Southern and Eastern Scalefish and Shark Fishery
Shark Resource Assessment Group (SharkRAG)

Meeting minutes

Date: 3-4 December 2018

Grand Vue Queenscliff

Attendees

Name	Membership
Mr Sandy Morison	Chair
Mr Brodie Macdonald	AFMA member
Dr Brendan Kelaher	Scientific member
Dr Ian Knuckey	Scientific member
Dr Robin Thomson	Scientific member
Dr Charlie Huveneers	Scientific member
Ms Anissa Lawtrence	Conservation member
Mr Leigh Castle	Industry member
Mr David Stone	Industry member
Mr Kyri Toumazos	Industry member
Mr Robert Curtotti	Economic member (ABARES)
Dr Miriana Sporcic	Invited participant – scientific (CSIRO)
Mr Ross Bromley	Industry invited participant
Mr James Woodhams	ABARES observer
Ms Belinda Norris	AFMA observer
Mr Ryan Keightley	AFMA Executive officer

Meeting Minutes

1   Preliminaries

1.1   Introduction and apologies

The Chair opened the fourth meeting of SharkRAG for 2018, and welcomed members, invited participants and observers to Queenscliff, noting no apologies. Participants were advised that the meeting was being recorded to assist with the preparation of the meeting minutes as per Fisheries Administration Paper 12.

1.2   Declaration of interests

The Chair reminder members that at SharkRAG 3 2018, the RAG agreed participants with a declared conflict must, as a general rule, not contribute to formal advice on the conflicting items, but can remain in the room for any recommendations. It was noted that this should not prevent participants from absenting themselves on a case by case item if they consider it appropriate to do so.

Participants reviewed and updated the Declarations of Interest included at **Attachment B**. The RAG considered each participants interests, and, recognising the participant's knowledge and valuable contribution to the discussions, agreed that they should participate in all Agenda Items, but not contribute to any recommendations for items for which there was a declared interest.

1.3   Adoption of agenda

The agenda at **Attachment A** was adopted by the RAG as final.

1.4   Adoption of previous meetings minutes

The Chair noted the draft minutes from SharkRAG 2 and 3 2018 were circulated to members, and following a comment period, were tabled for adoption as final. There were no futher comments on either set of Minutes and the RAG endorsed them as final.

1.5   Status of actions arising

The RAG was updated on the status of remaining actions arising from previous meetings as per the tabled the paper (**Attachment B**). Items discussed are outlined as follows:

Action item 3 SharkRAG 2 2016 – Note in the review of the School Shark Rebuilding Strategy that results of the close kin research have indicated that there isn't enough connectivity between Australian and New Zealand school shark to require joint management of these stocks, which is contrary to one of the conclusions of the Sebastian *et al* paper [CHECK REFERENCE AND INSERT FOOTNOTE].

Action item 2 GHAT Data working group – The issue of conducting biennial collection of biological data for stock assessment is a broader question for the SESSF, and this should be refered to SESSFRAG February 2019 data meeting.

Action item 6 SharkRAG 3 2018 – The RAG suggested that the exploration of using this data for CPUE standardisations be considered as a research priority broadly in the SESSF.

Action item 8 SharkRAG 3 2018 – The RAG requested this paper be sent to SharkRAG out of session prior to the SESSFRAG February meetings. Dr Knuckey noted that he submitted a paper to SPC outlining data that can be collected from electronic monitoring systems, and he would submit this paper to the SESSFRAG February meeting for information.

> **Action item 1 –** Refer the question of conducting biennial collection of biological data for stock assessment to SESSFRAG February 2019 data meeting.
>
> **Action item 2** – Dr Knuckey to send SPC Electronic Monitoring data collection summary paper to SESSFRAG for its February 2019 meeting.

The RAG questioned whether there has been consideration of providing onboard observers with electronic observer forms. Dr Knuckey, noting a conflict of interest, stated that he had provided AFMA with information and an offer regarding an OLRAC e-observer product. Mr Keightley informed the RAG that e-observer is identified as a priority under AFMAs red tape reduction agenda, and all options will be considered as part of this project.

2   Updates

2.1   Managers update

Mr Macdonald presented an oral managers update as follows:

- Dr James Findlay (AFMA CEO) has now moved into his new role as Director at Parks Australia, and Ms Anna Willock has been appointed as acting AFMA CEO until the position is filled permanently.
- Dr Nick Rayns (Executive Manager Fisheries) has retired and Mr George Day is acting in this role until the position is filled permanently.
- The Canberra AFMA Office is relocating to Majura Park, Canberra Airport, from 2 January 2018.

- The new Commonwealth Fisheries Harvest Strategy Policy (HSP) and Guidelines and Bycatch Policy (BP) and Guidelines have been released and are available on the Department of Agriculture and Water Resources website at http://www.agriculture.gov.au/fisheries/domestic/harvest_strategy_policy. Dr Knuckey noted he has developed a summary of HSP which he has distributed to the RAG for information.
- There are a range of SESSFRAG meetings and workshops in Canberra during the week commencing 25 February 2019. This will include a SESSFRAG meeting, a technical working group and a data strategy meeting. The RAG requested that the relevant AFMA staff provide an update on the e-fish and ICT strategy projects at these meetings.
- The reviews of the GHAT and SPF Dolphin Mitigation Strategies will be released for public comment in December 2018.
- A meeting to discuss school shark management will take place in Lakes Entrance on 11 December 2018.

Action item 3 – Mick Roses and Andrew Powell to present information on e-fish and the ICT Strategy at the SESSFRAG meetings in February 2019.

2.2 Industry updates

Mr Toumazos stated that gummy shark catch in South Australia have been very good. His new automatic longline vessel is going well, setting 5 000 hooks per day with 85 per cent baiting efficiency, and good catches of gummy shark with very little bycatch. The RAG noted that baiting efficiency may be an important consideration for CPUE standardizations, and suggested that AFMA investigate including this as an additional field in logbooks for automatic longline vessels.

Action item 4 – AFMA, and SESSFRAG at its February 2019 meetings, investigate including baiting efficiency as an additional field in logbooks for automatic longline vessels to be used for CPUE standardization.

Mr Castle stated that gummy shark have turned up in the fishery off Tasmania. School shark are still thick off South West Tasmania making it impossible to fish in that area.

Mr Stone explained that the fishing in Bass Strait has been good, however larger landings have driven the market price down a bit. He stressed that the biggest concern for Bass Strait fishers in the seismic surveys proposed for March 2019, stating that this will impact catch rates in the fishery. Dr Huveneers drew the RAG's attention to a journal article that will be released soon regarding the impacts of seismic surveys on a range of fish species, authored by Barry Bruce (CSIRO).

