

## **TENTATIVE CONCEPTS FOR CPUE-BASED SIMPLE CANDIDATE MANAGEMENT PROCEDURE FOR MSE OF ATLANTIC BLUEFIN TUNA**

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### **SUMMARY**

*This document describes details of calculation for a candidate management procedure (CMP) for management strategy evaluation of Atlantic bluefin tuna. The basic concept of this CMP is easy to understand and simple to use. TAC from this CMP could be determined by three indices for eastern and western area, respectively. This document consists of tentative flow for this CMP and tentative results from this CMP.*

### **RÉSUMÉ**

*Ce document décrit les détails du calcul pour une procédure de gestion potentielle (CMP) pour l'évaluation de la stratégie de gestion du thon rouge de l'Atlantique. Le concept de base de cette CMP est facile à comprendre et simple à utiliser. Le TAC découlant de cette CMP pourrait être déterminé par trois indices pour la zone orientale et la zone occidentale, respectivement. Le présent document comprend le flux provisoire de cette CMP et les résultats provisoires de celle-ci.*

### **RESUMEN**

*Este documento describe detalles del cálculo de un procedimiento de ordenación candidato (CMP) para la evaluación de la estrategia de ordenación del atún rojo del Atlántico. El concepto básico de este CMP es fácil de comprender y simple de utilizar. El TAC establecido a partir de este CMP podría determinarse mediante tres índices para la zona oriental y occidental, respectivamente. Este documento consiste en un flujo provisional para este CMP y los resultados provisionales de este CMP.*

### **KEYWORDS**

*Atlantic bluefin tuna, Management Strategy Evaluation, Management Procedure*

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## 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 (CMP) 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. 6.6.17.

## Concept and details of CMP

The primary objective of this CMP is to conserve western stock for its recruitment and spawning stock biomass (SSB) by using USRR\_66\_114 and GOM\_LAR\_SUV indices, while Japanese longline index either in western or eastern area is used as indicator of SSB in each area. The trend in SSB at year,  $y$ , is determined by the ratio of the averaged values in recent period,  $y-2$  to  $y-6$ , to that in previous period from  $y-5$  to  $y-9$ . Using 5 years average would be enough to reduce the uncertainty and unexpected fluctuation in the indices.

Firstly, when ratio of trend in GOM\_LAV\_SUV is less than  $\alpha$ , which currently is 0.9 for western area and 0.8 for eastern area, TACs will be decreased in accordance with the ratio of trend. When this is not applicable, there is another threshold in terms of recruitment in western area by USRR\_66\_114 only in western area CMP. This is a kind of emergency rule when once recruitment index in recent 5 years is lower than the historical third lowest one. When this happens, TAC in western area is automatically reduced by 10%.

After two thresholds regarding to conservation of Western stock, the ratio of trend in JPN\_LL in each area are used to determine the TAC in each area. When the ratio of trend is between 95% and 105%, there will be no change in TACs. Once fluctuation of ratio is over 5%, TAC will change by ratio, but no more than 140% or no less than 80% of the current TAC. Finally, if TAC is less than 1,000mt and 10,000mt in western and eastern area respectively, then TAC is fixed at those values. Those flow of TAC calculation is in **Figures 1 and 2**.

## Tentative Results

**Table 1 and 2** shows some statistics estimated by this CMP across 96 OMs and 12 Robustness tests in east and west, respectively. Statistics for catch, i.e. AvC30, C30 and AAVC, are for each area while those for stock status, i.e. D30, PGK and Br30, are for each stock. Currently, tuning Br30 in to 1.0 for the western stock is regarded as a milestone toward being comparable for CMPs in ABTWG. This CMP can obtain 0.96 in Br30 for western stock on average over the interim 96 OM grids and 12 Robustness tests although there are no tuning parameters.

## Future work

To get closer value to 1.0 in Br30 for western stock, the tuning parameters to adjust the ratio of Japanese longline index values for each area should be considered and tuned instead of using nominal ratios. The threshold of lowest and highest limits of TAC change and intervals of changing TAC will be revised in corresponding to decision by managers and stakeholders.

## Reference

Anon. 2019, Report of the 2018 ICCAT Bluefin Tuna Species Group MSE intersessional meeting, Collect. Vol. Sci. Pap. ICCAT, 75(6), 1056-1159.

Punt, A. E., Butterworth, D. S., Moor, C. L., Oliveira, J. A. A., Haddon, M., 2016, Management strategy evaluation: best practices, *Fish and Fisheries*, 17, 303-334.

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.** Several statistics of some performance indicators in East under this candidate management procedure over the interim 96 OM grids and 12 Robustness tests.

