



Madrid – April 19, 2013

## ICCAT CIRCULAR # 1893 / 2013

**SUBJECT: TERMS OF REFERENCE - CALL FOR TENDERS – GBYP 04/2013 –  
MODELLING APPROACHES: SUPPORT TO BFT STOCK  
ASSESSMENT (ICCAT/GBYP – Phase 4 - 2013)**

I have the honor to transmit to you the attached Call for Tenders GBYP 04/2013 for  
“**Modelling Approaches: Support to BFT Stock Assessment**” of the ICCAT Atlantic-Wide  
Research Programme on Bluefin Tuna (GBYP).

Please accept the assurances of my highest consideration.



Driss Meski  
*Executive Secretary*

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**Attachment:** Call for Tenders GBYP 04/2013.

**TERMS OF REFERENCE**  
**CALL FOR TENDERS – GBYP 04/2013**  
**MODELLING APPROACHES: SUPPORT TO BFT STOCK ASSESSMENT.**  
**ATLANTIC-WIDE RESEARCH PROGRAMME ON BLUEFIN TUNA**  
**(ICCAT/GBYP Phase 4 – 2013)**

**1. Background and objectives**

The comprehensive objectives of the ICCAT Atlantic-Wide Research Programme on Bluefin Tuna (GBYP) are to improve data collection, knowledge of key biological and ecological processes, assessment models and management.

An important element of the Programme is to develop a robust advice framework consistent with the Precautionary Approach. This requires the development of new stock assessment methods that take into account the main sources of uncertainty and utilise the new data sets and knowledge provided by the GBYP. New data sets include, for example, historic catch and effort data, aerial surveys of spawning aggregations and tagging of juveniles. In order to evaluate novel approaches the SCRS is developing a Management Strategy Evaluation (MSE) framework that includes a simulation or Operating Model (OM). This will allow current and alternative assessment and advice frameworks to be evaluated with respect to their ability to meet multiple management objectives with acceptable levels of risk.

The details are included in **Annex 1** to this call.

The ICCAT is publishing this announcement in order to select public institutions or private entities to submit offers in order to develop modelling approaches as described below.

***Lot 1: Risk Assessment***

Although several sources of uncertainty were considered when formulating the East Atlantic and Mediterranean Bluefin Tuna Recovery Plan, not all sources of uncertainty were explicitly considered. Therefore, a contract for a *Risk Assessment* was awarded in 2011 and 2012 to identify the main sources of uncertainty and concerns of a wide range of stakeholders. This follow up tender is to turn this initial qualitative study into a quantitative one that can be used to weigh the plausibility of simulation trials (i.e., scenarios) within the Operating Model used in the MSE.

***Lot 2: Statistically based stock assessment methods***

The current assessment is based on Virtual Population Analysis that assumes that catch-at-age is known exactly and which uses the simplex algorithm for maximizing the likelihood and provides estimates of parameter uncertainty via a bootstrap simulation. This call is to develop an alternative statistical catch-at-age based assessment model for use by the Bluefin Tuna Species Group that can be used as part of a Management Procedure with the MSE.

***Lot 3: Development of Biological Hypotheses for use within the MSE***

When building the OM, it is necessary to develop hypotheses about stock and fishery dynamics. This requires that appropriate analyses be proposed and data collection procedures that resolve uncertainty about stock dynamics be designed. This call is for an external expert in Biology to help specify how hypotheses are to be implemented in the OM and evaluated in the MSE. The expert must have demonstrated the appropriate expertise in meta-populations, growth and maturity, stock recruitment

dynamics, as demonstrated by an appropriate publication record. The expert must also be experienced in stock assessment and in helping to develop OMs.

## **2. Contractors tasks**

Contractors will work in close consultation with the ICCAT-GBYP, the Rapporteurs of the Bluefin Tuna Species Group and the ICCAT Population Dynamics Expert.

### ***Lot 1: Risk Assessment***

The qualitative study conducted in Phase 2 and 3 shall be turned into quantitative analyses that can be used to weigh the plausibility of simulation trials (i.e., scenarios) within the Operating Model used in the MSE.

### ***Lot 2: Statistically based stock assessment methods***

The state-of-the-art maximum likelihood stock assessment methods is now to use automatic differentiation and random effects using ADMB. This allows measurement and process error to be considered in stock assessment models.

The development of a statistical catch-at-age based stock assessment model for bluefin tuna must include:

- i) Estimates of uncertainty for reference points and stock status that can be used to provide advice within the Kobe Advice framework;
- ii) Measurement error in catch data and time series used for calibration; and
- iii) Process error in system dynamics.