2.3 ABARES updates

Mr Curtotti provided the following oral update:

- The ABARES Fishery Status Report 2018 was released in September. There were no changes in status of the SharkRAG species from the previous year.
- Gross Value of Production has been determined for this fishery for 2017-18 at 22.9 million, compared to 25.3 million in 2016-17.
- The latest GHAT Net Economic Returns survey was lacking representative data, and as such ABARES are unlikely to publish it without gaining any additional data.
- The Australian fisheries and aquaculture statistics report for 2017 is due to be released in late December 2018.

3   Monitoring and data update

Industry data collection project

Mr Bromley provided an update on the Shark Industry Data Collection project (SIDaC). He noted that the first trial has been undertaken successfully. There was an issue identified with the cable tie tags that has been addressed. All length frequency data for this quarter has been collected for gummy shark, with more sampling required for school shark.

Mr Bromley noted he has met with Mr Toumazos in South Australia to line up sampling from his fleet. He has also met with scalefish operators in Tasmania for sampling of scalefish. Cooperation has been good so far from Industry, and Mr Bromley thanked all who have been involved and have provided invaluable assistance to date.

3.1   CPUE standardizations

Dr Sporcic presented updated CPUE Standardizations as per the action items from SharkRAG 3 2018, noting the following:

- The use of natural logs has been clarified in the captions
- Box 1 has been added to the report showing shark zones
- She has investigated the shallow shots from 2002-2005, and 2006-2012 and they were found to be legitimate. The RAG requested that a footnote be added to the document stating that these catches have been investigated and verified so the RAG does not enquire again in future.

Action item 5 – Dr Sporcic to add footnote to the CPUE Standardizations Document regarding the shallow water shots (2002-2005, and 2006-2012) in Tasmania, and the deeper water gillnet shots in South Australia, noting they have been investigated and verified.

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4   School shark

Dr Thomson introduced the item, explaining she has provided a presentation addressing the action items identified at SharkRAG 3 2018, as follows:

Constant exploitation rate projections

The RAG discussed the projections at Figure 1. Dr Thomson explained that the 2017 exploitation rate was relatively high compared to previous years, and that continued fishing at that level would allow stock recovery, but would be relatively slow. Dr Thomson further emphasised that confidence in the model's ability to estimate trend is not high.
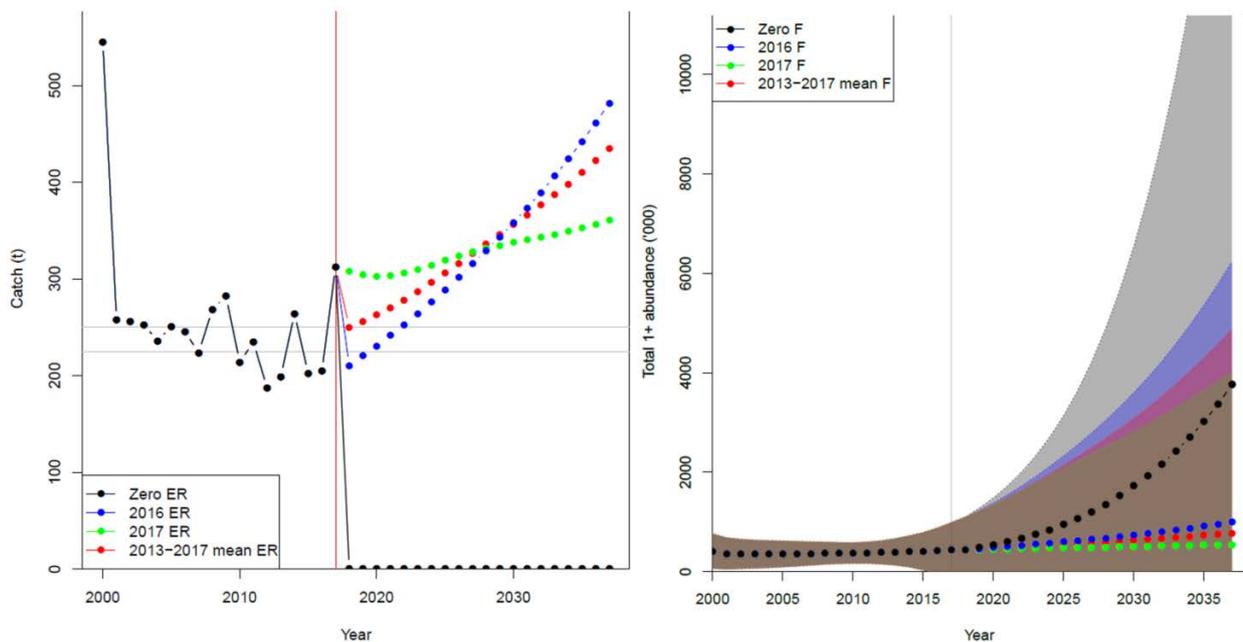
Figure 1: (a) Projected catch (t) using different constant exploitation rate scenarios. (b) Projected abundance estimates based on different constant fishing mortality rate scenarios.

Dr Knuckey suggested that a constant catch rate projection could be informative. Dr Thomson noted that a constant catch scenario would allow faster rebuilding of the stock, however, in a rebuilding scenario constant catch can only be achieved by progressively reducing fishing effort. Constant landings can be attained but only at the cost of increased discarding and therefore increased overall catch (unless all discards survived, which is improbable).Dr Knuckey noted it is possible to apply method specific post capture survivability figures that could partly address this issue.

Plot gummy shark numbers from the last assessment compared to school shark

The RAG discussed a plot showing the ratio of school to gummy shark numbers based on the their respective stock assessments, and noted the estimated relative numbers of school shark to gummy shark available to 6 inch gillnet gear was close to 20 per cent, suggesting there are five times more gummy shark available to the fishery than school shark. The RAG noted this is in line with the 20 per cent management ratio.

Plot tag recaptures and close kin data by depth

The RAG discussed a plot showing recaptures and close kin data by depth in order to investigate whether there may be evidence of separation of school shark stocks by depth. Dr Thomson noted that almost all close kin samples came from depths shallower than 80m. Only six close kin pairs were found where pairs span deeper and shallower than 80m. The RAG suggested going forward it would be useful to target samples from deeper water (>183) from the trawl or hook sectors.

