OUTCOMES OF THE 16th SESSION OF THE SCIENTIFIC COMMITTEE

PREPARED BY: IOTC SECRETARIAT[1], 14 OCTOBER 2014

PURPOSE

To inform participants at the 16th Working Party on Tropical Tunas (WPTT16) of the recommendations arising from the 16th Session of the Scientific Committee (SC16), held from 2–6 December 2013, specifically relating to the work of the WPTT.

BACKGROUND

At the 16th Session of the SC, the SC noted and considered the recommendations made by the WPTT in 2013 that included requests to address the deficiencies in data collection, monitoring and reporting by CPCs, as well as to carry out targeted research and analysis on tropical tuna species.

Tropical tunas caught in the IOTC area of competence and under the WPTT mandate

Common name	Species	Code
Bigeye tuna	*Thunnus obesus*	BET
Skipjack tuna	*Katsuwonus pelamis*	SKJ
Yellowfin tuna	*Thunnus albacares*	YFT

The recommendations on the deficiencies in data collection, monitoring and reporting by CPCs in relation to tropical tunas will be discussed under agenda item 6 and in paper IOTC–2014–WPTT16–07 and are therefore not presented in this paper.

Based on the recommendations arising from the WPTT15, the SC16 adopted a set of recommendations, provide at Appendix A of this paper.

The recommendations contained in Appendix A were provided to the Commission for consideration at its 18th Session held in May 2014. A separate paper, IOTC–2014–WPTT16–04 addresses the responses and actions of the Commission.

In addition, the SC16 reviewed and endorsed a Program of Work plan for the WPTT (*Research recommendation and priorities for IOTC Working Parties*), including a revised assessment schedule, as detailed in Appendix B and Appendix C. A separate paper (IOTC–2014–WPTT16–08) will outline the review and development process for a *Program of Work* for the WPTT for the next five years.

DISCUSSION

In addition to the recommendations outlined in Appendix A, Appendix B and Appendix C, the following extracts from the SC16 Report (2013) are provided here for the consideration and action of the WPTT16:

European Union fishery statistics

The SC **NOTED** errors in the procedure used to correct the species composition of the European Union purse seine catches on free-swimming schools. This error resulted in an over-representation (20–30%) of bigeye tuna on free swimming schools in the statistics provided to the IOTC Secretariat, compared to the composition produced by the species sampling. Recalling the need for the European Union to submit corrected catches by species to the IOTC, the SC **REQUESTED** that EU scientists document all estimation procedures and the changes in species composition arising from them and report this information at the next session of the WPTT, in 2014. (para. 90 of the SC16 Report)

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Bigeye tuna growth

NOTING that any changes in growth curves should be considered in conjunction with changes in natural mortality and other biological parameters used in the assessment, the SC **REQUESTED** that the WPTT inter-sessionally investigate bigeye tuna growth rates for individuals less than 50 cm, in conjunction with the changes in other biological parameter (such as natural mortality) and the effect that this may have into stock assessment to be presented to the next WPTT meeting. (para. 96 of the SC16 Report)

Environmental conditions/functioning

NOTING the importance of the environmental conditions and their inter-annual variability on CPUE indices of IOTC species, and more generally, on recruitment and biomass, the SC **REQUESTED** that the working parties take into account more environment and ecosystem-related issues when undertaking stock assessment analyses. This could be achieved by encouraging a greater participation of oceanographers and ecosystem modellers in the work of the working parties. Additional funds may be needed to attract modellers to IOTC working parties. (para. 140 of the SC16 Report)

Executive summaries for tropical tuna species

The SC also adopted revised Executive Summaries for tropical tuna species that can be found as appendices to the SC16 report, and which can be downloaded from the IOTC website in English and French:

English: http://iotc.org/science/scientific-committee

French: http://iotc.org/fr/science/comit%C3%A9-scientifique

RECOMMENDATION

That the WPTT:

1) **NOTE** paper IOTC–2014–WPTT16–03 which outlined the main outcomes of the 16th Session of the Scientific Committee, specifically related to the work of the WPTT.
2) **CONSIDER** how best to progress these issues at the present meeting.

