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# Scientific Research Program for CCSBT

## Suggestions for structuring and points for discussion

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# Summary

The 2013 meeting of the Extended Scientific Committee (ESC) is scheduled to recommend an updated five year Scientific Research Program (SRP), 2014-18, for consideration by the Extended Commission in October 2013. The 2013 SRP should aim to identify the longer term research priorities in line with the Convention's objective and the vision, goals and action plan outlined in the 2011 CCSBT strategic plan. This paper builds on the initial discussions at the 2012 ESC meeting and aims to provide a framework to focus the consideration of the SRP on the objectives and rationale for the potential components. Consideration of how SRP components relates to improving the ESC's ability to provide the best available scientific advice should be a key discussion area. The suggested structure separates the regular ESC work program from strategic, longer term research activities that maybe required to address key uncertainties in the current understanding of the status and dynamics of the stock and fisheries that harvest it.

The proposed structure is based around 1) scientific monitoring, 2) management procedure (MP) implementation, 3) stock assessment (operating model (OM) development). The paper lists uncertainties and possible research activities for ESC discussion and prioritisation. These have been identified based on previous ESC discussions, technical work in revising the OM and the outcomes of recent research. This list is not likely to be exhaustive but is provided as a proposed starting point for discussion by the ESC.

# 1 Introduction

The CCSBT Scientific Research Program (SRP) was initiated in 1999/2000 to address priority scientific monitoring and research requirements for the assessment of the southern bluefin tuna (SBT) stock and management of the fishery (CCSBT 2000). The External Scientific Advisory Panel was engaged by the Commission to design the SRP in consultation with national scientists. In designing the SRP, the focus was on where potential improvements could be made in stock assessment inputs, basic fishery data (e.g. size and age distribution), biological parameters (e.g. natural mortality, age of maturity, growth rates etc), and absolute and/or relative measures of abundance (e.g. CPUE, fishery independent surveys, tagging experiments) (CCSBT 2000).

The objective of the original SRP was:

*to improve the quality of the data used as input to the stock assessment and to contribute to the development of reliable indices to monitor future trends in stock size (CCSBT-SC 2001, Attachment D).*

The SC identified four research areas where additional direct CCSBT initiatives were most needed and likely to result in substantial gains in reducing uncertainty in the stock assessment in the short term (CCSBT-SC 2001, Attachment D):

1. Characterisation of the catch
2. CPUE interpretation and analyses
3. Development of a Scientific Observer Program
4. Development of a SBT Tagging Program.

The SC developed specific objectives and rationale for each component of the original SRP (CCSBT-SC 2001, Attachment D). The Commission requested advice on financial implications and relative priorities as a basis for development of final research proposals. These were developed in a collaborative manner through inter-sessional correspondence and focussed workshops. The SRP was conducted 2001-2006 and was reviewed regularly, with a substantial review in 2007 (CCSBT-SC, 2007; Davies et al; 2007; Itoh et al 2007).

Since the 2007 review of the SRP, the major focus of the ESC has been on the re-development of the operating model (OM) and management procedure (MP) design, testing and implementation. In 2012, Davies et al (2012) summarised the progress and outcomes since the 2007 SRP review and identified potential areas for future SRP focus. The 2012 ESC commenced discussions for the next SRP and identified preliminary activities and priorities (CCSBT-ESC 2012, Attachment 8).

The 2013 meeting of the ESC is scheduled to recommend an updated five year Scientific Research Program (SRP), 2014–18, for consideration by the Extended Commission in October 2013. The 2013 ESC provides an opportunity to identify strategic research and development priorities for the following five years, 2014–18, and beyond. The 2013 SRP should aim to identify the longer term research priorities in line with the Convention's objective and the vision, goals and action plan outlined in the 2011 CCSBT strategic plan (CCSBT 2011).

The CCSBT strategic plan (CCSBT 2011) includes the goal (3.2):

*Science process provides the best available scientific advice for management decisions.*

The strategies for achieving this goal include:

*ii) Develop a CCSBT research plan including Member-funded, collaborative and CCSBT-funded projects (2012)*

- *Implementation of CCSBT five year research plan*
- *Implement necessary scientific research by Commission and/or Members (e.g. CCSBT tagging program)*

This paper aims to provide a framework for continuing the SRP discussion by suggesting areas for ESC consideration, in the structuring the 2013 SRP and identifying priorities and collaborative efforts. The paper separates the ongoing scientific work program activities and data provision, from potential future research activities that address key uncertainties.

