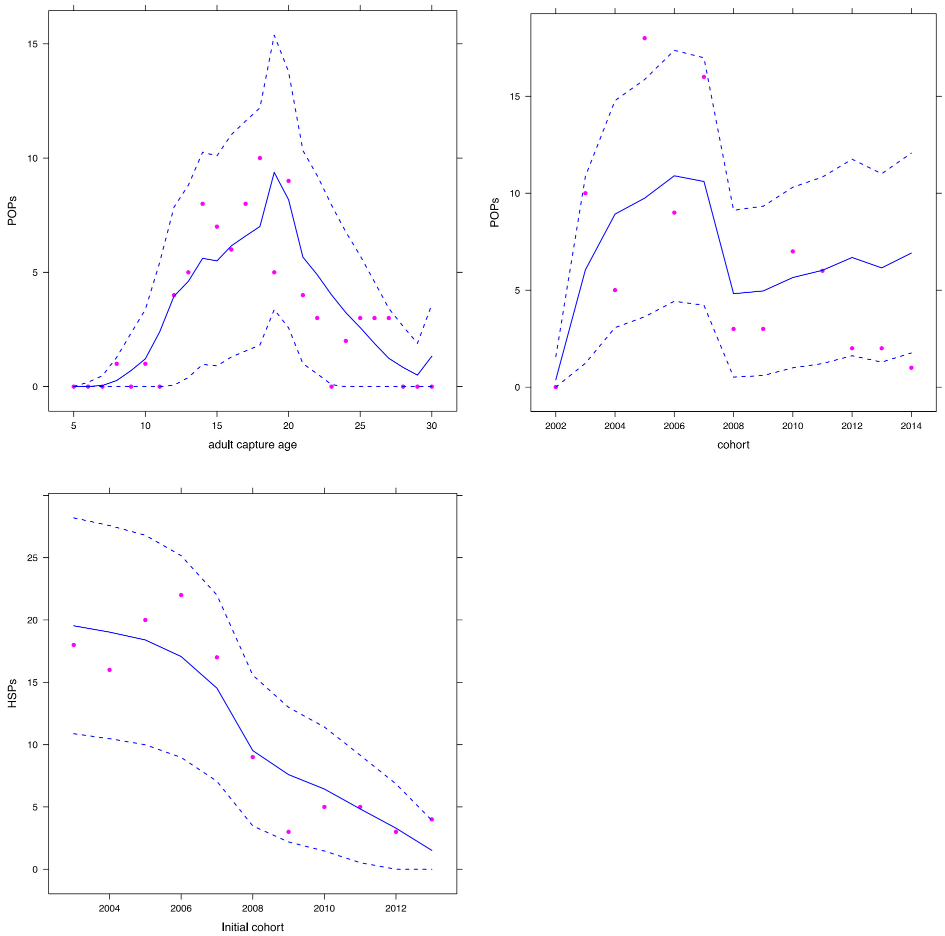


Figure 2: Observed (magenta) and predicted median and 95% CI (blue) for fits to the POP data aggregated to the cohort (top left) and adult capture age (top right) levels, and the HSP data aggregated to the initial comparison cohort level (bottom).

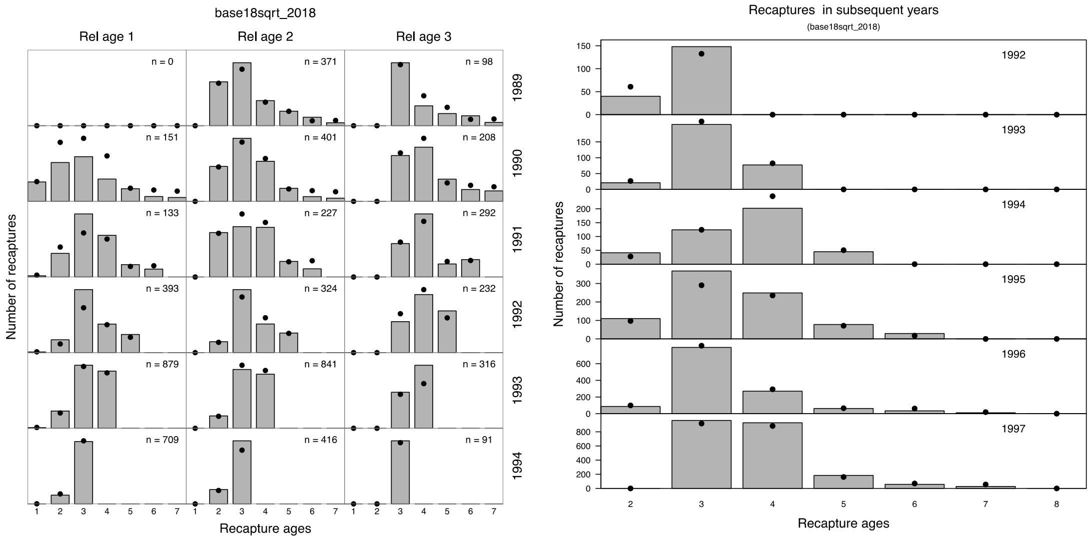


Figure 3: Disaggregated (left) and pooled (right) 1990s tagging data fitting summaries.

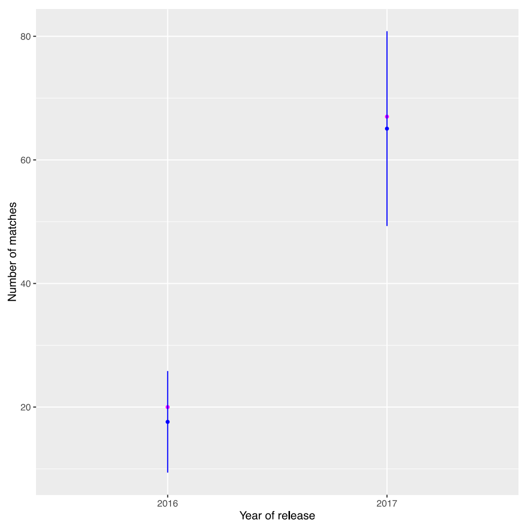


Figure 4: Observed (blue) and predictive median and 95% credible interval (magenta) for the 2016 and 2017 gene tagging recaptures.

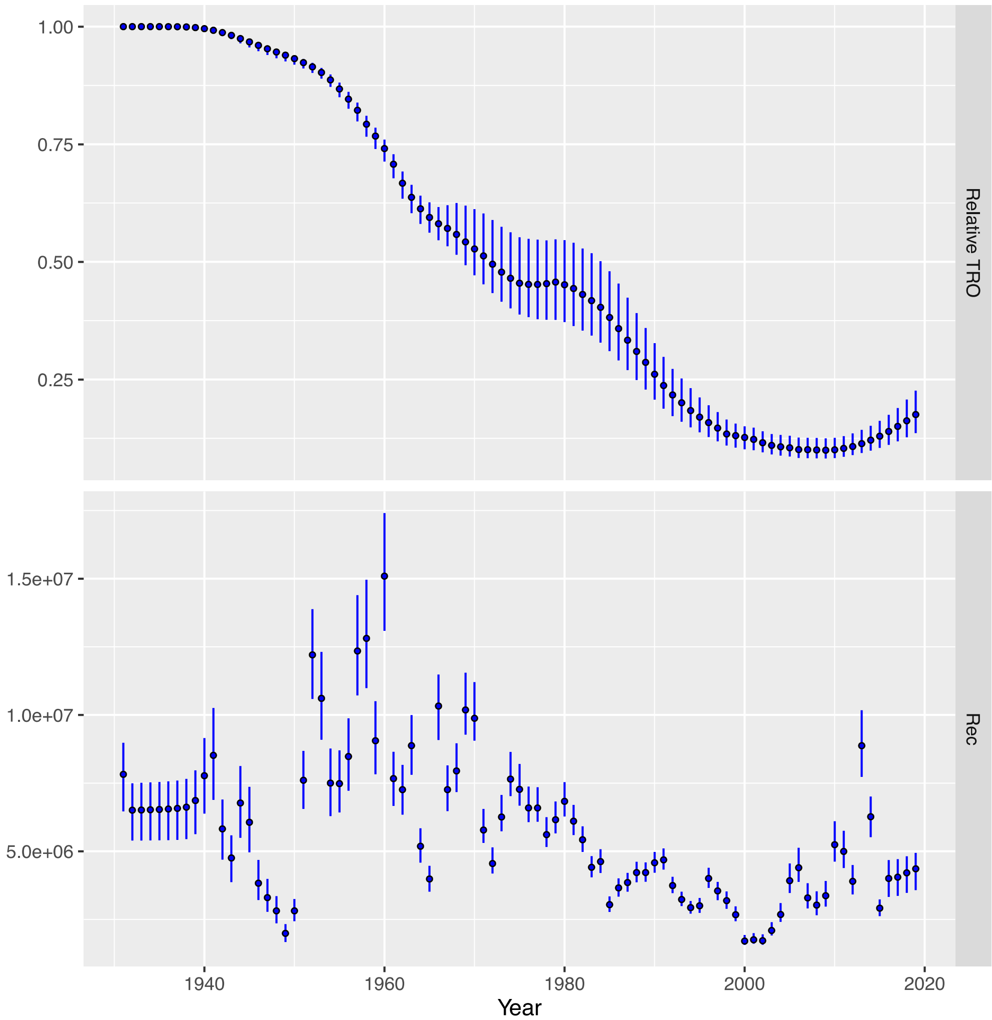


Figure 5: Estimated trend in relative SSB (TRO) and recruitment (age 0) from the 2019 reconditioning of operating models for testing CMPs.

Attachment 9

Report on Biology, Stock Status and Management of Southern Bluefin Tuna: 2019

The CCSBT Extended Scientific Committee (ESC) updated the stock assessment and conducted a review of fisheries indicators in 2017 to provide updated information on the status of the stock. This report updates the description of fisheries and the state of stock as advised in 2019 by the ESC following a review of indicators in 2019. It provides the latest 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 2018 are shown in Figures 1 - 3. Note that 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. 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 - 2018, 77% of the reported catch was taken by longline and 23% 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, 78.7% of the SBT catch has been made in the Indian Ocean, 16.6% in the Pacific Ocean and 4.7% 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 1191t over the past two decades. This variation in catch reflects 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 10,000t, averaging about 18,400t, and the reported Pacific Ocean catch has ranged from about 800t to 19,000t, averaging 5,035t over the same period (although SBT data analyses indicate that these catches may be under-estimated).

3. Summary of Stock Status

The 2017 stock assessment suggested that the SBT spawning biomass is at 13% of its initial biomass as well as below the level that could produce maximum sustainable yield. However, there has been improvement since the 2011 stock assessment which indicated the stock in 2010 was at 5.5% of initial biomass. 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. Work to develop a new management procedure results in an estimate of spawning biomass as 17% of its initial value, with an increase in spawning biomass of 79% since 2009.

A review of indicators in 2019 suggested that recruitment for the most recent year may have been lower than in recent years but that recruitment levels still remain above historic means. There are some consistent positive trends in the age-based longline CPUE estimates across a number of fleets. For the first time, the ESC noted an increased spawning stock biomass as evidenced by a significant increase in the close-kin mark recapture (CKMR) empirical index of spawning stock abundance.

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 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, the TAC for 2015 to 2017 was 14,647 tonnes and the TAC for 2018 to 2020 will be 17,647 tonnes.

The allocations of the TAC to Members and Cooperating Non-Members of the CCSBT from 2015 to 2020 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 (tonnes)

	2015	2016-2017	2018-2020
Japan	4,847	4,737	6,117[1]
Australia	5,665	5,665	6,165
Republic of Korea	1,140	1,140	1,240.5
Fishing Entity of Taiwan	1,140	1,140	1,240.5
New Zealand	1,000	1,000	1,088
Indonesia	750	750	1,023[1]
European Union	10	10	11
South Africa	40	150	450[1]

Current Allocations to Cooperating Non-Members (tonnes)

	2015	2016-2017[2]	2018-2020
Philippines	45	45	0

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:

[1] These figures reflect the voluntary transfers of 21t that Japan is providing to Indonesia and 27t that Japan is providing to South Africa for the 2018 to 2020 quota block. The starting point for Japan, Indonesia and South Africa in considering the allocation from 2021 will be 6165t, 1002t, and 423t respectively.

[2] Ceased 12 October 2017

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

Monitoring of SBT Transhipments

The CCSBT program for monitoring transhipments at sea came into effect on 1 April 2009. The program was revised to include requirements for monitoring transhipments in port 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 entered 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 at 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 2018-20 TAC in 2016 and the outcome of reviews of exceptional circumstances at its 2017, 2018 and 2019 meetings, the ESC recommended that there is no need to revise the EC's 2016 TAC decision regarding the TACs for 2018-20. The recommended annual TAC for 2018-20 was 17,647.4 t.

6. Biological State and Trends

The 2017 stock assessment suggested that the SBT spawning biomass is at 13% of its initial biomass as well as below the level that could produce maximum sustainable yield. However, there has been improvement since the 2011 stock assessment which indicated the stock in 2010 was at 5.5% of initial biomass. 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. Work to develop a new management procedure results in an estimate of spawning biomass as 17% of its initial value, with an increase in spawning biomass of 79% since 2009.

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

SOUTHERN BLUEFIN TUNA SUMMARY FROM ESC in 2017 (global stock)	
Maximum Sustainable Yield	33,036 t (30,000-36,000t)
Reported (2016) Catch	14,445 t
Current (2017) biomass (B10+)	135,171 t (123,429-156,676)
Current depletion (current relative to initial)	
SSB	0.13 (0.11–0.17)
B10+	0.11 (0.09–0.13)
SSB (2017) Relative to SSB_{msy}	0.49 (0.38–0.69)
Fishing Mortality (2017) Relative to F_{msy}	0.50 (0.38–0.66)
Current Management Measures	Effective Catch Limit for Members and Cooperating Non-Members: 14,647t in 2017 and 17,647t per year for the years 2018-2020

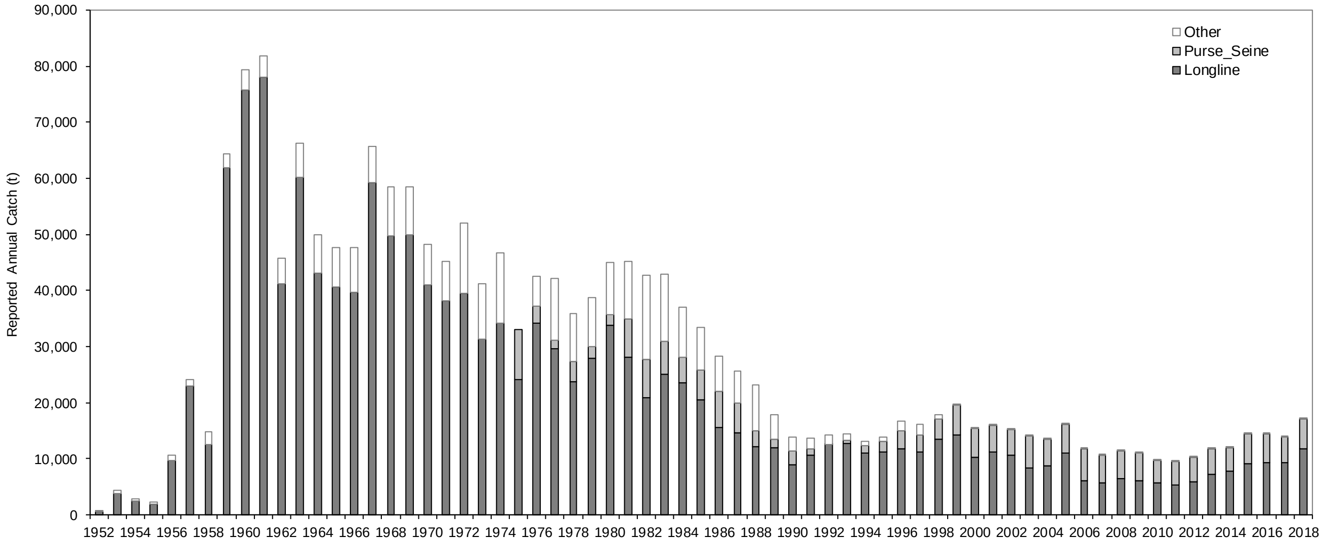


Figure 1: Reported southern bluefin tuna catches by fishing gear, 1952 to 2018. Note: a 2006 review of SBT data indicated that catches over the preceding 10 to 20 years may have been substantially under-reported.

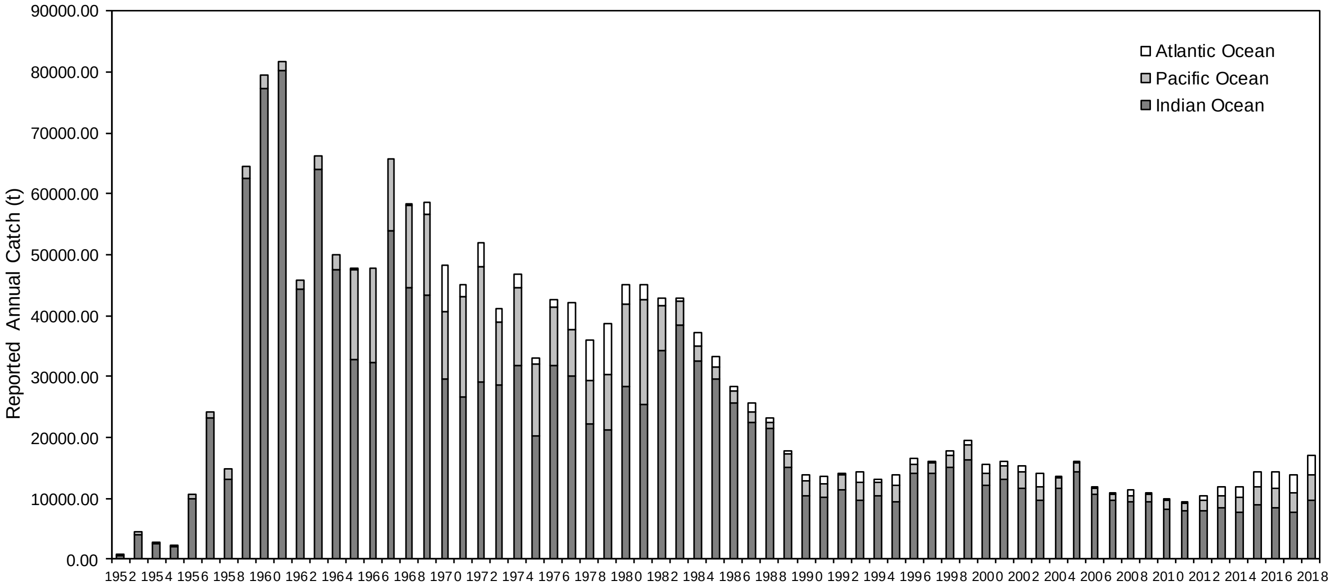


Figure 2: Reported southern bluefin tuna catches by ocean, 1952 to 2018. Note: a 2006 review of SBT data indicated that catches over the preceding 10 to 20 years may have been substantially under-reported.

