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SBT Operating model updates 2022

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Contents

Abstract

This paper provides the preliminary results on performance of the Cape Town Procedure, using a new CPUE series in the 2020 reference set of operating models that have been updated with the most recent available data, as a basis for further exploration at OMMP12.

1 Introduction

The Cape Town Procedure (CTP) was adopted by CCSBT in 2019. The 2019 OMMP and ESC meetings identified the need to further investigate the very high 2018 estimate in the standardised CPUE, and a plan to revise the CPUE series commenced. The CTP was tuned to reach the target of 30% of initial Total Reproductive Output (TRO) by 2035, with 50% probability. The CTP also met the performance of being greater than 20% of initial TRO by 2035 with 70% probability.

The purpose of updating the SBT operating models (OMs) in 2022 is to check the performance of the Cape Town Procedure (in the projections), where the CPUE used in the OMs is the new CPUE series proposed by the CPUE working group and provided in Itoh and Takahashi, 2022.

There were several delays to exchange of data to the CCSBT this year, which has delayed updating datafiles for running the SBT OMs. The collated data used in the OM datafiles for results presented here, were provided by the Secretariat on 14th June. This has left very little time for updating files and running the reference set of OMs and collating results. A brief explanation of the data inputs, preliminary fits to the data and preliminary performance results are provided for further exploration and initial discussion at the OMMP meeting.

2 Data inputs to the OMs

1. The CPUE series used in the 2022 OMs is described in Itoh and Takahashi, 2022.
2. The gene-tagging data for the OMs and CTP are described in Preece et al., 2021. In 2020 the tagging and release component of the project was cancelled because of tagging of low numbers of fish, bad fishing weather and COVID-19 border closures. As there were no fish tagged, the harvest sampling did not proceed in 2021 and there is no estimate for the 2020 2yr old cohort to report this year. The ESC noted that the CTP is designed to work even when data are missing (Anon. 2021). The available gene-tagging data are provided in Table 1. The gene-tagging program is on-going, with successful tagging field work completed in March 2021 and 2022. The 2021 abundance estimate will be provided in early 2023.

Table 1 The results of the gene-tagging programs 2016-2019 which provide the absolute abundance estimate for the age-2 cohort in the year of tagging.

YEAR	COHORT AGE	N RELEASES	N HARVEST	N MATCHES	ABUNDANCE ESTIMATE (MILLIONS)	CV
2016	2	2952	15389	20	2.27	0.224
2017	2	6480	11932	67	1.15	0.122
2018	2	6295	11980	66	1.14	0.123
2019	2	4242	11109	31	1.52	0.180

3. Updated close-kin mark recapture data have been provided to the 2022 CCSBT data exchange and will be further documented in a working paper for the 2022 ESC. We note that shipment of otoliths and tissue samples has been disrupted due to COVID-19, and additional juveniles have been processed in place of the missing adult samples.
4. Total catches, Proportions at Length, Proportions at Age have been updated with data provided to the data exchange. Catch data from South Africa are preliminary. The Indonesian age distribution has not been updated in the OM input datafiles since 2019 because of uncertainty in the length distribution, which has not been resolved (Anon. 2021; Farley et al., 2021 (BGD paper to OMMP 2022), and disruption of shipment of otoliths from Indonesia to CSIRO due to COVID-19. T

3 Reference set specification

The reference set used in these runs of the OMs presented in this paper is the same as the reference set used in the 2020 stock assessment (Table 2; Anon. 2020), apart the change to the new CPUE series. There were changes in 2020 from the reference used in 2019 to tune the CTP (Table 3, Anon 2019).

Table 2 Reference set grid used for checking performance of the Cape Town Procedure using a new CPUE series (Itoh and Takahashi, 2022). Sampling weight refers to how the grid of models is sampled to generate a distribution from 2000 parameter draws. The values for M0, M10 and h below differ from those used in 2019 for MP testing (see Table 3) but are the same as the set of models for the 2020 stock assessment.

