PRELIMINARY DEVELOPMENT OF A SIMPLE CANDIDATE MANAGEMENT PROCEDURE USING INDEX OF JAPANESE LONGLINE

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SUMMARY

This paper presents a candidate MP for ABT only using the indices of Japanese longline in each area and larval survey in Gulf of Mexico. The simple MP makes it easy not only to obtain the indices sustainably but also promotes understanding of managers and stakeholders.

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KEYWORDS

Management strategy evaluation, Candidate management procedure, Japanese longline

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1. Introduction

Management strategy evaluation (MSE) is widely considered to be the most appropriate way to evaluate the trade-offs achieved by alternative management strategies and to assess the consequences of uncertainty for achieving management goals (Punt *et al.* 2014). The MSE for Atlantic bluefin tuna (ABT) is now under the development by SCRS (Rec [15-07], Anon 2019). The management procedure (MP) involves assessing the consequences of alternative options for management actions, for example determination of total allowable catch (TAC) (Rademeyer *et al.* 2007).

This paper presents a candidate MP for ABT which is simple and empirical. The simple and empirical MP makes it easy not only to obtain the indices sustainably but also promotes the understanding of managers and stakeholders. In this paper, the results of the candidate MP were calculated by R package "ABTMSE" ver. 4.2.15 circulated on Feb 2, 2019.

Material and Method

For candidate MP developers of MSE for ABT, there are 8 candidate indices suggested. Three of them are CPUEs which depend on fisheries and the others are survey indices which don't depend on fisheries. The fishery dependent index, which is likely to be vulnerable to change of fishing operation, requires less effort and cost to collect than fishery independent index, such as aerial or larval survey, for data collection. One of the key features of a sustainable MP is the ease and continuity of data collection, therefore we believe that fishery dependent index should be the primal index in future MP of ABT. If the performance of MPs with and without fishery independent survey are similar, one without fishery independent survey has a cost advantage.

Among the three CPUEs, Japanese longline index in west as well as east area covers wide range of fishing area in the central Atlantic, where the stocks are well mixed. These indices can be representative for abundance of whole stocks. In addition, in the case of ABT, the size of western stock is smaller than that of eastern stock. Therefore, the larval survey index in Gulf of Mexico should be included as the index only of western stock. The conceptual flowchart of this MP is shown in **Fig. 1**.

At this stage, the concrete mathematical method in MP can't be finalized because management objectives and operating model have not been finalized. Here, we show the prototype of candidate MP using Japanese longline and larval index in Gulf of Mexico.

[Threshold by GOM larval survey in both area]

$$\frac{(Average\ value\ among\ last\ three\ years)}{(Average\ value\ from\ 5years\ ago\ to\ 3years\ age)} \leq 1$$

then,

$$New\ TAC\ in\ each\ area = \ Current\ TAC * \frac{(Average\ value\ among\ last\ three\ years)}{(Average\ value\ from\ 5years\ ago\ to\ 3years\ age)}$$

$$\frac{(Average\ value\ among\ last\ three\ years)}{(Average\ value\ from\ 5years\ ago\ to\ 3years\ age)} > 1$$

then threshold by JPN LL CPUE in each area is calculated.

[Threshold by JPN LL CPUE in each area]

$$\frac{(Average\ value\ among\ last\ three\ years)}{(Average\ value\ from\ 5years\ ago\ to\ 3years\ age)} < 0.9$$

then

$$New\ TAC\ in\ each\ area = \ Current\ TAC * \ 0.95$$

and

$$1.1 < \frac{(Average\ value\ among\ last\ three\ years)}{(Average\ value\ from\ 5years\ ago\ to\ 3years\ age)}$$

then

$$New\ TAC\ in\ each\ area = \ Current\ TAC * \ 1.05$$

and

$$0.9 \leq \frac{(Average\ value\ among\ last\ three\ years)}{(Average\ value\ from\ 5years\ ago\ to\ 3years\ age)} \leq 1.1$$

then

$$New\ TAC = \ Current\ TAC$$

TACs are set for three years. The thresholds are the ratio of average value in recent three years to that of three to five years ago. The threshold by GOM larval survey is stricter than that for JPN LL CPUE, so that fluctuation of western stock is more influential for the shifting of TAC.