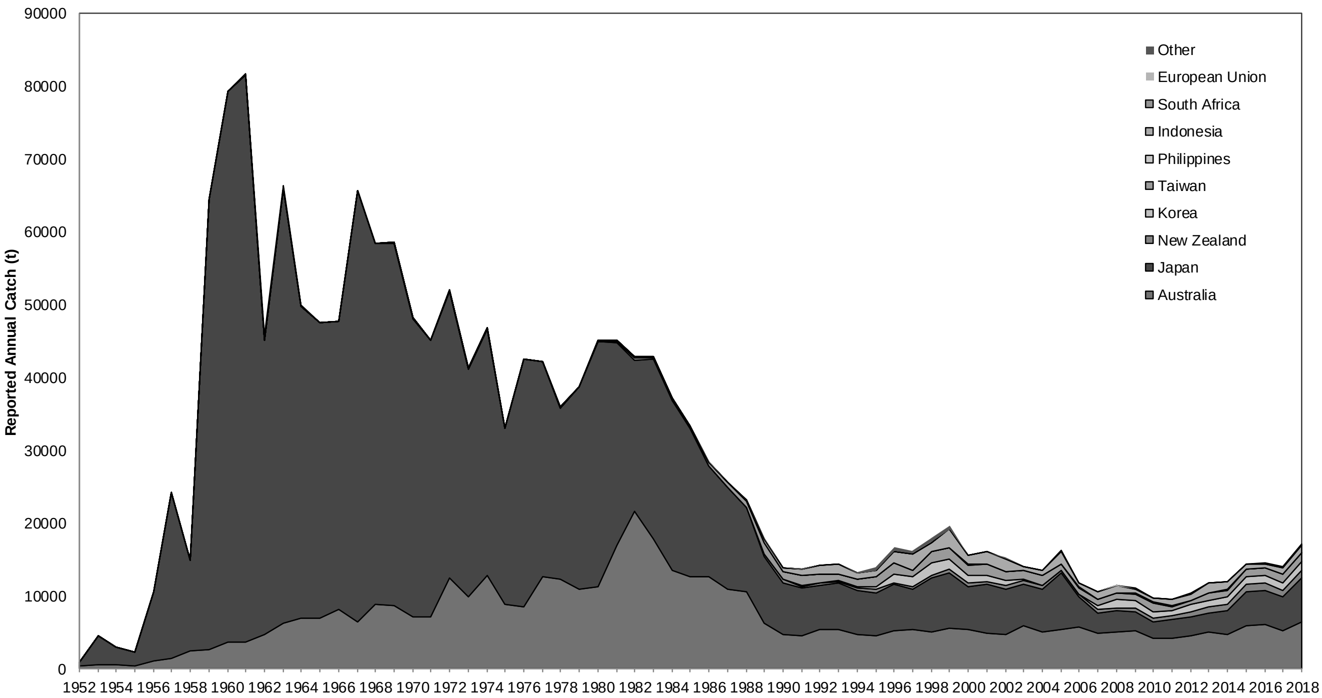


Figure 3: Reported southern bluefin tuna catches by flag, 1952 to 2018. Note: a 2006 review of SBT data indicated that catches over the preceding 10 to 20 years may have been substantially under-reported.

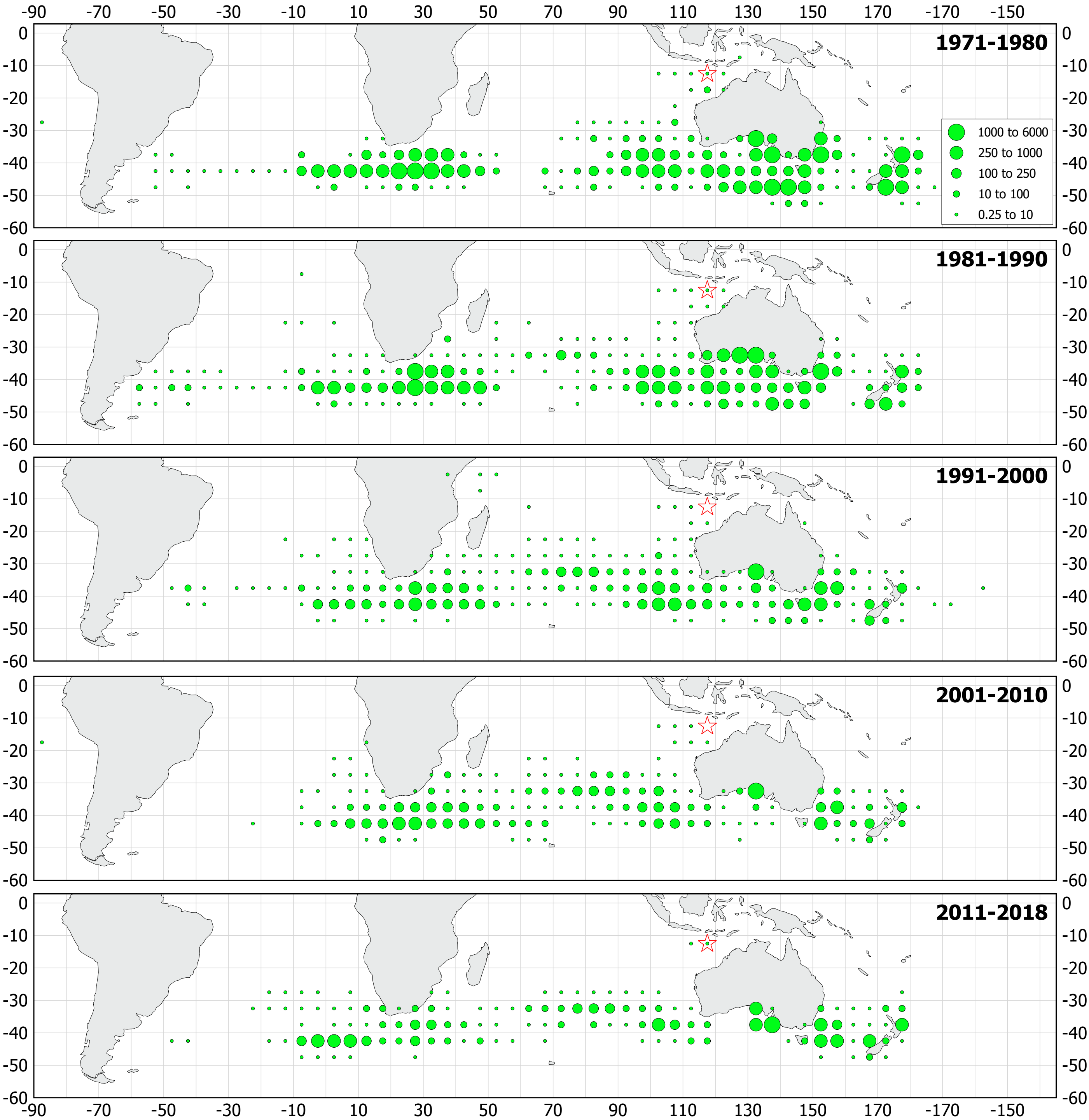


Figure 4: Geographical distribution of average annual reported southern bluefin tuna catches (t) by CCSBT members and cooperating non-members over the periods 1971-1980, 1981-1990, 1991-2000, 2001-2010 and 2011-2018 per 5° block. The area marked with a star is an area of significant catch in the breeding 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.

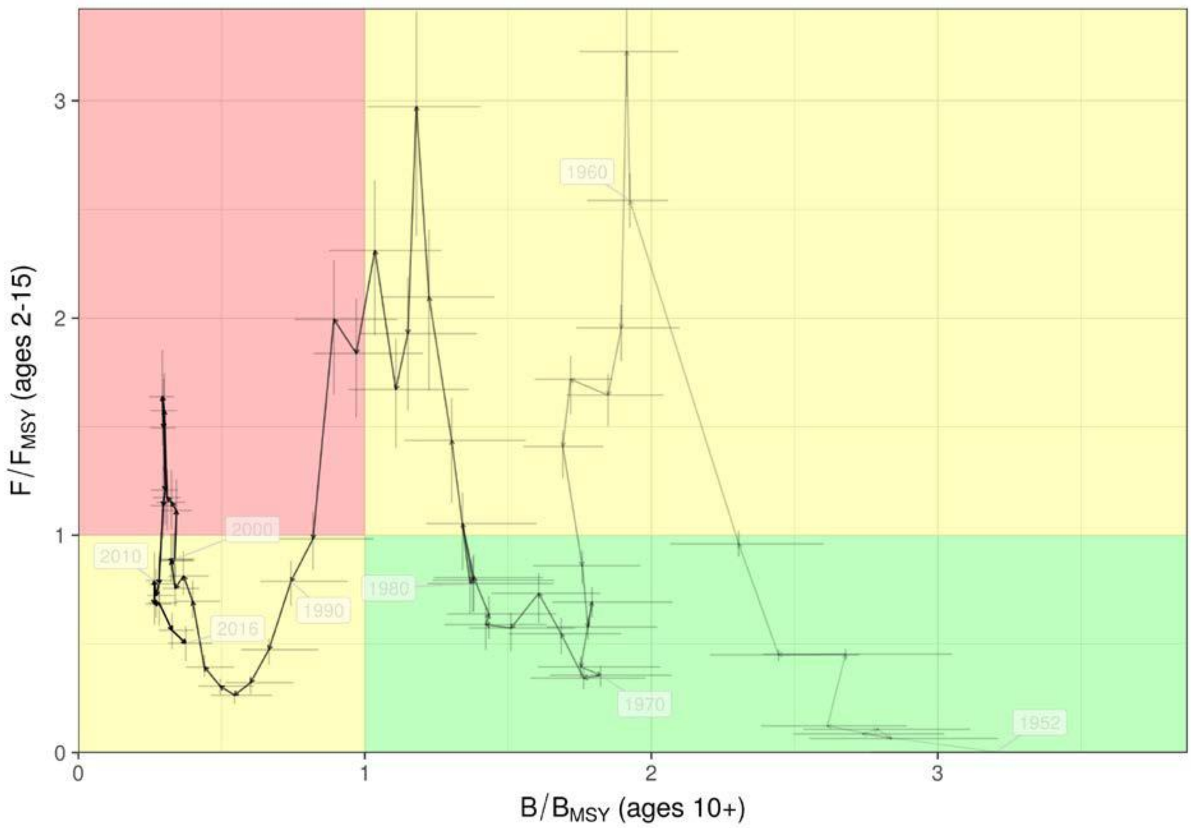


Figure 5. Time trajectory from 1952 to 2016 of median fishing mortality over the F_{msy} (for ages 2-15) versus spawning biomass (B) over B_{msy}. The fishing mortality rates are based on biomass-weighted values and the relative fishery catch composition and mean SBT body weights in each year. Vertical and horizontal lines represent 25th-75th percentiles from the operating model grid.

Attachment 10

CMP Comparisons

This attachment present figures and tables comparing different sensitivities/robustness trials, different tuning levels (30% by 2035 and 35% by 2040), and different maximum TAC changes (2000, 3000, and 4000). A general overview of each of the four main CMPs is provided in the table below.

Table 1: Draft table of CMPs (updated from OMMP10 report).

	RH13	AAA	NT4	DMRM
Type of CMP	Hybrid version of HCR with a model-based log-linear trend in TRO inferred by an age-structured model using genetic data and an empirical-based-staged response to CPUE	Same as RH13 MP but uses CK and GT data only and excludes use of CPUE data	Two-phase (before and after 2035, switch depending on POP index) hybrid version of HCR with log-linear trend in CPUE and safeguard by gene-tagging recruitment index (by gene-tagging)	Sum with differing weights of three CMPs, each tuned for a different data type input
Key references for CMP development	CCSBT-ESC/1909/16	CCSBT-ESC/1809/20, CCSBT-ESC/1909/15	CCSBT-OMMP/1906/10 CCSBT-ESC/1909/29	CCSBT-OMMP/1906/11 CCSBT-ESC/1909/30
How data are used in CMP				
CPUE	An empirical-based-staged response	NA	Slope; gain slow up fast down	Target; gain slow up fast down
CKMR (POP and HSP)	TRO index I_y^{ck}, gain parameter changes smoothly relative to target	TRO (I_y^{ck}) index	Empirical POP, gain param changes depending on biomass relative to target (No HSP)	Pre-specified year-dependent target with a TRO index (I_y^{ck}); gain slow up fast down
Gene Tagging	Limit (recent 5-year average); gain fast down below limit, intermediate range no change, above range, slow increase	Limit (recent 5-year average); gain slow up fast down	Limit (minimum estimated; recent 2-year average); fast down if below limit	Target; gain slow up fast down

Table 2. List of robustness test for MP testing. The selected subset of tests to be conducted prior to the ESC are shaded in grey.

Test name	Code	Conditioning and projection notes	Priority	Code?
lowR10	reclow10	Reduce future recruitment by half during the first n years. For 2018, n was set to 10.	L	
lowR5	reclow5	Reduce future recruitment by half during the first n years. For 2018, n was set to 5.	H	
highR	rechigh	Increase future recruitment by 50% during the first n years. For 2018, n was set to 5.	M	Easy
h=0.55	h55	Check estimation	M	
IS20	fis20	Indonesian selectivity flat from age 20+	M	
Upq2008	cpueupq	CPUE q increased by 25% (permanent in 2008)	H	
Omega75	cpueom75	Power function for biomass-CPUE relationship with power = 0.75	H	
Var sq. CPUE	cpuew0	Variable squares	L	
Const sq. CPUE	cpuew1	Constant squares	L	
S50CPUE	cpues50	50% of LL1 overcatch associated with reported effort	M	
S00CPUE	cpues00	Overcatch had no impact on CPUE	L	
Drop q increase	cpuenocrp	of 0.5% yr-1 in future years – no continuous effort creep	L	Easy
High fut. CPUE CV	cpuehcv	Increase the future CPUE CV to 30% (currently 20%)	M	
	cpue59	Age range from 5-9, check connection between OM and projections…seem to be passed through so ok	M	
Aerial2016	as2016	Remove the 2016 aerial survey data point	H	
	reclow5as2016	Combination of reclow5 and as2016	H	
	reclow5cpuew0	Combination of reclow5 and cpuew0	L	
	as2016cpue18	Remove the 2016 aerial survey data point and 2018 CPUE	H	
	reclow5h55	Combination of reclow5 and h55	M	
q_hsp1	hspq1	Set HSP proportionality coefficient to 1, to be moved to reference set, next year	M	
GT q high	gtqh	q=1.15 Specifics and rationale to be determined	L	
GT overdisp.	gtod	Use over-dispersion as applied to conventional tagging	M	
GT qtrend	gtqtr	1% increase per year, note that an increasing q leads to over-estimated abundance	M	Easy
GT q low	gtql	q=0.85, Specifics and rationale to be determined	M	
GTI	troll	Includes the grid type trolling index as additional recruitment index. Increase CV of aerial survey to preclude aerial survey dominating the fit, given apparent conflicts in the data.	L	
Corr Sel	selrev	Reversing order of estimates at decadal scale “Corrugated selectivity”	L	Hard
	selalt	Five year blocks of Alternate bimodal and recent selectivity, most extreme case of bimodality should be used (for projections).	M	Hard
LL1 Case 2 of MR	case2	LL1 overcatch based on Case 2 of the 2006 Market Report	L	
SFOC40	sfo40	40% overcatch by Australian surface fishery: ramps up from 1% in 1992 to 40% by 1999 and onwards to 2016. Adjust the age composition as was done for the 20% method. Continued 40% overcatch in projections	M	
SFO00	sfo00	No historical additional catch in surface fishery. No future additional catch in surface fishery	L	

Comparisons of different sensitivities/robustness trials for 30% by 2035 tuning level

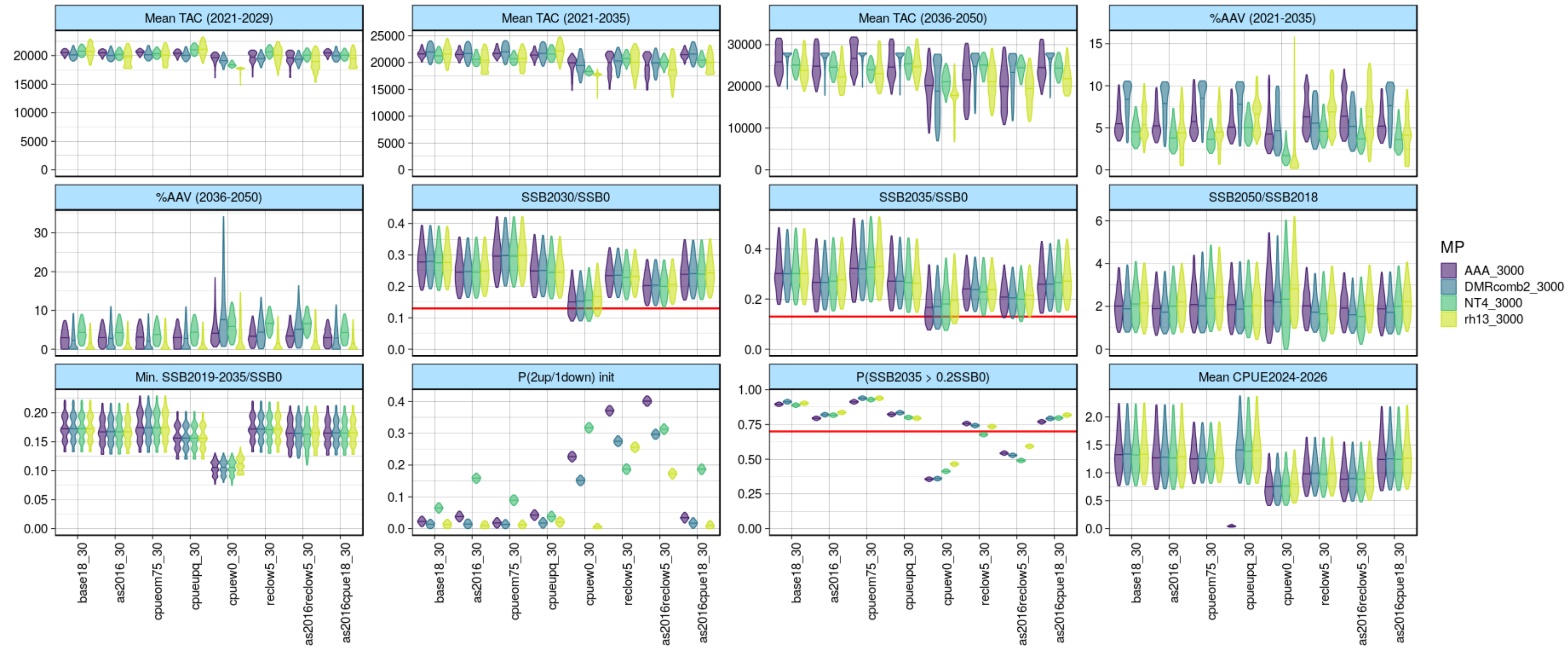


Figure 1: Distribution of selected output statistics by run and MP for the 30% by 2035 tuning level. The horizontal line within each violin represents the median and the vertical spread of the violin represents the 90% interval. The red horizontal on the SSB/SSB_0 panels indicate a level of 13%, corresponding to the depletion estimated in 2017 for 2016.

