

## **TERMS OF REFERENCE FOR THE PROVISION OF SCIENTIFIC SERVICES TO THE IOTC: COLLABORATIVE ANALYSIS TO PREPARE CPUE INDICES**

### **Scientific Services to be provided:**

Methods for standardisation of joint catch and effort from DWFNs that incorporated an innovative approach on identifying target changes were developed in 2015 and 2016. Standardised CPUE indices have been used as abundance index in the most recent Indian Ocean bigeye and yellowfin tuna stock assessments. The working party on tropical tuna (WPTT) has recommended the method to be further developed in 2017. Following the suggestions of WPTT19, the IOTC requires a short-term consultancy for the following activities:

### **COLLABORATIVE ANALYSES TO PREPARE CPUE INDICES**

- Validate and improve methods for developing indices of abundance for tropical and albacore tunas.
- Provide indices of abundance for bigeye and yellowfin tunas and draft working papers to be presented at the WPM09 (13-15 October 2017) and WPTT19 (17-22 October 2017).
- Provide support and training to national scientists in their analyses of catch and effort data.
- The analyses will consider data to be provided by Japanese, Taiwanese, Korean, and Seychelles research agencies.
- Analyses will be carried out in a series of meetings in March and April. After preliminary meetings between the consultant and some of the participating data providers to prepare each dataset and develop methods, there will be a joint meeting between all participating countries and the consultant.

### **Tasks will include the following, to the extent possible in the available time:**

- Work with the Stock Assessment Officer to coordinate a series of meetings between data holders and the consultant.
- Prepare and test computer hardware and software that will facilitate the fast and efficient running of large numbers of computer-intensive analyses.
- Load, prepare, and check each dataset, given that data formats and pre-processing often change between years and data extracts, and important changes to fleets and reporting sometimes occur in new data. The Seychelles data have not previously been included in the analyses and will require additional preparation.
- Conduct the following analyses to improve CPUE methods:
  - Apply cluster analyses and bigeye and yellowfin CPUE standardization using reliable data from each CPC. Prepare separate indices for each fleet, and joint indices. Thoroughly check all code and results in order to validate indices.
  - Develop a simulator to test methods for standardizing CPUE, and to allow the development and testing of new code during periods when the joint data are unavailable
  - Explore alternative modelling and data transformation methods in order to normalise residuals and to accommodate strata with no zero catches.
  - Explore spatial and temporal patterns in residuals by fleet and cluster, in order to better understand the factors driving CPUE changes, to explore potential confounding effects and and possible seasonal catchability changes
  - Identify appropriate subareas for modelling time-area interactions within regions, by region and species. Explore adding subarea-time interactions in the standardization models, to address differences in trends among areas.
  - Explore residual patterns spatially and among clusters, fleets and vessels through time, and change models where necessary to address any problems identified.

- Investigate the 1976-80 discontinuity in the tropical CPUE of bigeye and (to a lesser extent) yellowfin
  - Explore options for extending the Japanese time series of vessel effects into the pre-1979 period.
  - Increase understanding of the fisheries that provide the CPUE by a) exploring the size data associated with each fleet, if possible with size data at the vessel set level (including using standardizing method to identify spatial and temporal patterns); and b) exploring vessel movement patterns through time. This task involves using data held by the IOTC Secretariat.
  - Develop standard methods for estimating relative regional weights so as to apportion relative abundance among regions
- All work is subject to the agreement of the respective fisheries agencies to make the data available.
  - To document the analyses in accordance with the IOTC “*Guidelines for the presentation of CPUE standardisations and stock assessment models*”, adopted by the IOTC Scientific Committee in 2014; and to provide draft reports to the IOTC Secretariat no later than 60 days prior to the meeting of the WPTT19, i.e. **17 August 2017**, and the final report no later than 15 days prior to the meeting of the WPTT19, i.e. **2 October 2017**.
  - To undertake any additional analyses deemed relevant by the WPTT19 or the IOTC Secretariat up to 60 days after the start date of the contract.

### Conditions and payment

In total this Service will require 70 days of work.

Honorarium is determined by FAO based on previous earnings and pre-approved consultant daily rates in Category A.

The IOTC Secretariat will pay the cost of return airfares (based on FAO travel regulations) to meetings in Japan and Taiwan, the joint CPUE meeting in Pusan, Rep. Korea, and the WPM09 and WPTT19 meetings in Victoria, Seychelles. A Daily Subsistence Allowance will also be paid in accordance with FAO procedures for attendance at the Working Party meetings.

#### Expected Outputs:

- To provide an updated draft report of the joint CPUE meetings to the IOTC Secretariat no later than 60 days prior to meeting of the WPTT19, i.e. **17 August 2017**.
- To provide the final report of the joint CPUE meetings to the IOTC Secretariat no later than 15 days prior to the meeting of the WPTT19, i.e. **2 October 2017**.

#### Required Completion Date:

- 30 August 2017
- 2 October 2017