OUTCOMES OF THE FOURTEENTH SESSION OF THE SCIENTIFIC COMMITTEE

PREPARED BY: IOTC SECRETARIAT, 30 SEPTEMBER, 2013
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PURPOSE

To inform participants at the Working Party on Tropical Tunas (WPTT15) of the recommendations arising from the Fifteenth Session of the Scientific Committee (SC15), held from 10–15 December 2012, specifically relating to the work of the WPTT.

BACKGROUND

At the 15th Session of the SC, the SC noted and considered the recommendations made by the WPTT in 2012 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

Based on the recommendations arising from the WPTT14, two sets of recommendations were adopted at SC15 that are relevant to the work of the WPTT15:

1) Consolidated set of recommendations of the Fifteenth Session of the Scientific Committee (10–15 December, 2012) to the Commission, relevant to the WPTT (provided at Appendix A).
2) Research recommendations and priorities for IOTC Working Parties in 2013 (provided at Appendix B).

The recommendations contained in Appendix A were provided to the Commission for consideration at its 17th Session held in May 2013. A separate paper, IOTC–2013–WPTT15–04 will address the responses from the Commission.

The recommendations contained in Appendix B will be reviewed and updated throughout the course of the WPTT15 meeting.

DISCUSSION

In addition to the recommendations outlined in Appendix A and Appendix B, the SC made several other comments and requests relevant to the WPTT15, which participants are asked to consider:

Impacts of catching bigeye tuna and yellowfin tuna juveniles and spawners

The SC **NOTED** that the Commission, at its 16th Session, adopted Resolution 12/13 *for the conservation and management of tropical tunas stocks in the IOTC area of competence*, which superseded Resolution 10/01. Contained within Resolution 12/13 is a requirement that the SC will provide at its 2012 and 2013 plenary session, the following:

c) *an evaluation of the impact on yellowfin and bigeye tuna stocks by catching juveniles and spawners taken by all fisheries. The Scientific Committee shall also recommend measures to mitigate the impacts on juvenile and spawners* (para. 228 of the SC15 report)

The SC **NOTED** that the most direct measure of impact of fishing fleets on juveniles could be obtained by looking at the catches of juvenile yellowfin tuna and bigeye tuna by gear, as presented in Table 9 below. It should be noted that the estimates of catches of juvenile fish are doubtful for some gears, for which catch-at-length information is severely limited or almost non-existent. The SC reiterated its **AGREEMENT** from 2011, that the WPTT should provide the SC with multi-gear yield-per-recruit estimates for all stocks assessed in 2013, as this is another useful indicator of the impact of each gear on potential yields. (para. 229 of the SC15 report)

The SC **ADVISED** the Commission that the Western and Central Pacific Fisheries Commission has implemented since 2009 a FAD closure for the conservation of yellowfin tuna and bigeye tuna juveniles. The SC **REQUESTED** further investigation of the feasibility and impacts of such a measure, as well as other measures, in the context of Indian Ocean fisheries and stocks. (para. 233 of the SC15 report)

Executive summaries for tropical tuna species

The SC15 report may be downloaded from the IOTC website in English and French:

English: http://iotc.org/files/proceedings/2012/sc/IOTC-2012-SC15-R%5BE%5D.pdf [14 mb]

French: http://iotc.org/files/proceedings/2012/sc/IOTC-2012-SC15-R%5BF%5D.pdf [14 mb]

RECOMMENDATION

That the WPTT **NOTE** paper IOTC–2013–WPTT15–03 which outlined the main outcomes of the Fifteenth Session of the Scientific Committee (SC15), specifically related to the work of the WPTT, and consider how to progress outstanding issues at the present meeting.

APPENDICES

Appendix A: Consolidated set of recommendations of the Fifteenth Session of the Scientific Committee (10–15 December, 2012) to the Commission, relevant to the Working Party on Tropical Tunas.
Appendix B: Research recommendations and priorities for IOTC working parties in 2013 and 2014.

