A CHECK OF OPERATING MODEL PREDICTIONS FROM THE VIEWPOINT OF THE MANAGEMENT PROCEDURE IMPLEMENTATION IN 2018

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Abstract: Values of the core vessels' longline CPUE index (one of the series required for input to the Bali management procedure [MP]) are compared to projection results obtained from the operating model (OM). Recent observations for this index fall well within the 95% probability envelope predicted by the Base case OM in 2011. As regards the aerial survey (AS) index (the other required input to the procedure) this is not available after 2017. Therefore, to evaluate this year's recruitment level and consider the possible occurrence of Exceptional Circumstances in the absence of the 2018 AS index, information from the estimate from the gene-tagging project in 2018, the result of the 2017 stock assessment, and the past AS index values are examined in combination. A hypothetical 2018 AS index inferred from this examination (as if the AS had been conducted in 2018) would fall within the 95% probability envelope predicted by the projections. 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 2019 season, it is considered that no modification of the value of this TAC is required because: 1) there is no 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 by which the total reported global catch exceeds the TAC (the overcatch of the TAC) and the scale of unaccounted mortality (UAM)); 2) no unexpected change has been detected in the fisheries' indicators examined; and 3) there are no indications of any appreciable decline in the recruitment indices available in 2018.

要旨： コア船延縄 CPUE 指数（バリ方式［MP］への入力に必要なシリーズの 1 つ）の値を、オペレーティングモデル（OM）から得られた将来予測結果と比較している。この指数の近年の観測値は、2011 年のベースケース OM により予測された 95%の確率範囲に十分に入っている。航空目視調査（AS）指数（バリ方式に必要なもう 1 つの入力値）については、2018 年以降は入手不可能となる。それゆえ、2018 年の AS 指数がない状況で今年の加入水準を評価し、例外的状況の可能性を検討するために、2018 年の遺伝標識プロジェクトからの推定値、2017 年の資源評価結果および過去の AS 指数値の情報が統合的に精査される。この精査から推察された仮定的な 2018 年 AS 指数は（もし 2018 年に航空目視調査が実施されていたらどうなるかと考えて）、将来予測によって予想された 95%の確率範囲に入るだろう。これに基づき、2019 年漁期に対し勧告される TAC（2018-2020 年漁期のために 2016 年にバリ MP により計算されたもの）の実施については、TAC の変更は必要ないと考えられる。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（インドネシア小型/若齢魚漁獲、総報告全球漁獲が TAC を超過する「程度（TAC の過剰漁獲）および未考慮死亡（UAM）の規模）の観点から例外的状況の宣言を支持する証拠がないこと；2) 精査した漁業指標に予期せぬ変化がなかったこと；3) 2018 年に入手可能な加入量指数には感知できるほどの減少の兆候がないこと。

1. Introduction

Since 2011, the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) has used a management procedure[1] (MP; called the "Bali procedure") to guide the setting of the global

[1] The CCSBT has decided to develop a new MP to replace the current MP because of termination of the

total allowable catch (TAC) for southern bluefin tuna (SBT; *Thunnus maccoyii*). This MP was adjusted (tuned) and tested to achieve an interim management objective[2] 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 MP was adopted in 2011, and whether the assumptions made then have been shown subsequently to be invalid. As a part of the "metarule" process for the MP (CCSBT 2012[3]), 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 the occurrence of "a scientific aerial survey or CPUE result outside the range for which the MP was tested", where this "range" is defined as the "95% probability intervals for projections for the index in question made using the reference set of operating models during the testing of the MP" (CCSBT 2012). The Japanese core vessels' longline CPUE and aerial survey (AS) indices are the two main inputs for the current MP to be able to calculate a TAC value. These indices have been examined in this context since the 17th ESC meeting (Kurota et al. 2012, Sakai et al. 2013, Sakai and Takahashi 2014, Takahashi et al. 2015, 2016, 2017). As in these previous examinations, the operating model (OM) predictions are compared in this document to the most recent observations of the longline CPUE to check whether this index is within the range predicted by the OM projections. However, the AS index is not available after 2018 due to both budgetary and logistic reasons. Therefore, to evaluate this year's recruitment level and consider the possible occurrence of Exceptional Circumstances in the absence of the 2018 AS index, information on the estimate from the gene-tagging (GT) project in 2018 (corresponding to the age 2 SBT abundance in 2016), the result of the 2017 stock assessment based on the OM, and the past AS index values are

