INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

COMMISSION INTERNATIONALE POUR LA CONSERVATION DES THONIDES DE L'ATLANTIQUE

COMISION INTERNACIONAL PARA LA CONSERVACION DEL ATUN ATLANTICO

Madrid, 1 February 2023

ICCAT CIRCULAR # 0757/ 2023

SUBJECT: WORKSHOP ON DATA LIMITED ASSESSMENT METHODS FOR SMALL TUNAS
(Madrid (Spain), 9-12 May 2023)

Following the adoption by the Commission of the SCRS workplans for 2023, I should like to inform you that the Workshop for Data Limited Assessment Methods for Small Tunas is scheduled for 9-12 May 2023. This in-person workshop will be held at the ICCAT Secretariat in Madrid (Spain). Dr Luis Gustavo Cardoso (from Brazil) has been nominated as the invited expert to this workshop. He will provide a broad overview of fundamentals and assumptions of data limited stock assessment methods that can be applied to small tunas, as well as train participants in the practical application of a catch-based and a length-based stock assessment method within the data-limited stock assessment framework.

Due to the technical nature of the workshop, and to allow the invited expert to provide the necessary levels of individual assistance to participants, only a limited number of national scientists (maximum of 8-10, based on the available budget and logistics) will be allowed to attend the workshop, although geographical balance in terms of the candidates' origin will be sought to the extent possible.

All participants must have at least a minimum working knowledge of stock assessment methods and R software, and be able to hold a fluent conversation in English. Accordingly, a selection process, led by the SCRS Chair, the Small Tunas Rapporteur and the Secretariat, will be set to select the best candidates, which will take into consideration the candidates' technical skills and expertise, fluency in English, as well as regular participation in the SCRS Small Tunas Species Group work and meetings. Therefore, candidates are request to **submit applications to the Secretariat** (info@iccat.int and miguel.santos@iccat.int) no later than **24 February 2023**. Funding is available to cover travel and subsistence expenses for the selected candidates.

I am pleased to provide you with additional information for the potential candidates (attached herein, in English only), including some background information on workshop theme, the objectives, agenda and timetable. I would appreciate it very much if you could distribute this announcement to scientists who may be interested in participating in the workshop. This announcement will also be published on the ICCAT current meetings webpage, shortly.

Please accept the assurances of my highest consideration.

Executive Secretary

Camille Jean Pierre Manel

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Attachment: Additional information for candidates.

Workshop on Data Limited Assessment Methods for Small Tunas
(*Madrid, Spain – 9-12 May 2023)*

1. Background

Developing any harvest strategy for managing a fishery depends on assessing the stock status and population dynamics, which depends on data availability (Dowling *et al*., 2015). Several small-tunas stocks present limitations on the available data to conduct a comprehensive quantitative, model-based stock assessment to estimate the time series of biomass and fishing mortality relative to their reference points. Nevertheless, even with limited data, some aspects of stock status can be inferred. Data-limited assessment methods are increasingly used for management purposes to report on the regional status of fisheries across many stocks and to assess the status of individual data-limited stocks as inputs to management decisions (Dowling *et al*., 2019; Chrysafi and Kuparinen, 2016). These methods rely on removal time series and/or length composition's time series or snapshots, but all depend on a good understanding of the species' life history parameters.

Assessing stocks using only catch and life-history data started many years ago with the development of stock reduction analysis (SRA; Kimura *et al*., 1984). Since then, SRA has been extended to estimate productivity and reconstruct historical abundance trends by making assumptions about final biomass relative to unfished or initial biomass (i.e., stock depletion; Thorson and Cope 2015). SRA has been further extended to incorporate stochastic variability in population dynamics (stochastic-SRA; Walters *et al*., 2006), a flexible shape for the production function (depletion-based SRA; Dick and MacCall, 2011), prior information regarding resilience and population abundance at the start of the catch time series (catch – maximum sustainable yield, Catch-MSY; Martell and Froese, 2013), Bayesian approaches (C_{MSY}; Froese *et al*., 2017), and age-structured population dynamics (simple Stock Synthesis, SSS; Cope, 2013). Despite these differences, this family of catch-only models shares a common dependence on prior assumptions about final stock depletion. Simulation testing has previously indicated that these methods perform well only when assumptions regarding final relative abundance are met (Wetzel and Punt, 2015). Unsurprisingly, because final stock depletion is a prior assumption, the methods perform differently under different stock depletion levels (i.e., highly depleted or slightly depleted stocks; Walters *et al*., 2006) or different harvest history or catch trends.