Plot fishing mortality by fleet

The RAG noted a plot showing fishing mortality by fleet. Dr Thomson explained that the school shark model has a single trawl and line fleet because these are assumed to have the same knife-edged selectivity function. The RAG requested that Dr Thomson plot F for all methods combined across the fishery.

Action item 6 – Dr Thomson to plot school shark exploitation rate for all gears combined, including error bars.

Mr Toumazos explained that he had discussed school shark with three other fishers who in the past targeted school shark, and all believed that there was more than one stock. They recalled that school shark were there all the time in smaller local populations, but occasionally there were years where there was a huge influx of school sharks with no explanation of where they came from. Mr Toumazos suggested that the area of the fishery we are sampling now will only pick up the smaller 'local' population.

Scoping - Close Kin Mark Recapture ongoing sampling

The RAG (noting Robin absented herself from the decision) gave in principle support on continuing close kin sampling, with assistance from the SIDaC Industry data collection program, noting that AFMA will require a detailed costing and data collection proposal before agreement. The RAG recommended the following data collection targets should close kin continue:

- 400 samples from across the fishery; and
- 300 targeted samples from Western Australia, Western Tasmania and from deeper water (>183m, trawl and line) combined.

Action item 7 – Dr Thomson to provide a detailed costing and data collection proposal for the continuation of Close Kin Mark Recapture for school shark.

Further work

The RAG noted that the close kin assessment model differs from the previous base case as it considers only:

- one region
- one population
- starts in 2000; and
- does not allow (or need to take account of) movement between regions (because there is only one region).

The model shows a population that is relatively small compared with that estimated by the previous stock assessment model. However the model is inconsistent with the catches taken during the 1990s which brings into question whether or not the stock from which the close kin sample was taken is different from the stock that sustained catches prior to 2000. This was also an issue with the previous base case assessment model, which used complex stock structure assumptions to account for earlier large catches. Considering this, the RAG theorised that the stock being assessed through close kin currently may be a smaller subset of the stock than that which was historically fished. The RAG further theorised that another explanation may be due to a shift in productivity. The RAG recommended that these theories require more work to ultimately resolve this issue. Any future consideration of B_0 and associated reference points will also need to take these into account.

The RAG discussed the possibility of investigating whether targeted sampling of pups in estuaries in Victoria and, if possible, South Australia (this can be done non-lethally). Dr Thomson explained that if we had enough Parent Offspring Pairs between pups in these areas, and with animals we find elsewhere, it is in theory possible to investigate relative stock size and perhaps variable productivity between estuaries.

The RAG also considered the available information on recreational catch, and noted the South Australian estimate of school shark recreational catch from 2014 was 54 tonnes. The RAG noted that this level of catch (even if uncertain) is not insignificant.

Action item 8 – Dr Thomson and Dr Huveneers to investigate any additional recreational catch reports available, including those which provide numbers of animals caught, and conversion of these to weight.

The RAG again noted the importance of ensuring that State catches do not exceed the agreed levels allocated through the Memorandum of Understanding with Victoria, South Australia and Tasmania.

RBC recommendation

The RAG accepted the close kin assessment model noting high confidence in the absolute estimate of abundance produced by the model, and lower confidence in the estimates of trend at this stage. The RAG noted that confidence in trend will be gradually improved over time with continued close kin sampling.

The RAG recommended setting an incidental catch TAC for next three years based on projections using the average of the estimated fishery mortality rates over the last five years (2013-17 mean F, red line in figure 1). This rate, taking into account increasing stock size due to rebuilding, gives total fishing mortality estimates of 256 t in 2019-20, 263 t in 2020-21 and 270 t in 2021-22. This level of fishing mortality provides for consistent recovery, whereas projections using the 2017 fishing mortality rate (green line in figure 1) would lead to an initial reduction in stock size (for the first two years) before recovery due to the effect of age class inputs in the model.

The RAG discussed the frequency of re-running the close kin model. The RAG support running the model again after three years (2021), noting there is not likely to be much increase in confidence in trend, but an updated absolute estimate of abundance. The RAG also recommended that the update be done concurrently with the gummy shark model where possible given the species' importance as a companion species, and may help inform management of both species. Dr Thomson noted that because she is responsible for botht he school and gummy assessments, these cannot be run in the same year due to time contraints.

The RAG agreed to consider the updated school shark species summary at **Attachment D** out of session.

5   Gillnet Ecological Risk Assessment (ERA)

Ms Norris introduced the item as per the agenda paper, noting AFMA is seeking RAG review and comment on the draft ERA. Once RAG comments are received, the ERA will be revised.

Dr Sporcic provided a presentation summarising the ERA process as follows:

- The species list is provided by AFMA (including observer, logbook and EM data) and species are classified as key commercial, secondary, byproduct, bycatch, and protected species.
- CSIRO check over the data. If any protected species are not reported to species level, this is expanded to cover all species in that group within the fishery area, regardless of whether there are records of interaction in the fishery or not.
- CITES listed species (that are not EPBC listed) are excluded if not interacted/observed in the fishery.
- Any tiered assessed species are excluded from the level 2 analysis.

Dr Sporcic explained that there had been a recent update for the level 2 analysis as an issue with the bioregionalisation data that were used to produce the fishery overlap was identified. Species that are no longer high risk as a result of the updated bioregionalisation data include:

- Greeneye spurdog
- Great spider crab
- Draughtboard shark
- Grey nurse shark
- Australian angel shark.

Dr Sporcic presented the high risk species for RAG comment, noting that many species that have assessed as high risk are expanded species from generic groups such as 'Albatrosses'.

The RAG noted it has many questions about distribution, overlap and populations of these species within the fishery and may not have adequate information at the meeting to make a confident decision to amend the assessed status. As such the RAG questioned whether the lists should be considered by an expert group (e.g. AAD, Commonwealth Marine Mammal Working Group (CMMWG), IUCN shark reference group etc.). Mr Macdonald agreed to investigate this, however noted limitations due to timing, funding availability etc. of external groups and flow on implications on other ERAs already undertaken.

Action item 9 – Mr Macdonald to investigate the RAG suggestion that high risk species identified through ERA should go to expert reference groups (e.g. AAD, CMMWG, IUCN shark reference group etc.) for consideration.

Seabirds
Dr Knuckey requested that that the observer interactions reported are checked to ensure they are interactions with fishing gear, as there is potential some have just landed on deck for a rest.

