BLUEFIN TUNA OPERATING MODEL INDEX PROJECTIONS AND QUESTIONS OF PLAUSIBILITY: ARE THESE FUTURES POSSIBLE?

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SUMMARY

The bluefin tuna management strategy evaluation is entering into the final phase of testing management procedures. During these tests of various management procedures several indices of abundance were carefully reviewed to see their ranges of values in the future It was noted that in some CPUE indices the future values were very high, well beyond any values observed in the index's historic period. Values for MEXUS are particularly impactful as several CMPs use the MEXUS index. MEXUS undergoes a large increase (+188% in OM1 and +70% in OM15) in its first projected year (2021), This clearly will impact the performance indicator "C1" (catches in year 1) for any CMP using MEXUS to calculate the TAC. The question remains is how plausible are these increases in the near and long-term.

RÉSUMÉ

L'évaluation de la stratégie de gestion du thon rouge entre dans la phase finale de test des procédures de gestion. Au cours de ces tests de diverses procédures de gestion, plusieurs indices d'abondance ont été soigneusement examinés pour voir leurs gammes de valeurs dans le futur. Il a été noté que pour certains indices de CPUE, les valeurs futures étaient très élevées, bien au-delà de toutes les valeurs observées dans la période historique de l'indice. Les valeurs pour MEXUS ont un impact particulier, car plusieurs CMP utilisent l'indice MEXUS. MEXUS subit une forte augmentation (+188% dans OM1 et +70% dans OM15) dans sa première année de projection (2021), ce qui aura clairement un impact sur l'indicateur de performance « C1 » (captures de l'année 1) pour toute CMP utilisant MEXUS pour calculer le TAC. La question reste de savoir dans quelle mesure ces augmentations sont plausibles à court et à long terme.

RESUMEN

La evaluación de estrategias de ordenación para el atún rojo ha entrado en la fase final de prueba de los procedimientos de ordenación. Durante estas pruebas de varios procedimientos de ordenación, se revisaron cuidadosamente varios índices de abundancia para ver sus rangos de valores en el futuro. Se señaló que en algunos índices de CPUE los valores futuros eran muy elevados, muy por encima de cualquier valor observado en el periodo histórico del índice. Los valores de MEXUS son especialmente impactantes, ya que varios CMP utilizan el índice MEXUS. MEXUS experimenta un gran aumento (+188 % en OM1 y +70 % en OM15) en su primer año proyectado (2021). Esto repercutirá claramente en el indicador de desempeño "C1" (capturas en el año 1) para cualquier CMP que utilice MEXUS para calcular el TAC. La cuestión sigue siendo hasta qué punto son plausibles estos aumentos a corto y largo plazo.

KEYWORDS

Management Strategy Evaluation, operating models, CPUE

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1. Introduction

Currently ICCAT's SCRS Bluefin Tuna species group is working on finalizing their work on analyzing different candidate management procedures (CMPs). These CMPs have been developed by different CPC scientists who have free reign to construct and test any CMP they believe may be successful in achieving the management objectives outlined by the commission for the eastern and western Bluefin tuna (BFT) stocks. While exploring these operating models the estimated values of indices in future years is receiving more scrutiny.

Until recently the focus has been on how the 48 OMs functioned in the past and many layers of diagnostics have been conducted to determine and evaluate how the OMs, CPUE and survey series, and biomass trends compared to historic time periods. Little time has been spent on the future projected time period and how these variables reacted in the various OM scenarios.

During explorations of one CMP the values of the CPUE/survey indices used in the CMP were explored across a couple OMs and questions were raised about the plausibility of the CPUE's value in the projection period. The critical question was how likely were those values in the given timeframes.

This paper explores some of these indices for specific OMs to visualize what happens to their trends in the projection periods.

2. Catch Per Unit Effort (CPUE) and Oms

2.1 CPUE/Survey values

The OMs each produce projected values of the CPUE indices. These indices values are used by the candidate management procedures (CMPs) to set the TAC in future years. Each CPUE/Survey is based off different data, fisheries and methods used to calculate the index value.

The index values for each OM run are saved and plotted to display their trend over model years 56 (2020) to 96 (2060), the original "known" values are included in the plots.

3. Results & Discussion

Below are some figures created from runs of OM1 and OM15 using the FZ CMP. Operating model 15 is: recruitment scenario 3; low comp data; +/- scale, and A spawning fraction/M. Operating model 1 is: recruitment scenario 1.

