A CHECK OF OPERATING MODEL PREDICTIONS FROM THE VIEWPOINT OF IMPLEMENTATION OF THE MANAGEMENT PROCEDURE IN 2025

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Abstract: We examined observations/information of input index/data (Japanese longline GAM22 CPUE, age 2 abundance estimate from the gene-tagging, and close-kin mark recapture data) for the Cape Town procedure (CTP) comparing to the 2019 operating model (OM) prediction. These examinations indicate that all the observations/information are consistent with the predicted ranges from the 2019 OM. In terms of the input index/data for the CTP, therefore, there is no evidence to support a declaration of Exceptional Circumstances. Accordingly, regarding a decision on implementation of the recommended TAC for the 2026 season (20,647 t, calculated by the CTP in 2022 to be applied to the 2024-2026 period), it is concluded that no modification of the value of this TAC is required because: 1) 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 factors (the extent by which the total reported global catch exceeds the TAC, unaccounted mortality, results of stock assessment conducted in 2023, issues related to biological sampling in Indonesia and changes in operation pattern of Indonesian fishery); and 2) no unexpected change has been detected in the fisheries and scientific survey indicators examined. Additionally, we also reviewed the inspection of the inputs for the CTP which was done at the OMMP15 meeting in July 2025 to consider validity of operation of the CTP regarding a TAC recommendation for the 2027-2029 period. This paper continues to follow the conclusion from the OMMP15 meeting about the inputs. In addition to this, based on metarule evaluations of the points discussed above, we conclude that the CTP can be applied to provide TAC advice for the 2027-2029 period.

要旨： ケープタウン方式（CTP）の入力指数／データ（日本はえ縄 GAM22 CPUE、遺伝子標識からの 2 歳魚資源尾数推定値、近縁遺伝子標識再捕データ）の観測値／情報を 2019 年のオペレーティングモデル（OM）の予測値と対比させて精査した．この精査では全ての観測値／情報が 2019 年の OM の予測範囲と矛盾しないことを示している．したがって，CTP の入力指数／データに関しては、例外的状況の宣言を支持する証拠はない．これらに基づき，2026 年漁期に対して勧告された TAC（2024-2026 年漁期間に適用するため 2022 年に CTP によって算定された 20,647 トン）の実施の決定に関して，この TAC 値の変更は必要ないと判断される．理由は以下の通り：1) OM 予測の確認ならびにその他の可能性のある要因（総報告全球漁獲が TAC を超過する程度，未考慮漁獲死亡および 2023 年に実施された資源評価の結果，インドネシアにおける生物サンプリングおよびインドネシア漁業の操業パターンの変化に関連した問題）の観点から例外的状況の宣言を支持する決定的な証拠がないこと；2) 精査した漁業ならびに科学調査指標に予期せぬ変化がなかったこと．上記に加えて，2027-2029 年漁期間の TAC 勧告に関して，CTP の計算の妥当性を検討するために 2025 年 7 月の OMMP15 会合で行われた CTP の入力情報の点検についてもレビューした．本文書でもこの入力情報に関する OMMP15 会合からの結論を踏襲する．このことに加えて，上記で議論した観点のメタルール判断に基づき，2027-2029 年漁期間の TAC 勧告を提供するために CTP を適用できると結論付けた．

1. Introduction

Since 2011, the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) has used a management procedure (MP) to guide the setting of the global total allowable catch (TAC) for southern bluefin tuna (SBT; *Thunnus maccoyii*). The previous MP ("Bali procedure") was

replaced with a newly developed and adopted MP ("Cape Town procedure (CTP)") in 2019. The CTP was developed because of cessation of the scientific aerial survey in 2018 which had provided an index of recruitment required for the input to the Bali procedure. The CTP was used to recommend TACs for the 2021-2023 seasons in 2020 and the 2024-2026 seasons in 2022.