The RAG, noting the information available at the meeting, recommended that Petrels assessed as high risk should be reduced to medium risk as they are from an expanded list, and the population information available at the meeting suggests that the level of interaction shouldn't constitute high risk. The RAG suggested, however, that this may be considered by an expert reference group.

Dolphins
The RAG suggested that Indian Ocean bottlenose and common bottlenose should be considered by an expert reference group.

Ms Lawrence suggested that common dolphins (currently medium risk) should be considered for a revision to high risk as there are many known interactions in the fishery. The RAG suggested that the common dolphin was reduced to medium though the level 2 assessment and suggested that the species remain at medium risk but still be refered to an expert group.

Sharks
The RAG noted that there is a close kin estimate of abundance available for both eastern and western white sharks which should be considered as part of the risk assessment. The RAG also discussed shortfin mako as a low risk species, which are caught in relatively high numbers, and potentially should be considered further.

Action item 10 – Dr Huveneers and Dr Sporcic to work through the ERA results for sharks out of session.

Mr Woodhams noted there is a project considering species that are difficult to assess, including those which have previously had accepted 'tiered' stock asessments.. These species have not been included in the ERA level 2 assessment by default as they had recently had an accepted tiered stock assessment. The RAG recommended that this should be discussed though the project working group and also be considered by the ERA working group as to whether there is value in

assessing these species through ERA while the challenges with assessment are being worked through.

Action item 11 – ERA working group to consider whether the 'hard to assess' species should be considered in level 2 ERA analysis noting the tiered assessments are no longer considered reliable for these species.

6   Research priorities

Mr Macdonald introduced the item, noting that the RAG is requested to review and update the annual research statement, checking for any gaps. The RAG discussed the annual research statement, reviewing current priorities as follows:

- Reflect the delay in the next gummy shark assessment.

- Note the 'updating knowledge of key species biology' project went out as an FRDC EOI, so can now be removed.

- Australian sea lion science review should be refered to the CMMWG and can be removed.

- The 'Strengthening the Tier 1 gummy shark assessment' density dependence item can be closed off.

The RAG discussed the potential use of close kin mark recapture for gummy shark, with the primary reason being there is a possibility that CPUE may not be indexing abundance appropriately due to avoidance of school shark. The RAG requested that a Dr Thomson consider providing a scoping document for the project and it be recommended and put forward as a research priority.

The RAG recommended priorities as follows:

Table 1: SharkRAG research priorities. Costs = low <$50k, Medium $50-200k, High >$200k.

Project	Cost	Priority	Feasibility
Continued Close Kin Mark Recapture sampling for school shark. *potentially included in Stock Assessment contract.	Low/Medium	Essential	High
Close kin sampling of school shark pupping grounds (locations, connectivity) to get better understanding of stock structure.	Medium	Low	Medium
Close Kin Mark Recapture for gummy shark.	High	Medium	High
Standardizing CPUE for skipper effect using logbook skipper ID and experience in the SESSF.	Low	High	High
School shark (primary, secondary and tertiary) and gummy shark (tertiary) post release survival	Medium	High	High

The RAG noted a recommendation from Commonwealth Fishers Association for a project titled 'Viability of converting gillnet boats to hook boats in Bass Strait'. Mr Toumazos asked whether the project could be expanded to include auto-baiting in waters shallower than 183 m generally, particularly relating to whether there is still appropriate justification for the shallow water closure. Mr Macdonald explained that will work with Mr Toumazos on revising the scope of the project, and will provide the final scope to the RAG for information.

The RAG also discussed the need for discard estimates for GHAT species, and recommended that further consideration of collecting discard estimates and length measurements from electronic monitoring for school and gummy shark be discussed at the data strategy workshop in February.

> **Action item 12** – Refer consideration of collecting discard estimates and length measurements from electronic monitoring for school and gummy shark to the SESSFRAG data strategy workshop in February.

7 Other business and close of meeting

Noting there was no other business, the Chair thanked participants for valuable input, wished all a safe Christmas and Happy New Year, and closed the meeting.

Table 2: Actions arising from SharkRAG 4 2018.

Action	Agenda item	Description	Responsibility
1	1.5	Refer the question of conducting biennial collection of biological data for stock assessment to SESSFRAG February 2019 data meeting.	SESSFRAG
2	1.5	Dr Knuckey to send SPC Electronic Monitoring data collection summary paper to SESSFRAG for its February 2019 meeting.	Dr Knuckey
3	2.1	Mr Roses and Mr Powell to present information on e-fish and the ICT Strategy at the SESSFRAG meetings in February 2019.	AFMA
4	2.2	AFMA and SESSFRAG at its February 2019 meetings, investigate including baiting efficiency an additional field in logbooks for automatic longline vessels to be used for CPUE standardization.	AFMA and SESSFRAG
5	3.1	Dr Sporcic to add footnote to the CPUE Standardizations Document regarding the shallow water shots (2002-2005, and 2006-2012) in Tasmania, and the deeper water gillnet shots in South Australia, noting they have been investigated and verified.	Dr Sporcic
6	4	Dr Thomson to plot school shark exploitation rate for all gears combined, including error bars.	Dr Thomson
7	4	Dr Thomson to provide a detailed costing and data collection proposal for the continuation of Close Kin Mark Recapture for school shark.	Dr Thomson
8	4	Dr Thomson and Dr Huveneers to investigate any additional recreational catch reports available, including those which provide numbers of animals caught, and conversion these to weight.	Dr Thomson and Dr Huveneers
9	5	Mr Macdonald to investigate the RAG suggestion that high risk species identified through ERA should go to expert reference groups (e.g. AAD, Commonwealth Marine Mammal Working Group, IUCN shark reference group etc.) for consideration.	Mr Macdonald
10	5	Dr Huveneers and Dr Sporcic to work through the gillnet ERA results for sharks out of session.	Dr Huveneers and Dr Sporcic
11	5	ERA working group to consider whether the 'hard to assess' species should be considered in level 2 ERA analysis noting the tiered assessments are no longer considered reliable for these species.	ERA working group
12	6	Refer consideration of collecting discard estimates and length measurements from electronic monitoring for school and gummy shark to the SESSFRAG data strategy workshop in February.	SESSFRAG

Signed (Chairperson):
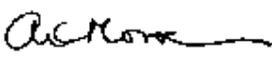
Date: 24 Feb 2019

Attachments

Attachment A: SharkRAG 4 2018 final agenda
Attachment B: Declarations of interest
Attachment C: Action item status
Attachment D: School shark species summary