4. Conclusions

The values of the indices in the projection years for the two presented indices are much higher than anything seen in the indices historic period. While this does not mean that these values are implausible it does raise the question about if these indices could actually increase as much as the OMs are indicating and if these increases could occur as quickly as observed in the projection period. Some CPUE indices could have saturation points where increases, or at least large increases, would be very difficult to achieve as the gear and fishing method simply cannot catch any more fish per unit of effort.

For example, setting and pulling in a longline or a set of traps might take a specific period of time that cannot be shortened any further. If this time is included in the CPUE calculation then once a trap is full or all the hooks on a LL are occupied there is no possible increase in the CPUE for that method. With such large increases in the CPUEs being observed in this OM it is unclear whether all of these CPUEs can in fact increase to these high values, or if a saturation point would be hit before these values are achieved.

Oddly MEXUS and MOR_POR_Traps were two of the best performing CPUE during the historic periods with low CVs, however their values during the projection period may require some more inspection before being used on their own or as a critical piece of CMPs being developed.

Currently CMPs use the indices values to modify catch, so their trends and magnitudes are highly influential on the performance of the CMP. But are these future CPUE/survey values realistic and plausible? If they are not then the performance of the CMPs are not useful metrics of what could happen in the future.

Values for MEXUS are particularly impactful as several CMPs use MEXUS. The index undergoes a large increase (+188% in OM1 and +70% in OM15) in its first projected year (2021), This clearly will impact the performance indicator "C1" (catches in year 1) for any CMP using MEXUS to calculate TAC.
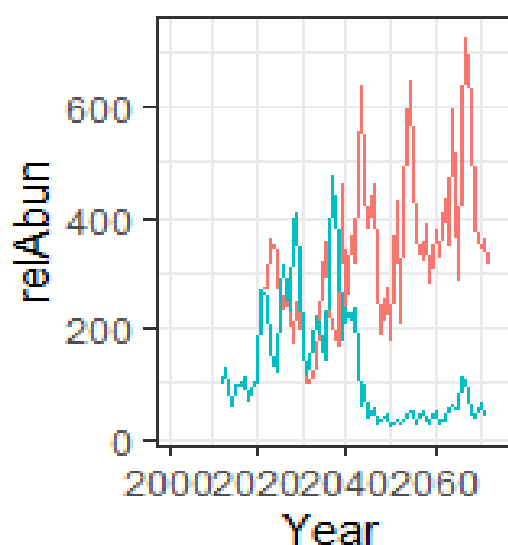
Figure 1. Moroccan and Portuguese traps CPUE trend from OM15 (blue) and OM1 (red) running the FZ CMP. Last data point in the index timeseries calculated from fishery data is 2020 (value= 104.13). The projected period is 2021-onwards. Starting in 2021, in both OMs, the index rapidly increases to 267 in 2021, after this they diverge. OM1 continues to increase reaching peaks over 600 by 2043. OM15 also has large increases (reaching a peak of 478 in 2037), but in OM15 the index eventually drops after 2040 to low levels.
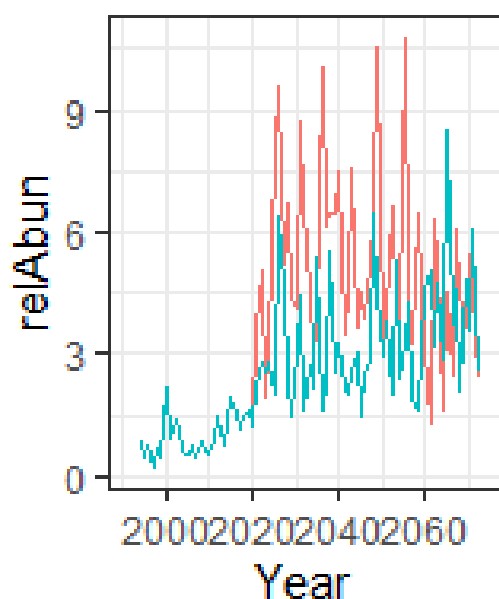
Figure 2. MEXUS CPUE trend from OM15 (blue) and OM1 (red) running the FZ CMP. Last data point in the index timeseries calculated from fishery data is 2020. The projected period is 2021-onwards. The value of the MEXUS index in 2020 = 1.26, its highest observed value was 2.21 in 2000. In OM1 starting in 2021 the index rapidly increases and remained high for most of the time-series, reaching as high as 10.56 in 2049. In OM15 starting in 2021 the index also rapidly increased but had very large fluctuations, it reached as high as 6.5 in 2048.