## 2 Proposed refinement to the SRP structure

The SRP has evolved since 2002 and since 2007 there has been a merging to some extent, of elements of the regular ESC work program and strategic, longer-term research. This paper suggests that it would be useful to clarify the distinction between the two elements within the research plan and proposes the following changes to the SRP structure for consideration by the ESC.

Table 1 includes the on-going scientific monitoring and annual ESC work program and data submission elements. These activities are on-going commitments by CCSBT, members and cooperating non-members and are supplemented by the work plans of the ESC, the catch per unit effort (CPUE), and the stock assessment working groups.

Table 2 focuses on the strategic, longer-term research activities that aim to improve on-going scientific monitoring or address key uncertainties in the stock assessment, annual status advice and management advice provided by the ESC. These have been identified in previous ESC discussions, technical work in revising the OM and the outcomes of completed research. This list is preliminary and not exhaustive.

The aim of this structure is to facilitate a focused discussion of the strategic research issues, relative priorities and potential areas of collaboration among the members.

### 3 Research objectives, rationale and activities

This paper also suggests that the ESC provides a set of recommended objectives, rationale and activities for the 2013 SRP for consideration by the Commission. The 2012 preliminary SRP discussion (Appendix 1) include a combination of research objectives (e.g. characterisation of the catch; recruitment monitoring) and research approaches that might contribute to achieving research objectives (e.g. SBT tagging; scientific observer program, CPUE interpretation). The proposed revised structure focuses on the research objectives and key uncertainties in a similar way to the original SRP (CCSBT-SC 2001). This structure is suggested as it may provide a clearer basis for discussions about the content the 2013 SRP.

Given the above, it would be useful for the ESC to clarify the goals of the SRP for the coming period (2014-2018). The high level objectives are likely to be similar to the previous SRP, to address priority scientific monitoring and research requirements for the assessment of the SBT stock and management of the fishery objectives. However, given the research progress to date, the revisions to the OM and the implementation of the MP, the objectives of the specific components are likely to be different.

The work of the ESC which should further inform the 2013 SRP includes:

1. **On-going scientific monitoring.** This includes fishery dependent and independent monitoring that forms the basis of the annual ESC advice on SBT stock status and management recommendations and the key data series in the operating model (OM) and management procedure (MP). These are on-going activities that generally require annual updates, including:

- i) Characterisation of catch
- ii) Abundance Indices
  - a) Recruitment
  - b) Sub-Adults
  - c) Spawning biomass
- iii) Biological parameters

2. **CCSBT Management procedure implementation.** The specifications of the CCSBT MP (CCSBT 2012, Attachment 7) identify regular ESC activities required over the next five years, including;

**2014** In depth stock assessment (including reconditioning of the operating model with updated data); determine whether there is evidence for exceptional circumstances; and determine whether the stock assessment results are outside the MP bounds or other information indicating the need for MP review/revision.

**2016** MP scheduled to be used to compute the TAC for 2018-20.

**2017** First formal review of MP performance, including consideration of whether there are indications of any need or not, for a revised MP. Noting that this is

due to occur in 2016 (after 6 years), however as stated in *Specifications of the CCSBT Management Procedure* (CCSBT 2012) this will not coincide with years when a new TAC is calculated from the MP.

**2017** In depth stock assessment (reconditioning of the operating model with updated data); determine whether there is evidence for exceptional circumstances; and determine whether the stock assessment results are outside the MP bounds or other information indicating the need for MP review/revision.

**Annual** Review of stock and fishery indicators and any other relevant data, for evidence of exceptional circumstances.

3. **Stock assessment (OM development).** The technical work to complete the 2014 in depth stock assessment (described in the ESC 2012 workplan and updated in CCSBT-OMMP4 2013) is underway. In line with the three year cycle of in depth stock assessments and objective of providing a robust assessment of the SBT stock, research activities that may address key uncertainties for future stock assessments (2017) are included within this component.