It must also be implemented in software that can be used as part of the MSE, i.e., in R and/or ADMB and all code published under an open source licence.

### ***Lot 3: Development of Biological Hypotheses for use within the MSE***

The expert must assist in the development of Operating Model hypotheses, participate in the GBYP modelling meeting in Tenerife, and then help in drafting an SCRS paper documenting the processes to be modelled and scenarios for consideration in the MSE. This paper must:

- i) Document the processes to be included in the OM;
- ii) Specify how the processes will be modelled;
- iii) Summarise the data and knowledge requirements;
- iv) Outline what data collection procedures should be considered (i.e. specify an Observation Error Model); and
- v) Prepare a bibliography.

The expert will be fully responsible for ii) and v) in particular.

## **3. Contractor minimum qualifications**

- A minimum of 5 years of experience in stock assessment and management advice.
- University degree in any of the following: Mathematics, Statistics, Engineering, Fisheries Science, Marine Biology Natural Sciences, Biological Sciences, Environmental Sciences or a closely related fields.
- Excellent working knowledge of one of the three official languages of ICCAT (English, French and Spanish). A high level of knowledge of English is highly desirable.

#### 4. Submission of bids

Scientists and public or private Scientific Institutes or entities interested shall submit an offer to the attention of Mr. Driss Meski, the Executive Secretary of ICCAT, at the following address: [driss.meski@iccat.int](mailto:driss.meski@iccat.int) by **April 28, 2013**, including:

- a) A detailed offer, which shall include: a description of methodology to be used;
- b) A short *Curriculum vitae* of the tender (in case of individual scientists) and of any collaborators, i.e., the 5 most relevant papers and involvement in research projects or management bodies;
- c) An estimated budget which shall not exceed €10K for each item;
- d) The name, address, and telephone number of the tendering body;
- e) The institutional and administrative background of the tendering body (e.g., statutes, type of institution, annual budget, budget control procedures, etc.), if applicable;
- f) A detailed list of any subcontracts;
- g) Acknowledgement of this Call for Tenders; and
- h) A statement specifying the extent of agreement with all terms, conditions, and provisions herein included.

Offers sent after the deadline or that fail to furnish the required documentation or information, or reject the terms and conditions of the Call for Tenders will not be considered.

#### 5. Selection of bids

The ICCAT Secretariat will make a selection of the offers. Following the selection process, the ICCAT Executive Secretary will notify the entity selected for the contract by **April 30, 2013**, at the latest.

Contracts will be awarded on the basis of competitive tendering and the evaluation of proposals will be undertaken objectively, consistently and without bias towards particular suppliers. Tenders will be evaluated against a pre-determined set of criteria, which include: (i) cost; (ii) proven track record; (iii) technical merit based on work plan; (iv) flexibility to future changes to requirements; and (v) contribution to the overall objectives of the GBYP.

The ICCAT Secretariat will examine each tender received and make recommendations as to which tender is the most economically advantageous. Once the decision to award the contract has been made, both the successful and unsuccessful tenders will be notified. Unsuccessful tenders may request a detailed letter explaining the reasons for the decision and the relative characteristics of their bid compared to the winning bid.

#### 6. Deliverables

##### *Lot 1: Risk Assessment*

- 1) An SCRS paper that performs a quantitative risk analysis based on the qualitative work conducted under Phase 3 and provides a basis for weighting the scenarios used in the MSE, to be provided by **September 23, 2013**, at the latest.
- 2) The contractor should attend the BFT meeting in Tenerife in May; expenses should be covered by the contract.
- 3) A final report to be submitted by December 13, 2013, at the latest, to the GBYP Coordination ([gbyp@iccat.int](mailto:gbyp@iccat.int)).

### ***Lot 2: Statistically based stock assessment methods***

- 1) An SCRS paper that replicates the 2012 VPA stock assessment, then evaluates the benefits of explicitly considering process and measurement error to be provided by **September 23, 2013**, at the latest.
- 2) Code written in ADMB that implements the model in the SCRS paper.
- 3) A final report and code to be submitted by December 13, 2013, at the latest, to the GBYP Coordination ([gby@iccat.int](mailto:gby@iccat.int)).

### ***Lot 3: Development of Biological Hypotheses for use within the MSE***

- 1) An SCRS paper that describes how appropriate alternative hypotheses about stock dynamics based on the Risk Analysis should be implemented in the OM to be provided by **September 23, 2013**, at the latest. It should also summarise how uncertainty and these processes could be reduced based on scientific research and data collection.
- 2) The contractor should attend the BFT meeting in May; expenses will be included in the contract.
- 3) **A final report** to be submitted by **December 13, 2013**, at the latest, to the GBYP Coordination ([gby@iccat.int](mailto:gby@iccat.int)).