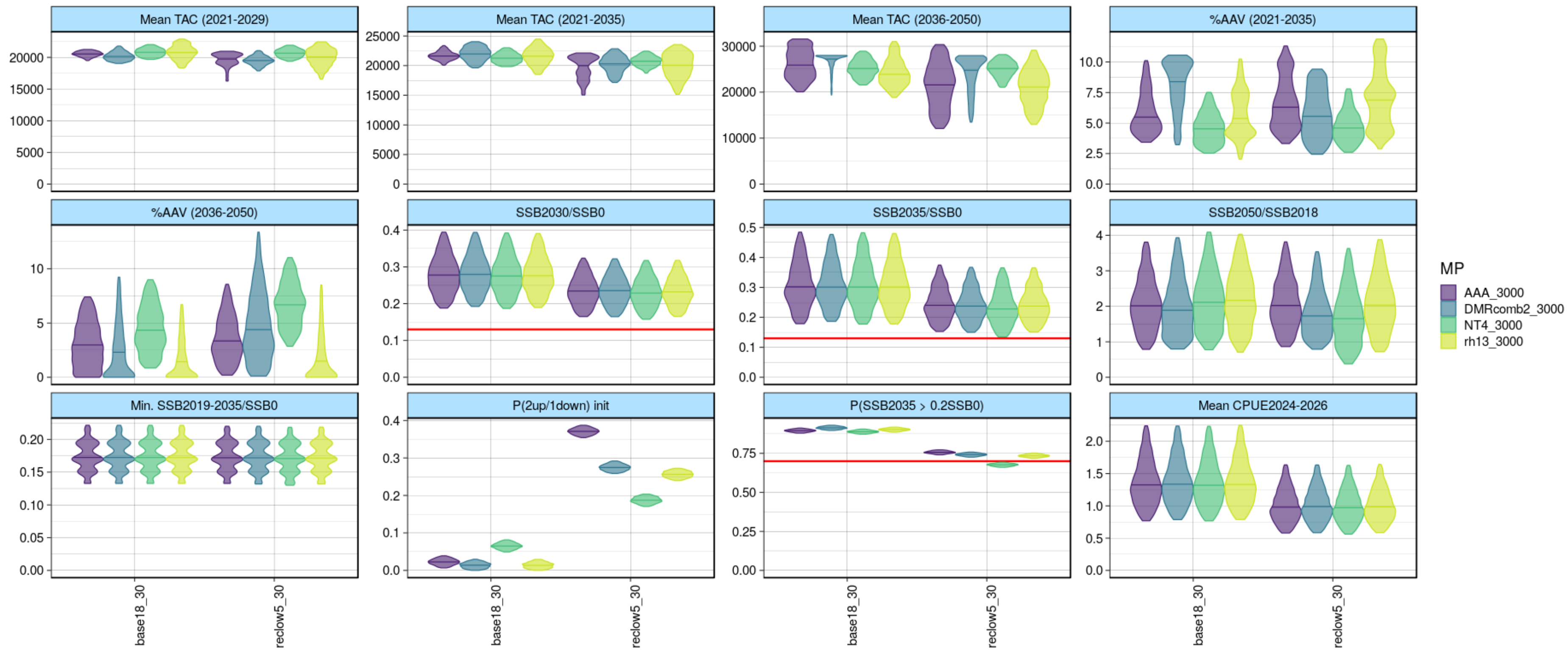


Figure 2: Distribution of selected output statistics by run and MP for the 30% by 2035 tuning level. The horizontal line within each violin represents the median and the vertical spread of the violin represents the 90% interval. The red horizontal on the SSB/SSB_0 panels indicate a level of 13%, corresponding to the depletion estimated in 2017 for 2016.

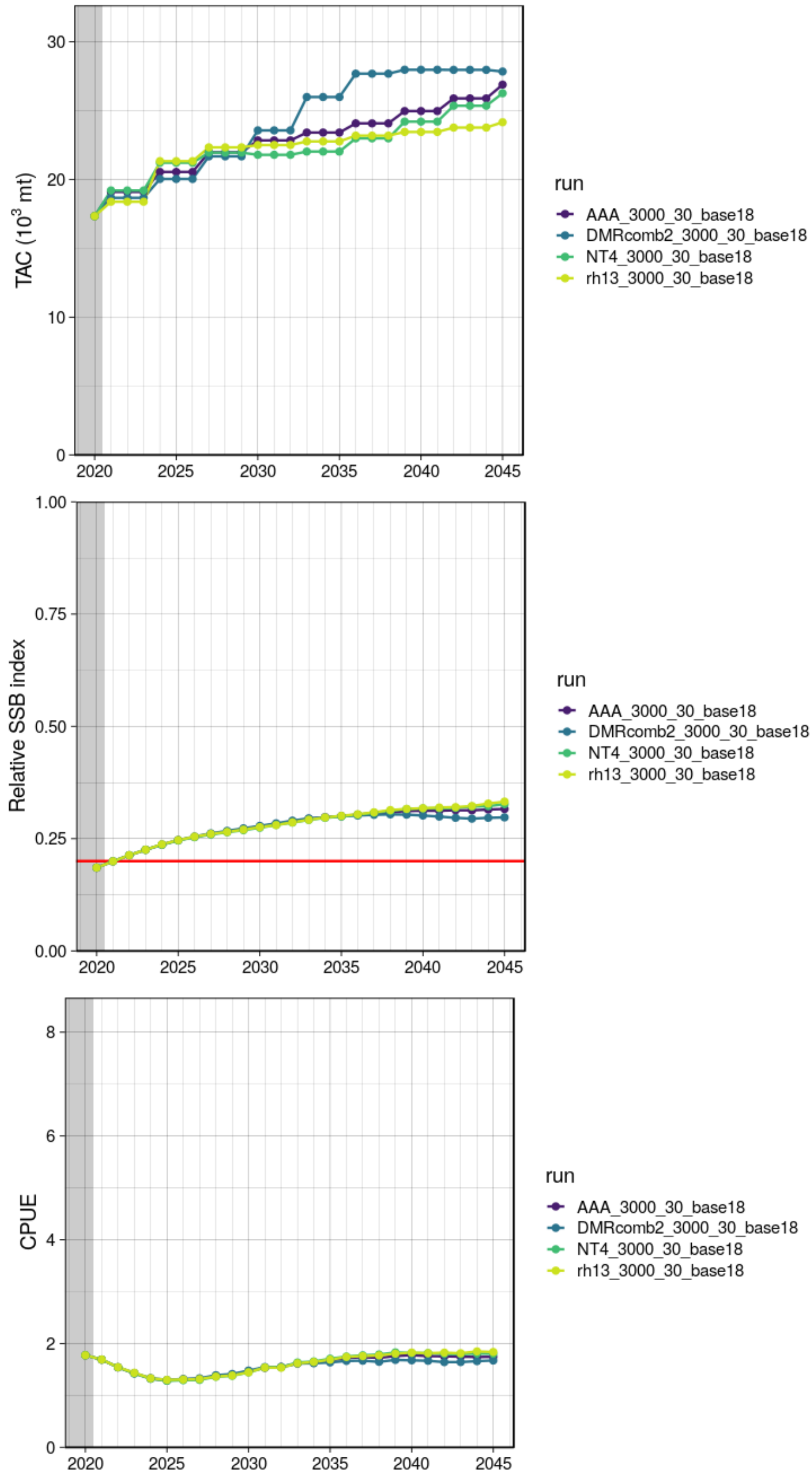


Figure 3: The median total allowable catch (TAC) for the 30% by 2035 tuning level [top], the median relative spawning stock biomass (SSB) [middle], and the median CPUE [bottom] for the four main MPs.

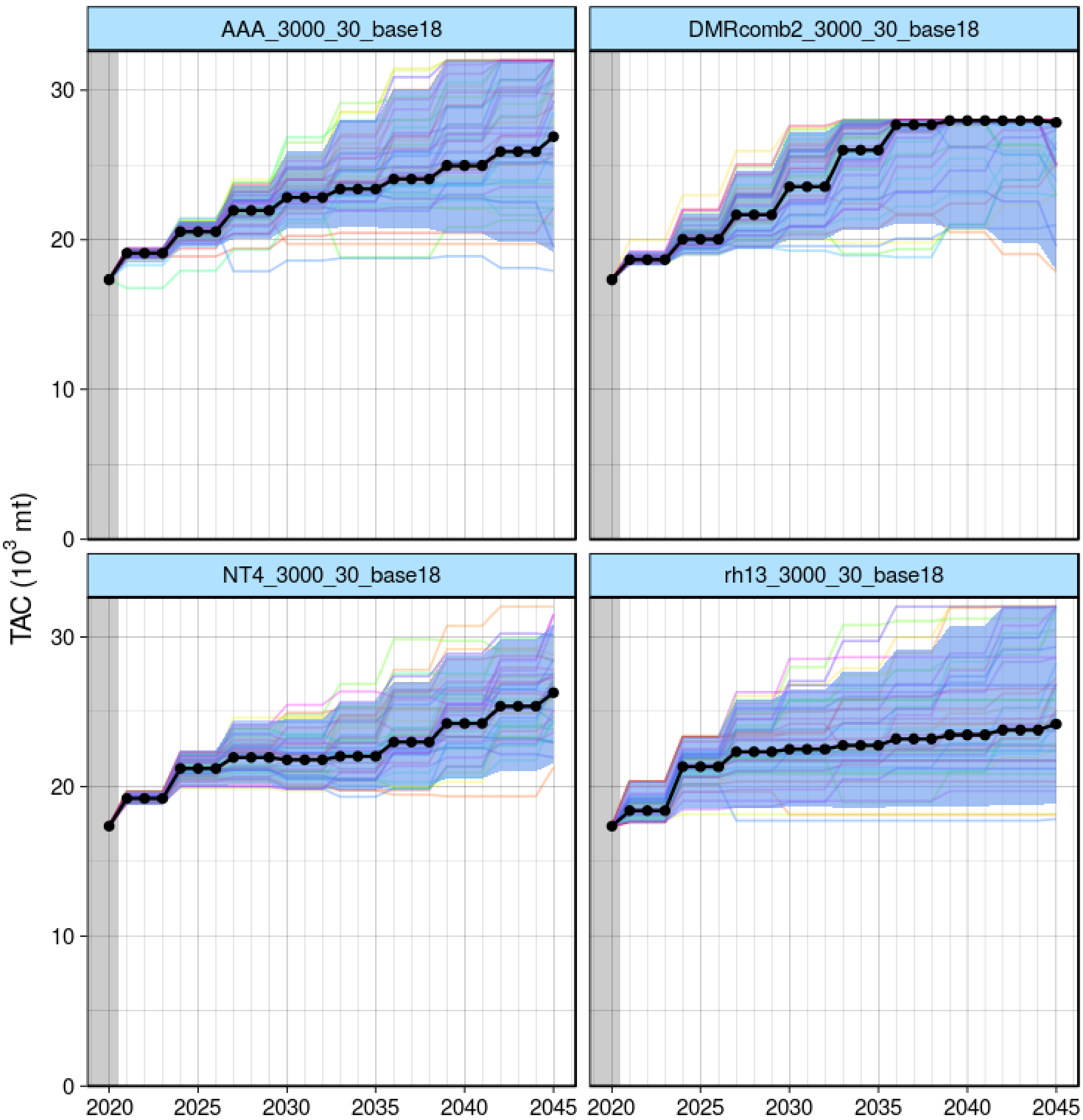


Figure 4: The TAC for the selected MPs showing 50 individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading).

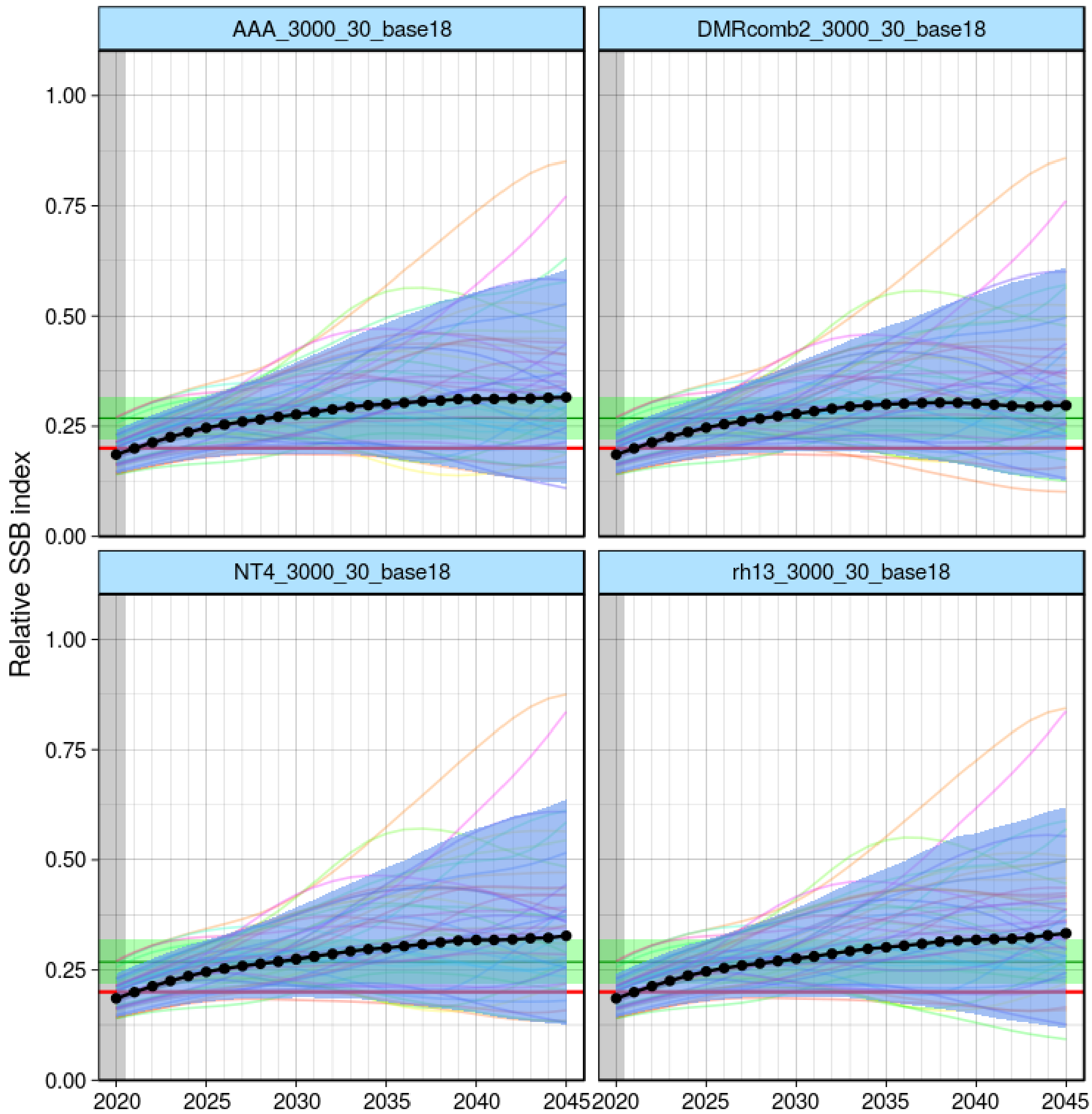


Figure 5: The relative spawning stock biomass (*SSB*) for the selected runs showing several individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading). The median and 90% confidence interval for the maximum sustainable yield (MSY) is also presented (horizontal green line and shaded region).

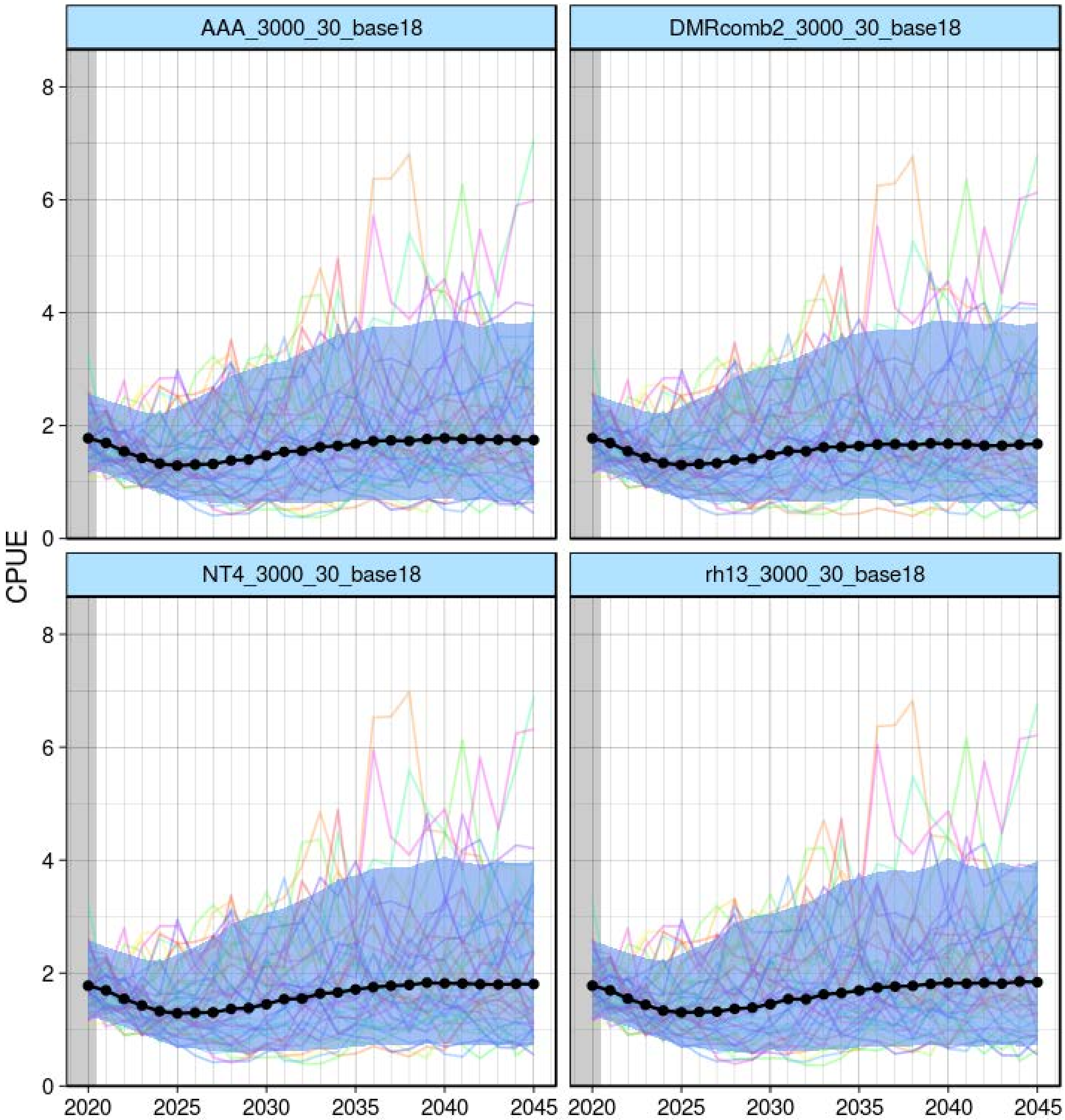


Figure 6: The catch per unit effort (CPUE) for the selected runs showing several individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading).