For many small-scale data-limited fisheries, obtaining reliable time series on total historical catches is difficult, whereas sampling lengths from the catch is easier. Mean-length mortality estimators (Beverton and Holt, 1957) assume that fishing mortality directly influences the mean length of the catch under equilibrium conditions. This basic method has been extended by length-based spawning potential ratio (LBSPR; Hordyk *et al*., 2015a), length-based integrated mixed effects (LIME; Rudd and Thorson, 2018), and length-based Bayesian approach (LBB; Froese *et al*., 2018) models, among others. These allow estimating instantaneous fishing mortality (F) and spawning potential ratio (SPR) when basic biological parameters are known. In contrast with LBSPR and LBB, LIME does not assume equilibrium conditions. The mixed-effects aspect of LIME extends length-based methods by estimating changes in recruitment and separating them from fishing mortality over time (Rudd and Thorson, 2018).

Furthermore, when removals time series are available with current/updated length composition samples, it is possible to combine them and construct catch-length models using tools like the Data-limited Stock Synthesis tool (SS-DL tool, Cope, 2020). The SS-DL tool uses the age-structured population dynamic model Stock Synthesis (Methot and Wetzel, 2013) to implement several standard data-limited assessment methods in one modeling framework. The SS-DL allows flexible use of life history parameters and fishery data to build a population dynamics model to assess stock status and estimate management parameters. The SS-DL tool also allows building catch or length-based assessment models in an independent way.

A broad review of the available methods will be performed in the data-limited stock assessment workshop. One framework and three model types will be presented and practiced in deep. The Simple Stock Synthesis (SSS) model will be presented as a catch-based method, and the participants will be trained to apply it in a real data set as an example. The SSS presented the best performance in a study comparing several catch-limit assessment methods in data-limited fisheries (Pons *et al*., 2020). The LBSPR method will also be

presented, and the participants will be trained to apply it in a real data set. Chong *et al*., (2020) compared several length-based stock assessment methods and found the LBSPR one of the most consistent and accurate methods. In summary, participants will learn to employ catch-only, length-only, and catch-length models. They will get to use LBSPR and SS-DL to do them.

2. Objectives

The main objectives of the workshop are:

- To present the fundamentals and assumptions of different data-limited stock assessment methods;
- To train 8-10 national scientists from different CPCs on managing the related software and applying a catch-based and length-based assessment method;
- To train 8-10 national scientists from different CPCs on using a comprehensive stock assessment framework, the Stock Synthesis Data-limited tool;
- To apply practical examples for illustrating the data limited model building and tuning.

3. Expert tasks

- To present a broad overview view and the fundamentals and assumptions of data limited stock assessment methods that can be applied to the small tuna species;
- To train 8-10 national scientists in the practical application of a catch-based and a length-based stock assessment method;
- To train 8-10 national scientists in the practical application of the data-limited stock assessment framework;
- To apply the presented methods to real small tunas data sets as practical examples.

4. Workshop Agenda and Timetable

- Day 1: Overview of data limited stock assessment methods;
    - Detailed description of a catch based (Simple Stock Synthesis) and a length-based (LB spawning potential ratio) methods;
- Day 2: Detailed description of the Data-limited stock synthesis tool;
- Day 3: Hands on working with real data sets, running codes, fixing bugs, and fitting models;
- Day 4: Hands on working with real data sets, running codes, fixing bugs, and fitting models.

Workshop wrap-up

5. Number of participants

8-10 national scientists will participate in the workshop.*
1 expert

* All participants must have at least a minimum working knowledge of R software, and have the required packages installed on their computers before the workshop. A list and a manual on installing it will be provided within a month before the workshop.

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