APPENDIX A

CONSOLIDATED SET OF RECOMMENDATIONS OF THE FIFTEENTH SESSION OF THE SCIENTIFIC COMMITTEE (10–15 DECEMBER, 2012) TO THE COMMISSION RELEVANT TO THE WORKING PARTY ON TR

OPICAL TUNAS

Extract of the Report of the Fifteenth Session of the Scientific Committee

(IOTC–2012–SC15–R; Appendix XXXVIII, PAGES 275–288)

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

Tuna – Highly migratory species

SC15.01 (para. 207) 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 X
- Skipjack tuna (*Katsuwonus pelamis*) – Appendix XI
- Yellowfin tuna (*Thunnus albacares*) – Appendix XII

GENERAL RECOMMENDATIONS TO THE COMMISSION

Report of the Fourteenth Session of the Working Party on Tropical Tunas (WPTT14)

Yellowfin tuna – Stock Assessment

SC15.34 (para.158) The SC **AGREED** that a comparative analysis on the Multifan-CL / SS3 assessments in both the Indian Ocean and East Pacific Ocean should be performed by a small group of experts (at least the IOTC consultant and the IATTC expert) working jointly. The objective of this comparative work is to understand why the biomass estimated by the models differ by a ratio 1:10 when many parameters driving the assessment are very similar, i.e. spatial extent of the fishery, estimated MSY, size range of fish caught and growth pattern. One of the aims would be to understand why such differences exist in order to revisit some of the basic assumptions of the models. Therefore, the SC **RECOMMENDED** that the Commission consider funding this proposed work which would need to cover one consultant airfare (up to US$6,000), DSA (up to US$350 per day – 7 days), plus an FAO consultancy rate of US$450 per day (7 days). The total amount requested for this comparative study is US$11,600) per consultant.

Stock assessment consultant

SC15.35 (para.161) The SC **NOTED** the excellent work done by Mr. Adam Langley (consultant) and his contributions and expertise on integrated stock assessment models, and **RECOMMENDED** that his engagement be renewed for the coming year.

Report of the Fourth Session of the Working Party on Methods (WPM04)

Capacity building

SC15.32 (para.128) The SC **RECOMMENDED** that 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 Recommendation 12/14 *on interim target and limit reference points* should be incorporated into the workshop. The SC **REQUESTED** that the Commission's budget incorporate appropriate funds for this purpose.

Work on MSE development

SC15.33 (para.134) The SC **RECOMMENDED** that the Commission allocate funds in the 2013 and 2014 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.

Summary discussion of matters common to Working Parties

Funding for Chairs and Vice-Chairs to attend IOTC meetings

SC15.40 (para.178) The SC **RECOMMENDED** that the IOTC Secretariat include a proposed budget line in the IOTC budget for 2013 and all future years, that would cover the travel expenses of Chairs and Vice-Chairs from developing countries (and developed countries when they are not attached to any national institutions) who are otherwise unable to obtain funding to support their attendance at their respective working party meeting, and for a Chair or Vice-Chair to attend the SC meeting each year.

IOTC species identification cards

Tunas and mackerels

SC15.43 (para.183) The SC **RECOMMENDED** that the Commission allocate funds in the 2013 budget to develop 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 the first 1000 sets of the identification cards is around a maximum of US$16,200 (Table 8). 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.

TABLE 8. Estimated production and printing costs for 1000 sets of tuna species identification cards (11 species of tropical, temperate and neritic tunas and mackerels)

Description	Unit price	Units required	Total
Purchase images	US$100	22 (2 per species, plus 2 covers)	2,200
Contract days	US$350	20	7,000
Printing plates / plate	US$100	15	1,500
Printing /1000 sets	US$5500	1	5,500
Total estimate (US$)			**16,200**

Fishing hook identification cards

SC15.44 (para.184) Noting the continued confusion in the terminology of various hook types being used in IOTC fisheries, (e.g. tuna hook vs. J-hook; definition of a circle hook), the SC **RECOMMENDED** that the IOTC Secretariat develop an identification guide for hooks and pelagic gears used in IOTC fisheries, as staffing and financial resources permit, and to distribute the guide to all CPCs once completed. The SC also **AGREED** that circle hooks are defined by hooks having their point turned at least 90° from their shank.

Identification cards – general

SC15.45 (para.185) The SC **RECOMMENDED** that IOTC CPCs translate, print and disseminate the identification cards to their observers and field samplers (Resolution 11/04), and as feasible, to their

fishing fleets targeting tuna, tuna-like and shark species. This would allow accurate observer, sampling and logbook data on tuna and tuna-like species to be recorded and reported to the IOTC Secretariat as per IOTC requirements.

Dedicated workshop on CPUE standardisation

SC15.46 (para.189) **NOTING** the combined recommendations from the WPB, WPTmT and WPTT to hold a dedicated workshop on CPUE standardisation, the SC **RECOMMENDED** that a dedicated, informal workshop on CPUE standardisation, including issues of interest for other IOTC species, should be carried out before the next round of stock assessments in 2013. The terms of reference (TORs) for the workshop are provided in Appendix VII. Where possible it should include a range of invited experts, including those working on CPUE standardisation in other ocean/RFMOs, in conjunction with scientists from main tuna fishing countries, and supported by the IOTC Secretariat. The IOTC Secretariat shall include a budget item for this workshop, for the consideration of the Commission.