Comparisons of different sensitivities/robustness trials for 35% by 2040 tuning level

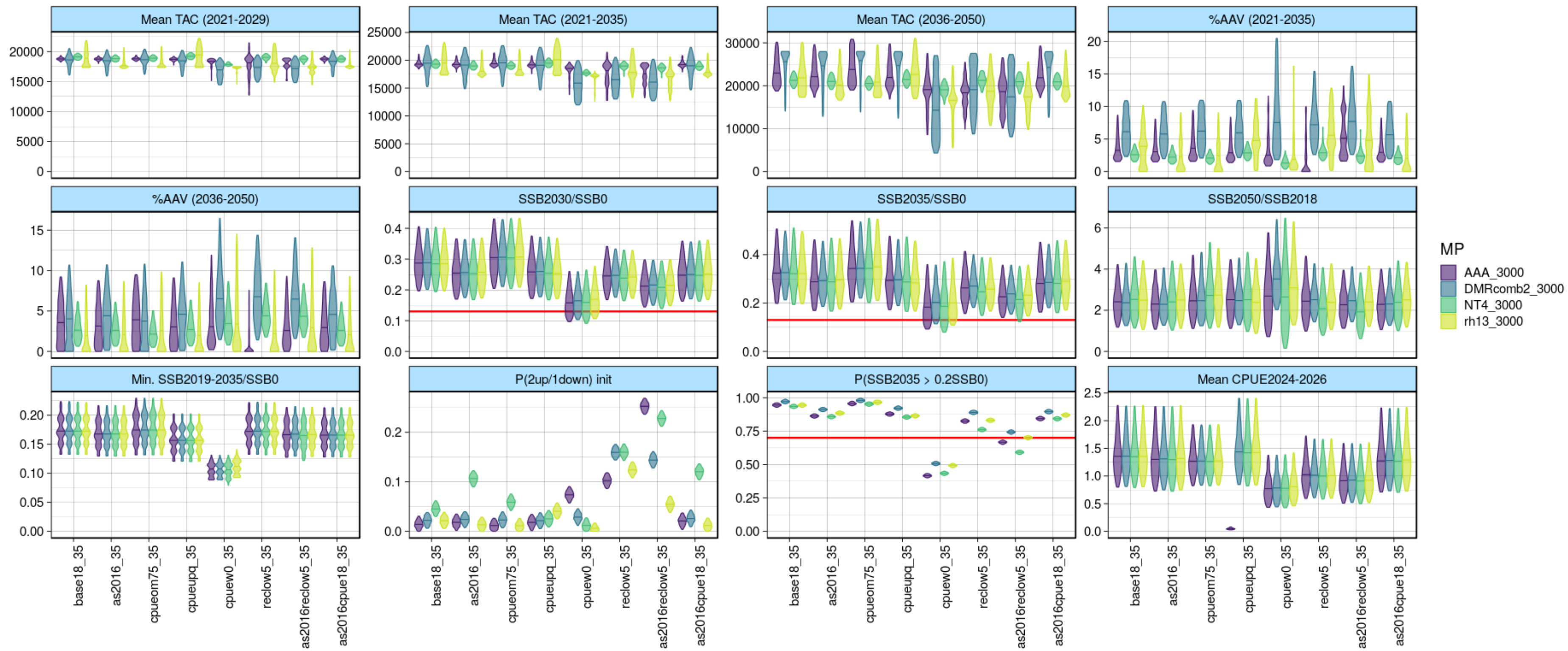


Figure 7: Distribution of selected output statistics by run, tuning and MP for the 35% by 2040 tuning level. The horizontal line within each violin represents the median and the vertical spread of the violin represents the 90% interval. The red horizontal on the SSB/SSB_0 panels indicate a level of 13%, corresponding to the depletion estimated in 2017 for 2016.

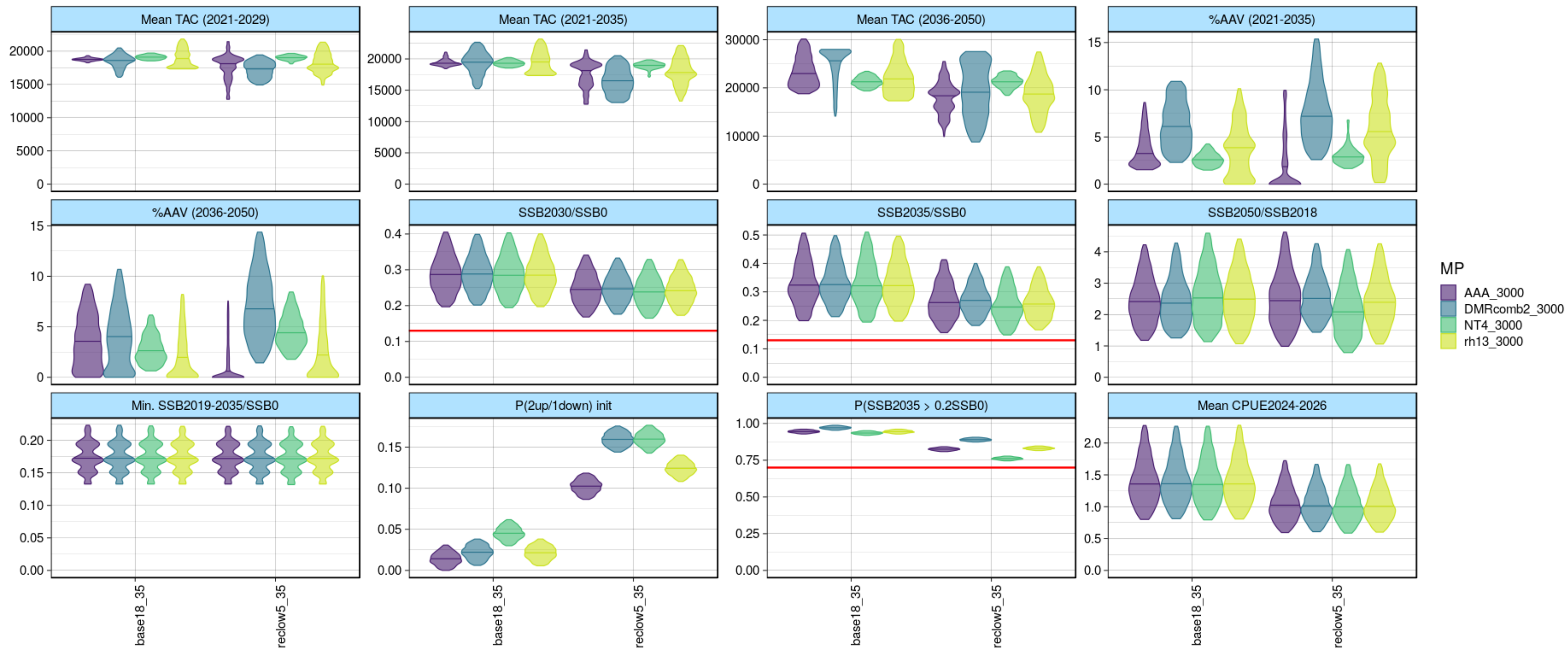


Figure 8: Distribution of selected output statistics by run, tuning and MP for the 35% by 2040 tuning level. The horizontal line within each violin represents the median and the vertical spread of the violin represents the 90% interval. The red horizontal on the SSB/SSB_0 panels indicate a level of 13%, corresponding to the depletion estimated in 2017 for 2016.

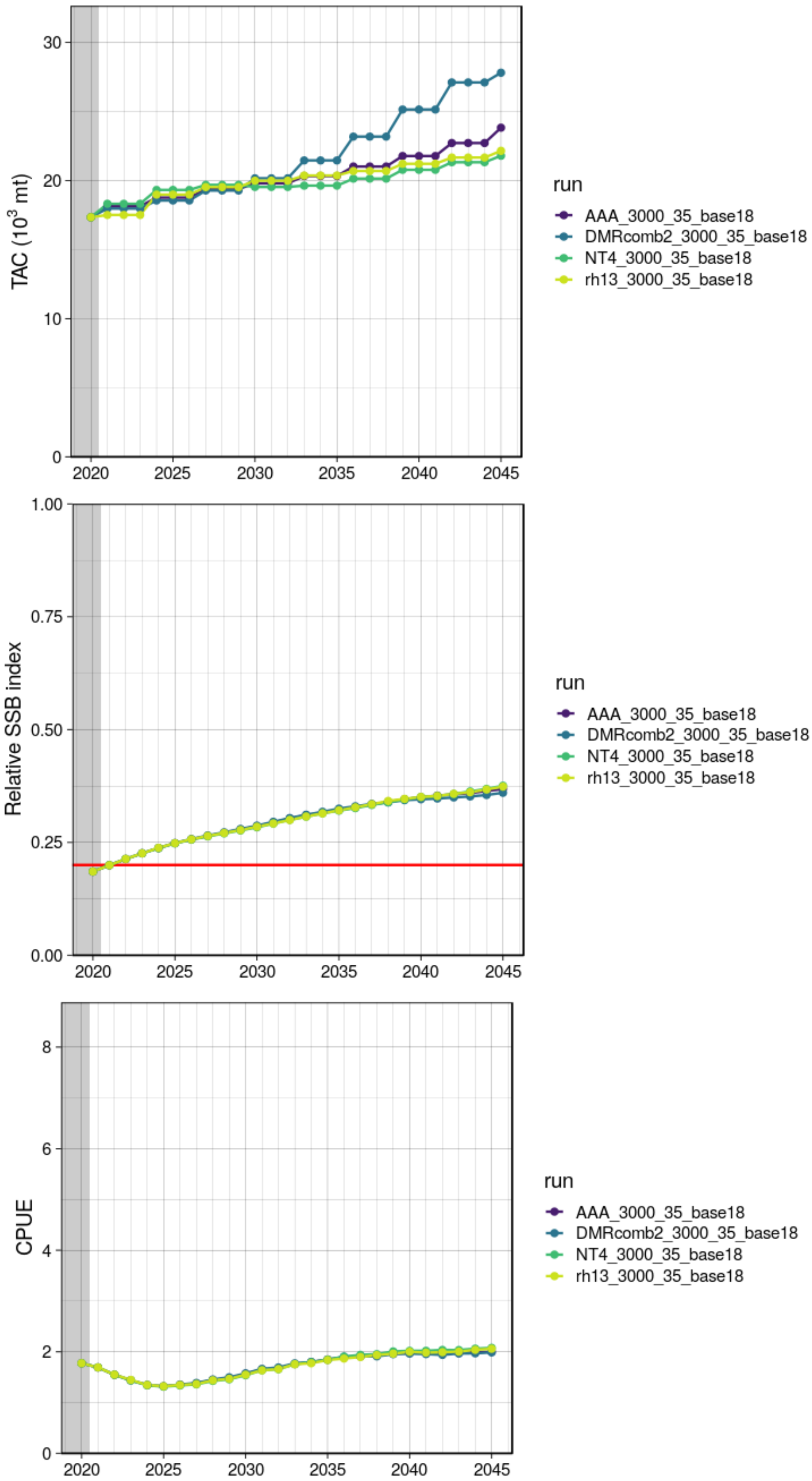


Figure 9: The median total allowable catch (TAC) for the 35% by 2040 tuning level [top], the median relative spawning stock biomass (*SSB*) [middle], and the median CPUE [bottom] for the four main MPs.

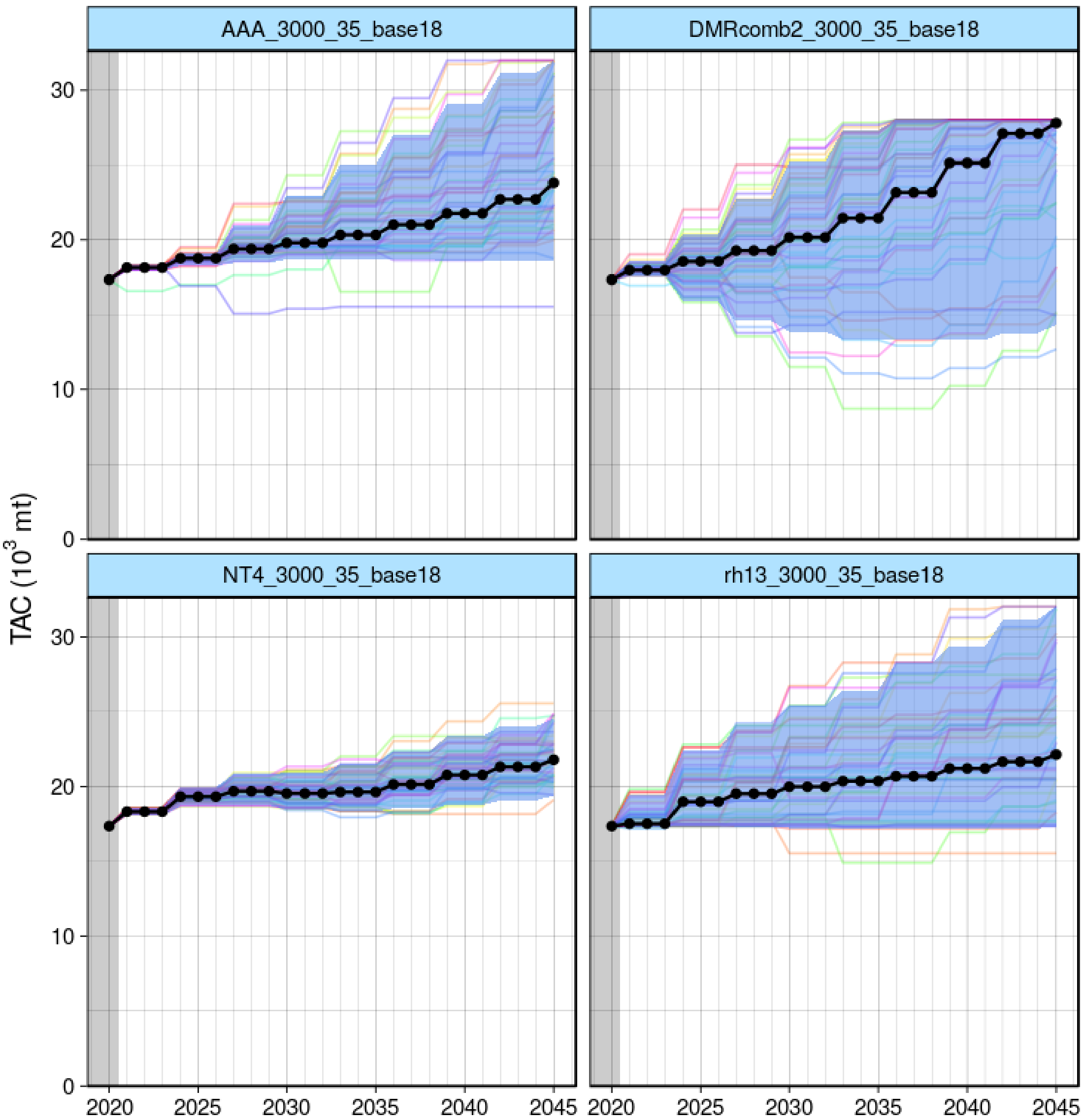


Figure 10: The TAC for the selected runs showing 50 individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading).

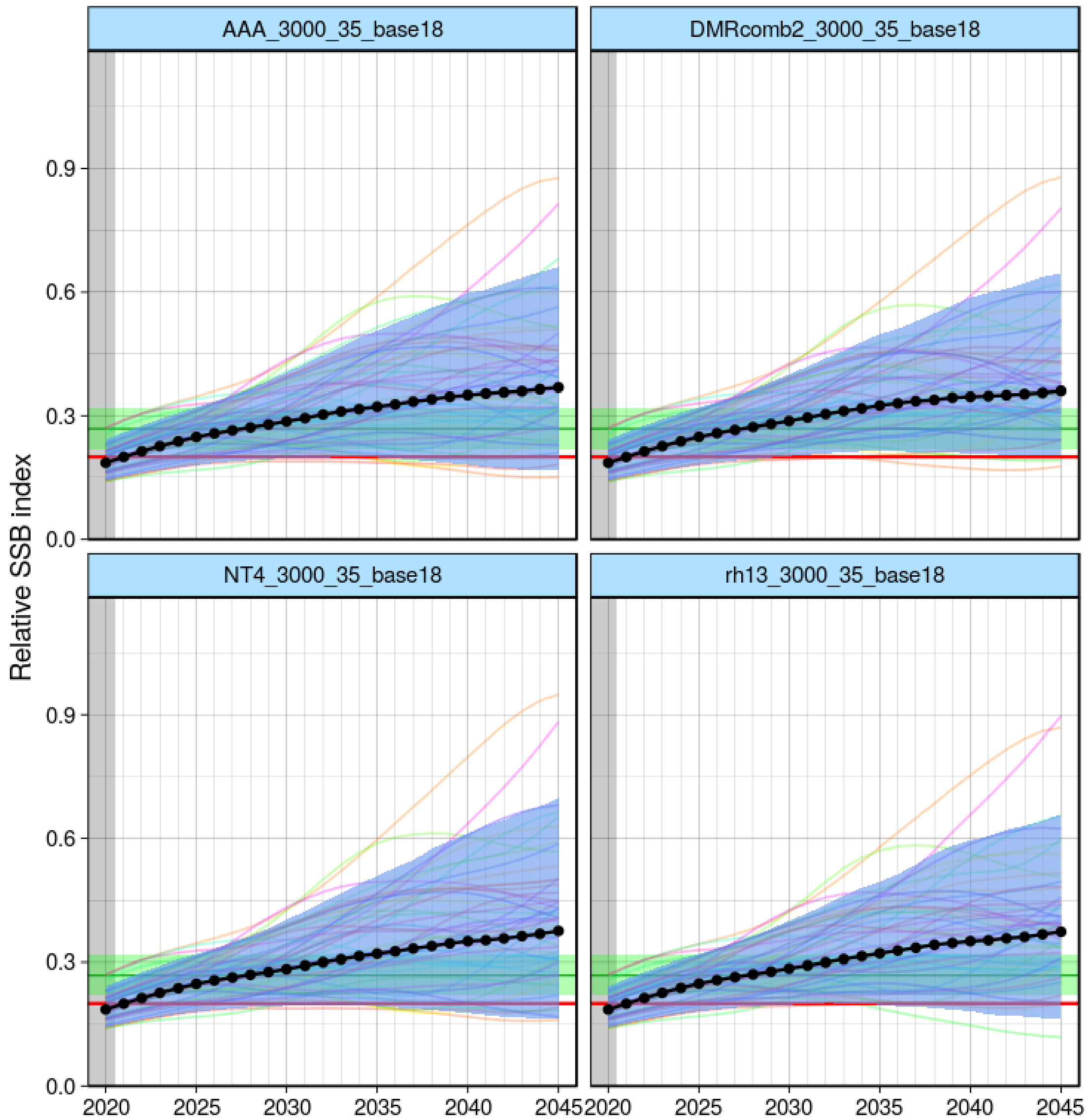


Figure 11: The relative spawning stock biomass (SSB) for the selected runs showing several individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading). The median and 90% confidence interval for the maximum sustainable yield (MSY) is also presented (horizontal green line and shaded region).