Result

In this paper, we show the results from OM 3 (3 A I) in ABT MSE package ver. 4.2.15. The observation error was "Good_obs" and implementation error was "Overage_10". **Figure 2** shows the future projection of catch in each area and SSB for each stock, which is output by function *plot* in ABTMSE package, by Zero Catch, Current TAC, 50% Current catch and presented MP. The present MP is more conservative than Current TAC MP. The average of catch weight in each era (C10, C20, C30) decline with an increase in depletion (D10, D20, D30) (**Table 1**). It is thought that this process enables to set TAC to appropriate level while both eastern and western stocks are conserved.

Reference

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Rademeyer, R. A., Plaganyi, E. E., Butterworth, D. S., 2007, Tips and Tricks in designing management procedures, ICES JOURNAL OF MARINE SCIENCE, 64(4), 618-625.

Table 1. Summary measures and statistics for several MPs in OM 3 by ABTMSE ver4.2.15.

MP	Area / Stock	AvC30	C10	C20	C30	D10	D20	D30	LD	DNC	LDNC	POF	POS	PGK	AAVC	Br30
Zero catch	East	2.917	8.751	0	0	0.706	0.819	0.843	0.539	1	1	0	100	100	3.704	2.541
Current TAC	East	30.835	30.465	31.02	31.02	0.607	0.586	0.417	0	0	0	0	100	100	0	1.25
50% Current TAC	East	16.876	19.608	15.51	15.51	0.658	0.705	0.632	0.116	0.125	0.125	0	100	100	0	1.919
Present MP	East	20.059	22.559	19.316	18.067	0.643	0.661	0.566	0.121	0.145	0.145	0	100	100	5	1.757
Zero catch	West	0.246	0.737	0	0	0.875	0.884	0.913	0.687	1	1	0	100	100	3.846	2.919
Current TAC	West	2.572	2.547	2.585	2.585	0.763	0.756	0.715	0.069	0.07	0.07	0	100	100	0	2.288
50% Current TAC	West	1.409	1.642	1.293	1.293	0.817	0.82	0.819	0.649	0.797	0.797	0	100	100	0	2.613
Present MP	West	2.147	2.249	2.146	2.022	0.79	0.793	0.783	0.64	0.769	0.769	0	100	100	5	2.498