The ESC discussion could focus on any key uncertainties, approaches to resolving these and relative priorities within the 2013 SRP.

As was the case for the development of the original SRP, the ESC could seek guidance from the Commission on logistic and costs constraints to guide the development of detailed research projects.

Table 1: The on-going scientific monitoring and annual work program activities, undertaken by the CCSBT, members and the ESC. The activities (shown in shaded cells) were identified during discussions at 2012 ESC, with the associated preliminary ESC priority (CCSBT-ESC 2012, Attachment 8).

Activity	Preliminary ESC Priority	Input to	Timeframe
<b>1. Ongoing scientific monitoring</b>			
<b>i) Characterization of catch (Future)</b>			
Catch amount	Essential	OM and annual status advice	annual
Size structure	Essential	OM and annual status advice	annual
Age structure (Indonesian catch, Indonesian and Australian updated age-length keys)	High	OM and annual status advice	annual
Scientific observer program	High	OM, annual status advice, ERS assessments	annual
<b>ii) Abundance Indices</b>			
<b>a) Recruitment</b>			
Scientific Aerial Survey	Essential	OM, MP and annual status advice	annual
Piston line	Medium	Annual status advice	annual
SAPUE	Medium	Annual status advice	annual
<b>b) Sub-adults</b>			
Monitoring and review of the core CPUE for the MP	Essential <sup>a</sup>	OM, MP and annual status advice	annual
Monitoring series ('reduced base' and 'shot by shot' stated in the MP specifications)	Essential <sup>a</sup>	Annual status advice and MP implementation	annual
<b>c) Spawning biomass</b>			
Indonesian catch and effort data	High	OM and annual status advice	annual
Current close kin data (incorporation of the results from the completed research into the OM)	High	OM 2014	2014
<b>iii) Biological parameters</b>			
Age-length relationship		OM and annual status advice	

Activity	Preliminary ESC Priority	Input to	Timeframe
<b>2. MP Implementation</b>			
Review of exceptional circumstances	Essential <sup>a</sup>	MP and annual status advice	annual
Consideration of the implications of the 2014 updated assessment for the MP	Essential <sup>a</sup>	MP implementation	2014
2016 MP run to estimate 2018-21 TAC	Essential <sup>a</sup>	MP	2016
Review of MP performance (2017)	Essential <sup>a</sup>	MP	2017
<b>3. Stock Assessment (OM development)</b>			
New data in OM (2013) and reconditioning of OM (2014)	High/Essential	OM 2014	2014
Revised stock assessment (2017)	Essential <sup>a</sup>	OM 2017	2017

<sup>a</sup> It is assumed these are essential as they are stated in the CCSBT MP specifications (CCSBT 2012).

Table 2. Potential research activities that may improve on-going scientific monitoring or address key uncertainties in the stock assessment, annual status and management advice provided by the ESC. These have been compiled from previous ESC discussions, the 4<sup>th</sup> OMMP technical workshop and the outcomes of completed research.

Activity		Potential research	Relevance	Reference/further information
<b>1. On-going scientific monitoring</b>				
<i>i) Characterization of catch (Future)</i>	Catch amount	Information on total removals, including accounting for recreational catches, releases, discards, discard mortalities	Improved estimate of total mortalities for the OM and annual status advice	Para. 112 CCSBT-ESC (2012)
	Size structure	Value of using the CDS data as a comprehensive sample of the size structure of removals	OM and annual status advice	Para. 112 CCSBT-ESC (2012)
	Age structure	Feasibility of moving towards catch at age data rather than using cohort slicing in the OM.	Improved estimates of recruitment and selectivity from the longline fisheries, OM and annual status advice.	Para. 76-79 & 120 CCSBT-ESC (2012)
<i>i) Abundance indices</i>	<b>a) Recruitment</b>	Proportion of the juvenile population that move into the Great Australian Bight each summer  (Possible approaches include otolith microchemistry, electronic or conventional tagging approaches)	Stock structure and assumptions for recruitment indices and close-kin analysis.	Para. 81-83 CCSBT-ESC (2012)
		Environmental interactions with the scientific aerial survey	Improved relative recruitment index; MP implementation	Para. 29 CCSBT-ESC (2012)
		Alternative measures of absolute juvenile	Estimates of absolute abundance	