On Interim Target and Limit Reference Points

SC15.47 (para.194) **NOTING** the completion of the MSE work on tropical tunas is likely to take several years, and that the lack of data or information to improve the work on formal stock assessments should not hinder the application of the Precautionary Approach, the SC **RECOMMENDED** that the Commission consider the adoption of the interim target and limit reference points as a Resolution. Furthermore, interim harvest controls rules should be considered by the Commission for adoption in the Resolution.

Employment of a Fisheries Officer (Science)

SC15.48 (para.195) **NOTING** the rapidly increasing scientific workload at the IOTC Secretariat, including a wide range of additional science related duties assigned to it by the SC and the Commission, and that the current Fishery Officer supporting the IOTC scientific activities will depart at the end of February 2013, the SC strongly **RECOMMENDED** that the Commission approve the hiring of a Fishery Officer (Science) to work on a range of matters in support of the scientific process, including but not limited to science capacity building, bycatch and regional observer schemes.

Examination of the Effect of Piracy on Fleet Operations and Subsequent Catch and Effort Trends

SC15.50 (para.204) The SC **RECOMMENDED** that given the lack of quantitative analysis of the effects of piracy on fleet operations and subsequent catch and effort trends, and the potential impacts of piracy on fisheries in other areas of the Indian Ocean through the relocation of longliners to other fishing grounds, specific analysis should be carried out and presented at the next WPTT meeting by the CPCs most affected by these activities, including Japan, Republic of Korea and Taiwan,China. The Chair of the WPTT shall facilitate the analysis and report back to the SC in 2013.

Implementation of the Regional Observer Scheme

SC15.51 (para.218) The SC **RECOMMENDED** that all IOTC CPCs urgently submit, and keep up-to-date, their list of accredited observers to the IOTC Secretariat and implement the requirements of Resolution 11/04 *on a Regional Observer Scheme*, which states that:
"The observer shall, within 30 days of completion of each trip, provide a report to the CPCs of the vessel. The CPCs shall send within 150 days at the latest each report, as far as continuous flow of report from observer placed on the longline fleet is ensured, which is recommended to be provided with 1°x1° format to the Executive Secretary, who shall make the report available to the Scientific Committee upon request. In a case where the vessel is fishing in the EEZ of a coastal state, the report shall equally be submitted to that Coastal State." (para. 11)

SC15.52 (para.220) The SC **RECOMMENDED** that the Commission consider how to address the lack of implementation of observer programmes by CPCs for their fleets and reporting to the IOTC Secretariat as per the provision of Resolution 11/04 *on a Regional Observer Scheme*, noting the update provided in Appendix XXXIII.

Outlook on Time-Area Closures

SC15.53 (para.225) 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. For example, the WPTmT noted that longline fishing effort has been redistributed to traditional albacore fishing grounds in recent years, thereby further increasing fishing pressure on this stock.

SC15.54 (para.226) **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.

SC15.55 (para.227) **NOTING** the lack of research examining time-area closures in the Indian Ocean by the WPTT in 2011 and 2012, as well as 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.

Impacts of Catching Bigeye Tuna and Yellowfin Tuna Juveniles and Spawners

SC15.56 (para.231) The SC **NOTED** however, that the fishery statistics available for many fleets, in particular for coastal fisheries, are not accurate enough for a comprehensive analysis as has been repeatedly noted in previous WPTT and SC reports. In particular, the SC **RECOMMENDED** that all CPCs catching yellowfin tuna should undertake scientific sampling of their yellowfin tuna catches to better identify the proportion of bigeye tuna catches. Therefore, the SC **RECOMMENDED** the countries engaged in those fisheries to take immediate actions to reverse the situation of fishery statistics reporting to the IOTC Secretariat.

RECOMMENDATIONS TO SPECIFIC CPCS AND/OR OTHER BODIES

Report of the Fourteenth Session of the Working Party on Tropical Tunas (WPTT14)

Data availability

SC15.76 (para.139) **NOTING** that the main tropical tuna data issues that are considered to negatively affect the quality of the statistics available at the IOTC Secretariat, by type of dataset and fishery, which are provided in Appendix VI of the WPTT report (IOTC–2012–WPTT14–R), the SC **RECOMMENDED** that the CPCs listed in the appendix, make efforts to remedy the data issues identified and to report back to the WPTT at its next meeting.

