A check of operating model predictions to perceive the current circumstances of the abundance indices using stock assessment in 2014

2014 年の資源評価に使用する資源指標の現状把握の観点から見た
オペレーティングモデルによる予測の検証

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Summary

In this working paper, recent aerial survey (AS) index and longline CPUE index values are compared to the projection results that were obtained from operating models (OMs). The recent longline CPUE values have been within the 95% probability envelope predicted using base case OM since 2011. On the other hand, the updated AS index value for 2014 is extremely high, and is outside that OM's predicted 95% probability interval as is the case in 2012. But a robustness trial (high aerial CV scenario) has projections whose 95% probability intervals cover these largely fluctuated AS observations, thus the large fluctuation of AS index would not indicate the "exceptional circumstances". The AS index is one of the essential information for the MP implementation and current stock assessment, thus further consideration of this large fluctuation is desirable to better understand the characteristics of this index.

要約

更新された最新の航空目視指数および延縄 CPUE が、オペレーティングモデルによる予測の範囲から外れていないかを検討した。近年の延縄 CPUE 観察値は予測の範囲内であったが、2014 年の航空目視指数は極端に高い値を示し、2012 年の航空目視指数と同様にベースケースで予測された 95%区間から外れた値を示した。しかし、これらの値は頑健性試験で検討したシナリオの 95%区間には含まれているため、「想定外の事態」を示すものではないだろう。航空目視指数は MP の運用や資源評価に不可欠な情報の一つであり、その大きな変動については更なる検討を行うことが望ましい。

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1. Introduction

The management procedure (MP) which CCSBT introduced in 2011 to decide the total allowance catch (TAC) of southern bluefin tuna (SBT) (the "Bali procedure") needs the two types of stock indices for the input data for the MP: the Japanese longline CPUE index and the Australian aerial survey (AS) index. These indices are also essential abundance indices for the stock assessment using the operating model (OM), thus we need to monitor them carefully to check whether or not either indicates the existence of "exceptional circumstances". The Extended Scientific Committee (ESC) is required as an annual task to (1) review stock and fishery indicators, and any other relevant data or information on the stock and fishery; and (2) on the basis of this, determine whether there is evidence for exceptional circumstances. If the ESC agrees that exceptional circumstances exist, then the ESC needs to (1) determine the severity of the exceptional circumstances, and (2) on the base of the severity, formulate advice to the Extended Commission (EC) on the action to be taken under the associated "meta-rule".

One of the key criteria to determine the existence of exceptional circumstance is "a scientific aerial survey (AS) or CPUE result outside the range for which the MP was tested", where the "range" is defined as the "95% probability intervals for projections for the index in question made using the reference set of the operating models during the testing of the MP" (CCSBT 2012). The indices for the 2012 and 2013 season were examined in this context during the 17th and 18th ESC (Kurota et al. 2012; Sakai et al. 2013). In this document, using the same criterion, the OM projections that were conducted in 2011 are compared with the latest observed values for the longline CPUE and AS indices, which have been updated and exchanged in 2014.

2. Methods

Projections which were rerun by the authors using the previous projection program (sbtprojv120) were compared to the most recent observations that have become available under the data exchange in 2014. The focus here is on two indices: (1) the scientific AS index for 2012–2014, and (2) LL1 (mainly consisting of Japanese longline data) CPUE for 2011–2013. These comparisons were made using existing results for the "MP3_2035_3000_inc" scenario, which were projection results using MP3 (the Bali procedure) under the specifications of a tuning year of 2035 and a maximum TAC change of 3000t, with a 3000t TAC increment during first period. This is "Base case" scenario for the MP tuning.

In this document, the result of a robustness trial is also examined in addition to the base case regarding the lower AS value observed in 2012 (Eveson et al. 2012). This is the "high_aerial_cv", trial which assumes higher variation (CV=0.5) for the AS index (CCSBT 2010) and can result in a low AS index (Kurota et al. 2012; Sakai et al. 2013). The following table summarizes the scenarios and indices considered in this document.

Scenario (trial)/Indices	2012–2014 AS indices	2011–2013 LL CPUE
Base	X	X
High aerial CV	X	

3. Results

3.1. Scientific aerial survey index

The AS index value for 2012, which was re-standardized by GLMs after the data update in 2014, still shows a substantial decrease from that of 2011. Then the index has increased, the value of 2013 shows 2010–2011 levels, and the value of 2014 shows an extremely high level. The unscaled index values of 2012 and 2014 were 108.7 and 563.5, respectively (AU_AerialSurvey_1993_2014.xlsx of 2014 data exchange), while the OM predictions made in 2011 for the base case were 256.3 and 201.3, respectively [with probability intervals of 118.4-547.4 and 81.3–501.2 for 2.5–97.5% ranges for 2012 and 2014, respectively] (Fig. 1). In other words, the AS values for 2012 and 2014 were outside the 95% range for the base case prediction of the OM.

