A CHECK OF OPERATING MODEL PREDICTIONS FROM THE VIEWPOINT OF IMPLEMENTATION OF THE MANAGEMENT PROCEDURE IN 2019

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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 using the Base case operating model (OM). Recent observations for this index fall well within the 95% probability envelope predicted using the Base case OM in 2011. As regards the aerial survey (AS) index (the other input required for the procedure) this 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) is examined. The recruitment estimates of the GT project and of 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: 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 reasons (the Indonesian small/young fish catch, the extent by which the total reported global catch exceeds the TAC and the scale of unaccounted mortality); and 2) no unexpected change has been detected in the fisheries' indicators examined.

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、ベースケースオペレーティングモデル（OM）を用いて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 を用いて予測された 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っている。それゆえ、2019 年の AS 指数がない状況で本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、遺伝標識（GT）プロジェクトおよびグリッドタイプ曳縄指数（TRG）からの推定値の情報を精査する。GT プロジェクトおよび TRG の加入推定値は、2019 年 AS で観測されたであろう 2016 年級と 2017 年級の加入水準は著しく低くはなく、2011 年のベースケース OM の下での将来予測によって予想された範囲におそらく入るという推論を導く。これに基づき、2020 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 を超過する程度および未考慮死亡の規模）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) 精査した漁業指標に予期せぬ変化がなかったこと。

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 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 any of the assumptions made then have subsequently been shown 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 from which the current MP is 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, 2018). As in these previous examinations, the Base case operating model (OM) prediction is compared in this document to the most recent observation of the longline CPUE to check whether this index is within the range predicted by the OM projection. 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 2019 AS index, information on the estimates of the age 2 SBT abundance from the gene-tagging (GT) project and from the grid-type trolling index

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

(TRG) for age 1 SBT is examined. 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.

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 provided by the core vessels' CPUE index (Itoh and Takahashi 2019), which is available under the data exchange in 2019[5]. Reference here is 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 has occurred in 2019 without any value for the AS index (which relates to the 2016 and 2017 cohorts, under the assumption that the AS index reflects the abundance of age 2 and 3 SBT combined), levels/trends of the age 2 abundance in 2016 and 2017 (corresponding to the 2014 and 2015 cohorts) as estimated from the GT project of 2018 and 2019 (Preece et al. 2019), and levels/trends of the TRG recruitment index of age 1 SBT (Tsuda and Itoh 2019) for 2016-2019 (corresponding to the 2015 to 2018 cohorts) were examined.

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 for 2018 lies within the 95% probability intervals for the Base case OM predictions conducted in 2011 (Fig. 1). Although the CPUE in 2018 shows a marked increase over preceding values, the time series of most of the CPUEs observed in past years have fluctuated close to the trend of the median CPUE predicted in 2011 when the MP was agreed and implemented. Itoh and Takahashi (2019) investigated cause(s) of this large increase in the 2018 CPUE and found that this was a result of the process of area weighting in calculating the abundance index and of the increase of CPUE in Area 8. The impact of this CPUE increase in 2018 on assessment results will be examined by the ESC in 2020 (next year) when a full stock assessment is next

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

[5] The file names for the core vessels CPUE in the 2019 data exchange are 'JP_CoreVesselCPUE_1969_2018.xlsx'.

conducted.

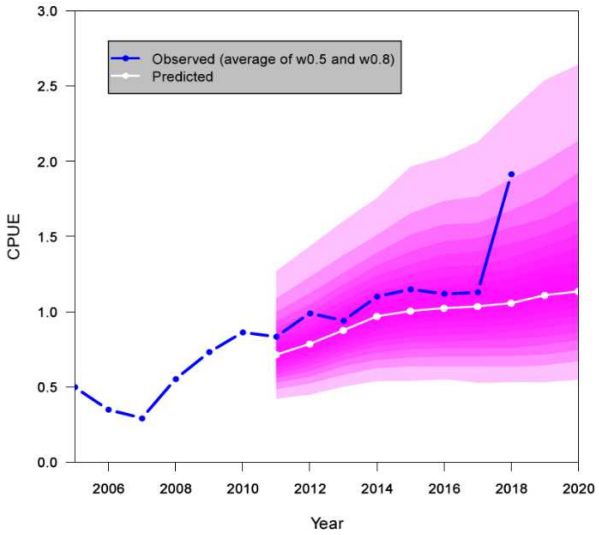

Fig. 1. The average of the two core vessels' longline CPUE series, "w0.5" and "w0.8", observed over 2005-2018 (blue line with dots) and the future index as projected in 2011 from 2011 to 2020 for the "Base case" ("Reference Set") OM, where the white line with points is the median projected CPUE, and the purple shades represent percentiles from 2.5% to 97.5% in increments of 5%.