SC15.77 (para.140) **NOTING** that the Maldivian skipjack tuna catch is not separated by association type, i.e. aFAD or free schools, and therefore the proportion of skipjack tuna caught under aFADs around the Maldives is unknown, the SC **RECOMMENDED** that the Maldivian data collection system is further improved in order to account for the association of the reported catch, as this could improve the standardisation of the pole-and-line CPUE.

SC15.78 (para.141) **NOTING** that there were discrepancies in catch, effort and notably size data (low sampling rate, uneven distribution of sampling in regard to the spatial extent of the fishery) in the Japanese and Taiwan,China tropical tuna data sets, the SC **RECOMMENDED** they review the data to assess reasons for discrepancies identified by the IOTC Secretariat and to report results at the next meeting of the WPTT, including a comparison of length frequency data samples collected from commercial, research and training vessels.

Skipjack tuna

SC15.79 (para.146) **NOTING** that concerns were expressed on the ability of both the Maldives pole and line CPUE and the EU purse seine CPUE to reflect the dynamics of the stock, and given their major role in driving the current stock assesment results, the SC **RECOMMENDED** that further investigation is carried out for both CPUE series prior to the next WPTT meeting, and during the planned WPM workshop on CPUE standardisation.

SC15.80 (para.147) The SC **RECOMMENDED** further investigation of the existing data to produce an improved standardised CPUE series for the FAD-associated school skipjack tuna fishery in the Indian Ocean, and for information on these matters to be presented to the next meeting of the WPTT.

SC15.81 (para.148) **NOTING** that the areas used in the various CPUE standardisations undertaken in 2012

varied, the SC **AGREED** that there is a need to define core area(s) for each gear (pole-and-line and purse seine) for the CPUE standardisation of skipjack tuna and **RECOMMENDED** that scientists from CPCs with pole-and-line, and purse seine fisheries for skipjack tuna, work together to explore their data in a manner to advance CPUE standardisation work for the next meeting of the WPTT in 2013, and defined such core areas for each gear, well in advance of the next WPTT meeting in 2013.

SC15.82 (para.149) **NOTING** that the tagging data is now more complete and available, including the tagging experiment results from Maldives in the 1990s the SC **RECOMMENDED** effective use of tagging data in the new assessment including any revision on the estimates of mortality and growth rates from the tagging data.

SC15.83 (para.150) **NOTING** the use and application of interim target and limit reference points, the SC **RECOMMENDED** that the Kobe II strategy matrix should include the risk levels associated with those reference points. Furthermore, the SC **AGREED** that the probability of breaching the interim limit reference points for skipjack tuna of $1.5*F_{MSY}$ and $0.4*SB_{MSY}$ is very low and this information should be added to the Executive Summary.

Taiwan, China – Catch-per-unit-of-effort (CPUE)

SC15.84 (para.160) The SC **NOTED** that data from Taiwanese vessels flagged to India was not used in the analysis, the SC **RECOMMENDED** that national scientists from Taiwan,China work with the IOTC Secretariat to gain a better estimate of catch in the Bay of Bengal.

Parameters for future analyses: Yellowfin tuna CPUE standardisation and stock assessments

SC15.85 (para.162) **NOTING** that the areas used in the various CPUE standardisations undertaken in 2012 were very different from one analysis to another, the SC **AGREED** that there is a need to define core area(s) for the CPUE standardisation of yellowfin tuna and **RECOMMENDED** that scientists from CPCs with longline and purse seine fisheries for yellowfin tuna, work together to explore their data and define such core areas, well in advance of the next WPTT meeting in 2013.

Development of priorities for an Invited Expert at the next WPTT meeting

SC15.86 (para.163) The SC **RECOMMENDED** the following core areas of expertise and priority areas for contribution that need to be enhanced for the next meeting of the WPTT in 2013, by an Invited Expert:

- CPUE analysis and standardisation
- Tuna tagging data analysis
- Tuna stock assessment models

Where possible the Invited Expert should attend both the proposed CPUE workshop and the Working Party in 2013, noting that Invited Experts are unpaid.