For the high_aerial_cv scenario, however, the observed values for 2012 and 2014 are located within the 95% probability intervals for the prediction [84.5–727.2 in 2012 and 62.1–661.7 in 2014] (Fig. 2). It is therefore evident that the robustness trial included the possibility that the AS index could fluctuate between as low a level as observed for 2012 and as high a level as observed for 2014 in the short term.

3.2. Longline CPUE index

Observed longline CPUE series (w0.8, w0.5, and the average of their values) from 2011 to 2013 (JP_CPUE_w05w08.xls of 2014 data exchange) are within the 95% probability intervals [0.42-1.27 in 2011, 0.45-1.43 in 2012, and 0.50-1.60 in 2013] for the base case OM prediction made in 2011 (Fig. 3).

4. Discussion

The AS index as updated in 2014 shows an extremely high value for 2014 besides a low value for 2012. These values are outside of 95% probability intervals of the base case but are covered by those of a robustness trial. Therefore the large fluctuation of the AS index would not be considered as an exceptional circumstance in SBT stock. Additionally, the recent longline CPUE values provide no justification for declaring that.

In the stock assessment using OM, only AS index provides information of the most recent recruitment level. Thus, the extreme values of this index would strongly affect the future biomass level in the stock projection. Further consideration for the large fluctuation of the AS index would be desired to verify the adequateness of the stock assessment and projection.

5. References

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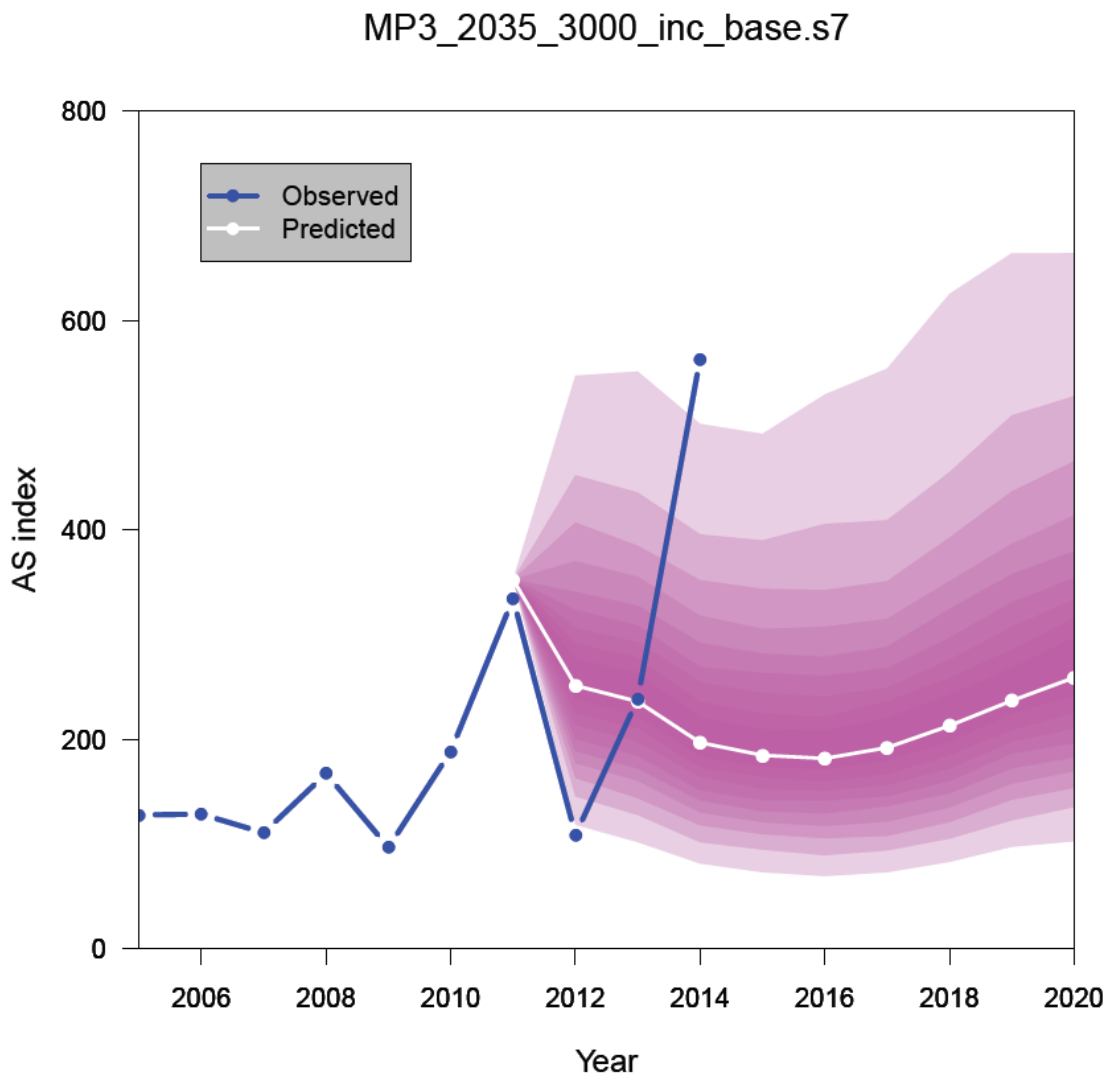

