TERMS OF REFERENCE FOR THE PROVISION OF SCIENTIFIC SERVICES TO THE IOTC: ESTIMATE GROWTH OF ALBACORE USING DIRECT AGE ESTIMATES

Following the assessments of the Indian Ocean albacore (*Thunnus alalunga*) stock undertaken in 2014 and the work program of the Working Party on Temperate Tuna (2015-2019) that indicated that the current uncertainty about albacore growth curve is a primary source of uncertainty in the stock assessment and the absence of mark-recapture data and large uncertainties associated with size-frequency data available from albacore fisheries, the IOTC requires a short-term consultancy for the following activities:

➢ Liaise with Dr. S Bonhommeau (Ifremer; sylvain.bonhommeau@ifremer.fr) and Mrs. Zahirah Dhurmeea (IRD-University of Maurititus-CSIRO; dzahirah@hotmail.com) to organize the cleaning, scanning and delivery of 600 pairs of sagittal otoliths (300 Females and 300 Males) collected in the Western Indian Ocean during 2013–2015 and covering the size range 67-118 cm fork length;

➢ Estimate for each fish an absolute age following standard and published protocols of otolith reading for temperate tunas: (i) select one otolith for each pair, (ii) weigh it to the nearest 0.1 g, (iii) embed the otolith in resin, (iv) make a transverse section, and (v) count the number of opaque zones (i.e. increments) to provide a discrete annual age;

➢ Provide information on the uncertainty associated with age estimates through (i) assignment of confidence scores to each reading based on the reader experience and quality of the preparation and interpretation and (ii) multiple readings (at least 2 by the primary reader and a subsample by a second reader) for all otoliths;

➢ Fit different growth models (i.e. Richards, Gompertz, Schnute, von Bertalanffy) to the age-length data split by sex and assess the best model through statistical criteria (e.g. Akaike Information Criterion) to provide a set of model parameters with associated uncertainty (standard error) for albacore growth curve;

➢ Investigate the spatial effect on albacore growth curve since recent work conducted in the Western-Central Pacific Ocean showed that growth of albacore tuna can significantly vary with area.

A condition of availability of the data from Ifremer is the scanning of the otoliths for future studies aimed at examining the population structure of albacore tuna since stock structure (i.e. connectivity) is a priority of the WPTmT. The scanned images will be made available to the IOTC scientists for shape analysis.

Conditions and payment

In total this Service will require 60 days of work and will include a mission to attend the 6th Session of the Working Party on Temperate Tuna (WPTmT06), in Shanghai, China.

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

The IOTC Secretariat will pay the cost of a return airfare (based on FAO travel regulations) from the contractor's home to the WPTmT06 meeting. A Daily Subsistence Allowance will also be paid in accordance with FAO procedures for attendance at the Working Party meeting.

KEY PERFORMANCE INDICATORS	
Expected Outputs:	Required Completion Date:
• To provide otolith readings and the data to the IOTC Secretariat no later than 45 days prior to meeting of the WPTmT06, i.e. **3 June 2016**.	3 June 2016
• To provide a draft report of the albacore growth curve analysis to the IOTC Secretariat no later than 30 days prior to meeting of the WPTmT05, i.e. **18 June 2016**	18 June 2016
• To provide the final draft report of the albacore growth curve analysis to the IOTC Secretariat no later than 15 days prior to the meeting of the WPTmT05, i.e. **3 July 2016**	3 July 2016
• To present the results of the work undertaken to the WPTmT06 to be held from the **18–21 July 2016**	18–21 July 2016
• To provide the final report of the albacore growth curve analysis no later than **5 August 2016**	5 August 2016