The CTP was adjusted (tuned) and tested to achieve the management objective[1] under certain assumptions/predictions about SBT stock and fishery. Thus, it is essential to check whether the current status of SBT stock falls within the range predicted when the CTP was developed in 2019, and whether any of the assumptions made then have subsequently been shown to be invalid. As a part of the "metarules" process for the MP (CCSBT 2012[2]), the Extended Scientific Committee (ESC): (1) annually reviews stock and fishery indicators, and any other relevant data or information on the stock and fishery; and (2) every three years conducts an in-depth stock assessment. Then, on the basis of (1) and (2) above, the ESC determines whether there is evidence for Exceptional Circumstances. If the ESC agrees that Exceptional Circumstances exist, then the ESC will (1) determine the severity of the Exceptional Circumstances; (2) formulate advice on the action required depending upon the severity; and (3) report to the Extended Commission (EC) that Exceptional Circumstances exist and provide the advice mandated in such an eventuality.

One of the most important criteria used to determine the existence of Exceptional Circumstances is whether input index/data (observations) for the CTP are outside the predicted (projected) range for which the CTP was tested, where this "range" is defined as the 95% probability intervals for projections for the index/data in question made using the reference set of operating models (OMs) during the testing of the MP (CCSBT 2012). The Japanese core vessel longline CPUE (Itoh and Takahashi 2022), absolute abundance estimate (for 2-year old SBT) and the number of matches from the gene-tagging (GT) project (Preece et al., 2025), and parent-offspring pairs (POPs) and half-sibling pairs (HSPs) data from the close-kin mark recapture (CKMR) project (Farley et al. 2025) were originally necessary inputs for the CTP (Hillary et al. 2020). As CPUE input for the CTP, the core vessels CPUE was replaced with a newly developed CPUE series in 2022 due to technical problems recognized in the core vessels CPUE (CCSBT 2022a). The new CPUE series (called "GAM22") is based on standardization by generalized additive model (GAM) and all vessels data (Itoh and Takahashi 2025) whereas the core vessels CPUE was standardized by generalized linear model (GLM). The GAM22 CPUE index was used as an input for the CTP to calculate TAC for the 2024-2026

[1] The CCSBT management objective is to rebuild the stock to the reference point of 30% of the pre-exploitation spawning stock biomass by 2035 with a 50% probability.

[2] The technical specifications of the CTP are available from http://www.ccsbt.org/.

seasons in 2022 (CCSBT 2022b).

In this paper, the Base case (reference set) OM prediction done in 2019 is compared to the most recent observations of the input index/data for the CTP to check whether these index/data are within the range predicted by the OM projection. Based on this examination, the possible occurrence of Exceptional Circumstances and its severity are discussed along with other factors that are also related to the possibility of the occurrence of Exceptional Circumstances, regarding the TAC recommended for the 2026 season (2024-2026 period) in 2022 and validity of operation of the CTP to provide a TAC recommendation for the 2027-2029 period in 2025.

2. Japanese longline GAM CPUE index

The GAM22 CPUE index for 2024 (Itoh and Takahashi 2025) barely lies within the 95% probability intervals for the Base case OM predictions conducted in 2019 (Fig. 1).