Figure 1. The scientific aerial survey (AS) index (blue line; 2005-2014) and the future index as projected in 2011 for 2012 to 2020 for the "base case" OM scenario (reference set), where the white line with its points is the median projected AS index, and the shades of purple represent percentiles from 2.5% to 97.5% in increments of 5%.

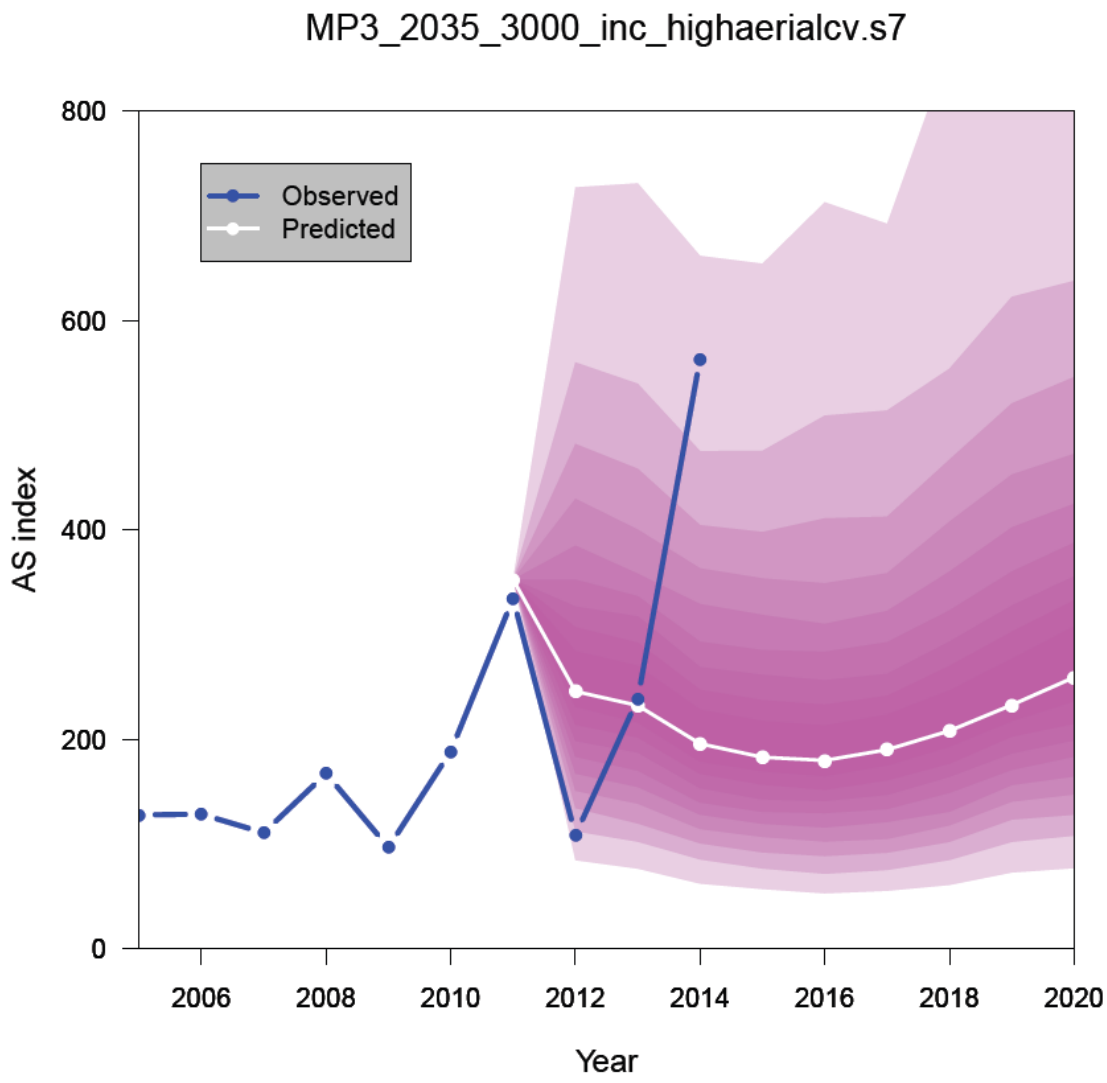

Figure 2. The scientific aerial survey (AS) index (blue line; 2005-2014) and the future index as projected in 2011 for 2012 to 2020 for the "high aerial cv" scenario, where the white line with its points is the median projected AS index, and the shades of purple represent percentiles from 2.5% to 97.5% in increments of 5%.