Activity		Potential research	Relevance	Reference/further information
		recruitment (conventional or gene-tagging approaches)	of cohorts for the OM	
	<b>b) Sub-adults</b>	Exploration and refinement of alternative CPUE monitoring series	MP implementation	Para. 50-53 & CCSBT-ESC (2012)
		Monitoring and exploration of changes in fleet operations over time	MP implementation and OM	Para. 58-60 CCSBT-ESC (2012)
		Monitoring/research sets – longline surveys. Feasibility studies for using research sets as a basis for providing consistent time/area distribution of longline CPUE	Improved CPUE standardisation and interpretation; MP implementation and OM	Para. 60 CCSBT-ESC (2012), CCSBT-OMMP4 (2013)
		Standardised CPUE series for other longline fleets (e.g. Taiwanese & Korean fleets)	Annual status advice	Para. 54-56 & 60 CCSBT-ESC (2012), CCSBT-OMMP4 (2013)
<b>d) Spawning biomass</b>	Potential future role of the close-kin genetics abundance estimation (design study)	Costs and benefits of a time series of close-kin data collection for the OM	Para. 114 CCSBT-ESC (2012)	
<i>ii) Biological parameters</i>		Improved estimate of the size at maturity	Defining effective reproductive contribution in the OM	CCSBT-OMMP4 (2013)
		Understanding within season spawning behaviour and potential skip spawning behaviour (e.g. electronic tagging approaches and otolith microchemistry for spawning frequency)	Defining effective reproductive contribution in the OM	Para. 118 CCSBT-ESC (2012)
<b>2. MP Implementation</b>		Indicators of MP performance	To inform the first formal review	

Activity		Potential research	Relevance	Reference/further information
			of the MP (2017).	
<b>3. Stock Assessment (OM development)</b>		Selectivity of the fishery on the spawning grounds. Potentially informed by investigations of fleet operations (shifts in targeting, spatial temporal distributions in effort, species composition, hook setting depth) and within season spawning behaviour (electronic tagging approaches)	OM – basis for domed selectivity and defining effective reproductive contribution	Para. 115 CCSBT-ESC (2012), CCSBT-OMMP4 (2013)
		Incorporation of SRP tagging data from 2000s		
		Improved information on cohort abundance, fishing mortality and natural mortality (e.g. genetic tagging approaches)	OM – mortality estimates	Para. 88-89, 117, CCSBT-OMMP4 (2013)
		Evaluation of the use of SAPUE in the OM for informing recruitment	OM	Para. 87 CCSBT-ESC (2012)
		Potential costs and benefits of a spatially explicit stock assessment	OM	Para. 89 CCSBT-ESC (2012)

<sup>a</sup> Attachment 8 of CCSBT-ESC (2012)

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## Appendix 1 – Attachment 8 from CCSBT-ESC (2012)

Item	Preliminary ESC priority	Informs
<b>Characterization of catch</b>		
<i>Future</i>		
Catch amount	Essential	H, SSB
Size structure	Essential	H, SSB, R
Age	High	H, SSB, R
Australian SV	High	H, R
<b>CPUE interpretation</b>		
SAPUE	Medium	SSB, R
Monitoring/research sets-longline surveys	Medium	SSB, R
Commercial gear-all fleets	High	SSB, R
CPUE other longline fleets	Medium	SSB, R
<b>Spawning biomass index</b>		
Indonesian C&E	High	SSBT, M, F
Close kin	High	SSB, M, F
Otolith microchemistry	High	Assumptions for close kin; stock structure
<b>Scientific observer program</b>		
	High	SSB, R, F
<b>SBT tagging</b>		
Conventional tagging	Low	F, M, R, SSB
Genetic tagging	High	F, M, R, SSB
Electronic tagging	Medium	Movement, stock structure, assumptions for close kin
<b>Recruitment monitoring</b>		
Scientific aerial survey	Essential	R
Piston line	Medium	R
<b>Direct ageing</b>		
Sample collection/ageing	High	SSB
Analysis for stock assessment	High	SSB
<b>MP implementation</b>		
	High	H
<b>OM development</b>		
New data in OM (2013)	High	SSB, R, F, M, H
Reconditioning of OM (2014)	High	SSB,R, F, M, H