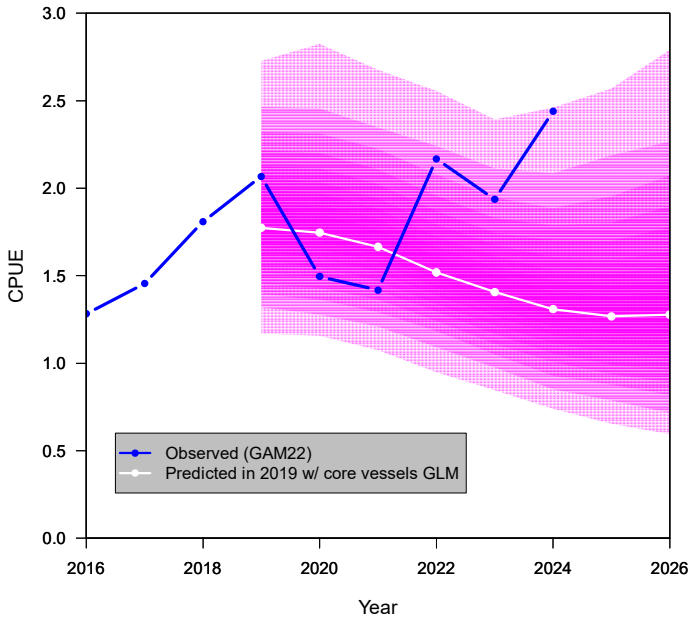

Fig. 1. The Japanese longline GAM22 CPUE series, observed over 2016-2024 (blue line with points) and the future index as projected in 2019 from 2019 to 2025 for the "Base case" ("reference set") OM, where the white line with points is the median projected CPUE, and the purple shades represent percentiles from 2.5% to 97.5% in increments of 5%.

3. Abundance for 2-year-old SBT estimated from the gene-tagging (GT)

Absolute abundance estimates for age 2 SBT obtained from the GT are used as a recruitment indicator in the CTP. Currently, seven estimates are available for age 2 SBT of 2016, 2017, 2018, 2019, 2021, 2022, and 2023 (Preece et al. 2025). There is no estimate for 2020, because the 2020 tagging field work was cancelled due to COVID-19 restrictions, poor weather conditions and difficulty finding fish (Preece and Bradford 2023). The CTP uses the

number of matches, and the abundance estimates for age 2 in TAC calculation (as the 5-year average weighted by the number of matches; Hillary et al. 2025).

The abundance estimate for age 2 SBT and the number of matches for 2023 lie within the 95% probability intervals for the Base case OM predictions in 2019 (Fig. 2).