Parameter	Value	Cumul N	Prior	Sampling weight
H	0.55, 0.63, 0.72, 0.80	4	Uniform	Prior
M_0	0.4 0.45 0.5	12	Uniform	Posterior
M_{10}	0.065, 0.085, 0.105	36	Uniform	Posterior
Omega (Ω)	1	36	Uniform	Prior
CPUE	GAM2021	36	Uniform	Prior
CPUE age range	4-18, 8-12	72	0.67, 0.33	Prior
Psi (ψ)	1.5, 1.75, 2.0	216	0.25, 0.5, 0.25	Prior

Table 3 Reference set of OMs used in 2019 for Candidate Management Procedure testing and selection.

Parameter	**Value**	**Cumul N**	**Prior**	**Sampling**
H	0.60,0.70,0.8	3	uniform	Prior
M_0	0.35,0.4,0.45,0.5	12	Uniform	ObjFn
M_{10}	0.05,0.085,0.12	36	Uniform	ObjFn
W	1	36	Uniform	Prior
CPUE	w0.5, w0.8	72	Uniform	Prior
CPUE age range	4-18,8-12	144	0.67,0.33	Prior
Psi	1.5,1.75,2.0	432	0.25,0.5,0.25	Prior
UAM1	Described below	432		

Source: OMMP report, Anon. 2019

4 Results

4.1 Fits to data

In this preliminary set of results, the fit to the CPUE (Figure 1), gene-tagging data (Figure 2) and close-kin data (Figure 3), are provided.