APPENDICES

Appendix A: Consolidated set of recommendations of the 16th Session of the Scientific Committee (2–6 December 2013) to the Commission, relevant to the Working Party on Tropical Tunas.
Appendix B: Research recommendations and priorities for the IOTC Working Party on Tropical Tunas (WPTT).
Appendix C: Assessment schedule for the WPTT 2014–2018.

APPENDIX A

CONSOLIDATED SET OF RECOMMENDATIONS OF THE 16th SESSION OF THE SCIENTIFIC COMMITTEE (2–6 DECEMBER 2013) TO THE COMMISSION RELEVANT TO THE WORKING PARTY ON TROPICAL TUNAS

Extract of the Report of the 16th Session of the Scientific Committee

(IOTC–2013–SC16–R; Appendix XXXVIII, PAGES 301–312)

STATUS OF TUNA AND TUNA-LIKE RESOURCES IN THE INDIAN OCEAN

Tuna – Highly migratory species

SC16.01 (para. 161) The SC **RECOMMENDED** that the Commission note the management advice developed for each tropical and temperate tuna species as provided in the Executive Summary for each species.

- Bigeye tuna (*Thunnus obesus*) – Appendix IX
- Skipjack tuna (*Katsuwonus pelamis*) – Appendix X
- Yellowfin tuna (*Thunnus albacares*) – Appendix XI

GENERAL RECOMMENDATIONS TO THE COMMISSION, TO SPECIFIC CPCs AND/OR OTHER BODIES

Standardisation of IOTC Working Party and Scientific Committee report terminology

SC16.07 (para. 23) The SC **ADOPTED** the reporting terminology contained in Appendix IV and **RECOMMENDED** that the Commission considers adopting the standardised IOTC Report terminology, to further improve the clarity of information sharing from, and among its subsidiary bodies.

Report of the Fifteenth Session of the Working Party on Tropical Tunas (WPTT15)

Data collection and processing systems

SC16.40 (para. 87) The SC **THANKED** Japan and Taiwan,China for addressing some of the concerns raised by the WPTT in 2012 about data collection and length frequency processing, and **RECOMMENDED** that both Japan and Taiwan,China, as well as the IOTC Secretariat continue joint work, in cooperation with countries having longline fisheries, to address other issues identified by the WPTT, such as conflicting trends in the longline CPUE among the main longline fleets, the lack of specimens of small size from the samples for Taiwan,China longline fleet, and discrepancies in the average weights estimated using the available catch-and-effort and length frequency data for the Japanese longline fleet.

Length Frequency inter-sessional meeting guidelines

SC16.41 (para. 88) **NOTING** the size data issues (discrepancies in size data (low sampling rate, uneven distribution of sampling in regard to the spatial extent of the fishery) in the Japan and Taiwan,China tropical tuna data sets) identified by the WPTT in 2012 and 2013 and the Scientific Committee in 2012, the SC **RECOMMENDED** that the course of action outlined in para. 105 of this report is undertaken.

India fisheries

SC16.42 (para. 91) **NOTING** the potential utility of the longline CPUEs derived from the research surveys conducted by the "Fishery Survey of India", the SC **RECOMMENDED** that as a high priority, India undertake a standardisation of the CPUE series, with the support of the IOTC Secretariat, and for this to be presented at the next WPTT meeting.

Consultants

SC16.43 (para. 92) The SC **NOTED** the excellent work done by IOTC consultants in 2013 on a range of projects from Management Strategy Evaluation to the bigeye tuna SS3 stock assessment, and **RECOMMENDED** that their engagement be renewed for the coming year to supplement the skill set available within IOTC CPCs. An indicative budget is provided at Table 11.

