

TOOLS TO GUIDE THE SELECTION OF CPUE SERIES – REVISITED AND REVISED

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SUMMARY

In 2012 the WGSAM proposed a procedure for evaluating CPUE series presented to the species groups. This procedure has been utilized for several years now to evaluate CPUE series for inclusion in assessment models. However, it has become apparent that the process is time-consuming and needs to be updated to streamline the work of the various groups. This paper presents an updated evaluation table, which should considerably reduce the time required to evaluate the CPUE series, by removing the subjective scoring system used previously. In addition, it is proposed that previously evaluated series that have merely been updated, should include the previous assessment in their relevant SCRS document. The species group should then be able to assess these series far more rapidly and only make changes to the previous assessment if absolutely necessary.

RÉSUMÉ

En 2012, le WGSAM a proposé une procédure d'évaluation des séries de CPUE présentées aux groupes d'espèces. Cette procédure a été appliquée pendant de nombreuses années pour évaluer les séries de CPUE et les inclure dans les modèles d'évaluation. Il est devenu toutefois évident que le processus prend beaucoup de temps et qu'il devrait être mis à jour pour simplifier le travail des divers groupes. Ce document présente un tableau d'évaluation mis à jour qui devrait considérablement réduire le temps nécessaire à l'évaluation des séries de CPUE en supprimant le système subjectif de qualification utilisé préalablement. En outre, le document propose que les séries évaluées antérieurement, et simplement mises à jour, incluent l'évaluation antérieure dans le document SCRS correspondant. Les groupes d'espèces devraient ensuite être en mesure d'évaluer ces séries plus rapidement et de n'apporter des changements à l'évaluation antérieure que si cela s'avère absolument nécessaire.

RESUMEN

En 2012, el WGSAM propuso un procedimiento para evaluar las series de CPUE presentadas a los grupos de especies. Este procedimiento ha sido ya utilizado durante varios años para evaluar las series de CPUE e incluirlas en los modelos de evaluación. Sin embargo, está claro que el proceso requiere mucho tiempo y debe ser actualizado para agilizar el trabajo de los diversos grupos. Este documento presenta una tabla de evaluación actualizada, que debería reducir considerablemente el tiempo requerido para evaluar las series de CPUE, eliminando el sistema de asignación de puntuación subjetiva utilizado anteriormente. Además, se propone que las series evaluadas anteriormente que solo han sido actualizadas, incluyan la evaluación anterior en el documento SCRS pertinente. Tras ello, el grupo de especies debería ser capaz de evaluar dichas series de manera mucho más rápida y solo aportar cambios a la evaluación anterior si fuera absolutamente necesario.

KEYWORDS

CPUE, assessment models, evaluation criteria

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1. Introduction

Catch-per-unit-of-effort (CPUE) is often the main piece of information used in fisheries stock assessments. CPUE is usually assumed to be proportional to abundance and therefore included in the stock assessment as a relative index of abundance. Commercial CPUE, is expected to result in biased relative abundance indices because they reflect changes in abundance (N) as well as changes of fishing strategies, techniques and gears. Although catch rates of fishing fleets are not ideal they are often used because many exploited species are not monitored or not monitored comprehensively. High cost associated with a large scale pelagic survey has prevented the development of comprehensive scientific monitoring programs for highly migratory species (Bishop, 2006) like tuna (Lynch *et al.*, 2012). In addition, when standardizing CPUE series for use in assessment models, it is important to understand and account for mechanisms that could affect catchability for the time period of the CPUE that has been standardised.

Recognising the limitations and caveats regarding CPUE standardisation and its suitability as an index of abundance, the ICCAT working group on Stock Assessment Methods (WGSAM) attempted in 2012 to provide tools to guide the selection of CPUE series and evaluate their utility (Anon 2013, Table 2). The WGSAM went on to state:

“The Group recommends that the table elements be evaluated by the species groups before stock assessment models are constructed but noted that the table elements may not be applicable to all stock assessment formulations. Given this, species groups should evaluate the sufficiency of CPUE series with regard to the table elements and the stock assessment model chosen. In principle, only CPUE series judged to be sufficient should be included in stock assessment models. The conclusions of the species groups should be documented and justified in the report of the meeting.”