3. 2. Is there any problem occurred in recruitment in 2019?

Abundance estimates for age 2 SBT in 2016 and 2017 (i.e., the 2014 and 2015 cohorts, respectively) obtained from the 2018 and 2019 GT project are 2,270,000 with a CV of 0.224 and 1,150,000 with a CV of 0.122 respectively (Preece et al. 2019). Although the estimated age 2 abundance decreases by about 50% from 2016 to 2017, the abundance level in 2017 (corresponding to the 2015 cohort) is still of a reasonable size, suggesting that the recruitment level of the subsequent 2016 cohort may not be problematically low.

In contrast, the TRG recruitment index for age 1 SBT declined from 2016 to 2017 (corresponding to the 2015 and 2016 cohorts) and then has remained at almost the same level in 2017, 2018, and 2019 (corresponding to the 2016, 2017, and 2018 cohorts) (Tsuda and Itoh 2019). This recruitment level for age 1 is similar to those observed in 2003 and 2005, which is higher than extremely low recruitment levels observed between 2000 and 2002 cohorts. It also suggests that the recruitment levels of the 2016 and 2017 cohorts are of a reasonable size and are not problematically low.

4. Discussion

The core vessels' longline CPUE index values observed since 2012 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.

With respect to recruitment status, although the AS index is not available for 2019, from the recruitment estimates of the GT project and of the TRG it can be inferred that the recruitment levels of the 2016 and 2017 cohorts which would have been covered by the 2019 AS are not notably low and hence probably fall within the range predicted by the projections for MP test in 2011 (3.2 of Results section). Thus, this result does not constitute a reason to declare Exceptional Circumstances either.

In addition to the core vessels' longline CPUE and levels of recent recruitment, 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. Only the first three aspects are discussed here as a full stock assessment and future projections are not to be conducted in 2019 (this year).

From the 2012/13 to the 2016/17 season there were increases in the catch of small/young SBT in Indonesian fishery (Sulistyaningsih et al. 2019). 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 had 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 to the south of the spawning ground (Farley et al. 2017). However, based on revised length data analyzed for the three most recent spawning seasons (2015/16 to 2017/18) which included only SBT catches by vessels predominantly operating in Area 1 (the spawning ground), Sulistyaningsih et al. (2019) advise that catches of small/young SBT appear to be from this spawning ground. Although this suggests some evidence for Exceptional Circumstances, the strength of evidence is still uncertain (the severity of the Exceptional Circumstances, if any, seems likely to be low). Moving forward, further examination to resolve identified uncertainties in the catch location of these small/young fish and refinement/improvement of the quality control of the monitoring program need to continue to be pursued.

The global TAC was exceeded by 484 t in 2013 and 354 t in 2014 (CCSBT Secretariat 2019). 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, 2017, and 2018, estimates for the reported catch were under the global TAC by 529 t, 520 t, 535 t, and 399 t respectively (CCSBT Secretariat 2019). Thus, over this six-year period, the cumulative overcatch has been well below than any single year's TAC awarded, would consequently not have impacted resource rebuilding greatly, and accordingly

does not seem to provide evidence for Exceptional Circumstances.

UAM was also not considered explicitly when adopting the MP in 2011. Identification of the scale of all UAM is still in progress in the ESC. Results for some sources of UAM have been presented at past and the current ESC meetings (e.g., Itoh and Takeda 2015, Edwards et al. 2016, Itoh and Omori 2016, 2017, Itoh and Ara 2018, Edwards et al. 2019, Itoh and Morita 2019). 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 2020 season, 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' indicators (primarily CPUE) examined (Takahashi et al. 2019).

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