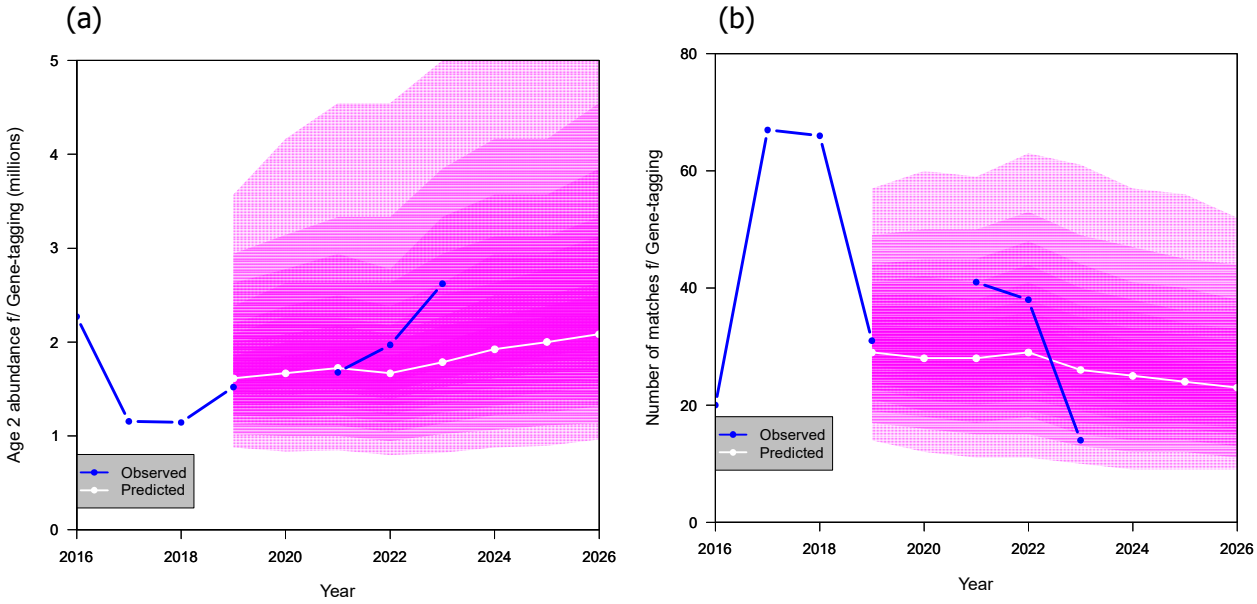

Fig. 2. The age 2 SBT abundance estimate (a) and the number of matches (b) for 2023 from this year's (2025) gene-tagging (GT) analysis, and the future abundance estimates and numbers of matches as projected in 2019 from 2019 to 2025 for the "Base case" ("reference set") OM, where the white lines with points are the medians, and the purple shades represent percentiles from 2.5% to 97.5% in increments of 5%.

4. Data from the close-kin mark recapture (CKMR)

Parent-offspring pairs (POPs) and half-sibling pairs (HSPs) data from the CKMR are used to estimate time series of spawning stock abundance in the CTP (Hillary et al. 2025).

Very few muscle tissue samples of adult SBT for the CKMR were collected from the Indonesian longline fishery in the 2022/23 and 2023/24 seasons due to disruptions caused by institutional changes in Indonesia (Farley et al. 2024, 2025). In contrast, muscle tissue samples were collected from harvested juvenile SBT at tuna processors in Port Lincoln, Australia, in 2023, and were analyzed. Thus, the numbers of detected POPs and HSPs were updated to include the new juvenile data only (Farley et al. 2025).

For the CKMR data, observed CKMR data available in 2025 were compared with simulated data based on the OM used in the 2023 stock assessment since we could not retrieve simulated CKMR data from the 2019 OM. The 2023 assessment shows improvement of the stock status which is on track for the management objective (Hillary et al. 2023), and thus the simulated CKMR data from the 2023 OM is consistent with that from the 2019 OM.

Fig. 3 compares observed CKMR data available in 2025 and the predicted CKMR data from the 2023 OM. The observed CKMR POPs and HSPs data fall within the predicted range.