The objective of this paper is to review and evaluate the use of this table since its inception and to address various suggestions for modifications to the table intended to improve on or refine the table to better meet original stated objectives.

2. CPUE preparation for ICCAT assessments

This has resulted in species working groups utilising the table to assess CPUE series prior to their use in the assessment models as a trial in 2012, and subsequently by recommendation of the SCRS (Anon 2014). In 2015, the WGSAM revisited this issue (Anon 2016), taking into consideration comments by the various species groups that had utilised the tables prepared in 2012. At that's stage, the Group made several important observations. These are summarised below.

- The exercise is time consuming! HOWEVER, subsequent evaluations of the same index during future assessments should be less time consuming.
- The general (quantitative) scoring method of metrics was intended to provide a measure of each criterion for individual indices, but not to create an overall score for ranking of indices.
- The main intention of the criteria table is to facilitate the review of the appropriateness of CPUE series for inclusion in the stock assessment models.
- Inclusion of the CPUE series is dependent on the assessment model
- Some of the metrics could potentially be combined to simplify the table.
- The Group agreed that a revised version of the table be reviewed at the next meeting of the WGSAM and to provide recommendations if necessary.

These observations can be broken into two major themes, a) Assessment Utility - The use of the table to assess the suitability/quality of the CPUE series; b) Time consumption – The time required to implement the assessment table and the complexity of said table.

The intention of this paper is to address the final observation made by the group, which was to revise the table, which unfortunately was not possible during the 2016 WGSAM meeting as was initially intended.

3. The Major Issues

The currently used table is provided as **Table 1**.

a) *Assessment Utility*

It was noted that, although numeric values have been assigned to each category, for each series, the intention of this tool, is not actually to provide a competitive scoring framework to evaluate the CPUE series. The intent of the final scores obtained are not intended to be used to determine whether a series is “better” than another, nor are they suitable for use as weighting criteria for the CPUE series in assessment models. However, substantial time has been taken up during meetings for participants to agree on these numerical values. This would suggest that the practice of assigning a “score” is an unproductive use of the available time during the meetings. For several fields, it may be more appropriate to include a simple presence/absence type of evaluation (e.g. diagnostics).

The WGSAM in 2015 also noted that categories such as “Catch fraction” should be removed. Instead of removing this criterion, it may be possible to simplify the evaluation of this category. The authors of this document (in their capacities of current and past chairs of the WGSAM) also would like to stress, that these tables were never intended to be used primarily as a tool to decide whether a CPUE passes or fails the test to be included in an assessment (although if series are clearly inadequate, this table would help identify that issue). The intention of the tables were to encourage working groups to critically evaluate the CPUE series presented, and to identify whether there is enough information available to understand how the CPUE series were standardised, whether the standardisation techniques used are appropriate and how best to use the available series. The concern was that in the past CPUE series had been inappropriately or insufficiently standardised and/or were being used inappropriately in assessment models. In theory, the table encouraged the groups to run through a process, that in reality, every assessment scientists should go through prior to including a series in a model. It is the feeling of the authors that the process has become too formalised and pedantic, and that the tables were only ever intended to provide guidance, not be prescriptive.

b) *Time Consumption*

The major issue with using this CPUE evaluation table is the time taken to complete it. Data preparatory meetings are usually 5 days long, often with the final day dedicated to finalising the report. CPUE discussions have been known to take several days on their own, significantly reducing the time available to discuss other important issues, such as catch data, biology, model assumptions and scenarios etc. In addition, the scoring of CPUEs is somewhat subjective and significant time has been taken up deciding whether a CPUE series deserves a 3 or 4 (for example) for a particular category. Again, as these scores are not used to weight, nor to decide definitively whether a series should be excluded, this lengthy discussion to finalise scores, appears trivial. This paper will propose alternate methods to evaluate the series being discussed.