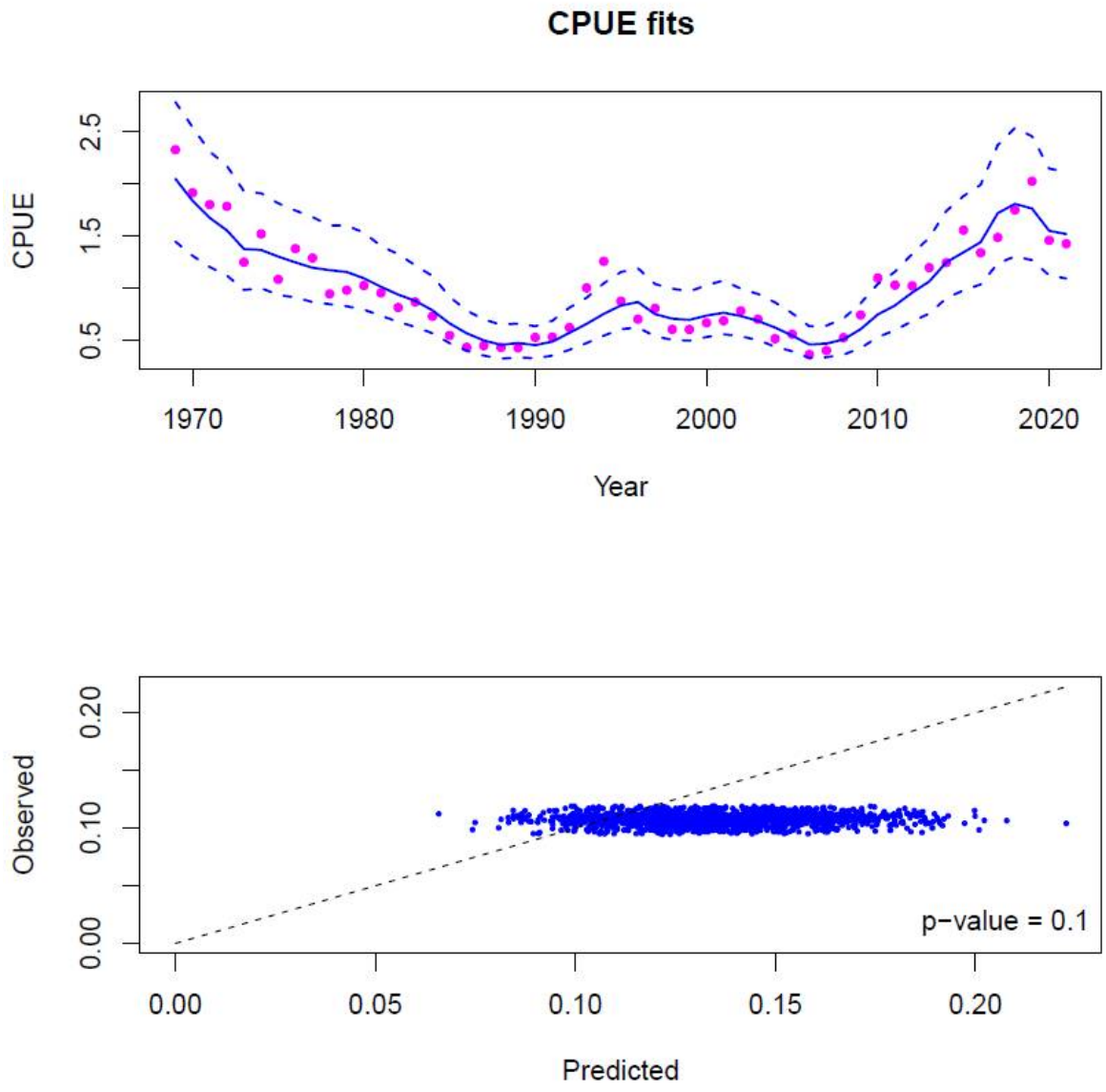

Figure 1 Predictive summary for the new CPUE series used in reference set of OMs. The upper panel shows the fits to the data (magenta); the lower panel the overall predictive p-value for the series.

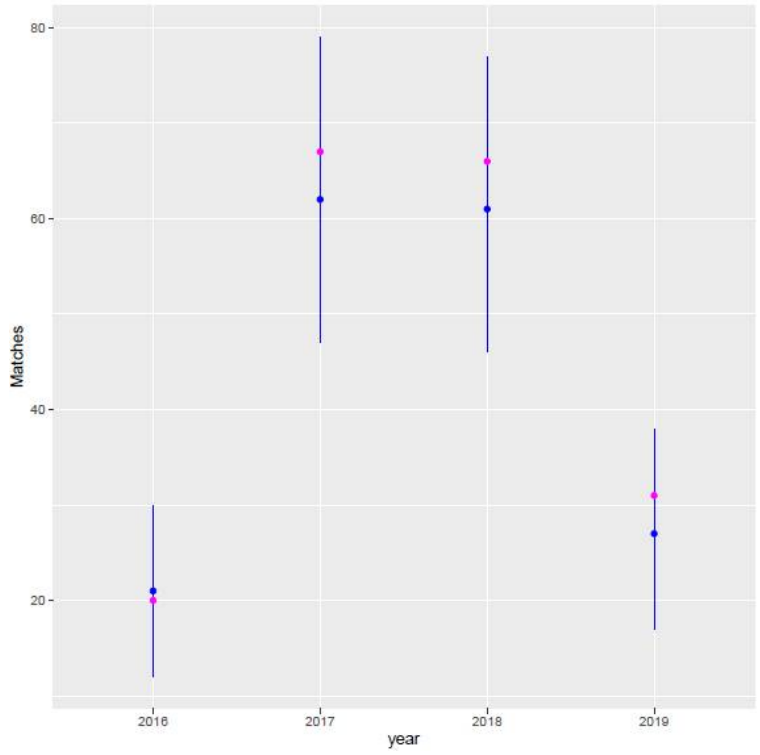

Figure 2 Predictive summary for the gene tagging data (magenta) included in the reference set of OMs. We plot only the predictive fits to the data as the series is currently too short to calculate a meaningful predictive p-value.