Report of the Ninth Session of the Working Party on Data Collection and Statistics (WPDCS09)

Resolution 10/02 Mandatory statistical requirements for IOTC Members and Cooperating Non-Contracting Parties (CPC's).

SC16.44 (para. 98) The SC **RECOMMENDED** that the Commission amends IOTC Resolution 10/02 as follows:

- Adding the following definitions in order to clarify the type of fisheries, area and species covered by Resolution 10/02:
  - Longline fisheries: Fisheries undertaken by vessels in the IOTC Record of Authorized Vessels that use longline gear.
  - Surface fisheries: All fisheries undertaken by vessels in the IOTC Record of Authorized Vessels other than longline fisheries; in particular purse seine, pole-and-line, and gillnet fisheries.
  - Coastal fisheries: Fisheries other than longline or surface, as defined above, also called artisanal fisheries.
  - IOTC Area of Competence: as described in Annex A of the IOTC Agreement.
  - Species: refers to all species under the IOTC mandate as described in Annex B of the IOTC Agreement, and the most commonly caught elasmobranch species, as defined by the Commission in IOTC Resolution 13/03 or any subsequent revisions of this Resolution.
  - Support vessels: Any types of vessels that operate in support of the fishing activities of purse seine vessels.
- Specify the requirements for Nominal Catch data, including:
  - Changing the term Nominal by Total;
  - Change the time-period resolution of Total catch data from Year to Quarter, in order to be able to assess the seasonality of fisheries that do not report catch-and-effort data;
  - Request separate reports for retained catches (in live weight) and discards (in live weight or number), as per the above resolution.
- Specify the requirements for Catch and effort data, including:
  - Surface fisheries: Extend the requirements to report catch and effort data by type of fishing mode to other fisheries that use FADs, drifting or anchored; and ensure that the effort units reported are consistent with those requested in Resolution 13/03 or any subsequent revisions to such Resolution;
  - Coastal fisheries: Specify the time-period to be used to report this information, preferably Month.
- Specify that Size Frequency data shall be reported according to the procedures described in the IOTC Guidelines for the Reporting of Fisheries Statistics (instead of those set out by the IOTC Scientific Committee).
- Specify the requirements for data on supply vessels, including:
  - Change the term Supply to Support (Support Vessels);
  - Indicate that data on the activities of support vessels shall be reported by the flag country of the vessels that receive the assistance of the support vessel (and not by the flag country or other parties);
  - Request the name of the purse seiners that receive assistance from each support vessel;
- Recall Resolution 13/08 which contains provisions for CPCs to collect more detailed information on Fish Aggregating Devices

Resolution 11/04 On a regional observer scheme

SC16.45 (para. 99) The SC **NOTED** that the number of trips covered by observers over the total number of trips estimated for longliners have been used to estimate levels of coverage on longline fleets, further noting the difficulties that some countries have to use the number of sets/operations covered by observers over the total number of sets/operations by their fleets, as requested by the Commission. Using the number of trips as unit of effort to measure coverage by observers may not be appropriate as longline fishing trips can extend for more than one year and are usually not fully covered by scientific observers. For this reason, and acknowledging the difficulties that some countries have to estimate the total number of sets/operations for their fleets, the use of alternative units of effort may be appropriate to assess coverage, the SC **RECOMMENDED** that the total number of days-at-sea covered by observers versus the total number of days-at-sea for each fleet over a year is used instead of the number of sets/operations.

General discussion on data issues

SC16.46 (para. 101) The SC **NOTED** that India had reported very incomplete catches and effort, and no size data, for its commercial longline fleet. Over 60 longliners from India had operated in the Indian Ocean during 2006–07. The SC **RECALLED** the recommendation from the WPTT that scientists from Taiwan,China assist India in the estimation of catches of IOTC species and sharks for this fleet, with the majority of those vessels used the flag of Taiwan,China in the past. The SC thanked the scientists from Taiwan,China for offering assistance and **RECOMMENDED** that India reports a revised time-series of catch and effort for its longline fleet, where required, as soon as the review is finalised.