The SCRS also proposed (although it was unfortunately never officially documented), that the CPUE evaluation tables should be completed by 3 different sources prior to the commencement of the data preparatory meeting. The proposal was that the Working Group chair, the secretariat and the author of the CPUE document should all complete the tables prior to the meeting and make their scores available to the species working group (J. Santiago pers com). This was done for a few species groups, but has generally not been widely adopted. This process in theory would significantly reduce the discussions during the meetings as the groups would need to simply discuss how to harmonise the presented scores, and provide any additional small revisions to the scoring. Unfortunately the CPUE series are not always available with sufficient time prior to the meeting commencement for the sources to carry out these evaluations and thus the system is entirely reliant on the timing of the availability of the CPUE series.

In 2015, the WGSAM also noted that “*subsequent evaluations of the same index during future assessments should be less time consuming*”. In reality, this has not actually been the case.

4. **Suggestions to improve the table/process**

This paper proposes that **Table 1** should be replaced with a new table (**Table 2**), that is simplified and provides “pull down” menus to comment on CPUE series, in order to reduce unnecessary discussions. In addition, it is the recommendation of the authors, that any previous evaluation of a presented CPUE time series should be included in the updated CPUE paper presented to the SCRS. This will allow the group to quickly determine whether the series has been evaluated previously, if any substantial changes to the series have been made and thus if a new evaluation is necessary. If no substantial revisions have been made to the series, the group can quickly adopt the previous evaluation and move on to other series or issues. This should reduce the time taken to review the CPUE series as envisioned by the WGSAM in 2015.

5. Conclusion

The suggestions made in this paper are not made to reduce the importance nor necessity to critically evaluate CPUE series that are presented for use in assessments. In fact the basic structure of the table remains the same and the same questions/criteria are included. The authors strongly advocate the need to fully understand and assess CPUE series prior to their utilization. However, this process has become bloated and time-consuming under its current format. As such the suggestions made in this document aim to streamline the assessment process by reducing the need for unnecessary discussion. The simple method of evaluating the assessment criteria is no more subjective than the previous method, and in fact reduces the need to reach consensus on arbitrary scores that have no practical meaning. We urge the WGSAM to discuss this issue and if required, provide revisions to the method proposed.

References

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Table 1. Current CPUE evaluation table as created in 2015. Criteria are ranked from 1-5.

	Paper	
	Index	
1	Diagnostics	
2	Appropriateness of data exclusions and classifications (e.g. to identify targeted trips).	
3	Geographical Coverage	
4	Catch Fraction	
5	Length of Time Series relative to the history of exploitation.	
6	Are other indices available for the same time period?	
7	Does the index standardization account for Known factors that influence catchability/selectivity?	
8	Are there conflicts between the catch history and the CPUE response?	
9	Is the interannual variability within plausible bounds (e.g. SCRS/2012/039)	
10	Are biologically implausible interannual deviations severe? (e.g. SCRS/2012/039)	
11	Assessment of data quality and adequacy of data for standardization purpose (e.g. sampling design, sample size, factors considered)	
12	Is this CPUE time series continuous?	

Table 2. Proposed revised CPUE table (Note: options provided per criteria will be incorporated as pull down menus in an excel file).

	Use in stock assessment?			
	SCRS Doc No.			
	Index Name			
1	Diagnostics	Yes	No	
2	Documented data exclusions and classifications?	Yes	No	
3	Data exclusions appropriate?	Yes	No	
4	Data classifications appropriate?	Yes	No	
5	Geographical Coverage	Atlantic	Atl N	Atl S
		Atl NW	Atl NE	Atl SW
		Atl SE	Tropical	Localised
6	Ranking of Catch of fleet in TINC database (use data catalogue)	1 - 5	6 - 10	11 or more
7	Length of Time Series relative to the history of exploitation.	Long	Medium	Short
8	Are other indices available for the same time period?	Yes	No	
9	Does the index standardization account for Known factors that influence catchability/selectivity?	Yes	No	
10	Interannual CV (including potential evidence of unaccounted process error, trends in deviations from production model dynamics, high peaks, multiple stanzas, increasing or decreasing catchability)	High	Medium	Low
11	Is data adequate for standardization purposes (e.g. sampling design, sample size, factors considered)	Yes	No	
12	Is this CPUE time series continuous?	Yes	No	
13	Should the series be split into different temporal partitions?	Yes	No	
14	Other Comments (model applicability etc.)			