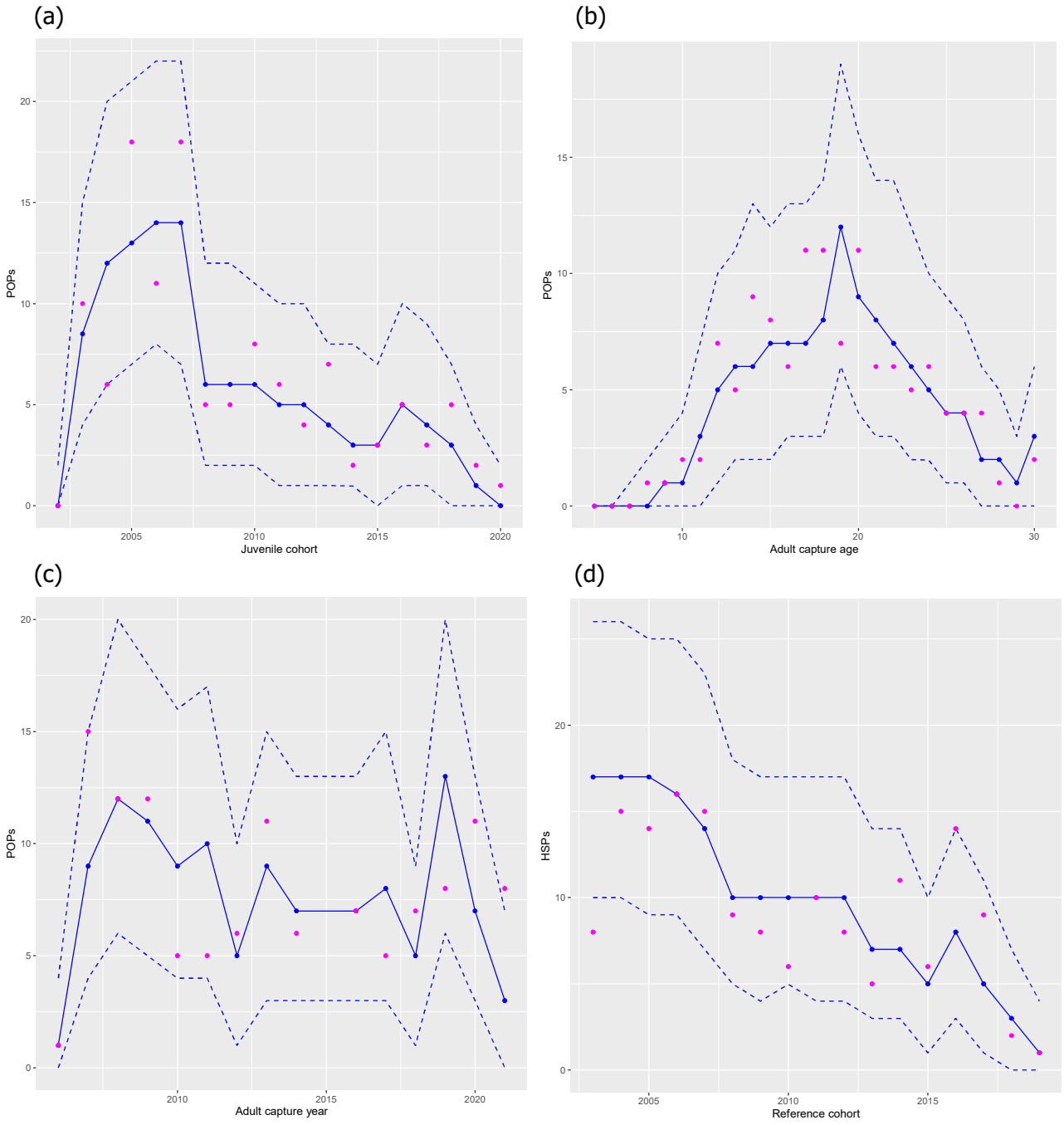

Fig. 3. Observations (magenta points) available in 2025 and predictions (blue solid and dashed lines indicate the median and 95% probability intervals) from the 2023 OM of CKMR POPs and HSPs data. POPs aggregated by juvenile cohort (a), POPs aggregated by adult capture age (b), POPs aggregated by adult capture year (c), HSPs aggregated by the initial (reference) cohort level (d), and total matches of POPs and HSPs (e).

(e)

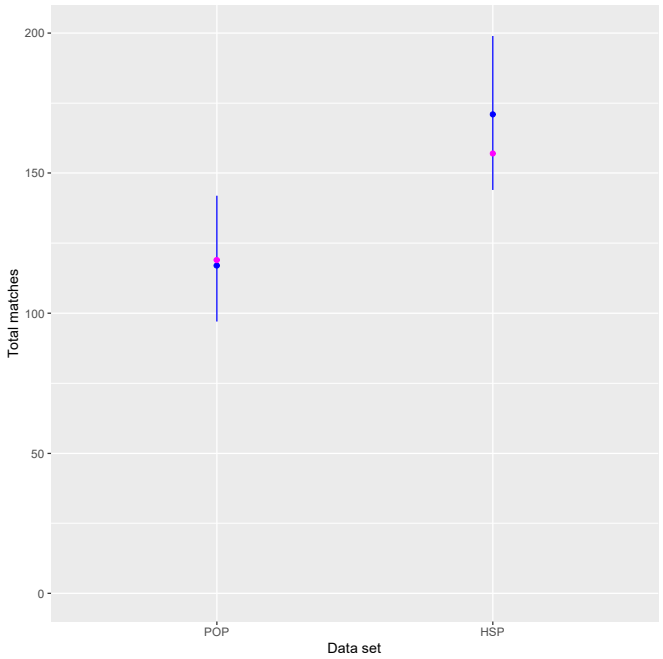

Fig. 3 (cont'd). Observations (magenta points) available in 2025 and predictions (blue solid and dashed lines indicate the median and 95% probability intervals) from the 2023 OM of CKMR POPs and HSPs data. POPs aggregated by juvenile cohort (a), POPs aggregated by adult capture age (b), POPs aggregated by adult capture year (c), HSPs aggregated by the initial (reference) cohort level (d), and total matches of POPs and HSPs (e).

