

UPDATED COMMENTS ON PARRACK'S VPA TUNING PROCEDURE

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SUMMARY

The Parrack VPA tuning procedure (Parrack 1986) was examined by reviewing the assessment work on the west Atlantic bluefin tuna stock made by the ICCAT scientists in 1985 and 1986. Under existing circumstances, the procedure was not to be used as a standard stock assessment tool because of the weighting problem among CPUE's being unsolved.

It is the purpose of this report to examine the Parrack VPA tuning procedure used in assessing the west Atlantic bluefin tuna stock in the 1985 Miami meeting and the 1986 Madrid meeting, and to point out some unsolved problems.

RESUME

La méthode de Parrack pour l'ajustement des VPA (Parrack 1986) a été examinée lors d'une révision du travail d'évaluation effectué par les scientifiques de l'ICCAT en 1985 et 1986 sur le stock de thon rouge de l'Atlantique ouest. Dans les circonstances actuelles, la méthode n'est pas à utiliser en tant que processus standard d'évaluation des stocks, vu que la question de la pondération des CPUE n'est toujours pas résolue.

RESUMEN

Se examina el procedimiento de ajuste por VPA (Parrack 1986) al examinar el trabajo de evaluación del stock de atún rojo del Atlántico Oeste, realizado por los científicos de ICCAT en 1985 y 1986. En las actuales circunstancias, este procedimiento no ha de ser aplicado como instrumento estandar en la evaluación del stock, debido a que el problema de la ponderación entre las diferentes CPUEs sigue sin resolver.

El objetivo de este documento es examinar el procedimiento de ajuste de Parrack, que fué aplicado en la evaluación del stock de atún rojo del Atlántico Oeste en la reunión de Miami (1985) y también en la reunión celebrada en Madrid (1986) y señalar aquellos problemas que quedan sin resolver.

the 1985 Miami meeting

In this meeting, the preliminary VPA runs were made using an assumed M value and a partial recruitment pattern in order to examine whether the individual CPUE series is a useful abundance index or not. On evaluation of individual CPUE, the full catch-at-age matrix of ages 0 to 30 fish during 1970-1984 was used for the preliminary calculation. The procedure estimates catchability (q) for each abundance series for each M and F in an iterative process. It was done by assuming that CPUE and estimated population size are linearly related. Based on the results of preliminary runs, an abundance index which unsatisfies the following three criteria was rejected:

- 1) the probability of significant positive correlation between the index and VPA population size estimates was less than 0.8;
- 2) the differences between the predicted and observed CPUE's (i.e. the residuals) exhibited a trend over time; or
- 3) the minimum sums of squares occurred for a terminal fishing mortality rate (Ft) outside the range of 0.0001-6.0.

After the examination, the seven indices were finally selected as shown in the table 1.

The full catch-at-age matrix and selected indices were used in tuning the final VPA. The residual sum of squares stands at a minimum when Ft was 0.209 under the condition of M being 0.1 (ICCAT 1986).

The outline of Miami meeting being mentioned above, the procedure was not necessarily kept in practice. The meeting group made a mistake where they used Mediumfish (5B) in the final VPA run, though the correlation coefficient being nearly equivalent to zero and the sum of squares occurred without the acceptable range (Table 1).

Medium fish (5B) series dominated 47% of the sum of squares in the final VPA run. It is the largest one among seven CPUE's used. Ironically, Medium fish (5B), the index to be considered useless, played the most important role in determining Ft. This discrepancy clearly indicates that the Parrack's tuning method without weighting CPUE's involves the fatal deficiency.

Based on the re-assessment work with replacing Medium fish (5B) by West 2, the full F for the fish at 13-year old and over is estimated half the size (0.113) and the resulting population number became twice (57,000) as much as the estimated value of the Miami meeting (Nagai and Miyabe 1987). This is also derived from non-weighted CPUE's.

There is a possibility that a recent decrease in the adult fish abundance recognized in the Miami meeting might have been overstressed in comparison with the actual state, because the four CPUE's (Gulf-1° square, Larval index, Canadian Rod and Reel, and Canadian Handline) having large overlapping on the year and age in the catch-at-age matrix were used in tuning the VPA.

the 1986 Madrid meeting

The meeting group agreed to use three partial recruitment patterns, and to select CPUE's which satisfy the following three criteria in the preliminary VPA runs:

- 1) the probability of significant positive correlation between the index and VPA population size estimates was larger than 0.81;
- 2) the differences between the predicted and observed CPUE's (i.e. the residuals) exhibited a trend over time; or
- 3) the minimum sums of squares occurred for a terminal fishing mortality rate within the range of 0.0001-2.0 and for a floating M within the range of 0.0001-0.4.

The CPUE which satisfied the above-mentioned criteria was only one in each two partial recruitment. Therefore, a part of the group proposed to relax the criteria, and to continue the calculation. Some members of the group insisted that there are some deficiencies in the estimation method, or that no useful indices were available in tuning a VPA if the used method was correct.

Finally, the calculation was continued after selecting CPUE's with relaxed criteria. The assessment result shows the surplus production in 1987 to be 1,670 tonnes which is smaller than the current catches for monitoring. That is why the estimate could not be used.

Conclusion

When using the Parrack's VPA tuning procedure, it is necessary not to use the largely overlapped CPUE's on the year and age in the catch-at-age matrix, and to scale the used indices among them. The former will be settled by selecting CPUE's with our experiences, while the latter having not come to a satisfactory solution. It seems that scaling the CPUE's among them is impossible without knowing the real population size. Consequently, it is not appropriate to use the Parrack's VPA tuning procedure as an assessment tool under the circumstances.

References

- ICCAT 1986: Report of the meeting of the bluefin working group, Miami, Florida, U.S.A., September, 1985. Int. Comm. for the Conserv. of Atlantic Tuna, CVSP XXIV: 1-254.
- Nagai, T. and M. Miyabe 1987: Comments on Parrack's VPA tuning program. Int. Comm. for the Conserv. of Atlantic Tuna, CVSP XXVI: 283-292.
- Parrack, M. L. 1986: A method of analyzing catches and abundance indices from a fishery. Int. Comm. for the Conserv. of Atlantic Tuna, CVSP XXIV: 209-221.

Table 1. Summary table of VPA run made in the 1985 Miami meeting.

CPUE series	Age groups	Years	VPA run			
			preliminary		final	
			full F	r	r	SS(%)
West 1	3-5	71-83	0.08	0.57	0.67	20
Mediumfish(5B)	6-9	71-81	6	0.29	0.10	47
West 2	6-9	79-83	-	-	0.70	9
Gulf 1° square	10+	73-81	0.12	0.64	0.67	10
Larval index	10+	77,78,81-83	0.14	0.66	0.65	8
Canadian RR	16+	75-80	0.28	0.74	0.72	3
Canadian MI	16+	81-84	0.17	0.81	0.82	3

SS: residual sum of squares.

Response surface was investigated within the Ft range of 0.0001-6.0.