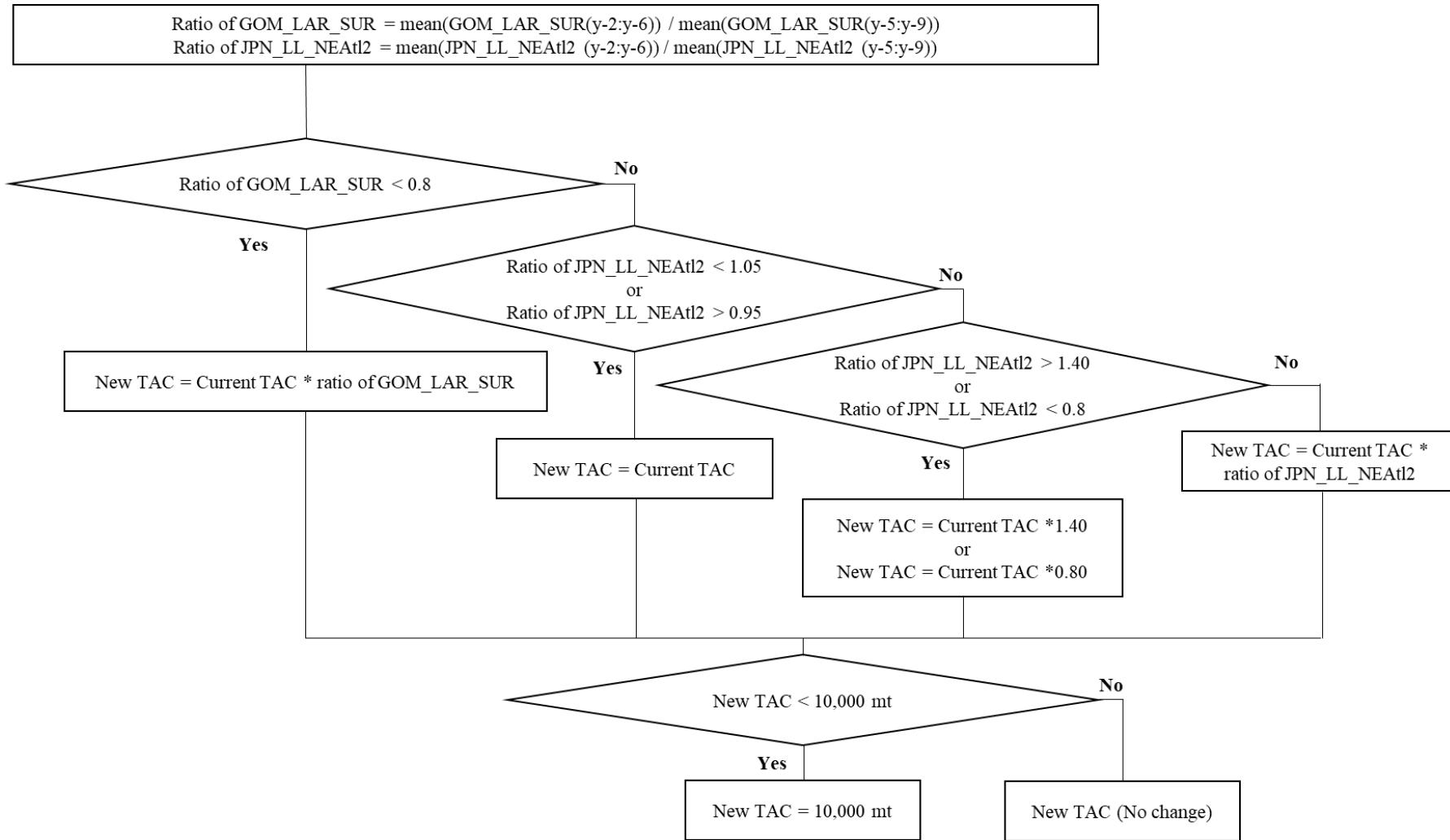
	AvC30	C30	D30	PGK	AAVC	Br30
Median	37.65	28.90	0.37	100.00	7.00	1.44
Average	36.43	30.67	0.35	67.33	8.14	1.40
Maximum	57.81	59.77	0.62	100.00	33.41	2.73
Minimum	15.41	2.08	0.00	0.00	0.00	0.00

**Table 2.** Several statistics of some performance indicators in West under this candidate management procedure over the interim 96 Om grids and 12 Robustness tests.