5. Discussion and conclusion

TAC for the 2026 season (recommended for the 2024-2026 period in 2022)

We examined observations of input index/data available in 2025 (longline GAM22 CPUE, age 2 abundance from the GT, CKMR POPs and HSPs) for the CTP comparing to the 2019 OM predictions in the sections 2 to 4 above. These examinations indicate that all the current observations are consistent with the predicted ranges from the 2019 OM (Figs. 1 to 3). Regarding the input index/data for the CTP, therefore, there is no evidence to support a declaration of Exceptional Circumstances.

In addition to those input index/data for the CTP, the following factors are considered to check whether there is possible evidence for Exceptional Circumstances: 1) the extent by which the total reported global catch exceeds the TAC (the overcatch of the TAC); 2) unaccounted mortality (UAM); 3) current stock status information from in-depth stock assessment/updated OM reconditioning and future projections; 4) issues related to biological sampling in Indonesia and changes in operation pattern of Indonesian fishery.

When testing the CTP in 2019, the assumption was made that TACs would not be

exceeded in future years. The reported catches in 2017, 2018, 2019, 2020, 2021, 2022, 2023, and 2024 were below the global TAC by 535 t, 386 t, 505 t, 1426 t, 1030 t, 1245 t, 627 t, and 2513 t (tentative for 2024), respectively (CCSBT Secretariat 2025). Accordingly, this does not provide evidence for Exceptional Circumstances.

The CTP was developed and tested considering non-cooperating Non-Members (NCNM) UAM (i.e., the "MP approach", see paragraph 53 in CCSBT (2016)), and thus it is not necessary to care NCNM UAM as far as its scale is smaller than that was assumed when the CTP was tested in 2019. The amount which is equal to a 10% of LL1 catch was assumed as NCNM UAM in the OM. A 10% of the quota for LL1 (Japan, New Zealand, Korea, European Union, and South Africa longlines) for 2024 is approximately 1063 t. The average actual estimate for NCNM UAM over 2007 to 2020 ranges 223 t to 632 t (Edwards and Hoyle 2023). On average, the actual scale of the estimates for NCNM UAM is smaller than the assumed and accordingly does not seem to provide evidence for Exceptional Circumstances. However, yearly estimates of longline effort for NCNM UAM appear to increase in recent years (Edwards and Hoyle 2023), and thus the ESC should continue to keep careful watch on changes of the scale of NCNM UAM. The UAM estimates need to be updated as two years have passed since the last analysis was conducted.

The key stock status summary ratios resulted from the 2023 stock assessment are improved compared to the last (2020) assessment (e.g., median relative Total Reproductive Output, TRO, is 0.20 in 2019 and 0.23 in 2022) (CCSBT 2020, Hillary et al. 2023). Future projections based on this 2023 reconditioning show that the CTP reaches a median TRO depletion of 0.30 with a probability of 0.51 by 2035, which indicates achieving the management objective. Thus, there is no evidence for Exceptional Circumstances with respect to updated stock status.

Muscle tissue samples of adult SBT for the CKMR were not collected from the Indonesian longline fishery (from the spawning ground) in the 2021/22 season and only very limited samples were collected in the 2022/23 and 2023/24 seasons due to disruptions caused by institutional changes in Indonesia (Farley et al. 2023, 2024, 2025). The lack of these data does not trigger Exceptional Circumstances because the CTP will still be able to calculate TAC by using the available data updated with new samples from juvenile SBT. However, in the 2019 OM for testing the CTP, it was assumed that "analysis of data" from the CKMR would be done as scheduled. In 2024/25 season, it still being slightly lower than the target sample size, but substantially higher muscle tissue samples than had been collected annually in the preceding three seasons were collected from adult SBT (Farley et al. 2025). Thus, we lower the flag that was raised last year noting that this was potential evidence for Exceptional Circumstances. We anticipate that the situation will improve more in the future.