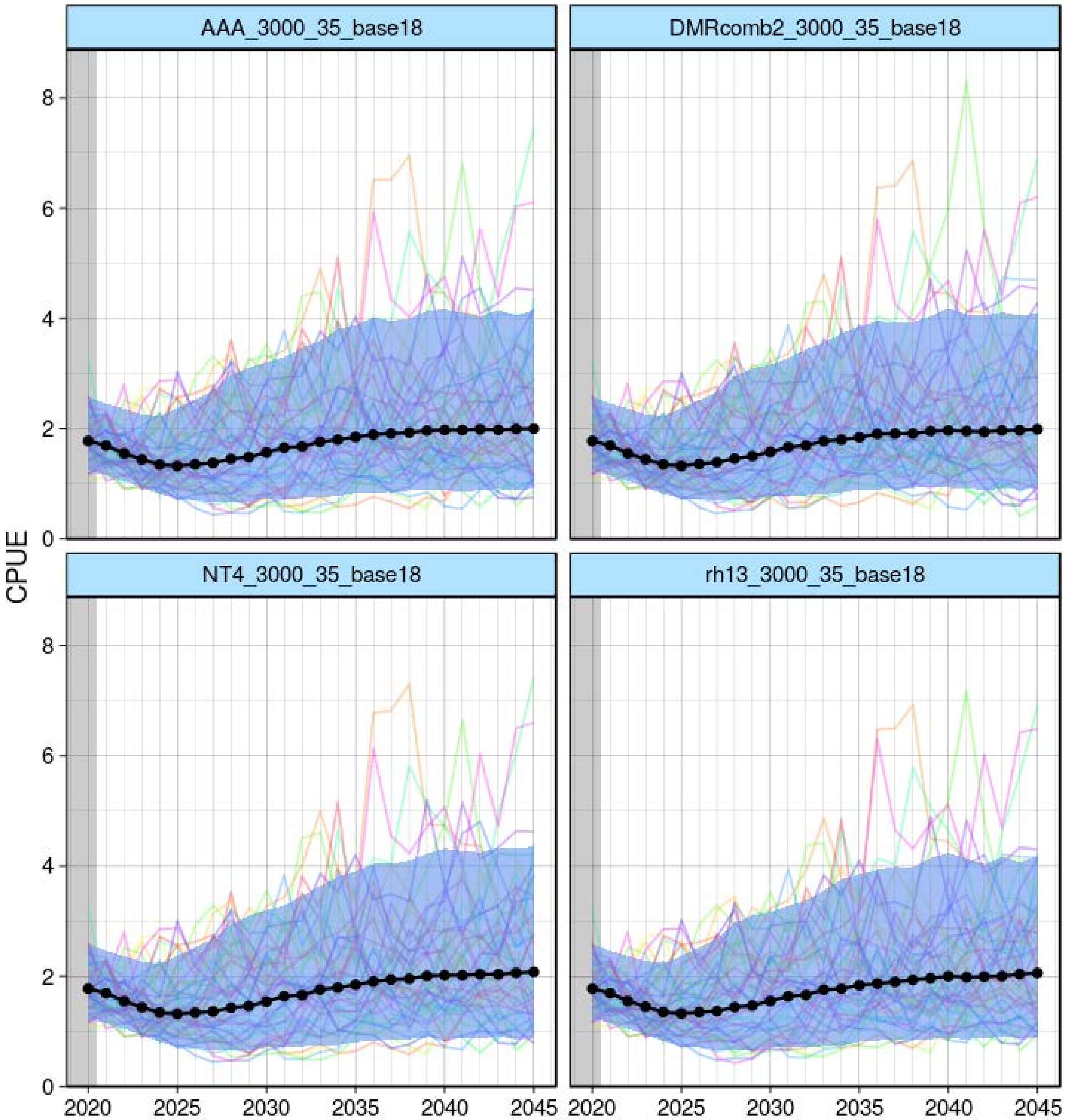


Figure 12: The catch per unit effort (CPUE) for the selected runs showing several individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading).

Comparisons of different tuning levels

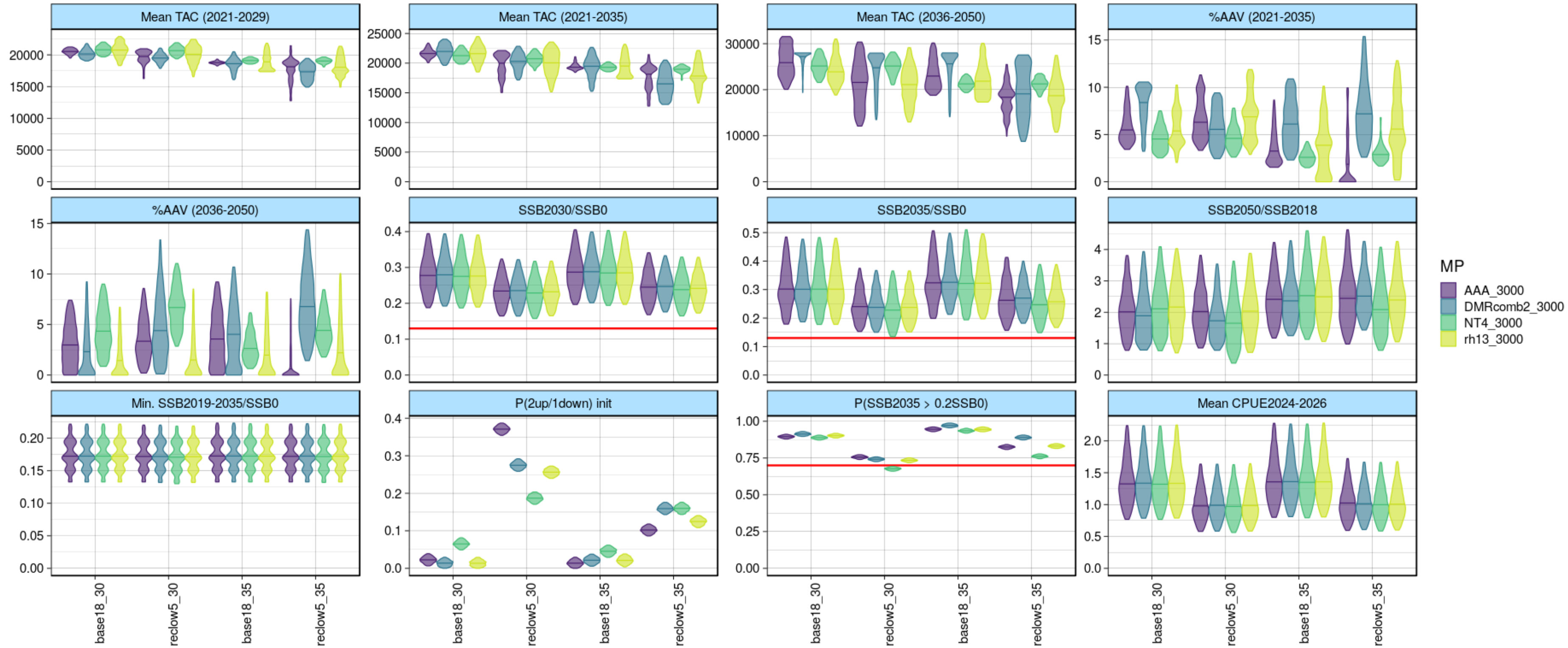


Figure 13: Distribution of selected output statistics by run, tuning and MP for the 30% by 2035 and 35% by 2040 tuning levels. The horizontal line within each violin represents the median and the vertical spread of the violin represents the 90% interval. The red horizontal on the SSB/SSB_0 panels indicate a level of 13%, corresponding to the depletion estimated in 2017 for 2016.

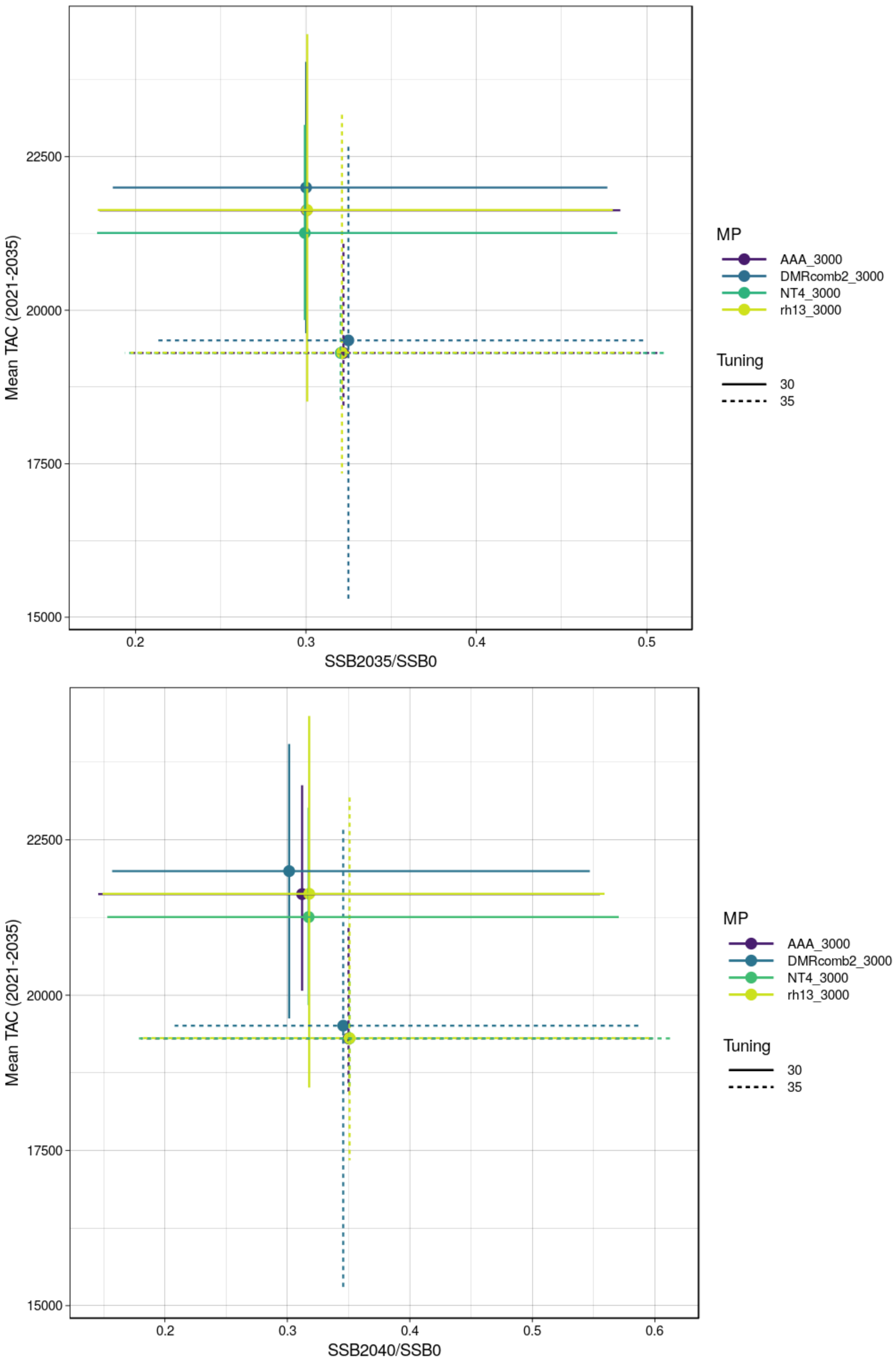


Figure 14: Comparison of SSB/SSB_0 [top] and SSB_{2040}/SSB_0 [bottom] versus Mean TAC from 2021-2035 for the 30% by 2035 and 35% by 2040 tuning levels.

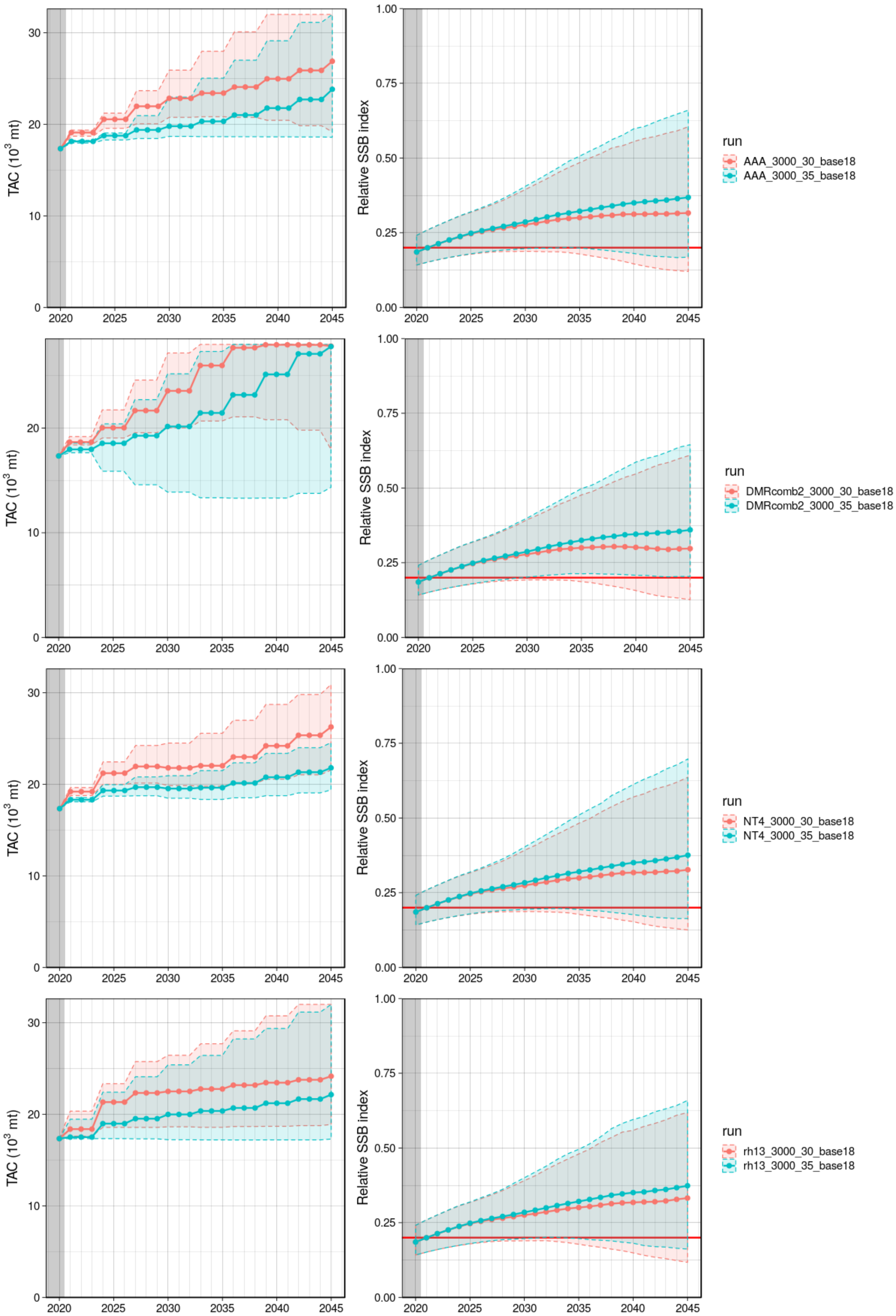


Figure 15: The total allowable catch (TAC) comparing the 30% by 2035 and 35% by 2040 runs showing the median (bold lines and points) [left] and the relative spawning stock biomass (SSB) for the selected runs showing the median (bold lines and points) and 90% confidence interval (coloured shading) [right].