SC16.47 (para. 102) **NOTING** that to date, I.R. Iran has not reported catch and effort data to the IOTC Secretariat

as per the IOTC Requirements; that the WPEB had previously recommended that I.R. Iran strengthen its monitoring of catches of sharks from both the logbook and observer programmes; and that I.R. Iran is setting procedures in its databases that will make it possible to report catch and effort data for its fisheries as per the IOTC standards in the future; the SC **RECOMMENDED** that I.R. Iran finalises this work and reports the available series of catch and effort data for its fisheries as a matter of priority.

IOTC Data Summary

SC16.48 (para. 110) The SC **NOTED** the plans from the IOTC Secretariat to resume publication of the IOTC Data Summary in electronic form, including work on the set-up of an online querying facility in the IOTC Web Site, which will allow site users to filter nominal catch and catch-and-effort data using a range of criteria and visualise the output in table or graphic format, including different types of charts, figures and maps. The work will facilitate the use of information in the IOTC Databases by the general public. The SC **RECOMMENDED** that the IOTC Secretariat carries out this work during 2014 and presents the new system to the next meeting of the WPDCS for suggested improvements.

Update on the inter-sessional work of the WPM small working group on Management Strategy Evaluation

SC16.49 (para. 115) The SC **NOTED** the need for the Commission, its Committee's and CPCs to develop a better understanding of management strategy concepts, including reference points, harvest control rules and the role of management strategy evaluation. There is also a need to explain and clarify the roles of the Commission, the SC and MSE through the process. To achieve this, the SC **RECOMMENDED** a process of familiarisation and capacity building at multiples levels as follows:

- The Chair of the Commission considers including an agenda item for each Commission meeting, which would provide Commissioner's with annual updates and explanatory material to ensure they are kept abreast of the methods and processes being undertaken as part of the broader IOTC MSE process. This should also cover a dialogue among scientists, managers and stakeholders on issues related to the specific formulation of management objectives that are required for a complete formulation and evaluation of management plans through MSE. In order to accelerate this process the SC **REQUESTED** that the IOTC Secretariat seek funding for, and coordinate a 'side event' on the topic associated with the 2014 Commission meeting. In addition, to prepare a workplan for the MSE dialogue in consultation with the WPM.
- The IOTC Secretariat coordinate the development and delivery of several training workshops focused on providing assistance to developing CPCs to better understand the MSE process, including how reference points and harvest control rules are likely to function in an IOTC context. The implications of IOTC Resolution 12/01 *on the implementation of the precautionary approach* and IOTC Resolution 13/10 *on interim target and limit reference points and a decision framework* should be incorporated into the workshops. The SC **REQUESTED** that the Commission's budget incorporate appropriate funds for this purpose, as detailed in Table 12.

SC16.50 (para. 116) The SC **RECOMMENDED** that the Commission allocate funds in the 2014 and 2015 IOTC budgets, for an external expert on MSE to be hired for 30 days per year, to supplement the skill set available within IOTC CPCs, and for the establishment of a participation fund to cover the planned WPM workshops, as detailed in Table 12.

Outcomes of the informal workshop on CPUE standardisation

SC16.51 (para. 127) The SC **ENDORSED** all of the recommendations from the workshop, contained in paper IOTC–2013–SC16–12. In particular, the SC **RECOMMENDED** that in areas where CPUE's diverged the CPC's were encouraged to meet inter-sessionally to resolve the differences. In addition, the major CPC's were encouraged to develop a combined CPUE from multiple fleets so it may capture the true abundance better. Approaches to possibly pursue are the following: i) Assess filtering approaches on data and whether they have an effect, ii) examine spatial resolution on fleets operating and whether this is the primary reason for differences, and iii) examine fleet efficiencies by area, iv) use operational data for the standardization, and v) have a meeting amongst all operational level data across all fleets to assess an approach where we may look at catch rates across the broad areas.