A large portion of catch by Indonesian longline fleet had been from Area 1 since 2011 (Satria et al. 2025). Since 2021, however, catches in Area 2 have been considerably increased compared to those in Area 1. This may indicate some potential changes in operation pattern of Indonesian longline fleet. Indonesian fishery has been assumed to operate mainly in SBT spawning ground (Area 1) in the OM. Although this change in operation pattern does not immediately affect the OM, we raise a flag with respect to future Exceptional Circumstances. Future changes in the operation pattern of this fleet should continue to be monitored along with an effort for resolving the uncertainty associated with the size and age composition of this fishery (Farley et al. 2021, Davies et al. 2023).

Although it does not directly relate to Exceptional Circumstances and is currently considered a potential problem in future, we just bring up some points to note pertaining to the GT here. A possibility of changes in distribution and migration of SBT aged between 1 and 4 in southern Australian coast might raise concerns. The age 1 recruitment index from the trolling survey has continued to be low in recent years and to show a divergent trend contrasted to high CPUE values of Japanese longline (Takahashi and Itoh 2025). Fork length of age 2 SBT sampled/released in the GT has become smaller (Preece et al. 2025). The age composition of SBT catch by purse seiners in the Great Australian Bight was used be dominated by age 3 fish, but it has changed to age 2 fish since 2019 (Takahashi and Itoh 2025). Careful monitoring with respect to these points would be necessary to ensure the validity of GT estimate.

Regarding a decision on implementation of the recommended TAC for the 2026 season (20,647 t , calculated by the CTP in 2022 to be applied to the 2024-2026 period), it is therefore concluded that no modification of the value of this TAC is required because: 1) there is no conclusive evidence to support a declaration of Exceptional Circumstances related to the factors discussed above; and 2) no unexpected change has been detected in the fisheries and scientific survey indicators examined (Patterson 2025, Takahashi and Itoh 2025).

Validity of operation of the CTP and TAC recommendation for the 2027-2029 period

At the OMMP15 meeting in July 2025, the OMMP group reviewed the inputs for the CTP and agreed that the inputs did not appear to present problems or inconsistencies that would suggest exceptional circumstances (CCSBT 2025). In this paper, we continue to follow this conclusion from the OMMP15 meeting about the inputs. In addition to this, based on metarule evaluations of the points discussed above, we conclude that the CTP can be applied to provide TAC advice for the 2027-2029 period.

The code of the CTP and input data for TAC calculation are available to the CCSBT members. We ran the code and could obtain 23,647 t that is same as in Hillary et al. (2025),

which is a maximum of permitted 3,000 t increase from previous TAC.

References

CCSBT. 2012. Report of the seventeenth meeting of the Scientific Committee, 27-31 August 2012 Tokyo, Japan. The Commission for the Conservation of Southern Bluefin Tuna, Canberra, Australia. 87 pp.

CCSBT. 2016. Report of the twenty third annual meeting of the Commission, 13 October 2016. The Commission for the Conservation of Southern Bluefin Tuna, Canberra, Australia. 91 pp.

CCSBT. 2020. Report of the twenty fifth meeting of the Scientific Committee, 7 September 2020 Online. The Commission for the Conservation of Southern Bluefin Tuna, Canberra, Australia. 142 pp.

CCSBT. 2022a. Report of the twelfth Operating Model and Management Procedure technical meeting, 20-24 June 2022 Hobart, Australia. The Commission for the Conservation of Southern Bluefin Tuna, Canberra, Australia. 33 pp.