Comparisons of different maximum TAC changes

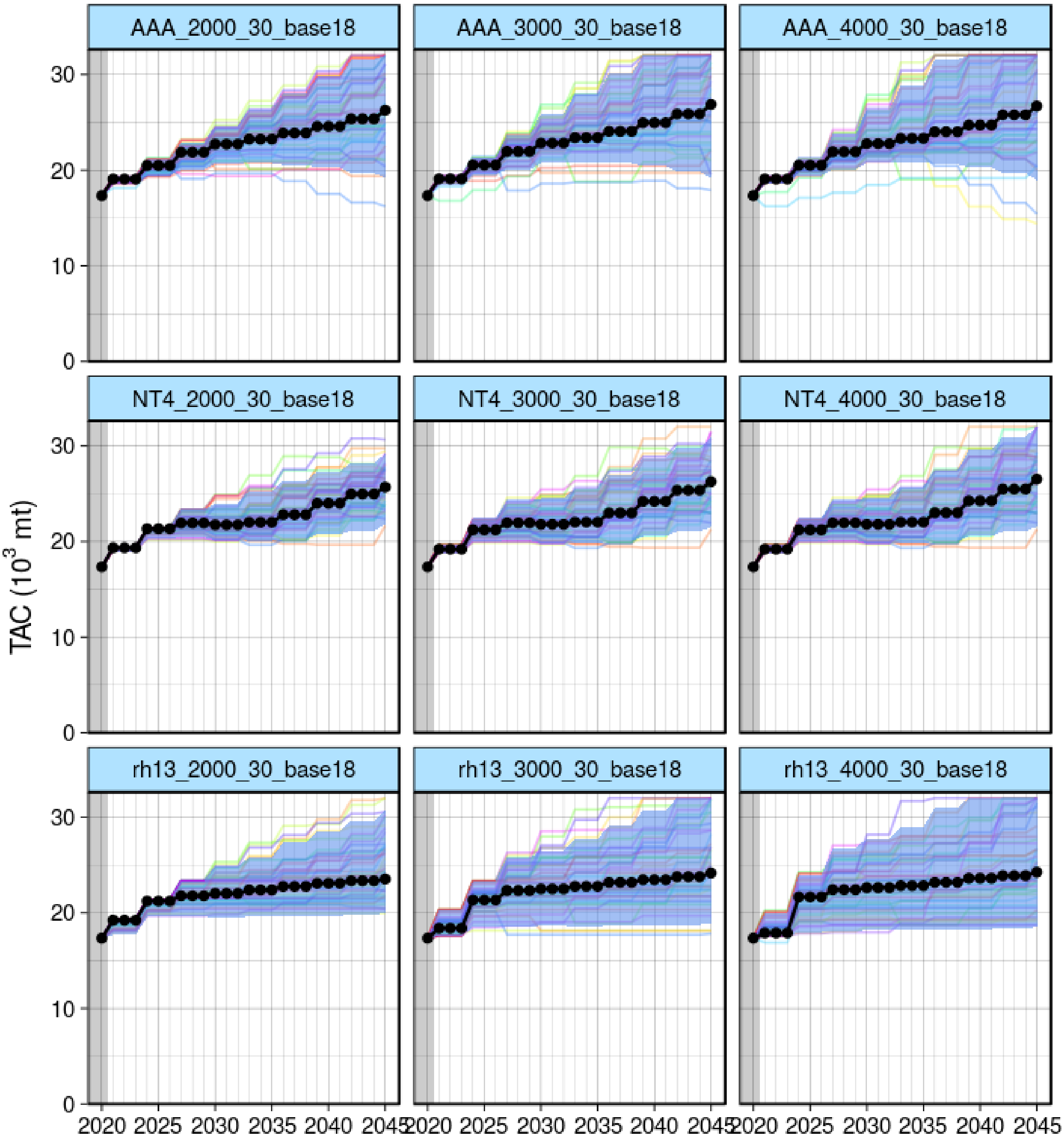


Figure 16: The TAC for the selected runs showing 50 individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading).

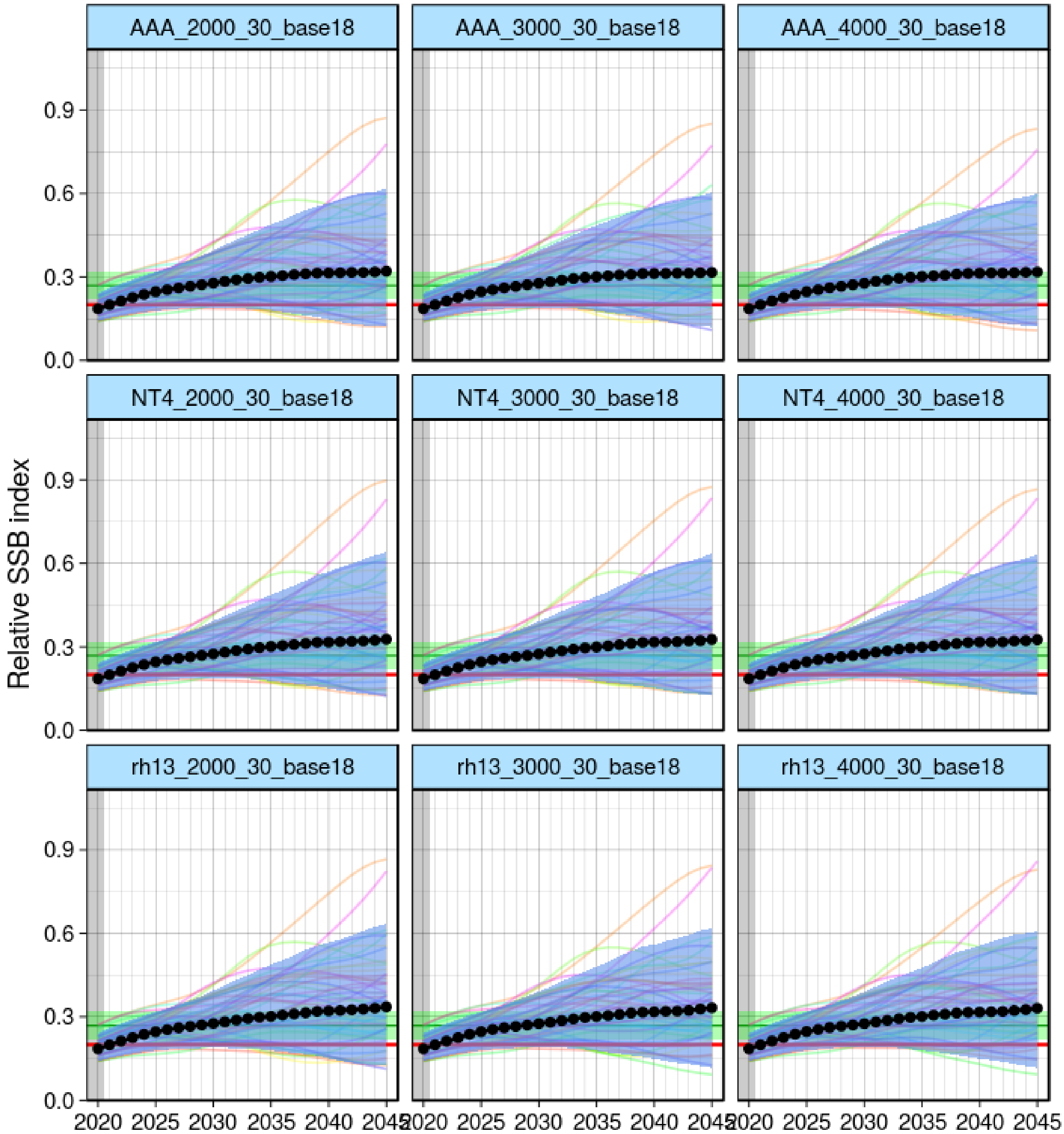


Figure 17: The relative spawning stock biomass (*SSB*) for the selected runs showing several individual iterations or worms (thin lines), the median (bold black line and points), and 90% confidence interval (blue shading). The median and 90% confidence interval for the maximum sustainable yield (MSY) is also presented (horizontal green line and shaded region).

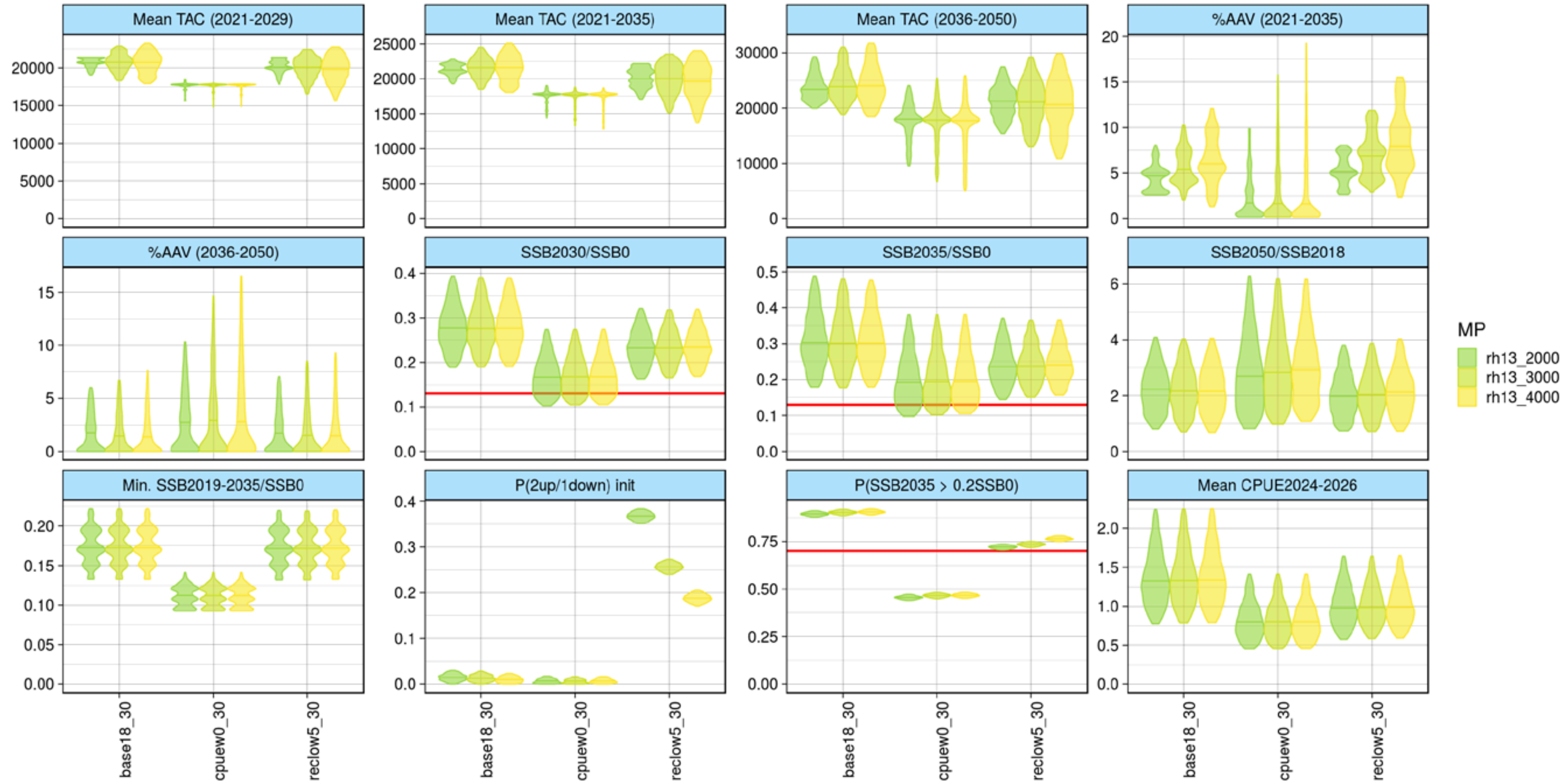


Figure 18: Performance statistics for a single MP tuned with maximum TAC change of 2000t (green), 3000t (light green), and 4000t (yellow), for the base_set, cpuew0, and reclow5 robustness tests. The horizontal line within each violin represents the median and the vertical spread of the violin represents the 90% interval. The red horizontal line on the SSB/SSB_0 panels indicate a level of 13%.

Table 3: Performance statistics for tuning to the median *SSB* equal to 30% by 2035, part 1, catch performance related.

tuning	MP	run	Mean TAC (2021-2029)	Mean TAC (2021-2035)	Mean TAC (2036-2050)	%AAV (2021-2035)	%AAV (2036-2050)	Mean CPUE2024-2026	P(2up/1down) init
30	AAA_3000	base18	20537 (19495, 21247)	21627 (20071, 23380)	26001 (20067, 31560)	5.4 (3.4, 10.1)	3.0 (0.000, 7.4)	1.3 (0.768, 2.2)	0.022
30	DMRcomb2_3000	base18	20148 (19036, 21783)	21997 (19625, 24043)	27400 (19375, 28000)	8.6 (3.2, 10.6)	1.9 (0.000, 9.2)	1.3 (0.786, 2.2)	0.013
30	NT4_3000	base18	20799 (19678, 22012)	21257 (19839, 23018)	25147 (21558, 28915)	4.5 (2.5, 7.5)	4.3 (0.856, 9.0)	1.3 (0.768, 2.2)	0.065
30	rh13_3000	base18	20765 (18312, 22895)	21631 (18512, 24495)	23839 (18846, 31017)	5.4 (2.0, 10.2)	1.1 (0.000, 6.7)	1.3 (0.788, 2.2)	0.012
30	AAA_3000	as2016	20496 (19392, 21208)	21516 (19921, 23196)	24839 (18739, 31414)	5.2 (3.2, 9.8)	3.0 (0.022, 7.7)	1.3 (0.703, 2.2)	0.038
30	DMRcomb2_3000	as2016	20007 (18924, 21704)	21698 (19286, 23944)	27130 (17829, 28000)	8.1 (2.8, 10.5)	2.6 (0.000, 11.0)	1.3 (0.715, 2.2)	0.014
30	NT4_3000	as2016	20229 (19135, 21473)	20591 (19261, 22468)	24611 (20944, 28396)	3.8 (1.9, 7.3)	4.2 (0.917, 9.0)	1.3 (0.703, 2.2)	0.158
30	rh13_3000	as2016	19727 (17771, 22149)	20355 (17828, 23458)	22194 (17835, 29699)	4.3 (0.498, 9.8)	1.0 (0.000, 7.3)	1.3 (0.727, 2.2)	0.009
30	AAA_3000	as2016cpue18	20486 (19327, 21242)	21484 (19671, 23183)	24528 (18083, 31322)	5.2 (3.2, 9.6)	3.0 (0.113, 7.6)	1.2 (0.681, 2.2)	0.034
30	DMRcomb2_3000	as2016cpue18	19957 (18881, 21631)	21603 (19198, 23886)	26985 (17238, 28000)	7.8 (2.6, 10.4)	2.7 (0.000, 11.5)	1.2 (0.695, 2.2)	0.018
30	NT4_3000	as2016cpue18	20081 (19037, 21296)	20430 (19142, 22233)	24408 (20792, 28188)	3.6 (1.8, 7.2)	4.2 (0.893, 9.1)	1.2 (0.683, 2.2)	0.187
30	rh13_3000	as2016cpue18	19399 (17743, 21917)	19968 (17762, 23210)	21803 (17699, 29227)	4.1 (0.389, 9.6)	1.0 (0.000, 7.7)	1.3 (0.707, 2.2)	0.009
30	AAA_3000	as2016reclow5	19640 (16171, 20948)	19597 (14873, 22049)	20118 (10835, 29412)	6.3 (3.4, 12.0)	3.3 (0.398, 8.8)	0.881 (0.485, 1.6)	0.401
30	DMRcomb2_3000	as2016reclow5	19369 (17718, 20930)	19940 (16745, 22688)	23915 (11765, 27895)	5.2 (2.2, 9.3)	5.1 (0.317, 16.4)	0.892 (0.493, 1.5)	0.296
30	NT4_3000	as2016reclow5	20105 (18872, 21346)	20085 (18110, 21732)	24543 (20446, 27569)	3.7 (1.9, 7.3)	6.6 (2.8, 11.1)	0.879 (0.479, 1.5)	0.313
30	rh13_3000	as2016reclow5	18976 (15326, 21704)	18623 (13539, 22591)	19547 (11602, 26760)	6.3 (0.980, 12.7)	1.6 (0.000, 10.3)	0.901 (0.506, 1.6)	0.173
30	AAA_3000	cpueom75	20618 (19669, 21267)	21707 (20301, 23569)	26889 (20319, 31842)	5.7 (3.4, 10.7)	3.1 (0.000, 7.8)	1.2 (0.808, 1.9)	0.018
30	DMRcomb2_3000	cpueom75	20167 (19071, 21780)	22020 (19633, 24072)	27541 (19799, 28000)	8.7 (3.3, 10.6)	1.6 (0.000, 9.1)	1.3 (0.818, 1.9)	0.012
30	NT4_3000	cpueom75	20372 (19348, 21519)	20686 (19455, 22248)	23991 (20845, 27402)	3.6 (2.0, 6.1)	3.7 (0.692, 8.6)	1.2 (0.809, 1.9)	0.09
30	rh13_3000	cpueom75	20058 (17854, 22274)	20739 (17919, 23500)	23018 (18236, 30925)	4.4 (0.654, 9.8)	1.4 (0.000, 8.0)	1.3 (0.825, 1.9)	0.01
30	AAA_3000	cpueupq	20418 (19171, 21166)	21411 (19446, 23105)	24684 (18117, 31388)	5.0 (3.1, 9.6)	3.0 (0.000, 7.8)	0.045 (0.026, 0.078)	0.042
30	DMRcomb2_3000	cpueupq	20037 (18927, 21578)	21718 (19317, 23895)	27197 (17934, 28000)	8.0 (2.8, 10.5)	2.5 (0.000, 10.9)	1.4 (0.815, 2.4)	0.018
30	NT4_3000	cpueupq	21059 (19891, 22228)	21592 (20045, 23349)	25435 (21555, 29479)	5.0 (2.8, 8.0)	4.3 (0.858, 9.0)	1.4 (0.795, 2.4)	0.038
30	rh13_3000	cpueupq	21091 (18624, 23257)	22145 (18806, 24761)	24712 (19052, 31368)	6.7 (3.0, 11.1)	0.950 (0.000, 7.0)	1.4 (0.811, 2.4)	0.021
30	AAA_3000	cpuew0	19683 (16115, 20630)	19982 (14790, 21712)	20305 (8793, 29139)	4.2 (1.9, 11.3)	4.0 (0.607, 18.5)	0.746 (0.414, 1.3)	0.226
30	DMRcomb2_3000	cpuew0	19125 (17555, 20647)	19474 (16219, 22594)	19341 (6936, 27733)	4.6 (1.7, 10.0)	7.0 (0.719, 34.2)	0.754 (0.416, 1.4)	0.152
30	NT4_3000	cpuew0	18378 (17821, 19211)	18303 (17495, 19413)	21147 (16173, 25524)	1.7 (0.505, 4.7)	5.8 (1.1, 12.1)	0.763 (0.417, 1.4)	0.317
30	rh13_3000	cpuew0	17741 (14797, 18003)	17761 (13272, 18805)	17871 (6689, 25446)	0.777 (0.164, 15.8)	2.1 (0.000, 14.7)	0.795 (0.459, 1.4)	0
30	AAA_3000	reclow5	19796 (16264, 20963)	20237 (15045, 22133)	21693 (12098, 30346)	6.3 (3.3, 11.3)	3.3 (0.195, 8.6)	0.971 (0.579, 1.6)	0.371
30	DMRcomb2_3000	reclow5	19502 (17876, 21060)	20338 (17158, 22847)	25407 (13496, 27960)	5.5 (2.4, 9.4)	4.2 (0.117, 13.4)	0.983 (0.583, 1.6)	0.275
30	NT4_3000	reclow5	20685 (19377, 21914)	20750 (18732, 22445)	25175 (21065, 28177)	4.6 (2.6, 7.8)	6.7 (2.9, 11.0)	0.966 (0.562, 1.6)	0.188
30	rh13_3000	reclow5	20122 (16548, 22448)	20068 (15164, 23549)	21187 (12983, 29131)	7.0 (2.9, 11.9)	1.1 (0.000, 8.5)	0.978 (0.584, 1.6)	0.256