SC16.52 (para. 128) **NOTING** the CPUE issues identified by the WPTT in 2010, 2011, 2012 and 2013 and the Scientific Committee in 2012, as well as the informal CPUE workshop in 2013, the SC **RECOMMENDED** that further inter-sessional work be carried out in conjunction with the IOTC Secretariat on the major longline CPC's in the Indian Ocean in early 2014 using operational data to address issues identified in the CPUE Workshop Report.

Estimation of fishing capacity by tuna fishing fleet in the Indian Ocean

SC16.53 (para. 130) The SC **NOTED** paper IOTC–2013–SC16–19 which outlines the main outcomes and findings from the report on estimation of fishing capacity by tuna fishing fleets in the Indian Ocean. The results presented in the study show that the contribution of vessels between 15–24 m LOA in the Indian Ocean has increased substantially in recent years. Vessels of this size that operate within the EEZ of coastal countries are not required to provide catch-and-effort and size data as per the same resolution as vessels in the IOTC Record of Authorized vessels. Thus, the SC **RECOMMENDED** that the Commission considers extending requirements for these vessels in IOTC Resolution 10/02 to equally apply to all of the Authorized vessels.

IOTC species identification cards

Tunas and mackerels

SC16.61 (para. 146) The SC **RECOMMENDED** that the Commission allocate additional funds in the 2014–15 budget to translate and print sets of identification cards for the three tropical tuna, two temperate tuna, and six neritic tuna and seerfish species under the IOTC mandate, noting that the total estimated production and printing costs for 1000 sets of the identification cards is around a maximum of US$16,200 (Table 15). The IOTC Secretariat shall seek funds from potential donors to print additional sets of the identification cards at US$5,500 per 1000 sets of cards.

Outlook on Time-Area Closures

SC16.67 (para. 185) The SC reiterated its previous **RECOMMENDATION** that the Commission note that the current closure is likely to be ineffective, as fishing effort will be redirected to other fishing grounds in the Indian Ocean. The positive impacts of the moratorium within the closed area would likely be offset by effort reallocation, as they will result in similar catch rates and total annual catches.

SC16.68 (para. 186) **NOTING** that the objective of Resolution 12/13 is to decrease the overall pressure on the main targeted stocks in the Indian Ocean, in particular yellowfin tuna and bigeye tuna, and also to evaluate the impact of the current time/area closure and any alternative scenarios on tropical tuna populations, the SC reiterated its previous **RECOMMENDATION** that the Commission specify the level of reduction or the long term management objectives to be achieved with the current or alternative time area closures and/or alternative measures, as these are not contained within the Resolution 12/13. This will, in turn, guide and facilitate the analysis of the SC, via the WPTT in 2013 and future years.

SC16.69 (para. 187) **NOTING** the slow progress made in addressing the Commission request, the SC reiterated its **RECOMMENDATION** that the SC Chair begins a consultative process with the Commission in order to obtain clear guidance from the Commission about the management objectives intended with the current or any alternative closure. This will allow the SC to address the Commission request more thoroughly.

APPENDIX B

RESEARCH RECOMMENDATIONS AND PRIORITIES FOR IOTC WORKING PARTIES IN 2014 AND 2015

Extract of the Report of the 16th Session of the Scientific Committee

(IOTC–2013–SC16–R; Appendix XXXIV, PAGES 286–289)

The SC **NOTED** the proposed work plans and priorities of each of the Working Parties and **AGREED** to the revised work plans as outlined in Appendix XXXIV. The Chairs and Vice-Chairs of each working party shall ensure that the efforts of their working party is focused on the core areas contained within the appendix, taking into account any new research priorities identified by the Commission at its next Session. (IOTC–2014–SC16–R, Para. 193)

Working Party on Tropical Tunas (WPTT)

(Extracts from IOTC–2013–WPTT15–R)

Requests from the Commission

At Sessions of the Commission, Conservation and Management Measures adopted contained elements which call on the Scientific Committee, via the WPTT, to undertake specific tasks.