SharkRAG 4

Agenda – 3-4 December 2018

Vue Grand Queenscliff

Day 1: 11:00am – 5:00pm

1	**Preliminaries**		**11:00 am**
1.1	Welcome and apologies	Chair	Information
1.2	Declarations of interest	Chair	Action
1.3	Acceptance of agenda	Chair	Action
1.4	Adoption of SharkRAG 2 and 3 Minutes	RAG	Action
1.5	Status of actions arising	AFMA	Action
2	**Updates**		
2.1	Management update (Management staffing, RAG memberships)	AFMA	Information
2.2	Industry update	Industry	Information
2.3	ABARES update	ABARES	Information
	Lunch		**12:30pm**
3	**Monitoring and data update**		
3.1	Industry data collection project update	Mr Bromley	Information
3.2	Updated CPUE standardisations	CSIRO	Discussion
4	**School shark**		
4.1	School shark assessment - Close kin assessment model - Changes since last meeting - Forward projections - RBC recommendation	CSIRO	Discussion
	Afternoon tea		**3:00pm**
	School shark assessment continued	CSIRO	
	Meeting close		**5:00 pm**

Day 2: 8:30am – 3:30pm

	Meeting open			**8:30am**
4	**School shark continued**			
4.1	School shark assessment continued (if required)	CSIRO		
4.2	School shark ongoing sampling regime	CSIRO		
4.3	School shark rebuilding strategy annual review	AFMA		
4.4	School shark Industry paper	Mr Castle		
	Morning tea			**10:30am**
5	**Species Summaries**			
5.1	Update species summaries (School, Gummy, Ele, Saw)	AFMA		
6	**Ecological Risk Assessment**			
6.1	Gillnet – Ecological Risk Assessment	AFMA	Discussion	
	Lunch			**12:30pm**
7	**Research**			
7.1	2020-21 GHAT research priorities	All		
8	**Other business and close of meeting**	Chair		**3:00 pm**
8.1	Review of meetings actions, next meeting and close	EO		
	Meeting close			**3:30 pm**

Member	Interest declared
Sandy Morison	Director of Morison Aquatic Sciences. Chair of SharkRAG, SERAG and the Tropical Rock Lobster Working Group. Scientific member on SEMAC. Contracted by government departments, non-government agencies and companies for a range of fishery related matters including research and (by SCS Global Services) for MSC assessments of AFMA managed and other Australian and international fisheries. No pecuniary or other interest in the SESSF.
Brendan Kelaher	Scallop Resource Assessment Group Chair and Scallop Management Advisory Committee member. No other interests declared.
Robin Thomson	CSIRO, Assessment scientist. Acquiring funding for research purposes. PI on data services contract and close kin project for school shark.
Charlie Huveneers	Senior lecturer and research scientist. Potential interest in funding for research. No pecuniary interest or otherwise.
Ian Knuckey * A full list of positions, current/recent project and funding, and current/recent clients was provided to the RAG in addition to these specific to SharkRAG	Director Fishwell Consulting Pty Ltd. Director – Olrac Australia (Electronic logbooks) Range of research interests and research projects in relation to South East fisheries particularly in the SESSF and GABTF. Involved in SESSF and GAB Fishery Independent Surveys. NPFRAG and TRLRAG Chair, Scientific member on NORMAC and GABRAG. Invited Participant of SEMAC and SERAG. Provides research advice to various industry associations, including Atlantis Fisheries Consulting Group, SETFIA, GABIA and SSIA.
David Stone	Executive Officer for Sustainable Shark Fishing Industry Assn. Declared interests in representing hook and gillnet industry member interests and in pursuing research for dolphin acoustic mitigation technology, and has a proposal to FRDC seeking funding. SESSFRAG observer. Declared interest in RBCs.
Leigh Castle	Tasmanian shark hook, scalefish hook and tuna minor line fisher. Owns SESSF quota and vessel statutory fishing rights. Has a declared interest in shark hook interests and RBC recommendations.
Kyri Toumazos	South Australia/Bass Strait shark fisher, boats fishing with hooks and gillnets. SESSF quota holder. Southern Rock Lobster Board CEO. Declared interests in RBCs.
Anissa Lawrence	Independent consultant. Director of TierraMar consulting. Conservation member on SEMAC. Undertakes contracts for a number of Conservation NGOs, government departments, non-government agencies on a range of fishery related matters. Provides environmental advice to industry associations. No pecuniary interest. President of the SEA LIFE Trust (ANZ). Director of FISHI International.
Robert Curtotti	ABARES. No interests, pecuniary or otherwise.
Brodie Macdonald	AFMA member. No interest pecuniary or otherwise.

Ryan Keightley	AFMA EO. No interest pecuniary or otherwise.
Invited Participant	**Interest declared**
Miriana Sporcic	CSIRO, Assessment scientist. A general interest in acquiring funding for research purposes. No interest, pecuniary or otherwise.
Observers	**Interest declared**
James Woodhams	ABARES. Potential interest in funding for research. No interests, pecuniary or otherwise.
Ross Bromley	Undertakes contracts as an independent consultant for Southern Shark Industry Alliance and Girella Fisheries consulting. A maybe general industry interests.
Ms Belinda Norris	AFMA management team. No interest pecuniary or otherwise.

Agenda item 1.4   Actions arising

Purpose: To inform the RAG of the action taken with respect to business arising from previous SharkRAG meetings.

• Complete/Redundant	• Underway	• Yet to start	• Need SESSFRAG advice

Meeting & agenda item reference	No.	Description	Responsibility	Timeframe	Status
SharkRAG 2 2016	1	For the next gummy shark assessment, the assessment scientist to investigate estimating selectivity separately for the three regional stocks and allowing it to be flexible in form. This may allow the differing availability function to be removed from the assessment.	CSIRO Assessment Scientist	In time for the next stock assessment.	To be actioned for the next stock assessment.
SharkRAG 2 2016	2	For the next gummy shark assessment, SharkRAG to review how density dependence is incorporated in the model including in the context of the paper 'Population biology and dynamics of the gummy harvested off southern Australia' (Walker 2010).	CSIRO Assessment Scientist, SharkRAG	In time for the next stock assessment.	To be actioned for the next stock assessment.
SharkRAG 2 2016	3	The School Shark Rebuilding Strategy to be updated to reflect research showing there is some genetic connectivity between Australian and New Zealand school shark stocks.	AFMA	2019	AFMA will update the School Shark Rebuilding Strategy following the results of the Close Kin Project and subsequent stock assessment. The RAG noted that close kin has indicated that there isn't enough connectivity between Australian and New Zealand school shark to justify joint management,