Table 3 continued (*SSB* related)

tuning	MP	run	SSB2030/SSB0	SSB2035/SSB0	SSB2040/SSB0	SSB2050/SSB0	SSB2035/SSB2018	SSB2050/SSB2018	Min. SSB 2019-2035/SSB0	P(SSB2030 > 0.3SSB0)	P(SSB2035 > 0.2SSB0)	P(SSB2035 > 0.3SSB0)
30	AAA_3000	base18	0.277 (0.188, 0.394)	0.300 (0.179, 0.484)	0.312 (0.146, 0.555)	0.326 (0.120, 0.639)	1.9 (1.2, 2.8)	2.0 (0.787, 3.8)	0.172 (0.133, 0.222)	0.357	0.896	0.501
30	DMRcomb2_3000	base18	0.278 (0.192, 0.394)	0.300 (0.187, 0.477)	0.301 (0.157, 0.547)	0.304 (0.120, 0.655)	1.9 (1.2, 2.8)	1.9 (0.797, 3.9)	0.172 (0.133, 0.222)	0.366	0.914	0.501
30	NT4_3000	base18	0.274 (0.187, 0.392)	0.299 (0.177, 0.483)	0.317 (0.153, 0.571)	0.340 (0.115, 0.677)	1.9 (1.2, 2.8)	2.1 (0.776, 4.1)	0.172 (0.133, 0.222)	0.34	0.888	0.497
30	rh13_3000	base18	0.276 (0.190, 0.391)	0.301 (0.178, 0.480)	0.318 (0.149, 0.559)	0.353 (0.113, 0.670)	1.9 (1.2, 2.8)	2.2 (0.706, 4.0)	0.172 (0.133, 0.222)	0.348	0.902	0.503
30	AAA_3000	as2016	0.246 (0.161, 0.357)	0.266 (0.149, 0.440)	0.279 (0.119, 0.508)	0.303 (0.093, 0.588)	1.7 (1.0, 2.6)	1.9 (0.648, 3.6)	0.166 (0.128, 0.217)	0.2	0.794	0.358
30	DMRcomb2_3000	as2016	0.247 (0.165, 0.355)	0.266 (0.157, 0.434)	0.270 (0.130, 0.501)	0.273 (0.106, 0.603)	1.7 (1.1, 2.6)	1.7 (0.720, 3.6)	0.166 (0.129, 0.217)	0.202	0.82	0.346
30	NT4_3000	as2016	0.245 (0.163, 0.357)	0.270 (0.153, 0.445)	0.291 (0.132, 0.531)	0.320 (0.101, 0.640)	1.7 (1.0, 2.6)	2.0 (0.711, 3.9)	0.166 (0.129, 0.217)	0.198	0.816	0.371
30	rh13_3000	as2016	0.248 (0.168, 0.358)	0.275 (0.159, 0.446)	0.301 (0.138, 0.531)	0.351 (0.121, 0.649)	1.7 (1.1, 2.6)	2.2 (0.789, 4.0)	0.166 (0.130, 0.217)	0.206	0.836	0.388
30	AAA_3000	as2016cpue18	0.238 (0.157, 0.349)	0.258 (0.143, 0.430)	0.272 (0.113, 0.501)	0.298 (0.090, 0.584)	1.6 (0.986, 2.5)	1.9 (0.626, 3.6)	0.165 (0.127, 0.212)	0.171	0.77	0.328
30	DMRcomb2_3000	as2016cpue18	0.240 (0.161, 0.347)	0.259 (0.152, 0.421)	0.264 (0.128, 0.494)	0.269 (0.104, 0.595)	1.6 (1.1, 2.5)	1.7 (0.719, 3.6)	0.165 (0.128, 0.213)	0.17	0.794	0.32
30	NT4_3000	as2016cpue18	0.238 (0.158, 0.348)	0.264 (0.148, 0.436)	0.287 (0.128, 0.521)	0.317 (0.098, 0.638)	1.7 (1.0, 2.6)	2.0 (0.693, 3.9)	0.165 (0.127, 0.212)	0.172	0.796	0.348
30	rh13_3000	as2016cpue18	0.242 (0.163, 0.352)	0.270 (0.156, 0.438)	0.296 (0.139, 0.532)	0.352 (0.122, 0.654)	1.7 (1.1, 2.6)	2.2 (0.829, 4.1)	0.165 (0.128, 0.213)	0.182	0.817	0.372
30	AAA_3000	as2016reclow5	0.203 (0.139, 0.286)	0.207 (0.126, 0.336)	0.226 (0.106, 0.422)	0.307 (0.115, 0.580)	1.3 (0.862, 1.9)	1.9 (0.771, 3.6)	0.165 (0.123, 0.212)	0.027	0.544	0.098
30	DMRcomb2_3000	as2016reclow5	0.204 (0.138, 0.285)	0.205 (0.122, 0.327)	0.212 (0.106, 0.405)	0.256 (0.113, 0.541)	1.3 (0.849, 1.9)	1.6 (0.746, 3.3)	0.164 (0.121, 0.212)	0.024	0.528	0.09
30	NT4_3000	as2016reclow5	0.200 (0.133, 0.284)	0.198 (0.110, 0.334)	0.209 (0.082, 0.416)	0.242 (0.035, 0.554)	1.2 (0.760, 1.9)	1.5 (0.233, 3.4)	0.163 (0.110, 0.212)	0.022	0.49	0.096
30	rh13_3000	as2016reclow5	0.206 (0.143, 0.287)	0.214 (0.130, 0.336)	0.237 (0.114, 0.431)	0.323 (0.117, 0.626)	1.4 (0.905, 2.0)	2.1 (0.762, 3.9)	0.165 (0.126, 0.212)	0.026	0.593	0.112
30	AAA_3000	cpueom75	0.296 (0.197, 0.422)	0.321 (0.187, 0.522)	0.328 (0.149, 0.603)	0.340 (0.114, 0.723)	2.0 (1.3, 3.0)	2.1 (0.766, 4.4)	0.173 (0.132, 0.229)	0.479	0.913	0.583
30	DMRcomb2_3000	cpueom75	0.297 (0.201, 0.419)	0.319 (0.194, 0.514)	0.319 (0.160, 0.604)	0.326 (0.114, 0.752)	2.0 (1.3, 3.0)	2.0 (0.768, 4.5)	0.173 (0.132, 0.229)	0.482	0.939	0.587
30	NT4_3000	cpueom75	0.296 (0.198, 0.422)	0.324 (0.188, 0.529)	0.346 (0.160, 0.636)	0.387 (0.129, 0.802)	2.0 (1.3, 3.1)	2.4 (0.824, 4.9)	0.173 (0.132, 0.229)	0.472	0.929	0.606
30	rh13_3000	cpueom75	0.297 (0.201, 0.423)	0.328 (0.194, 0.527)	0.350 (0.163, 0.626)	0.396 (0.135, 0.772)	2.0 (1.3, 3.1)	2.4 (0.884, 4.8)	0.173 (0.132, 0.229)	0.487	0.939	0.614
30	AAA_3000	cpueupq	0.249 (0.165, 0.365)	0.270 (0.153, 0.452)	0.283 (0.122, 0.527)	0.307 (0.092, 0.616)	1.9 (1.1, 2.9)	2.1 (0.688, 4.0)	0.156 (0.120, 0.202)	0.204	0.822	0.376
30	DMRcomb2_3000	cpueupq	0.251 (0.167, 0.363)	0.270 (0.161, 0.447)	0.272 (0.131, 0.521)	0.273 (0.101, 0.632)	1.8 (1.2, 2.8)	1.9 (0.725, 4.1)	0.156 (0.120, 0.202)	0.209	0.834	0.364
30	NT4_3000	cpueupq	0.244 (0.160, 0.360)	0.264 (0.147, 0.443)	0.279 (0.119, 0.530)	0.296 (0.069, 0.634)	1.8 (1.1, 2.8)	2.0 (0.536, 4.2)	0.156 (0.120, 0.202)	0.188	0.8	0.354
30	rh13_3000	cpueupq	0.245 (0.163, 0.359)	0.262 (0.147, 0.439)	0.273 (0.115, 0.521)	0.297 (0.064, 0.615)	1.8 (1.1, 2.8)	2.0 (0.449, 4.1)	0.156 (0.120, 0.201)	0.19	0.795	0.34
30	AAA_3000	cpuew0	0.150 (0.090, 0.252)	0.165 (0.077, 0.336)	0.184 (0.056, 0.436)	0.231 (0.026, 0.583)	1.6 (0.835, 3.0)	2.3 (0.278, 5.4)	0.106 (0.077, 0.131)	0.014	0.356	0.091
30	DMRcomb2_3000	cpuew0	0.152 (0.090, 0.250)	0.168 (0.080, 0.334)	0.183 (0.067, 0.424)	0.223 (0.077, 0.576)	1.6 (0.870, 3.0)	2.2 (0.810, 5.3)	0.106 (0.080, 0.131)	0.014	0.36	0.085
30	NT4_3000	cpuew0	0.155 (0.089, 0.260)	0.178 (0.075, 0.363)	0.201 (0.049, 0.472)	0.242 (0.000, 0.657)	1.7 (0.806, 3.2)	2.3 (0.000, 6.0)	0.106 (0.075, 0.131)	0.017	0.412	0.128
30	rh13_3000	cpuew0	0.166 (0.105, 0.274)	0.191 (0.102, 0.381)	0.223 (0.094, 0.499)	0.297 (0.097, 0.708)	1.8 (1.1, 3.2)	2.8 (0.982, 6.2)	0.111 (0.093, 0.141)	0.026	0.466	0.16
30	AAA_3000	reclow5	0.234 (0.165, 0.324)	0.240 (0.153, 0.375)	0.258 (0.131, 0.467)	0.328 (0.132, 0.629)	1.5 (1.0, 2.2)	2.0 (0.864, 3.8)	0.171 (0.133, 0.220)	0.105	0.756	0.218
30	DMRcomb2_3000	reclow5	0.236 (0.165, 0.322)	0.237 (0.150, 0.367)	0.243 (0.128, 0.454)	0.276 (0.122, 0.595)	1.5 (1.0, 2.1)	1.7 (0.790, 3.5)	0.171 (0.132, 0.220)	0.102	0.742	0.202
30	NT4_3000	reclow5	0.229 (0.158, 0.317)	0.228 (0.135, 0.365)	0.235 (0.104, 0.455)	0.266 (0.060, 0.598)	1.4 (0.891, 2.1)	1.6 (0.378, 3.6)	0.170 (0.130, 0.219)	0.088	0.677	0.18
30	rh13_3000	reclow5	0.232 (0.165, 0.318)	0.237 (0.151, 0.366)	0.256 (0.126, 0.456)	0.325 (0.111, 0.636)	1.5 (0.998, 2.1)	2.0 (0.720, 3.9)	0.171 (0.132, 0.219)	0.09	0.734	0.2

Table 4: Performance statistics for tuning to the median SSB equal to 35% by 2040, part 1, catch performance related.

tuning	MP	run	Mean TAC (2021-2029)	Mean TAC (2021-2035)	Mean TAC (2036-2050)	%AAV (2021-2035)	%AAV (2036-2050)	Mean CPUE2024-2026	P(2up/1down) init
35	AAA_3000	base18	18767 (18260, 19326)	19303 (18439, 21080)	22896 (18780, 30149)	3.1 (1.5, 8.7)	3.6 (0.000, 9.2)	1.3 (0.800, 2.3)	0.014
35	DMRcomb2_3000	base18	18613 (16091, 20496)	19508 (15262, 22661)	26137 (14126, 28000)	6.1 (2.3, 10.9)	4.0 (0.000, 10.7)	1.4 (0.811, 2.3)	0.022
35	NT4_3000	base18	19109 (18546, 19720)	19303 (18545, 20223)	21254 (19358, 23445)	2.6 (1.5, 4.3)	2.6 (0.637, 6.2)	1.3 (0.792, 2.3)	0.046
35	rh13_3000	base18	18708 (17341, 21837)	19308 (17341, 23182)	21748 (17309, 30070)	3.9 (0.000, 10.1)	1.5 (0.000, 8.2)	1.4 (0.806, 2.3)	0.022
35	AAA_3000	as2016	18746 (18022, 19279)	19252 (17887, 20824)	22124 (17316, 29576)	2.9 (1.5, 8.1)	3.2 (0.000, 8.8)	1.3 (0.728, 2.3)	0.018
35	DMRcomb2_3000	as2016	18493 (15939, 20295)	19180 (14890, 22318)	25345 (12891, 27965)	5.8 (2.0, 10.7)	4.3 (0.128, 10.7)	1.3 (0.748, 2.3)	0.024
35	NT4_3000	as2016	18825 (18264, 19447)	18984 (18245, 19924)	21015 (19120, 23189)	2.2 (1.1, 4.1)	2.6 (0.656, 6.1)	1.3 (0.725, 2.3)	0.106
35	rh13_3000	as2016	17593 (17189, 20676)	17991 (16899, 21860)	20115 (16650, 28513)	2.0 (0.000, 9.0)	1.7 (0.000, 8.7)	1.3 (0.746, 2.3)	0.013
35	AAA_3000	as2016cpue18	18752 (18017, 19258)	19217 (17903, 20859)	21871 (17246, 29256)	2.8 (1.4, 8.2)	2.9 (0.000, 8.6)	1.3 (0.711, 2.2)	0.02
35	DMRcomb2_3000	as2016cpue18	18423 (15825, 20156)	19049 (14689, 22322)	24959 (12657, 27953)	5.7 (2.0, 10.8)	4.5 (0.173, 10.6)	1.3 (0.732, 2.2)	0.026
35	NT4_3000	as2016cpue18	18748 (18214, 19359)	18901 (18183, 19826)	20912 (19031, 23093)	2.1 (1.1, 4.0)	2.6 (0.663, 6.1)	1.3 (0.706, 2.2)	0.12
35	rh13_3000	as2016cpue18	17516 (17144, 20294)	17792 (16831, 21253)	19809 (16225, 28336)	1.6 (0.000, 9.0)	1.7 (0.000, 9.3)	1.3 (0.728, 2.2)	0.011
35	AAA_3000	as2016reclow5	18115 (15143, 18920)	17771 (13246, 19551)	18772 (10130, 26531)	5.0 (1.6, 13.2)	2.6 (0.000, 9.3)	0.912 (0.509, 1.6)	0.252
35	DMRcomb2_3000	as2016reclow5	17176 (14817, 19288)	16033 (12720, 20174)	17392 (8101, 27292)	7.6 (2.6, 16.2)	6.4 (1.6, 14.1)	0.922 (0.523, 1.6)	0.144
35	NT4_3000	as2016reclow5	18752 (17842, 19377)	18649 (16853, 19506)	20964 (18104, 23250)	2.4 (1.2, 6.4)	4.3 (1.7, 8.4)	0.904 (0.497, 1.6)	0.228
35	rh13_3000	as2016reclow5	17401 (14498, 20088)	17231 (12702, 20586)	17480 (9820, 25568)	4.6 (0.000, 14.9)	2.4 (0.000, 12.8)	0.922 (0.519, 1.6)	0.054
35	AAA_3000	cpueom75	18788 (18356, 19372)	19360 (18611, 21304)	23712 (18995, 30837)	3.4 (1.6, 9.4)	4.0 (0.000, 9.5)	1.3 (0.824, 1.9)	0.01
35	DMRcomb2_3000	cpueom75	18639 (16216, 20378)	19594 (15275, 22629)	26353 (13885, 28000)	6.2 (2.1, 10.9)	3.6 (0.000, 10.8)	1.3 (0.834, 1.9)	0.023
35	NT4_3000	cpueom75	18894 (18373, 19461)	19019 (18365, 19803)	20550 (18962, 22264)	2.1 (1.1, 3.4)	2.1 (0.514, 5.1)	1.3 (0.822, 1.9)	0.058
35	rh13_3000	cpueom75	17752 (17341, 20810)	18171 (17279, 21951)	20589 (17217, 29517)	2.0 (0.000, 9.0)	2.1 (0.000, 9.8)	1.3 (0.838, 1.9)	0.009
35	AAA_3000	cpueupq	18706 (17759, 19194)	19168 (17600, 20818)	21886 (16900, 29758)	2.7 (1.4, 8.3)	3.1 (0.000, 9.1)	0.046 (0.027, 0.079)	0.018
35	DMRcomb2_3000	cpueupq	18460 (15854, 20200)	19114 (14676, 22337)	25426 (12456, 27967)	6.0 (2.2, 10.9)	4.5 (0.101, 11.1)	1.4 (0.846, 2.4)	0.022
35	NT4_3000	cpueupq	19238 (18651, 19858)	19470 (18670, 20428)	21448 (19428, 23787)	2.9 (1.7, 4.6)	2.7 (0.679, 6.3)	1.4 (0.821, 2.4)	0.025
35	rh13_3000	cpueupq	19341 (17341, 22190)	20029 (17234, 23929)	22579 (16999, 31036)	4.6 (0.176, 11.2)	1.6 (0.000, 8.5)	1.4 (0.838, 2.4)	0.04
35	AAA_3000	cpuew0	18396 (15162, 18857)	18548 (13844, 19684)	19073 (8569, 27534)	2.2 (0.861, 11.6)	2.8 (0.209, 11.9)	0.767 (0.434, 1.4)	0.074
35	DMRcomb2_3000	cpuew0	16951 (14453, 18967)	15859 (11972, 19940)	14271 (4307, 27042)	7.3 (1.8, 20.4)	6.4 (1.5, 16.5)	0.779 (0.442, 1.4)	0.029
35	NT4_3000	cpuew0	17851 (17527, 18300)	17741 (17141, 18354)	19079 (15604, 21673)	1.3 (0.370, 3.2)	3.4 (0.804, 8.7)	0.771 (0.426, 1.4)	0.011
35	rh13_3000	cpuew0	17341 (14579, 17505)	17160 (12629, 18048)	16642 (5555, 24697)	1.2 (0.231, 16.2)	3.0 (0.000, 14.5)	0.802 (0.462, 1.4)	0
35	AAA_3000	reclow5	18160 (12769, 21440)	18041 (12769, 21440)	18749 (9898, 25483)	0.000 (0.000, 9.9)	0.000 (0.000, 7.6)	1.0 (0.594, 1.7)	0.102
35	DMRcomb2_3000	reclow5	17365 (14921, 19447)	16484 (13033, 20516)	19251 (8762, 27551)	7.1 (2.6, 15.4)	6.7 (1.4, 14.4)	1.0 (0.608, 1.7)	0.16
35	NT4_3000	reclow5	19044 (18100, 19674)	18973 (17104, 19851)	21282 (18437, 23524)	2.9 (1.7, 6.8)	4.4 (1.8, 8.4)	0.992 (0.585, 1.7)	0.16
35	rh13_3000	reclow5	18059 (14909, 21361)	17769 (13274, 22138)	18728 (10775, 27456)	5.5 (0.182, 12.8)	1.7 (0.000, 10.0)	1.0 (0.600, 1.7)	0.124

