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Acknowledgements

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Scientific Research Program

Table 1: The on-going scientific monitoring and annual work program activities, undertaken by the CCSBT, members and the ESC.

Activity	Preliminary ESC Priority	Input to	Timeframe
1. Ongoing scientific monitoring			
i) Characterization of catch			
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
Electronic Monitoring (including stereo video)	High	OM and annual status advice	
Scientific observer program	High	OM, annual status advice, ERS assessments	annual
ii) Abundance Indices			
a) Recruitment			
2 year old gene tagging	Essential	OM, MP and annual status advice	annual
Piston line	Medium	Annual status advice	annual
SAPUE	Medium	Annual status advice	annual
b) Sub-adults			
Monitoring and review of the core CPUE for the MP	Essential	OM, MP and annual status advice	annual
Monitoring series ('reduced base' and 'shot by shot' stated in the MP specifications)	Essential	Annual status advice and MP implementation	annual
c) Spawning biomass			
Indonesian catch and effort data	High	OM and annual status advice	annual

Activity	Preliminary ESC Priority	Input to	Timeframe
Close kin abundance estimates	Essential	OM and MP	Annual or prior to each assessment
Close kin abundance timeseries	Essential	OM and MP	Annual or prior to each assessment
iii) Biological parameters			
Age-length relationship			
2. MP Implementation			
i) Development			
Selection of Candidate MPs	Essential	MP	2018
reconditioning of OM	Essential	MP	2019
MSE Candidate MPs	Essential	MP	2019
Recommend MPs to EC	Essential	MP	2019-20
ii) Implementation			
Review of exceptional circumstances	Essential	MP and annual status advice	annual
Consideration of the implications of the 2020 assessment for the MP	Essential	MP implementation	2020
2020 MP run to estimate 2021-24 TAC	Essential	MP	2020
Review of MP performance (2023)	Essential	MP	2023
3. Stock Assessment (OM development)			
Reconditioning of OM (2019)	Essential	OM 2019	2019
Revised stock assessment (2020)	Essential	OM 2020	2020

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, OMMP technical workshops and the outcomes of completed research.

Activity		Research	Relevance	Reference/further information
1. On-going scientific monitoring				
i) Characterization of catch (Future)	Catch amount	Develop methods to estimate and verify non member catch estimation.	Improved estimate of total mortalities for the OM and annual status advice. Likely to be increasing quantity as stock recovers	First Analyses completed in 2016
	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. PCM estimated in AU, JP however inference to fisheries operations needs to be evaluated Some Rec Fish estimates but not suitable for scaling to current circumstances JP set aside for discard mortality AU/NZ set aside for rec fish mortality	Tracey et al 2016 EC 2017 Moore et al 2016
		Non-member catch	Improved estimate of total mortalities for the OM and annual status advice. Likely to become a major source of UM as stock recovers	ESC21
	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 ESC 2012

Activity		Research	Relevance	Reference/further information
	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 ESC 2012.
<i>i) Abundance indices</i>	a) Recruitment	Proportion of juvenile population that move into the Great Australian Bight (otolith microchemistry, gene tagging)	Stock structure, and assumptions for recruitment indices and close-kin analysis. Completed –	Para. 81-83 ESC (2012)
		Alternative measures of absolute juvenile recruitment (gene-tagging approaches)	Estimates of absolute abundance of cohorts for the OM	2018 Preece
		Environmental interactions with the scientific aerial survey	Improved relative recruitment index; MP implementation No longer required?	Para. 29 ESC (2012)
	b) Sub-adults	Exploration and refinement of alternative CPUE monitoring series	MP implementation	Para. 50-53 & 60 ESC 2013 Preece 2018 CKMR Bravington
		Monitoring and exploration of changes in fleet operations over time	MP implementation and OM	Para. 58-60 ESC 2013 Itoh CPUE
		Monitoring/research sets – longline surveys. Feasibility studies for using research sets as a basis for providing consistent time/area	Improved CPUE standardisation and interpretation; MP implementation and OM	Para. 60 ESC 2013 OMMP

Activity		Research	Relevance	Reference/further information
		distribution of longline CPUE		
		Standardised CPUE series for other longline fleets (e.g. Taiwanese & Korean fleets)	Annual status advice	Para. 54-56 & 60 ESC 2012 Hoyle papers OMMP
	d) Spawning biomass	Close-kin genetics approach (design study for sampling framework, Updating CK estimation (trend), alternative genetic approach (snips))	Design study provide costs and benefits of a time series of close-kin data collection for the OM	Para. 114 ESC 2012 Bravington
ii) Biological parameters		Independent estimate of maturity schedule	Defining effective reproductive contribution in the OM	OMMP workshop
		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 ESC 2012
2. MP Implementation		Indicators of MP performance	To inform the first formal review of the MP (2017).	
		Feasibility of alternative indices for input to the MP (estimated trends from the		

Activity		Research	Relevance	Reference/further information
		stand-alone close kin assessment)		
3. Stock Assessment (OM development)		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 ESC 2012, OMMP ws report
		Mortality estimates for mature fish (10+ years old)	Current OM does not have data sources that provide substantial information on M10.	
		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, OMMP workshop
		Evaluation of the use of SAPUE in the OM for informing recruitment	OM	Para. 87 ESC 2012
		Potential costs and benefits of a spatially explicit stock assessment	OM	Para. 89 ESC 2012

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