Resolution 13/08 Procedures on a fish aggregating devices (FADs) management plan, including more detailed specification of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species

(para. 7) The IOTC Scientific Committee will analyse the information, when available, and provide scientific advice on additional FAD management options for consideration by the Commission in 2016, including recommendations on the use of biodegradable materials in new and improved FADs and the phasing out of FAD designs that do not prevent the entanglement of sharks, marine turtles and other species. When assessing the impact of FADs on the dynamic and distribution of targeted fish stocks and associated species and on the ecosystem, the IOTC Scientific Committee will, where relevant, use all available data on abandoned FADs (i.e. FADs without a beacon).

Resolution 13/11 On a ban on discards of bigeye tuna, skipjack tuna, yellowfin tuna, and a recommendation for non-targeted species caught by purse seine vessels in the IOTC area of competence

(para. 4) The IOTC Scientific Committee, the IOTC Working Party on Tropical Tunas, and the IOTC Working Party on Ecosystems and Bycatch shall annually:

a) review the information available on bycatch (retained and discarded) by purse seine vessels; and

b) provide advice to the Commission on options to sustainably manage discards in purse seine fisheries.

Resolution 12/13 For the conservation and management of tropical tunas stocks in the IOTC area of competence

(para. 10) The IOTC Scientific Committee will provide at its 2011, 2012 and 2013 Plenary sessions:

a) an evaluation of the closure area, specifying in its advice if a modification is necessary, its basic scientific rationale with an assessment of the impact of such a closure on the tropical tuna stocks, notably yellowfin tuna and bigeye tuna;

b) an evaluation of the closure time periods, specifying in its advice if a modification is necessary, its basic scientific rationale with an assessment of the impact of such a closure on the tropical tuna stocks, notably yellowfin tuna and bigeye tuna;

c) an evaluation of the impact on yellowfin tuna and bigeye tuna stocks by catching juveniles and spawners taken by all fisheries. The IOTC Scientific Committee shall also recommend measures to mitigate the impacts on juvenile and spawners;

d) any other advice on possible different management measures based on the Kobe II matrix, on the main targeted species under the IOTC competence.

Resolution 05/01 ***On Conservation and Management Measures for bigeye tuna***

(para. 7) The IOTC Scientific Committee be tasked to provide advice, including advice on;

- the effects of different levels of catch on the SSB (in relation to MSY or other appropriate reference point);
- the impact of misreported and illegal catch of bigeye tuna on the stock assessment and required levels of catch reduction; and
- evaluation of the impact of different levels of catch reduction by main gear types.

Priority species for 2014: *Skipjack tuna*

High priority projects 2014–2015

- ***Stock status analyses (development of abundance indices)***
  i. Develop/improve accurate standardised CPUE indices for all three tropical tuna species, for the Indian Ocean as a whole or by sub-region as appropriate.
  ii. Investigate the source of inconsistencies in the longline length frequency data, as identified by the WPTT.
  iii. Develop methods to estimate historical catch series by gear.
  iv. Develop life history and biological patterns for the species (namely migration patterns and distribution patterns).
- ***Tagging data analysis***
  i. Information and results arising from the RTTP-IO tagging program should be fully utilised and summarised for the 2014 WPTT skipjack tuna stock assessment. Additional analyses are recommended, including, inter alia:
     1. Analysis of the existing tagging data sets.
        - Skipjack tuna movements (taking into account the reporting rates of tags now estimated) using ad hoc models
        - Skipjack tuna growth: VB or others
        - Skipjack tuna total mortality rates based on temporal trends of recoveries
        - Skipjack natural mortality and longevity
        - Analysis of potential interactions between purse seine and pole-and-line fisheries
        - Review of FAD catches and their association to FADs: movements, growth, etc.