					which conflicts theSebastian *et al* paper. This should be reflected in the strategy.
GHAT Data Working Group March 2017	2	Robin Thomson to investigate the statistical implications of conducting biennial collection of biological data for the GHAT (subject to funding).	Robin Thomson	TBC	Potentially a reasonably large simulation study/MSE and may require funding. The RAG suggested this is a broader question for the SESSF and should be considered at the February 2019 SESSFRAG meetings.
SharkRAG 1 2017	2	AFMA, in consultation with Dr Knuckey and CSIRO, to find a more appropriate location for the released alive field outside of the discard code section of logbooks so that the discard reason is recorded separately from the condition of any discarded fish. AFMA to also ensure that this additional field is transferred to CSIRO with all other logbook data.	AFMA Member	2019	AFMA are currently reviewing its e-log program and back end infrastructure with a view to update and simplify the system, and will consult broadly in early 2019 on any changes.
SharkRAG 1 2018	3	AFMA to investigate removing elephant fish as a quota species in the SESSF	AFMA	TBC	To be considered as part of the SESSF Harvest Strategy review.
SharkRAG 2 2018	1	Dr Thomson to liaise with Dr Braccini to investigate the availability of further vertebrate samples taken during surveys	Dr Thomson/ Dr Braccini/FAS	TBC	Fish Ageing Services noted the survey data isn't with them (likely with CSIRO), but Robin hasn't been able to find the database, and is having issues with versions of Microsoft Access. It was noted that if they are with CSIRO, the samples may have already been investigated for use in close kin and may have been rotten and unusable.
SharkRAG 3 2018	1	AFMA to update the action items list with a 'traffic light' system for future meetings.	Mr Keightley	December 2018 meeting	Complete.

1.4					
SharkRAG 3 2018 3.1	2	Mr Macdonald to distribute the membership of the Commonwealth Marine Mammal Working Group to the RAG for information.	Mr Macdonald	December 2018 meeting	The current CMMWG membership comprises: • Mr Bill Talbot (Independent Chair) • Dr Karen Evans (Scientific/Mitigation member) • Dr John Wakeford (Scientific/Mitigation member) • Dr Simon Goldsworthy (Scientific/Mitigation member) • Mr Richard Wells (Industry member) • Mr Rhys Arangio (Industry member) • Mr Gerry Geen (Industry member) • Dr Julian Pepperell (Recreational / charter fishing scientific member) • Ms Alexia Wellbelove (Conservation member) • Mr Tony Harman (Department of Agriculture and Water Resources) • Mr Phil Ravanello (AFMA) • Dr Mike Double (Department of Environment)
SharkRAG 3 2018 3.1	3	SESSFRAG to review the appropriateness of how and where data such as State, recreational, aging and FIS data are collated and stored, and provide recommendations on the future collection and storage of these data.	AFMA	2019	AFMA have undertaken an audit on where this information is currently collected and held: • State: held be CSIRO and generally not authorised to be given to AFMA. What is available is included in the Catch and Discards report. • Recreational: CSIRO have included available information in the Catch and Discards report.

					• Ageing: included in Fish Ageing Services report and sent to CSIRO each year • FIS: All data (including biologicals) sent to AFMA after each survey and are recorded in AFMA databases. Note that SMARP includes recommendations on data collection and storage and these are being addressed in various streams, including AFMAs ICT plan. SESSFRAG advice not required. The RAG noted this, however had concerns over many different projects running concurrently regarding this information and uncertainty in whether this data is actually collected and stored. Recommend this still be discussed by SESSFRAG.
SharkRAG 3 2018 3.1	4	AFMA provide the RAG with a summary of the e-fish project.	AFMA	When available	AFMA will provide a summary when available.
SharkRAG 3 2018 3.2.1	5	AFMA to update the 'Monitoring Paper' to include collection against targets for the current year, break down observer trips by quarter and also include information on other data collected by observers (e.g. seabird observations etc.).	AFMA Observer coordinator	December 2018 meeting	AFMA observers collect fishery data on the following: • Specific vessel Details • Specific fishing gear details • Compliance with MARPOL and other pollution data • Vessel hospitality toward observers • A log of all vessel activities and positions for the trip • Wildlife abundance data • Wildlife interaction data

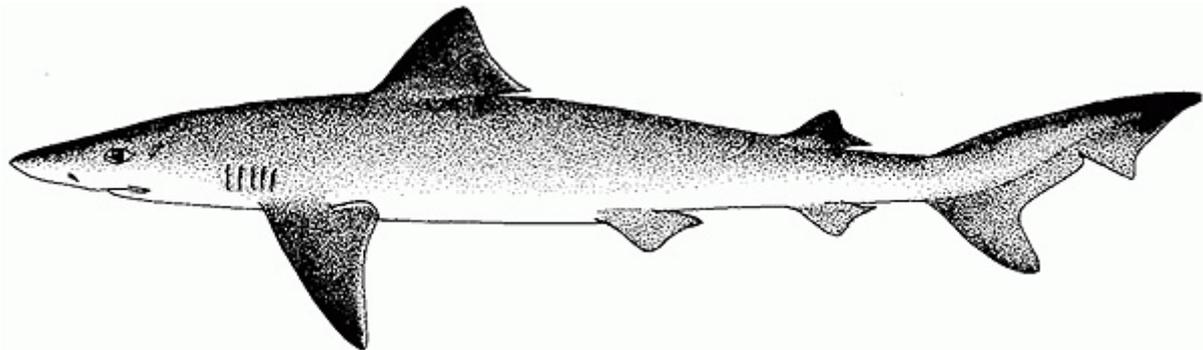|						
						• Specific details about each shot (position, depth, substrate, shot outcome etc) • Catch composition for each shot • Biological data on sampled catch individuals including length frequencies and otoliths/vertebrae The monitoring paper is at Attachment A.
SharkRAG 3 2018 3.3		6	AFMA to confirm whether skipper/authorised agent details are punched into the logbook database, and if so, whether this is/can be provided to CSIRO for CPUE standardization purposes.	Mr Keightley	December 2018 meeting	John Garvey has confirmed that this information is punched and available in the logbook database as 'AUTHORISED REPRESENTATIVE' and 'AUTHORISED_REP_YEARS_EXP'.
SharkRAG 3 2018		7	AFMA scrutinise depth of gillnet catch of South Australian Gummy Shark in 2016 and 2017 as there is potentially and operator reporting in fathoms instead of meters.	Mr Macdonald	December 2018 meeting	All records of gummy shark caught by gillnet in South Australia for 2016-2018 have been reported in depths <156 meters.
SharkRAG 3 2018		8	AFMA to send letter to Industry Associations for distribution to their members explaining the importance of recording accurately in logbooks, including gear information (net length/no. hooks).	Mr Macdonald	December 2018 meeting	In progress.
SharkRAG 3 2018		9	Dr Sporcic to update the CPUE Standardizations report as follows: • Add gear type and zone (e.g. ESA, WSA etc.) to table captions.	Dr Sporcic	December 2018 meeting	To be presented at December meeting.