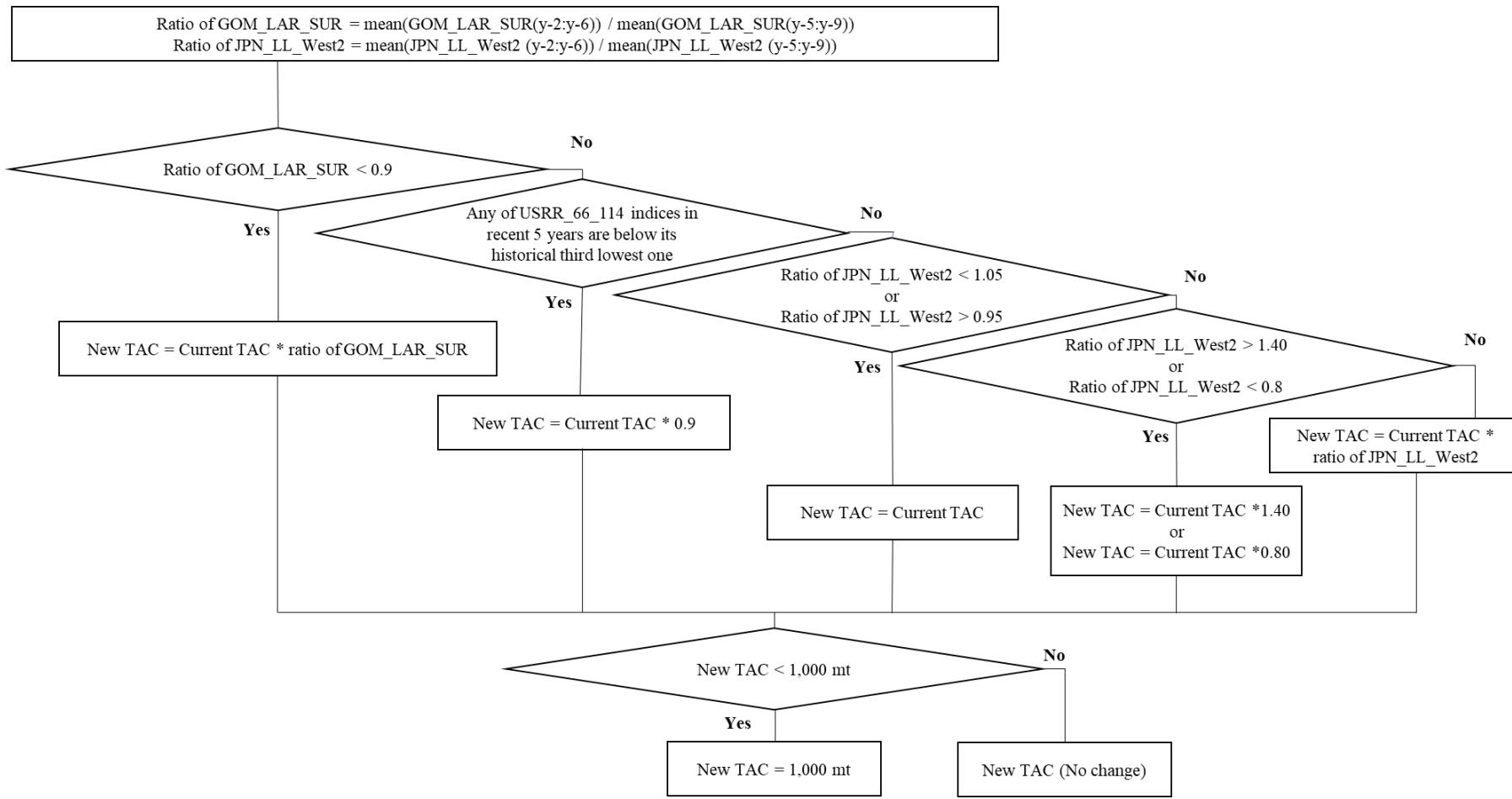
	AvC30	C30	D30	PGK	AAVC	Br30
Median	2.16	2.00	0.27	40.00	6.00	0.96
Average	2.23	2.02	0.26	48.64	5.41	0.91
Maximum	3.35	3.66	0.52	100.00	18.00	2.04
Minimum	1.15	0.39	0.00	0.00	0.00	0.00

Performance indicators (Statistics for catch, i.e. AvC30, C30 and AAVC, are for each area while those for stock status, i.e. D30, PGK and Br30, are for each stock.)

- ✓ AvC30 ... Averaged catch in weight (thousand ton) over first 30 projected years.
- ✓ C30 ... Averaged catch in weight (thousand ton) over projected years 21-30.
- ✓ D30 ... Depletion rate relative to dynamic B0 after projection year 30.
- ✓ PGK ... Probability of being in the Green Kobe region over 30 projected years.
- ✓ AAVC ... Average Annual Variability in Yield over the first 30 projection years.
- ✓ Br30 ... Depletion rate relative to dynamic B<sub>MSY</sub> after projection year 30.



**Figure 1.** Flowchart of calculation of Eastern TAC.



**Figure 2.** Flowchart of calculation of Western TAC.