scientific aerial survey from 2018. The aerial survey had provided an index of recruitment required for the input to the current MP. Although the new MP will be developed to give TAC advice for the 2021-2023 seasons in 2020, the meta-rule process for the current MP still needs to be addressed as before for existing TAC advice for the 2018-2020 seasons under the current MP.

[2] The CCSBT interim management objective is to rebuild the stock to the reference point of 20% of the pre-exploitation spawning stock biomass by 2035 with a 70% probability.

[3] The technical specifications of the MP were updated in 2013 (available from http://www.ccsbt.org/userfiles/file/docs_english/general/MP_Specifications.pdf).

examined in combination. Based on this examination, 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.

2. Methods

Projections were rerun by O. Sakai using the previous projection code (sbtprojv120) with the same settings which were used when testing the MP in 2011. The LL1 CPUE[4] index predicted was compared to the most recent observation providing the core vessels' CPUE index (Itoh and Takahashi 2018), available under the data exchange in 2018[5]. We are referring here to the results for the "MP3_2035_3000_inc" OM scenario, for which MP3 (the name of computer code for the Bali procedure) is applied to the "Base case" scenario (or the "reference set" of OMs) under the specifications of a tuning year of 2035 and a maximum TAC change of 3000 t, plus a 3000 t TAC increment during first period.

To determine what level of recruitment might have been obtained if the AS had been conducted in 2018, first the age 2 SBT abundance estimate (corresponding to the abundance in 2016, i.e., the 2014 cohort) obtained in 2018 from the GT project is compared with the result of the 2017 stock assessment based on the OM reference set. If the GT project and stock assessment give similar values of age 2 SBT abundance estimate for the 2014 cohort, then it is assumed that the recruitment level of the 2015 cohort can be inferred from the 2017 assessment result and the ratio of recruitment levels for the 2014 and 2015 cohorts is inferred from the ratio of the age 2 SBT abundance of the 2015 cohort to that of the 2014 cohort as obtained from the assessment result. Finally, assuming that the 2017 AS index primarily represents the recruitment level for the 2014 cohort, a hypothetical AS index for 2018 (assumed to correspond to the 2015 cohort) is inferred from the 2017 AS index and the ratio of the age 2 SBT abundance for the 2015 cohort to that for the 2014 cohort.

3. Results

3. 1. Is the longline CPUE index within the predicted range?

When the core vessels' observed longline CPUE indices, "w0.8" and "w0.5", are used for input to the MP, the average of the two is calculated. This averaged CPUE index lies well within the 95% probability intervals for the Base case OM predictions conducted in 2011 (Fig. 1). The time series of the averaged CPUE index observed has fluctuated close to the trend of the median CPUE index predicted in 2011 when the MP was implemented.

[4] LL1 CPUE consists mainly of Japanese longline data.

[5] The file names for the core vessels CPUE in the 2018 data exchange are 'JP_CoreVesselCPUE_1969_2017.xlsx'.