     This work should be conducted as soon as possible as all the data needed for this study (on fisheries and tags/recoveries) are now fully available and this work should also make use of the results from the tagging symposium research.

Stock assessment

- ***Skipjack tuna***

Medium priority project:

- ***Tagging data***

  i. Improved approaches for integrating tagging data into stock assessments.
  The recent RTTP-IO (and similar large-scale tagging programmes in the Pacific Ocean) have provided a wealth of data on tropical tuna population dynamics. However, recent analyses have demonstrated that movement dynamics are not compatible with standard tag-based population estimators for movement and natural/fishing mortality. In attempting to integrate the tagging data within stock assessments, the following problems are encountered:
     1. Tag reporting rates are thought to be low for all fleets except for the purse seine fleet landing in the Seychelles. If reporting rates by longline and artisanal fisheries are low, then this may introduce greater uncertainties in the recovery results.
     2. Tag displacements are relatively low on average (for instance in the Indian Ocean showing a full mixing only within 500 nautical mile radius) and full mixing of the tagged and untagged population is demonstrably limited at the basin scale.
     3. Tag release designs are unbalanced in the west and negligible in the east.
     4. Tagging results show various other complexities that are still difficult to incorporate in current assessments (for instance differential growth and mortality by sex).

5. Assessments are often sensitive to the inclusion of tagging data, and it is currently not clear that recent Indian Ocean assessments are improved by including tag dynamics, or whether large biases for movement and mortality are being introduced.

There is not a simple solution for these problems, but there are directions to explore:

1. Increasing the spatial resolution of the tagging model (for instance with full mixing boxes of ~500 mile radius) will reduce the impact of the tag mixing problem (but this comes at a cost of increased model complexity and over-parameterisation).
2. There is potential value in attempting to use environmental and physical oceanographic information to make inferences about population dynamics in data-poor regions.
3. Simulation studies can help to understand the biases, potentially develop bias correction methods, and improve the quantification of uncertainty introduced by constraining assumptions.

Estimated budget for IOTC consultants to be engaged on skipjack tuna analysis

Description	Unit price	Units required	Total
Improved approaches for integrating tagging data into stock assessments (fees)	US$400	75	30,000
Data preparation for skipjack tuna stock assessment	US$400	50	20,000
Total estimate (US$)			**50,000**

- ***Stock structure***

  i. genetic research to determine the connectivity of species throughout their distributions: such studies should be developed at the sub-regional level.

  ii. Additional tagging research to better understand and estimate exploitation rates, the movement dynamics, possible spawning locations, natural mortality, fishing mortality and post-release mortality of stocks from various fisheries in the Indian Ocean.

- ***Biological information***

  i. Quantitative biological studies are necessary throughout the species range to determine key biological parameters including age-at-maturity and fecundity-at-age/length relationships, age-length keys, age and growth, which will be fed into future stock assessments.

APPENDIX C
ASSESSMENT SCHEDULE FOR IOTC WORKING PARTIES

Extract of the Report of the 16th Session of the Scientific Committee

(IOTC–2013–SC16–R; Appendix XXXV, PAGE 297)

The SC **ADOPTED** a revised assessment schedule, ecological risk assessment and other core projects for 2014–18, for the tuna and tuna-like species under the IOTC mandate, as well as the current list of key shark species of interest, as outlined in Appendix XXXV. (IOTC–2014–SC16–R, Para. 195)

Species	2014	2015	2016	2017	2018
Working Party on Tropical Tunas					
Bigeye tuna	Indicators	Indicators	**Full assessment**	Indicators	Indicators
Skipjack tuna	**Full assessment**	Indicators	Indicators	**Full assessment**	Indicators
Yellowfin tuna	Indicators	**Full assessment**	Indicators	Indicators	**Full assessment**

Note: the assessment schedule may be changed dependant on the annual review of fishery indicators, or SC and Commission requests.