			• Investigate the peaks in larger catch for Tas gummy shark data in 2016-17. • Investigate data for the large spikes of catches in shallow depths (10-20m) throughout the 2000's for Tas gummy shark. • Update CPUE graphs to state they are natural log.			
	SharkRAG 3 2018	10	Dr Thomson to consider including trawl and Danish seine CPUE as a sensitivity in the next gummy shark stock assessment.	Dr Thomson	In time for the next stock assessment.	In time for the next stock assessment.
	SharkRAG 3 2018	11	Dr Thomson to undertake forward, constant catch and constant exploitation rate projections, with zero catch as a baseline for school shark.	Dr Thomson	December 2018 meeting	To be presented at December meeting.
	SharkRAG 3 2018	12	Dr Thomson to: • update the close kin model paper to include error bars and include gummy shark numbers from the gummy base case on the base case figure. • plot tag recaptures and close kin data by depth looking for separation of stocks by depth (earlier catches were taken by line in deeper water). Plot F by fleet.	Dr Thomson	December 2018 meeting	To be presented at December meeting.

SharkRAG 3 2018	13	Dr Thomson to provide a school shark sampling regime for the December meeting with advice on: • How many samples we need and how often • What cost • What is the best size range to collect • Where samples should come from, and whether we should target areas (e.g. Western Australia, western Tasmania) • What will we be able to conclude (especially regarding trend and CV) How often we need to update the close kin model to give us point estimates.	Dr Thomson	December 2018 meeting	To be presented at December meeting.
SharkRAG 3 2018	14	Dr Knuckey to provide AFMA and CSIRO length frequency data from the electronic monitoring project to supplement the data available.	Dr Knuckey	2018	The data has been provided to AFMA and is being incorporated into the Observer database.
SharkRAG 3 2018	15	Mr Macdonald to liaise with AAP to ensure they are using the same species list/codes as those used by fishers in e-logs.	Mr Macdonald	December 2018 meeting	To be discussed at monthly meeting with AAP on Wednesday 5 December.
SharkRAG 3 2018	16	RAG members to provide feedback to Dr Emery on his work '*Measuring congruence between electronic monitoring and logbook data in*	SharkRAG	By December 2018 meeting	

		Australian Commonwealth longline and gillnet fisheries'.			
SharkRAG 3 2018	17	Dr Thomson to liaise with Dr Koopman to get the EM data analysis code for incorporating into the existing discard estimation process.	Dr Thomson	Before SESSFRAG February 2019	Dr Thomson to provide update at meeting.
SharkRAG 3 2018	18	AFMA to develop proposal to do cross comparisons between EM retained length and Industry collected lengths for verification and cost.	Mr Macdonald	2019	AFMA to prepare paper for SESSFRAG data strategy meeting in February 2019.
SharkRAG 3 2018	19	AFMA to provide the TAC recommendations paper and TAC calculation spreadsheet to RAG members and invited participants for information each year.	Mr Macdonald	December each year	The SESSF TAC recommendations paper is sent in late December each year. AFMA EO's will distribute this to RAG members and invited participants.
SharkRAG 3 2018	20	AFMA to remind operators with EM to ensure they discard in view of cameras.	Mr Macdonald	2019	AFMA will provide include this with SharkRAG 3 2018 action item 8.

1. School Shark (Galeorhinus galeus)

Line drawing – FAO

Under a stock rebuilding strategy.

Summary	
Stock Structure	The close kin assessment model considers only one region, one population, starts in 2000 and does not allow (or need to take account of) movement between regions (because there is only one region).
	The previous stock assessment model included two biological stocks in the model but hypothesized that more than two stocks were likely present. It is possible that there are reproductively separate populations that have separate spatial distributions or movement patterns (while at the same time intermingling on the fishing grounds throughout the range). Movement to and from NZ is also known to occur but results of the close kin work indicated that the level of connectivity between Australian and New Zealand stocks is sufficiently low to justify separate management of these stocks. This movement also does adversely impact the close kin estimate of recent absolute abundance, where that is defined as the abundance of sharks that are available on the fishing grounds.

Stock status against reference points and trend	The CK model provides an estimate of current absolute abundance with trend back to 2000. It does not provide an estimate of depletion from Bo. The base case model shows a population that is relatively small compared with that estimated by the previous stock assessment model. However the model is inconsistent with the catches taken during the 1990s which brings into question whether or not the stock from which the close kin sample was taken is different from the stock that sustained catches prior to 2000. That is, the stock being assessed may have been a different and smaller stock than the stock that was historically fished and the school shark population may include differentially depleted stocks It is also possible that there has been a shift in productivity of the school shark stock. Any future consideration of B0 and associated reference points will need to take these into account.

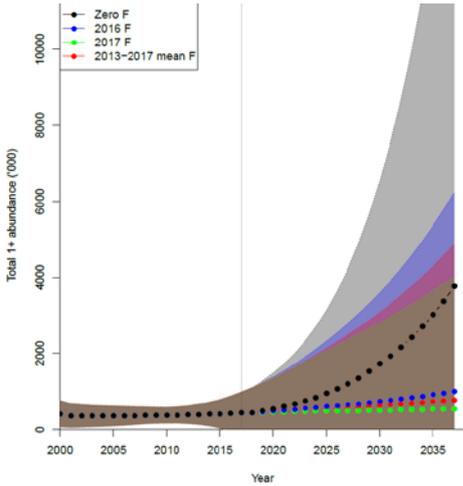|			
ABARES most recent assessment (2018)	**Biomass** Overfished	**Fishing Mortality** Uncertain	
GVP Figures (2016-17 season)	**GVP** TBC	**% Fishery GVP** TBC	
Is a MYTAC in place this season?	No	**Have breakout rules been triggered?**	N/A

Assessment Summary	
Tier Level	Tier 1 (close-kin assessment model)
Stock indicator trends	The CK model indicates that the stock had recovered slightly during the period from 2000 to 2017.