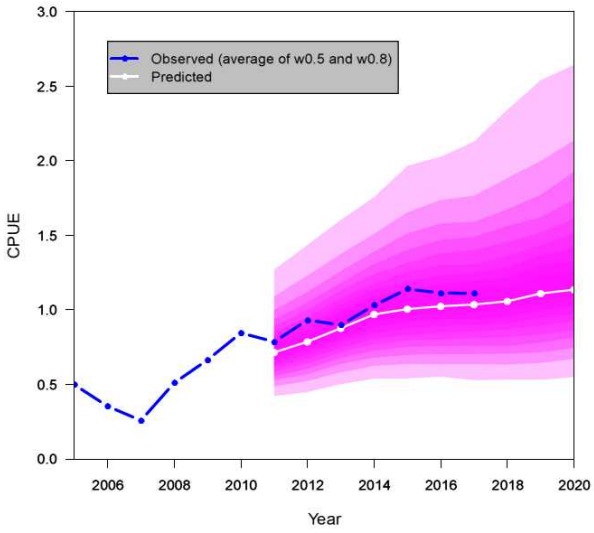
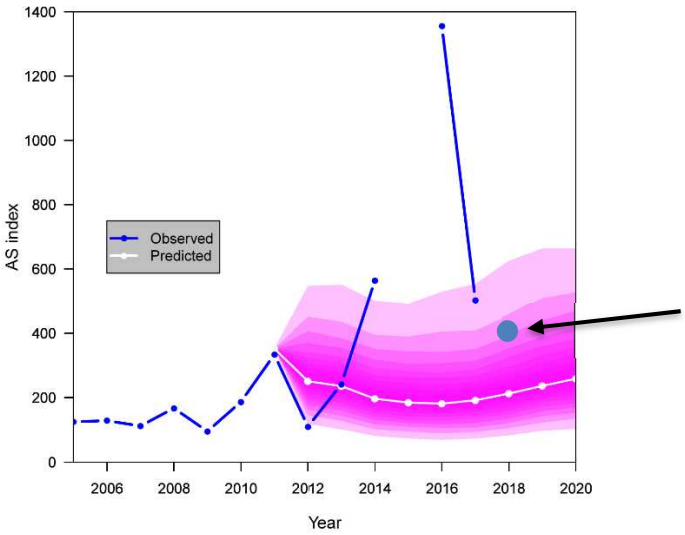


Fig. 1. The average of the two core vessels' longline CPUE series, "w0.5" and "w0.8", observed over 2005-2017 (blue line with dots) and the future index as projected in 2011 from 2011 to 2020 for the "Base case" ("Reference Set" OM), where the white line with points is the median projected CPUE, and the purple shades represent percentiles from 2.5% to 97.5% in increments of 5%.

3. 2. Would the AS index be within the predicted range had the AS was conducted in 2018? The abundance estimate for age 2 SBT in 2016 (i.e., the 2014 cohort) obtained for 2018 from the GT project is 2,417,786 with a CV of 0.21 (Preece et al. 2018). The median estimate of age 2 SBT in 2016 from the 2017 stock assessment is about 2,000,000 (a range of about 1,200,000 – 3,300,000). The GT project and stock assessment thus give similar values for age 2 SBT abundance estimate for the 2014 cohort, and accordingly it is considered reasonable to assume that the recruitment level of the 2015 cohort can be inferred from the 2017 assessment result. The median estimate of age 2 SBT in 2017 (i.e., the 2015 cohort) is about 1,500,000 (a range of about 1,000,000 – 2,300,000). The ratio of the age 2 SBT abundance of the 2015 cohort to that of the 2014 cohort is approximately 0.75. If we consider the estimate for the 2017 AS index (Eveson and Farley 2017), then assuming that the 2017 AS index primarily represents a recruitment level of 2014 cohort, the level of a hypothetical AS index of 2018 (assumed to correspond to the 2015 cohort) can be inferred to be about 0.75 of that for the 2017 AS index, which in turn leads to the conclusion that the hypothetical 2018 AS index falls inside the range predicted by the OM Base case projections (Fig. 2).



The inferred level of the hypothetical 2018 AS index had the AS been conducted in 2018

Fig. 2. The aerial survey (AS) index observed over 2005-2017 (blue line with dots) and the future index as projected in 2011 from 2011 to 2020 for the "Base case" ("Reference Set" OM), where the white line with points is the median projected AS index, and the purple shades represent percentiles from 2.5% to 97.5% in increments of 5%. A hypothetical level of the 2018 AS index is also shown by a light blue circle (see text for explanation). The AS was not conducted in 2015 for budgetary reasons so that no point is plotted for that year. The AS resumed in 2016 but will not be conducted from 2018 due to both budgetary and logistic reasons.