The Contractor(s) should be available to report to the ICCAT Working Group on Stock Assessment Methods (WGSAM), the Bluefin Tuna Species Group and the SCRS, if so required; reasonable expenses will be paid.

## **7. Payment details**

Disbursements will be made according to the following schedule:

- 1) 50% of the total amount of the contract upon signing of the contract;
- 2) 50% after the approval of the final report by the ICCAT SCRS upon incorporation of comments by the ICCAT GBYP Steering Committee.

## **8. Logistics**

All documents provided by the Contractor must be in Open Office, Latex or compatible software, all documents submitted must be in English, French or Spanish.

## **9. Copyright**

All software written by the Contractor will be licensed under GLP or similar open source licence.

For information concerning this call for tenders, please contact the Program Coordinator at the following address: [antonio.dinatale@iccat.int](mailto:antonio.dinatale@iccat.int)

# GBYP Phase IV; Modelling

Laurence T. Kell

April 15, 2013

## 1 Introduction

Under the GBYP the modelling programme is addressing objective

*3) Improve assessment models and provision of scientific advice on stock status through improved modelling of key biological processes (including growth and stock-recruitment), further developing stock assessment models including mixing between various areas, and developing and use of biologically realistic operating models for more rigorous management option testing.*

In addition in 2012 the Commission requested the SCRS (Doc. No. PA2-617A/2012 COM) to conduct a stock assessment in **2015** and to

- a) Develop a new assessment model allowing the inclusion of the last updated knowledge on the biology and ecology of bluefin tuna, in particular life-history parameters, migration patterns, and aiming at identifying and quantifying uncertainties and their consequences on the assessment results and projections.
- b) Release a stock status advice and management recommendations, supported by a full stock assessment exercise, based on the new model, additional information and statistical protocols mentioned in points above and on which basis all actions may be adopted and updated by the Commission through the management plan to further support the recovery.

This document provides a draft of the work to be done in 2013 under the modelling programme of phase IV of the GBYP. The work is part of a multi-year workplan, which includes objectives, timelines and deliverables. intended to meet the Commission's request and achieve the objectives of the GBYP. The document also identifies the work to be conducted under the GBYP and which components are the responsibilities of the SCRS, CPCs or the Secretariat.

There is a total of € 80,000 for the operating model development work in Phase IV. with € 20,000 to be used for a contract on management procedures and € 60,000 would be for external expert assistances with the operating model development.

In 2012 the GBYP Steering Committee (SC) recommended that a group be formed under the SCRS to develop an operating model. This group would work intersessionally to produce a draft agreed specification for an operating model that would be presented at a meeting to be held in May 2013 directly after the bluefin biological meeting. Specific terms of reference and a draft agenda for the workshop would be developed by the Secretariat.

## 2 Workplan 2013

The objective of the work to be conducted in 2013 is to provide a specification of the Operating Model (OM) and agree how this will be used as part of a Management Strategy Evaluation (MSE). This will require turning the qualitative risk analysis into a quantitative study based on the knowledge and data gained under the GBYP and the results from Data Workshop, This will involve an evaluation the relative impact of the various sources of uncertainty on management objectives.

The budget will be allocated in order to ensure sufficient expertise and resources to conduct the modelling work e.g.

**Stock Assessment** In order to develop new assessment methods

**Operating Model** To help develop hypotheses about stock structure and biological processes

**Operating Model** Develop an observation error model to help simulate data based on alternative designs (e.g. aerial surveys).

**Risk Analysis** Continue the Risk Analysis in order to engage the legitimate concerns of stakeholders

### 2.1 Milestones

MV.1 **BFT Meeting Tenerife** A draft specification will be prepared based on the Risk Assessment (Leach et al. 2013) and the hypotheses developed at the meeting.

MV.2 **BFT Meeting Boston** The draft specifications will be presented to get feedback on the proposal from the International community working on MSE.

MV.3 **SCRS** The specifications and a preliminary operating model will presented and adopted.

### 2.2 Deliverables

The deliverables are

DV.1 **SCRS Paper**; Quantitative Risk Assessment that identifies the main sources of uncertainties and associated risks.

DV.2 **SCRS Paper**; Specification of the Operating Model Design.