Table 4 continued (SSB related)

tuning	MP	run	SSB2030/SSB0	SSB2035/SSB0	SSB2040/SSB0	SSB2050/SSB0	SSB2035/SSB2018	SSB2050/SSB2018	Min. SSB 2019-2035/SSB0	P(SSB2030 > 0.3SSB0)	P(SSB2035 > 0.2SSB0)	P(SSB2035 > 0.3SSB0)
35	AAA_3000	base18	0.286 (0.197, 0.405)	0.322 (0.199, 0.506)	0.350 (0.181, 0.598)	0.390 (0.177, 0.694)	2.0 (1.3, 3.0)	2.4 (1.2, 4.2)	0.172 (0.133, 0.223)	0.42	0.946	0.615
35	DMRcomb2_3000	base18	0.287 (0.202, 0.399)	0.325 (0.213, 0.498)	0.346 (0.208, 0.586)	0.375 (0.200, 0.708)	2.0 (1.4, 2.9)	2.3 (1.3, 4.3)	0.172 (0.133, 0.223)	0.424	0.972	0.635
35	NT4_3000	base18	0.283 (0.194, 0.403)	0.320 (0.194, 0.510)	0.351 (0.177, 0.612)	0.410 (0.169, 0.758)	2.0 (1.3, 3.0)	2.5 (1.1, 4.6)	0.172 (0.133, 0.222)	0.406	0.936	0.596
35	rh13_3000	base18	0.285 (0.197, 0.400)	0.321 (0.197, 0.496)	0.351 (0.181, 0.595)	0.404 (0.168, 0.724)	2.0 (1.3, 2.9)	2.5 (1.1, 4.4)	0.172 (0.133, 0.222)	0.404	0.945	0.596
35	AAA_3000	as2016	0.255 (0.170, 0.366)	0.287 (0.169, 0.461)	0.316 (0.153, 0.548)	0.370 (0.156, 0.647)	1.8 (1.2, 2.7)	2.3 (1.1, 4.0)	0.166 (0.130, 0.217)	0.234	0.864	0.437
35	DMRcomb2_3000	as2016	0.256 (0.175, 0.363)	0.292 (0.186, 0.455)	0.319 (0.188, 0.541)	0.359 (0.197, 0.655)	1.8 (1.3, 2.7)	2.3 (1.3, 4.1)	0.166 (0.130, 0.217)	0.232	0.912	0.451
35	NT4_3000	as2016	0.253 (0.168, 0.366)	0.287 (0.166, 0.468)	0.320 (0.151, 0.567)	0.384 (0.148, 0.716)	1.8 (1.1, 2.8)	2.4 (1.0, 4.4)	0.166 (0.130, 0.217)	0.231	0.858	0.432
35	rh13_3000	as2016	0.256 (0.173, 0.369)	0.293 (0.176, 0.466)	0.331 (0.163, 0.564)	0.400 (0.172, 0.696)	1.9 (1.2, 2.8)	2.5 (1.1, 4.2)	0.166 (0.130, 0.217)	0.248	0.885	0.476
35	AAA_3000	as2016cpue18	0.247 (0.163, 0.358)	0.280 (0.163, 0.451)	0.310 (0.147, 0.540)	0.364 (0.150, 0.645)	1.8 (1.1, 2.7)	2.3 (1.1, 4.0)	0.165 (0.128, 0.213)	0.204	0.844	0.405
35	DMRcomb2_3000	as2016cpue18	0.250 (0.171, 0.356)	0.285 (0.181, 0.442)	0.313 (0.185, 0.535)	0.358 (0.198, 0.651)	1.8 (1.3, 2.6)	2.3 (1.3, 4.0)	0.165 (0.129, 0.213)	0.205	0.896	0.416
35	NT4_3000	as2016cpue18	0.246 (0.163, 0.359)	0.280 (0.160, 0.458)	0.314 (0.147, 0.558)	0.378 (0.145, 0.710)	1.8 (1.1, 2.7)	2.4 (1.0, 4.4)	0.165 (0.128, 0.213)	0.2	0.843	0.409
35	rh13_3000	as2016cpue18	0.251 (0.169, 0.362)	0.288 (0.171, 0.458)	0.327 (0.164, 0.557)	0.397 (0.175, 0.693)	1.8 (1.2, 2.7)	2.5 (1.2, 4.3)	0.165 (0.128, 0.213)	0.22	0.87	0.454
35	AAA_3000	as2016reclow5	0.212 (0.144, 0.297)	0.225 (0.140, 0.357)	0.258 (0.130, 0.457)	0.360 (0.167, 0.642)	1.4 (0.972, 2.1)	2.3 (1.1, 3.9)	0.166 (0.128, 0.213)	0.044	0.667	0.154
35	DMRcomb2_3000	as2016reclow5	0.216 (0.150, 0.296)	0.237 (0.154, 0.356)	0.277 (0.165, 0.463)	0.388 (0.229, 0.659)	1.5 (1.1, 2.1)	2.5 (1.4, 4.1)	0.166 (0.130, 0.215)	0.044	0.743	0.174
35	NT4_3000	as2016reclow5	0.208 (0.139, 0.294)	0.214 (0.122, 0.352)	0.237 (0.099, 0.451)	0.306 (0.089, 0.623)	1.3 (0.846, 2.0)	1.9 (0.617, 3.8)	0.165 (0.122, 0.213)	0.04	0.592	0.137
35	rh13_3000	as2016reclow5	0.215 (0.149, 0.298)	0.232 (0.147, 0.358)	0.268 (0.145, 0.464)	0.379 (0.183, 0.670)	1.5 (1.0, 2.1)	2.4 (1.2, 4.1)	0.166 (0.129, 0.213)	0.044	0.702	0.174
35	AAA_3000	cpueom75	0.304 (0.205, 0.430)	0.340 (0.205, 0.540)	0.365 (0.180, 0.645)	0.402 (0.169, 0.773)	2.1 (1.4, 3.2)	2.4 (1.1, 4.7)	0.173 (0.132, 0.229)	0.53	0.956	0.676
35	DMRcomb2_3000	cpueom75	0.305 (0.211, 0.428)	0.342 (0.221, 0.536)	0.359 (0.211, 0.629)	0.391 (0.202, 0.788)	2.1 (1.5, 3.1)	2.4 (1.2, 4.8)	0.173 (0.132, 0.229)	0.532	0.98	0.698
35	NT4_3000	cpueom75	0.304 (0.204, 0.431)	0.342 (0.202, 0.550)	0.373 (0.180, 0.670)	0.443 (0.169, 0.871)	2.1 (1.4, 3.2)	2.7 (1.1, 5.3)	0.173 (0.132, 0.229)	0.524	0.953	0.676
35	rh13_3000	cpueom75	0.306 (0.209, 0.432)	0.347 (0.211, 0.546)	0.381 (0.190, 0.662)	0.450 (0.185, 0.826)	2.2 (1.4, 3.2)	2.7 (1.2, 5.0)	0.173 (0.132, 0.229)	0.538	0.966	0.704
35	AAA_3000	cpueupq	0.258 (0.172, 0.375)	0.292 (0.173, 0.476)	0.323 (0.154, 0.567)	0.371 (0.149, 0.674)	2.0 (1.3, 3.0)	2.5 (1.1, 4.5)	0.156 (0.121, 0.202)	0.248	0.878	0.464
35	DMRcomb2_3000	cpueupq	0.259 (0.178, 0.371)	0.295 (0.189, 0.462)	0.322 (0.191, 0.555)	0.357 (0.188, 0.679)	2.0 (1.4, 2.9)	2.5 (1.3, 4.5)	0.157 (0.121, 0.202)	0.246	0.922	0.47
35	NT4_3000	cpueupq	0.254 (0.168, 0.372)	0.287 (0.165, 0.473)	0.315 (0.146, 0.576)	0.370 (0.128, 0.726)	2.0 (1.2, 3.0)	2.5 (0.975, 4.8)	0.156 (0.120, 0.202)	0.233	0.855	0.433
35	rh13_3000	cpueupq	0.253 (0.172, 0.368)	0.283 (0.167, 0.456)	0.306 (0.150, 0.549)	0.350 (0.122, 0.678)	1.9 (1.2, 2.9)	2.4 (0.877, 4.5)	0.156 (0.121, 0.202)	0.226	0.864	0.424
35	AAA_3000	cpuew0	0.157 (0.097, 0.260)	0.180 (0.093, 0.359)	0.208 (0.078, 0.470)	0.275 (0.069, 0.629)	1.7 (0.999, 3.2)	2.7 (0.720, 5.8)	0.107 (0.089, 0.131)	0.018	0.416	0.124
35	DMRcomb2_3000	cpuew0	0.164 (0.103, 0.259)	0.202 (0.114, 0.357)	0.247 (0.130, 0.482)	0.360 (0.202, 0.681)	1.9 (1.2, 3.2)	3.5 (2.0, 6.4)	0.107 (0.089, 0.131)	0.018	0.507	0.138
35	NT4_3000	cpuew0	0.159 (0.091, 0.265)	0.184 (0.079, 0.371)	0.212 (0.057, 0.493)	0.273 (0.015, 0.701)	1.8 (0.870, 3.3)	2.6 (0.155, 6.5)	0.106 (0.079, 0.131)	0.018	0.434	0.14
35	rh13_3000	cpuew0	0.168 (0.107, 0.277)	0.198 (0.109, 0.386)	0.234 (0.108, 0.509)	0.325 (0.131, 0.712)	1.8 (1.1, 3.3)	3.1 (1.3, 6.3)	0.112 (0.093, 0.141)	0.027	0.492	0.168
35	AAA_3000	reclow5	0.245 (0.168, 0.341)	0.261 (0.157, 0.413)	0.293 (0.144, 0.532)	0.394 (0.146, 0.754)	1.6 (1.1, 2.4)	2.4 (0.988, 4.6)	0.171 (0.133, 0.222)	0.166	0.825	0.325
35	DMRcomb2_3000	reclow5	0.247 (0.176, 0.333)	0.270 (0.182, 0.400)	0.307 (0.188, 0.508)	0.401 (0.231, 0.690)	1.7 (1.2, 2.3)	2.5 (1.4, 4.3)	0.172 (0.133, 0.222)	0.145	0.89	0.316
35	NT4_3000	reclow5	0.238 (0.165, 0.329)	0.246 (0.149, 0.388)	0.267 (0.128, 0.495)	0.338 (0.120, 0.676)	1.5 (1.0, 2.3)	2.1 (0.787, 4.1)	0.171 (0.132, 0.221)	0.122	0.762	0.255
35	rh13_3000	reclow5	0.241 (0.173, 0.328)	0.258 (0.167, 0.388)	0.287 (0.156, 0.490)	0.383 (0.167, 0.687)	1.6 (1.1, 2.3)	2.4 (1.1, 4.3)	0.171 (0.133, 0.222)	0.12	0.832	0.266

Attachment 11

Data Exchange Requirements for 2020

Introduction

The data exchange requirements for 2020, including the data that are to be provided and the dates and responsibilities for the data provision, are provided in **Annex A**.

Catch effort and size data should be provided in the identical format as were provided in 2019. 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 2020 to allow development of the necessary data loading routines.

Data listed in Attachment A should be provided for the complete 2019 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 2018 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 2018 data) must be accompanied by a detailed description of the changes.

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
CCSBT Data CD	Secretariat	31 Jan 20	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 2019 data exchange and any additional data received since that time, including: • Tag/recapture data (*The Secretariat will provide additional updates of the tag-recapture data during 2020 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 20	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 Apr 20	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 20	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 20	The mortality allowance (kilograms) that was used in the 2019 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 20 (New Zealand)[2] 30 Apr 20 (other members & Secretariat) 31 July 20 (Indonesia)	Catch (in numbers and weight) and effort data is to be provided as either shot by shot or as aggregated data (New Zealand provides fine scale shot by shot data which is aggregated and distributed by the Secretariat). The maximum level of aggregation is by year, month, fleet, gear, and 5x5 degree (longline fishery) or 1x1 degree for surface fishery. Indonesia will provide estimates based on either shot by shot or as aggregated data from the trial Scientific Observer Program.

[1] The text "**For MP/OM**" means that this data is used for both the Management Procedure and the Operating Model. If only one of these items appears (e.g. **For OM**), then the data is only required for the specified item.
[2] The earlier date specified for New Zealand is so that the Secretariat will be able to process the fine scale New Zealand data in time to provide aggregated and raised data to members by 30 April.

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
Non-retained catches	All Members	30 Apr 20 (all Members except Indonesia) 31 July 20 (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 20	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 20	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 20	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 20	Raw observer length frequency data as provided in previous years.

Type of Data to provide[1]	Data Provider(s)	Due Date	Description of data to provide
Raised Length Data	Australia, Taiwan, Japan, New Zealand, Korea	30 Apr 20 (Australia, Taiwan, Japan, Korea) 7 May 20 (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 20	Raw Length Frequency data from the South African Observer Program.
RTMP Length data	Japan	30 Apr 20	The length data from the real time monitoring program should be provided in the same format as the standard length data.
Indonesian LL SBT age and size composition	Australia Indonesia	30 Apr 20	Estimates of both the age and size composition (in percent) is to be generated for the spawning season July 2018 to June 2019. Length frequency for the 2018 calendar year and age frequency for the 2018 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 20	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 2017 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 20	Estimates of the different trolling indices (piston-line index and grid-type trolling index (GTI)) for the 2019/20 season (ending 2020), including any estimates of uncertainty (e.g. CV).

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

Type of Data to provide[1]	**Data Provider(s)**	**Due Date**	**Description of data to provide**
Tag return summary data	Secretariat	30 Apr 20	Updated summary of the number tagged and recaptured per month and season.
Gene tagging data	Secretariat	30 Apr 20	An estimate of juvenile abundance and mark-recapture data from the pilot gene-tagging study through a contract with CSIRO. The mark-recapture data will include the tagging release data (e.g. date of tagging, length of fish), tag recapture data (e.g. recapture sample date, length) and whether or not a genetic match with a release tissue was found.
Close Kin Data	Secretariat	30 Apr 20	Updated dataset of identified SBT parent-offspring pairs and half-sibling using SNPs. This is a deliverable of the SBT annual close-kin tissue sampling, processing, kin identification and Indonesian ageing project conducted by CSIRO under contract to the CCSBT.
Catch at age data	Australia, Taiwan, Japan, Secretariat	14 May 20	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 20	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 20[7]	These data will be provided for July 2018 to June 2019 in the same format as previously provided.
Raised catch-at-age for Indonesia spawning ground fisheries. **<u>For OM</u>**	Secretariat	24 May 20	These data will be provided for July 2018 to June 2019 in the same format as on the CCSBT Data CD.
Total catch per fishery and sub-fishery each year from 1952 to 2019. **<u>For OM</u>**	Secretariat	31 May 20	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.

[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
Catch-at-length (2 cm bins) and catch-at-age proportions. **<u>For OM</u>**	Secretariat	31 May 20	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 20	Calculate the total catch-at-age in 2019 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 20	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 20 (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)[10] (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 **<u>for OM/MP</u>**	Japan	15 Jun 20 (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. Due to loss of data from Japanese-flagged charter vessels in the New Zealand fishery from 2016 onward, these indices are calculated combining areas 4 and 5, areas 6 and 7, respectively.

Attachment 12

ESC Workplan for 2020-2022

Activity	2020	2021	2022
Routine Activity/Projects not requiring additional CCSBT Resources			
Continuation of tag recovery efforts	Yes	Yes	Yes
Standard Scientific Data Exchange	Yes	Yes	Yes
Provide SBT stock status report to other t-RFMOs	Yes	Yes	Yes
Contracted Work/Projects			
Routine OMMP code maintenance and development	Yes	Yes	Yes
Continued aging of Indonesian otoliths	Yes	Yes	Yes
Gene tagging	3rd GT estimate, Release 5, Recap 4	4th GT estimate, Release 6, Recap 5	5th GT estimate, Release 7, Recap 6
Continued collection & processing of close-kin samples	Yes	Yes	Yes
Purchase of ultra-low freezer for storing tissue samples	No	No	Yes
Additional 1,100 samples DNA extraction & sequencing	Yes	Yes	Yes
Close-kin identification & exchange	Yes	Yes	Yes
Maturity study	Complete data analysis[1]	No	No
Implementation of farm and market recommendations	This is not expected to be part of the ESC's workplan (more likely to be a Compliance Committee function)		
Meetings			
CPUE webinar	Yes	Yes	Yes
OMMP meeting (late June)	Yes[2]	No	Yes[3]
Informal OMMP meeting[4]	No	No	No
ESC meeting[5]	Yes	Yes	Yes
Contingency meeting (June)	Possible[6]	No	No

[1] CCSBT provided funding for a statistician for the maturity study in 2019. However, statistical analysis may not be completed on schedule due to delays for some Members in finalising ovary histology. If the work continues into 2020, it will use funds from 2019.
[2] For the stock assessment and consideration of the SRP.
[3] Running the MP to recommend the TAC for 2024-2026.
[4] One day, immediately prior to the ESC. No separate report of meeting.
[5] Each meeting includes: Regular review of indicators; Evaluation of meta-rules and exceptional circumstances; Review results of SRP activities. The 2020 meeting will also involve a stock assessment and the 2022 meeting will also involve running the MP.
[6] Special EC/ESC meeting in case the EC needs more time to agree on the MP.

Attachment 13

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)

	2020	2021	2022
Contracted Work/Projects			
Routine OMMP Code Maintenance / Development	5 P days + 6 months Shiny App	5 P days + 6 months Shiny App	5 P days + 6 months Shiny App
Continued aging of Indonesian otoliths	Contracted	Contracted	Contracted
Gene Tagging	Contracted	Contracted	Contracted
Continued close-kin sample collection & Processing	Contracted	Contracted	Contracted + $22,000 Freezer space
Additional 1,100 samples DNA extraction & sequencing	Yes	Yes	Yes
Close-kin identification & exchange	Contracted	Contracted	Contracted
Maturity study	$0[1]	$0	$0
Analysis of farming and market data	This is not expected to be part of the ESC's workplan (more likely to be a Compliance Committee function)		
Meetings			
CPUE Webinar	3 Panel days	3 Panel days	3 Panel days
June OMMP Meeting in Seattle *(no Sec, no Interp)*	5 days Cat: 3P, 1C, 1Ch + 3C Prep Days	No	5 days Cat: 3P, 1C + 3C Prep Days
Informal technical workshop (immediately prior to ESC, *no Interp*)	No	No	No
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
Contingency ESC/EC Meeting	5 days FM: 1Ch, 3P, 1C, 3 Interp, 3 Sec	No	No

[1] CCSBT provided funding for a statistician for the maturity study in 2019. However, statistical analysis may not be completed on schedule due to delays for some Members in finalising ovary histology. If the work continues into 2020, it will use funds from 2019.