Revised 'Guidelines for the Presentation of Stock assessment Models'

SC15.96 (para.247) **NOTING** the conclusions and recommendation from the KOBE 3 meeting held in 2011,

> "*Kobe III participants **agreed** that the K2SM is a useful tool for evaluating management strategies or options, **provided that the uncertainties in assessments can be adequately quantified**. Participants acknowledged that **considerable work remains to be done** both to reduce uncertainty in stock assessments, and to develop common standards or guidelines for how uncertainty is reflected. Kobe III participants recommended that the scientific committees and bodies of the tRFMOs jointly develop methods to **better quantify the uncertainty** and understand how this uncertainty is reflected in the risk assessment inherent in the K2SM.*"

the SC **RECOMMENDED** that in 2013, collaborative efforts be developed among tRFMO on this matter, by targeting the development of how to build K2SM with well estimated levels of uncertainty.

APPENDIX B

RESEARCH RECOMMENDATIONS AND PRIORITIES FOR IOTC WORKING PARTIES IN 2013 AND 2014

Extract of the Report of the Fifteenth Session of the Scientific Committee
(IOTC–2012–SC15–R; Appendix XXXV, PAGES 263–264)

The IOTC Scientific Committee **RECOMMENDED** that each of its Working Parties undertake the following research tasks as priorities in 2013 and tentatively for 2014:

Working Party on Tropical Tunas (WPTT)

Size data improvements

The SC **NOTED** that the evaluation of length frequency samples collected by the longline fisheries of Japan and Taiwan,China, has been postponed until later in 2013, or will occur via correspondence only.

The SC **NOTED** the indication from Japan that over the last two years, problems had been identified by the WPTT in the Japanese size data for tropical tunas. However, the planned size data meeting, to be held in Taiwan,China in January 2013 had been cancelled. The intention of the meeting was for Japan, Taiwan,China and the IOTC Secretariat to work towards resolving the size data issues for these two fleets.

The SC **NOTED** the efforts by Japan and Taiwan,China, and **URGED** all parties to resolve the problems as soon as possible, and before the next WPTT meeting.

CPUE standardisation

NOTING the importance of the various CPUE indices for stock assessment of the tuna tropical species, the SC **AGREED** that there was an urgent need to investigate the CPUE issues as detailed for bigeye tuna, skipjack tuna and yellowfin tuna in the WPTT14 report, and for these to be a high priority research activity for the tropical tuna resources in the Indian Ocean in 2013.

NOTING that nominal juvenile purse seine CPUE, once standardised, can be used as an indicator of the recruitment index in the stock assessment models, the SC **RECOMMENDED** that the standardised CPUE index for juvenile yellowfin tuna and bigeye tuna caught by the EU purse seiner fleets, be estimated and submitted to the WPTT before the next round of stock assessments of tropical tunas.

The SC **RECOMMENDED** that standardisation of purse seine CPUE be made where possible using the operational data on the fishery.

The SC **REQUESTED** that the following matters be taken into account when undertaking CPUE standardisation analysis for bigeye tuna as well as yellowfin tuna in 2013, noting that this is a modified list produced at the previous WPTT meeting in 2011:

- The SC **AGREED** that changes in species targeting is the most important issue to address in CPUE standardisations, and
- time, or there may need to be careful that the following points should be taken into consideration:
  i. While hooks between floats (HBF) provides some indication of setting depth, it is generally considered not to be a sufficient indicator of species targeting. HBF is just one aspect of the setting technique, which can vary by species, area, set-time, and other factors.
  ii. Highly aggregated (e.g. 5x5 degrees) data can make it difficult to observe the factors driving CPUE in a fishery, in particular the targeting effects. Operational data provides additional information that may allow effort to be classified according to fishing strategy (e.g. using cluster analyses or regression trees to estimate species targeting as a function of spatial areas, bait type, catch species composition, set-time, vessel-identity, skipper, etc.). Operational data also permits vessel effects to be included in analyses.
  iii. The inclusion of other species as factors in a Generalized Linear Model (GLM) standardization may be misleading, because the abundance of all species changes over time. Including these factors may also fail to resolve problems due to changes in targeting, particularly when modeling aggregated data. However, comparing models with and without the other species factors can be useful to identify whether there is likely to be a targeting problem.
- The SC **AGREED** that appropriate spatial structure needs to be considered carefully as fish density (and targeting practices) can be highly variable on a fine spatial scale, and it can be misleading to assume that large areas are homogenous when there are large shifts in the spatial distribution of effort. The following points should also be taken into consideration:
  i. Addition of finer scale (e.g. 1x1 degrees or latitude/longitude) fixed spatial effects in the model can help to account for heterogeneity within sub-regions.
  ii. Efforts should be made to identify spatial units that are relatively homogeneous in terms of the population and fishery to the extent possible (e.g. uniform catch size composition and targeting practices).
  iii. There may be advantages in conducting separate analyses for different sub-regions. The error distribution may differ by sub-region (e.g. proportion of zero sets), and there may be very different interactions among explanatory variables.

iv. If the selectivity differs among regions (e.g. due to spatial variability in the age composition of the population), it may not be appropriate to pool sub-regional indices into a regional index.
v. The possibility of defining a representative 'space-time' window: if this leads to the identification of a fishery with homogeneous targeting practices, it is probably worthwhile. However, it may not be possible to identify an appropriate window, or the window may be so small that it is not representative of the larger population (or has a high variance).