4. Discussion

The core vessels' longline CPUE index values observed in past years all fall comfortably within the range that was predicted when testing the MP (Bali procedure) in 2011 (Fig. 1). In this respect therefore, there is no evidence to support a declaration of Exceptional Circumstances. As explained in the Results section, it can be inferred that a hypothetical 2018 AS index would have fallen within the range predicted by the projections had the AS been conducted in 2018 (Fig. 2), and thus this result does not constitute a reason to declare Exceptional Circumstances either.

In addition to the core vessels' longline CPUE and AS indices, other factors considered as possible evidence for Exceptional Circumstances at past ESC meetings have been: 1) the Indonesian catch of small/young SBT observed in recent years; 2) the extent by which the total reported global catch exceeds the TAC (the overcatch of the TAC); 3) the scale of unaccounted mortality (UAM); and 4) current stock status information from an in-depth stock assessment and future projections. The first three aspects are discussed here as a full stock assessment and future projections are not to be conducted this year.

Since the 2012/13 season there have been increases in the catch of small/young SBT in Indonesian fishery (Sulistyaningsih et al. 2018). This is potential evidence for Exceptional Circumstances because, when testing the MP in 2011, the Indonesian fishery was assumed to occur entirely within the spawning grounds and thus has been assumed to catch larger and mature SBT only. Some earlier investigations suggested that the catch of small/young SBT was likely to have come from catches made in the south of the spawning ground (Farley et al. 2017). However, Sulistyaningsih et al. (2018) advise that, at this stage, it is not possible to identify the catch location of individual SBT sampled in the catch monitoring program. Analyses to identify the catch location of these small/young fish using CDS data need to continue to be pursued as this could potentially provide evidence for Exceptional Circumstances in the future.

The global TAC was exceeded by 484 t in 2013 and 354 t in 2014 (CCSBT Secretariat 2018). When testing the MP, the assumption was made that TACs would not be exceeded in future years. The cumulative effect of these overcatches of TAC must therefore be considered. In 2015, 2016, and 2017, estimates for the reported catch were under the global TAC by 529 t, 520 t, and 558 t respectively (CCSBT Secretariat 2018). Thus, over this five-year period, the cumulative catch has been less than the sum of the TACs awarded, and accordingly does not provide evidence for Exceptional Circumstances.

UAM was also not considered when adopting the MP in 2011. Identification of the scale of all UAM is still in progress. Results for some sources of UAM have been presented at past

and current ESC meetings (e.g., Itoh and Takeda 2015, Edwards et al. 2016, Itoh and Omori 2016, 2017, Itoh and Ara 2018). However, these results have still to be discussed in the ESC, and none are as yet considered to be definitive. Regarding the UAM of non-cooperating Non-Members (NCNM), the 23rd CCSBT agreed that 306 t (see paragraph 69 and Table 1 in CCSBT (2016a) for this estimate) would be set aside from 2018-2020 TAC to account for IUU catch by NCNM (i.e., the "direct approach", see paragraph 53 in CCSBT (2016b)). For some other sources of UAM such as the Australian recreational fishery, data collection is still underway. Therefore, the identification of the scale of all UAM components combined needs to continue to be pursued for determining their implications (if any) as regards the possible occurrence of Exceptional Circumstances.

Regarding a decision on implementation of the recommended TAC (calculated by the MP in 2016 to be applied to the 2018, 2019, and 2020 fishing seasons) for the 2019 season, it is therefore concluded that no modification of the value of this TAC is required because: 1) there is no evidence to support a declaration of Exceptional Circumstances related to the factors discussed above; 2) no unexpected change has been detected in the fisheries' indicators examined (Takahashi et al. 2018); and 3) there are no indications of any decline in either the fishery independent or dependent recruitment indices available in 2018 (see the top panel of Fig. 5-1 in Takahashi et al. 2018).

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