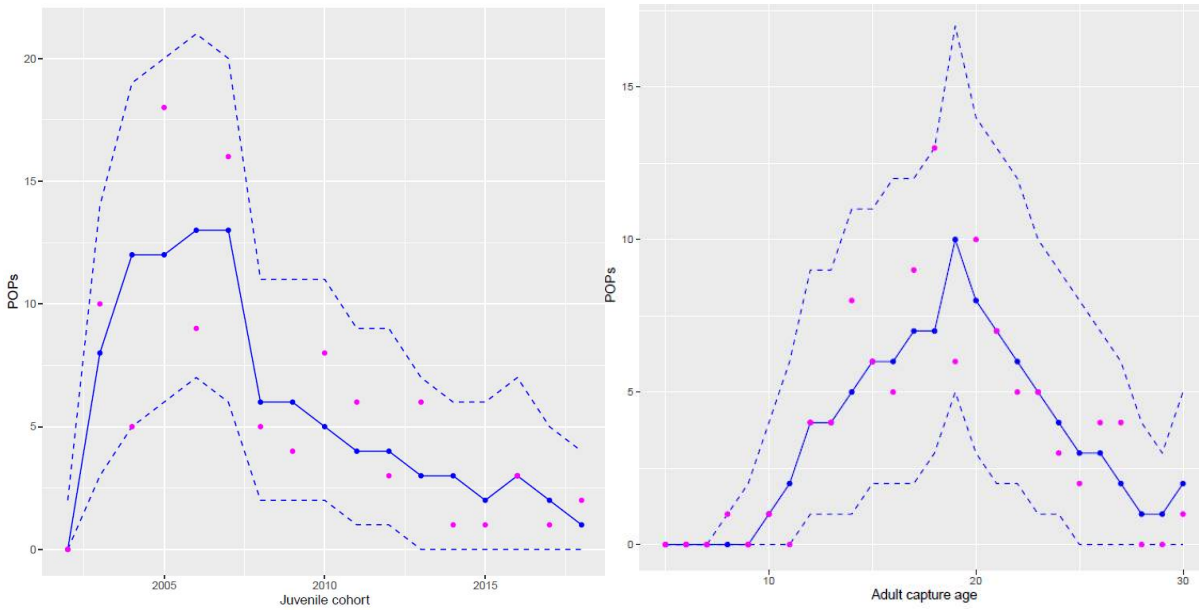

Figure 3 Fits to the POP data (magenta) for the juvenile cohort aggregation level (left), and adult capture age level (right.

4.2 Performance of the CTP

In these preliminary runs, there is a 0.39 probability of the TRO being greater than 30% of the unfished level by 2035. The target probability for the CTP is 0.5 (which is reached in 2042).

The median TRO in 2035 relative to unfished level is 28%.

The probability of TRO being greater than 20% of unfished levels in 2035 is 0.87, which is well above the 0.7 required.

5 Discussion

The preliminary examination of results indicates that the fits to updated data are good, and no concerning mis-fits are evident.

The CTP performance is poorer, relative to the target to which it was tuned in 2019, under these updated conditions: i.e., a new reference set, updated years of data, and a new CPUE standardisation. The results may mainly be attributed to the change in the reference set in 2020, which include a lower steepness value (0.55 added), higher M0 range (0.35 removed), and changes to the M10 range (0.05 value moved higher and 1.2 reduced) in 2020 reference set. The changes to the M values were required to be compatible with the impacts of the extension of the lower end of the steepness range. The settings for unaccounted mortality used in this reference set of OMs may need to be adjusted and will need discussion. As noted in section 2, there is also the outstanding issue of needing to resolve the uncertainty associated with the Indonesian size and age composition data and shipments of adult samples for CKMR (the latter due to COVID-19 impacts). Ensuring that these data series are updated and available in time for inclusion in the stock assessment scheduled for 2023 should be a high priority for the ESC.

As the aim of these checks on performance of the CTP is to determine whether there are exceptional circumstances triggered from use of the new CPUE, perhaps the most appropriate reference set to use is the 2019 set against which the MP was tested and tuned. However, the 2020 reference set is the most recent ESC view on the appropriate range of uncertainty for key parameters.

These results are preliminary because of delays in the data exchange this year and therefore limited opportunity for review of the updated data, settings for the models and results. Further examination and assessment of the impact of the change in CPUE series on MP performance will be undertaken at the OMMP meeting to provide advice to the ESC.

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