- The SC **NOTED** that the appropriate inclusion of environmental variables in CPUE standardisation is an ongoing research topic. The SC **AGREED** that often these variables do not have as much explanatory power as, or may be confounded with, fixed spatial effects. This may indicate that model-derived environmental fields are not accurate enough at this consideration of the mechanisms of interaction to include the variable in the most informative way.

Impacts if Piracy

The SC **NOTED** that the development of Somalian piracy has produced major changes in purse seine fisheries in the western Indian Ocean, which has resulted in a change in their effort levels and distribution, catch and catch-per-unit-effort. Some of those changes are visible in the basic fishery statistics, such as the decline of purse seine fishing effort and their changes in effort distribution. This was the case when after 2005, the purse seine fleets moved offshore, far from the Somalian coast, due to the end of fishing agreements and to the expansion of piracy. The SC **RECOMMENDED** that effects of the Somalian "quasi MPA" on the productivity of the stocks and on CPUEs and catches should be better evaluated, because this area is positioned in a highly productive area of the Indian Ocean that was actively fished by many fleets up until 2005. This study should be done in parallel for the three tropical tuna species (skipjack tuna, yellowfin tuna and bigeye tuna: by decreasing order of priority).

The SC **NOTED** that other changes of the purse seine fisheries due to piracy are not visible in the basic data presently available, for instance the changes in the purse seine fishing tactics and efficiency, due to "military operations". Various changes in the targeting of FAD associated or free schools due to the new fishing conditions may have also been occurring during recent years. The SC **RECOMMENDED** that the effects on the FAD CPUEs by the EU,Spain purse seine fleet, including the reduced number of supply vessels, should be tentatively estimated. The potential reduction of free school fishing power of EU,France purse seine fleet during their period of "twin vessels" fishing operations should be evaluated (and this period identified for IOTC scientists). If estimations are significant, all of these changes in the tactics and efficiency of the purse seine fleets should be taken into account in future stock assessment models.

The SC **NOTED** that longline fisheries have also been facing since 2007 similar effects of the Somalian piracy as those experienced by purse seine vessels. The major and more visible effect has been their change of fishing zones, all longliners abandoning since 2009 there best yellowfin tuna and bigeye tuna fishing zones of Indian Ocean, also creating in the north-west Indian Ocean a "quasi MPA" for the population of adult deep yellowfin tuna and bigeye tuna. These major changes in the longline fisheries have been widely altering the regional catches and CPUEs of longliners, but these effects remain difficult to incorporate in most stock assessment models. Furthermore, the SC has been informed that some armed longliners were now back in the "piracy area" where they are obtaining high CPUEs.
The SC **RECOMMENDED** that all these changes in fishing strategy, tactics and efficiency of the purse seine and longline fisheries in relation to piracy should be identified and analysed for the purse seine and longline fleets, and later carefully taken into account in future stock assessment models of the 3 species of tropical tunas.

APPENDIX XXXVI
ASSESSMENT SCHEDULE FOR IOTC WORKING PARTIES

Extract of the Report of the Fifteenth Session of the Scientific Committee
(IOTC–2012–SC15–R; Appendix XXXVI, PAGE 269)

The IOTC Scientific Committee **RECOMMENDED** that each of its Working Parties undertake stock assessments and development of stock status indicators following the schedule shown in Table 1.

Table 1. Schedule of stock assessments for IOTC species and species of interest in 2013 and tentatively for 2014–2017, and for the WPM priorities.

Species	2013	2014	2015	2016	2017
Working Party on Tropical Tunas					
Bigeye tuna	**Full assessment**	Indicators	Indicators	**Full assessment**	Indicators
Skipjack tuna	Indicators	**Full assessment**	Indicators	Indicators	**Full assessment**
Yellowfin tuna	Indicators	Indicators	**Full assessment**	Indicators	Indicators

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