DV.3 **Software**; Example Operating Mode

DV.4 **Software**; Example Observation Error Model

DV.5 **Software**; Example Management Procedure

## 3 Meeting Agendas

### 3.1 Tenerife

At the data workshop a presentation will be made of the Risk Analysis and the review of uncertainty conducted under the Modelling Programme of the GBYP and how the modelling under the GBYP will use Management Strategy Evaluation (MSE) to help develop a robust management framework. During that meeting a summary of the main sources of uncertainty will be prepared and a presentation made at the end of the meeting of the proposed specifications of an Operating Model (OM), i.e. a simulation model that represents alternative hypotheses about stock dynamics. Then at the GBYP meeting following the SCRS-BFT meeting an SCRC paper documenting the processes to be modelled and scenarios for consideration in the MSE will be drafted. This paper will

- document the processes to be included in the OM
- specify how the processes will be modelled
- summarise the data and knowledge requirements
- outline what data collection procedures should be considered (i.e. specify an Observation Error Model) and
- prepare a bibliography.

Attendees at the workshop will be the authors of the paper.

Although the modelling work will initially focus on new data on stock structure within the Eastern and Mediterranean stock, interactions with the Western stock and how these impact management of both stock will also be considered.

The manuscript will then be presented at the Boston meeting for review by appropriate experts.



## 3.2 Boston

The Boston meeting at the time of the World Conference on Stock Assessment Methods (WCSAM) and will be a unique opportunity to get feedback from the International community working on related issues; the GBYP will therefore benefit by input from recognised experts in the field.

At this meeting the report from the Tenerife meeting will be presented and discussed with the intention of finalising an agreed draft at the meeting. In addition the group will take advantage of the World Conference on Stock Assessment Methods (WCSAM) to identify appropriate stock assessment methods for use in the Management Procedure.

- Present the report(s) from the Data Workshop
- Present work on Risk Assessment
- Agree scenarios to considerable
- Agree how processes will be modelled
- Review the data and knowledge required
- Specify Observation Error Model(s)
- Propose MP
- Agree Performance Statistics
- Draft a report

## 4 Deliverables

The deliverables are of two types, SCRS (or peer review) papers and software ideally as R packages or ADMB executables.

### 4.1 SCRS Papers

The SCRS papers are

#### 4.1.1 Risk analysis

The objective of this paper is to turn the qualitative risk assessment (Leach et al. 2013) into a quantitative analysis in order to provide an evaluation of the relative importance of the various sources of uncertainty. This will allow the OM development to be prioritised and scenarios to be specified.

While the new advice framework will be developed using Management Strategy Evaluation (MSE). Conducting an MSE can take several years and considerable resources. Therefore, the initial qualitative analysis will be conducted using relatively simple approaches such as elasticity and sensitivity analysis. This will help identify and focus and prioritise research and management efforts.

#### **4.1.2 OM Specifications**

This paper will specify the scenarios to be considered and how the various hypotheses will be implemented. A first draft will be prepared at the Tenerife

### **4.2 Software**

Modelling will be conducted in R and so all software should ideally be made available as R packages, for example see Kell et al. [2007].

#### **4.2.1 OM**

The operating model will be used to evaluate alternative assessment and advice frameworks with respect to the assumptions about biological processes Kell and Fromentin [2007], Fromentin and Kell [2007] and stock structure Kell et al. [2009] see Kell et al. [2003] using the Operating Model.

Initially an example operating model will be developed that can be used to illustrate the approach to the SRCS.

#### **4.2.2 OEM**

The Observation Error Model is the component of the OM that generates fishery dependent and fishery independent resource monitoring data for input to an MP.

Work under Phase III has already developed statistical methods, which include estimates of uncertainty, for raising Task I and II to the total population. These will be used as part of the OEM.

Another Phase III contrat has developed statistical methods for converting size data to age, these methods will be evaluted, allowing different assessment methods (e.g. biomass, size and age based methods to be compared).

A key source of uncertainty is stock strucure and so an OEM will be developed that can generate data under a variety of hypotheses.

Initially this will be based on the work conducted for the Adult Aerial Survey, but should be extendable to all age classes and different data types.

### 4.2.3 MP

Stock assessment methods should include biomass, size, stage and size based.

**Biomass Dynamic** an R packge for ASPIC has been developed, this includes estimateion of reference points, projections and Harvest Control rules. In addition an R package has been developed based on ADMB that can model uncertainty in a variety of ways e.g. Hessian, MCMC and random effects. These packages will be released, added to the ICCAT software catalogue and evaluted using the OM.

**Age Based** Currently the Secretariat is working with Anders Neilsen on an aged based state space model, Under a GBYP Contract this model will be further developed for use as part of an MP.

**Length Based** Various length based models are under developement. It is proposed to collaborate with apporiate developers, e.g. through SISAM

**Stage Based** An important type of model, not considered by SISAM. The secretariate will develop an draft development proposal.

## References

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