CCSBT. 2022b. Report of the twenty seventh meeting of the Scientific Committee, 5 September 2022 Online. The Commission for the Conservation of Southern Bluefin Tuna, Canberra, Australia. 125 pp.

CCSBT. 2025. Report of the Fifteenth Operating Model and Management Procedure technical meeting, 3-4 July 2025 Online. The Commission for the Conservation of Southern Bluefin Tuna, Canberra, Australia. 25 pp.

CCSBT Secretariat. 2025. Secretariat review of catches. CCSBT-ESC/2508/04.

Davies, C., F. Satria, J. Farley, L. Sadihya, P. Suadela, R. Sulistyaningsih, B. Setyadji, and S. Mardi S. 2023. SBT catch monitoring and capacity building for biological sampling of spawning ground catches in Indonesia. CCSBT-ESC/2308/14.

Edwards, C.T.T. and S.D. Hoyle. 2023. Estimates of unreported SBT catch by CCSBT non-cooperating non-member states between 2007 and 2020. CCSBT-ESC/2308/BGD01 (*previously* CCSBT-OMMP/2306/07).

Farley, J., P. Eveson and R. Gunasekera. 2023. Update on the SBT close-kin tissue sampling, processing and kin finding 2023. CCSBT-ESC/2308/07.

Farley, J., P. Eveson and R. Gunasekera. 2024. Update on the SBT close-kin tissue sampling, processing and kin-finding 2024. CCSBT-ESC/2409/09.

Farley, J., P. Eveson and R. Gunasekera. 2025. Update on the SBT close-kin tissue sampling, processing and kin finding 2025. CCSBT-ESC/2508/08.

Farley, J., R. Sulistyaningsih, B. Setyadji, S. Mardi, and C. Davies. 2021. Review of data to

estimate the length and age distribution of SBT in the Indonesian longline catch. CCSBT-ESC/2108/07.

Hillary, R., A. Preece and C. Davies. 2020. Running the Cape Town procedure for 2020. CCSBT-ESC/2008/BGD06 (*previously* CCSBT-OMMP/2006/08).

Hillary, R., A. Preece and C. Davies. 2025. Running the Cape Town Procedure for 2025. CCSBT-ESC/2508/18.

Hillary, R. M., A. L. Preece, N. Takahashi, C. R. Davies, and T. Itoh. 2023. The southern bluefin tuna stock assessment in 2023. CCSBT-ESC/2308/16.

Itoh, T. and N. Takahashi. 2022. Update work of the core vessel data and CPUE for southern bluefin tuna in 2022. CCSBT-ESC/2208/BGD02 (*previously* CCSBT-OMMP/2206/06).

Itoh, T. and N. Takahashi. 2025. Update of CPUE abundance index using GAM for southern bluefin tuna in CCSBT (GAM22) up to the 2024 data. CCSBT-ESC/2508/BGD02 (*previously* CCSBT-OMMP/2507/06).

Patterson, H. 2025. Fisheries indicators for the southern bluefin tuna stock in 2024-25. CCSBT-ESC/2508/16.

Preece, A. L., and R. Bradford. 2023. Update on the gene-tagging program 2023 and RMA request. CCSBT-ESC/2308/09.

Preece, A. L., J. P. Eveson, J. R. Hartog, J. Dell, J. Aulich, N. Potter, S. Cooper, and P. Grewe. 2025. Update on the SBT gene-tagging recruitment monitoring program 2025. CCSBT-ESC/2508/09.

Satria, F., L. Sadiyah, B. Setyadji, S. A. Raup, S. Mardi, P. Suadela, A. Budiarto, and S. Patmiasih. 2025. Indonesia's tuna longline fishery interacted with Southern Bluefin Tuna in 2024. CCSBT-ESC/2508/SBT Fisheries – Indonesia.

Takahashi, N., and T. Itoh. 2025. Summary of fisheries and scientific survey indicators of southern bluefin tuna stock in 2025. CCSBT-ESC/2508/27.