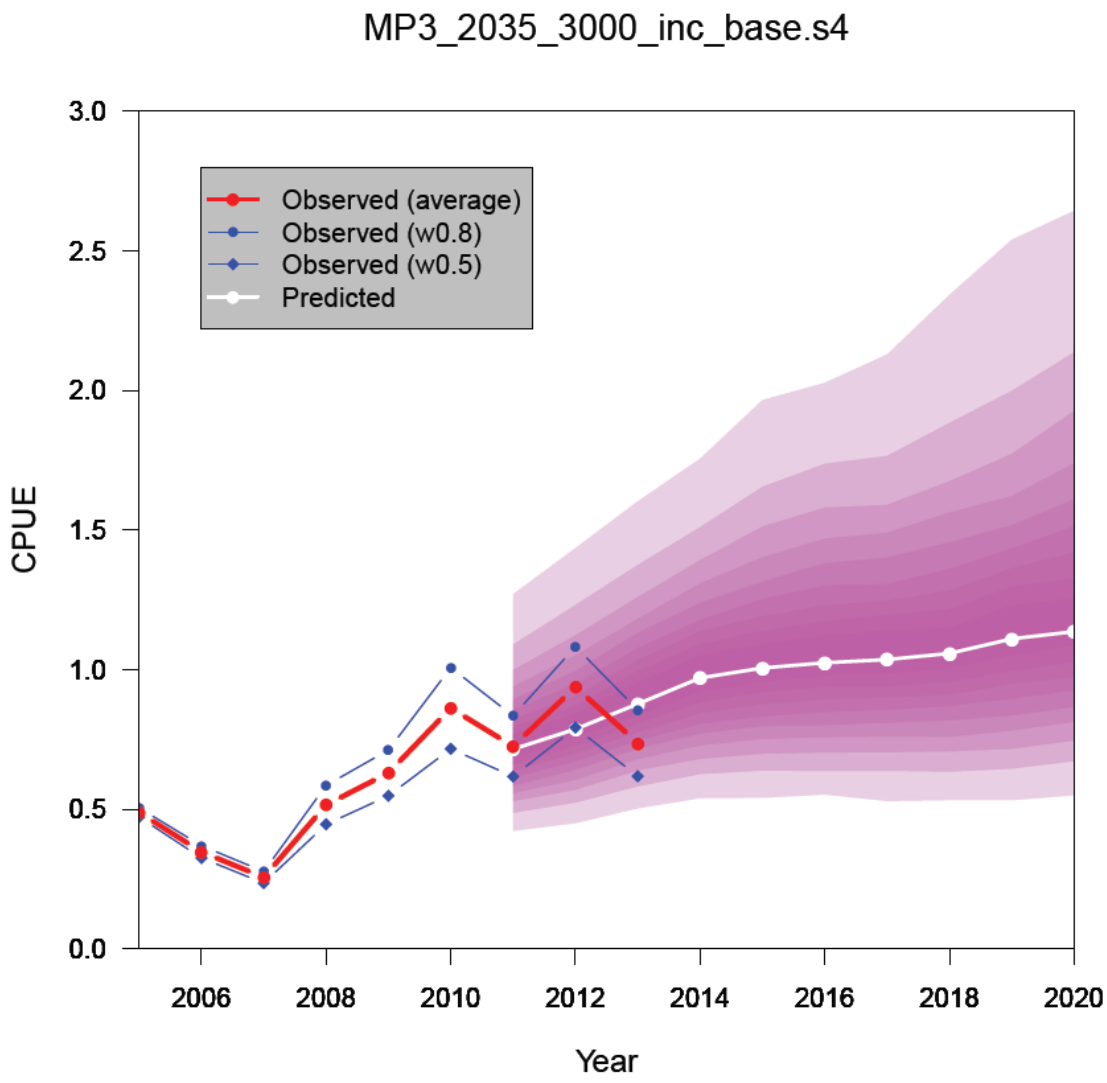

Figure 3. Historical longline CPUE series (2005-2013) of w0.5 and w0.8 (blue lines), the average of the two (thick red line) and the future index as projected in 2011 for 2011 to 2020 for the "base case" scenario (reference set), where the white line with its points is the median projected CPUE, and the shades of purple represent percentiles from 2.5% to 97.5% in increments of 5%.