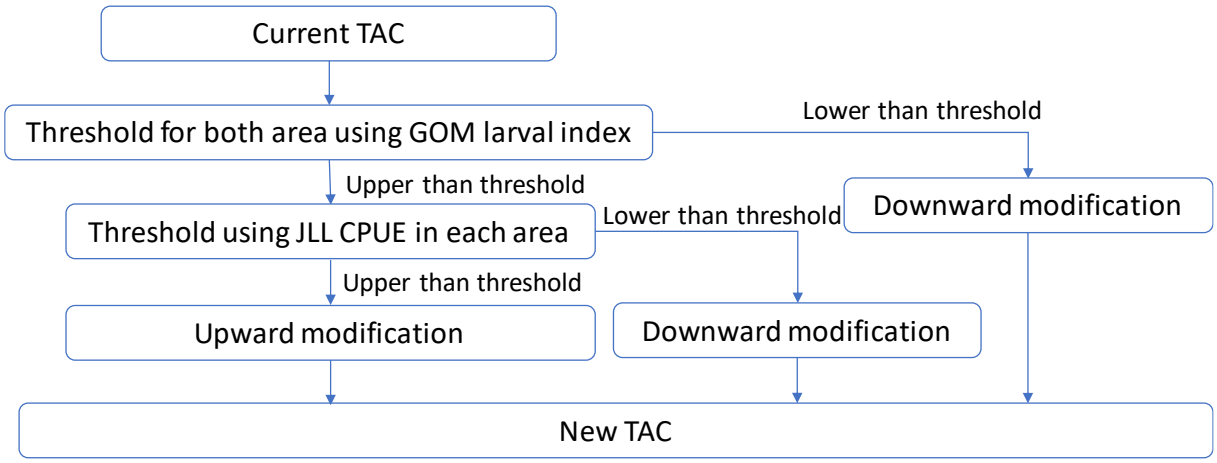

Figure 1. The conceptual flow of present management procedure.

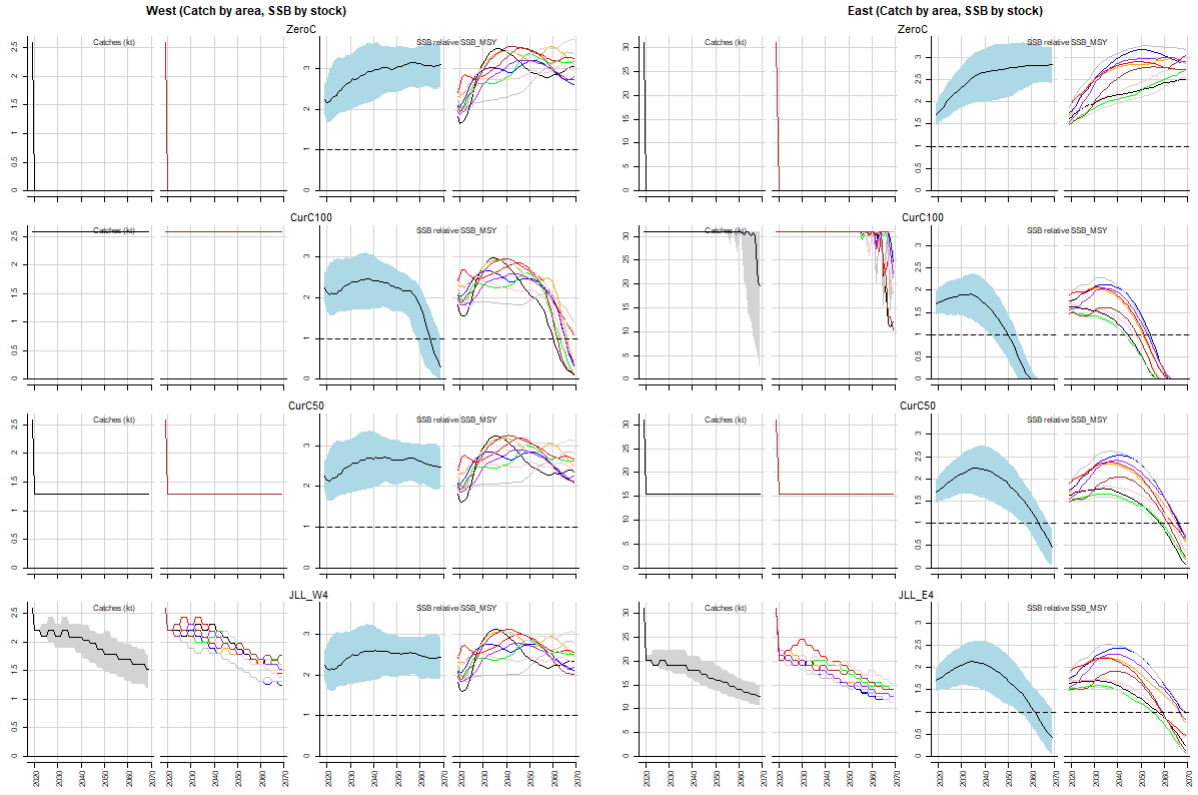

Figure 2. Output by plot function in ABTMSE package with Zero catch, current TAC, 50% current TAC and presented MP in OM 3 by ABTMSE ver4.2.15.