Key model technical assumptions/ parameters	Age structured population dynamics model, with close-kin mark recapture used as the primary indicator of abundance, and a data series that starts in 2000.

One region and one population,.

State catches and discards included (trawl discards applied for 2016 and 2017 due to missing data).

Five fleets (combined trawl and line, 6, 6.5, 7 & 8 inch mesh nets).

Dome-shaped gear selectivity for gillnets and knife edged for combined trawl and line.

Calculated weight-at-age and selectivity-at-age from weight at length and selectivity at length, within the model by integrating over length at age; based on probable lengths at age+0.5 (i.e. length in the middle of the year), for consistency with the stock assessments.

Female fecundity parameters based on Walker (2005) (linear relationship between number of pups per female for younger animals to 30 for the largest animals). Equal fecundity from age 8 for males.

Non zero selectivty for fish age 15 and over. |
| **Significant changes to data inputs** | Inclusion of data from close kin mark recapture research as the primary indicator of abundance.

The following inputs that were used in the previos assessment have been excluded from the assessment

- catches from NSW, western South Australia and further west
- trawl CPUE
- animals with more than 11 deposition zones (i.e. born before the year 2000)
- length frequencies from 2003-2004
- kin comparisons where the nominal difference in birth year was between 0 and 4 years
- tag-recpature data |

RAG Comments on data	The RAG also considered the available information on recreational catch, and noted the South Australian estimate of school shark recreational catch from 2014 was 54 tonnes. The RAG noted that this level of catch (even if uncertain) is significant. The RAG noted that the model does not cope well with including standardized trawl CPUE as it assumes a huge hidden biomass of mature fish that it cannot account for and is not consistent with fit to the length frequencies. Further, the use of CPUE in the model adversely affects the fit to the maternal half sibling pairs (MHSPs) (12.7 expected versus 29 observed), which are likely to be the most reliable and informative data available. The model uses gillnet ISMP discard rates from 2010-15, while trawl discard rates are applied for 2016 and 2017 due to the absence of observer data following the introduction of e-monitoring in the fishery. The RAG recommended utilising discard rates determined from electronic monitoring data in future years. All discards are currently considered as mortalities, and the RAG recommended that further work be undertaken on post capture mortality to inform the model in future.
RAG Comments on assessment	Using the average fishery mortality rates over the last five years (2013-17 mean F, red line in Figure 3 below), the projected level of fishing mortality provides for consistent recovery. In contrast, projections using the 2017 fishing mortality rate (green line in figures above) would lead to an initial reduction (first two years) in stock size before recovery due to the effect of age class inputs in the model. The RAG accepted the close kin assessment model noting high confidence in the absolute estimate of abundance produced by the model, and lower confidence in the estimates of trend at this stage. The RAG noted that confidence in trend will be gradually refined over time with continued close kin sampling and analysis.

Projected Biomass (with confidence intervals)	**Figure 1. Projected 1+ abundance with confidence intervals** The model shows a population that is relatively small compared with that estimated by the previous stock assessment model. However the model is inconsistent with the catches taken during the 1990s which brings into question whether or not the stock from which the close kin sample was taken is different from the stock that sustained catches prior to 2000. This was also an issue with the previous base case assessment model, which used complex stock structure assumptions to account for the large catches. Considering this, the RAG theorised that the stock being assessed through close kin currently may be a different and smaller stock than that which was historically fished.

RAG Recommendations		
Recommended Biological Catch	2019-20 - 256 t 2020-21 – 263 t 2021-22 – 270 t	No undercatch or overcatch as school shark is a rebuilding species
Is a MYTAC recommended for future seasons? *Indicate whether the multi-year recommendation is a RBC (e.g. based on Tier 1 model output) or TAC (e.g. a rollover of catch)*	The RAG recommended setting an incidental catch TAC for three years based on projections using the average fishery mortality rates over the last five years (2013-17 mean F, red line in figures above). This rate, taking into account increasing stock size due to rebuilding, gives total fishing mortality estimates of 256 t in 2019-20, 263 t in 2020-21 and 270 t in 2021-22.	

| Probability of RBC (or other levels of catch) causing a decline below limit reference under proposed management *Species that follow a HS rule that has been MSE tested will have a "very unlikely" score in this section (i.e. P<10%).* | Uncertain. The RAG noted that the CVs for the increasing trend in mature abundance are too high to allow confidence in the trend.

However, at the RAG recommended fishing mortality provides for consistent recovery, whereas projections using the 2017 fishing mortality rate (green line in figures above) would lead to an initial reduction (first two years) in stock size before recovery due to the effect of age class inputs in the model.

The appropriate definition of the limit reference point is uncertain as the new assessment does not provide an estimate of unfished biomass, against which the current estimated biomass can be compared. |
|---|---|
| **Research Catch Allowance** *Included/Addition to TAC* | N/A |
| **Implications for companion species / TEPs / multi-species fisheries** | School shark is caught in association with gummy shark by gillnet and longline fishers and may be a choke species, limiting gummy shark catches, particularly in areas such as west Tasmania and South Australia where school shark may be difficult to avoid. |

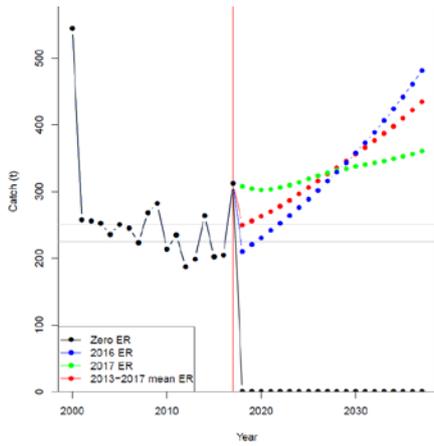| Catch and TAC						
Assessment Year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Tier / MYTAC	Rollover	Rollover	Rollover	Rollover	Rollover	Rollover
Stock Status	<B_{LIM}	<B_{LIM}	<B_{LIM}	<B_{LIM}	<B_{LIM}	<B_{LIM}
SESSF Season	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**	**2019/20**
RBC (t)	0	0	0	0	0	256
Agreed TAC	215	215	215	215	215	
TAC after Unders/Overs	215	215	215	215	215	
% TAC caught	90%	94%	84%	81%	96%	

Catch Trends

Figure 2: Actual catches (2000-2017) and projected catches (2018 onwards) using on a range of exploitation rates.

Figure 3. TAC and landings for school shark up to the 2017 calendar year