



Australian Government

Australian Fisheries Management Authority

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

SharkRAG 8 Meeting minutes

Date: 06 November 2020

Teleconference

Attendees

Name	Membership
Mr Sandy Morison	Chair
Dr Julian Morison	Economics Member
Dr Ian Knuckey	Scientific Member
Dr Charlie Huveneers	Scientific Member
Dr Robin Thomson	Scientific Member
Mr Jamie Papas	Industry Member
Mr Craig Harris	Industry Member
Dr Leonardo Guida	Conservation Member
Ms Natalie Couchman	AFMA Member
Mr Maxwell Bayly	Executive Officer
Ms Fiona Hill	AFMA Observer
Ms Miriana Sporcic	CSIRO Presenter
Mr Ross Bromley	Invited Participant
Mr James Woodhams	Invited Participant
Apologies	
Mr Kyriakos Toumazos	Industry Member
Mr Leigh Castle	Industry Member

Meeting Minutes

1. Preliminaries

1.1. Welcome and apologies

1. The Chair opened the meeting at 10:15 with an acknowledgement of country and welcomed attendees to the meeting. The Chair noted apologies from Mr Toumazos and Mr Castle.

1.2. Adoption of agenda

2. The RAG adopted the Agenda (Attachment A).

1.3. Declaration of interests

3. Declarations of interest were received from RAG members prior to the meeting (Attachment B). The Chair requested members disclose agenda items for which they may hold a conflict of interest. The AFMA member reminded RAG members that declared conflicts of interest are for both perceived and actual conflicts of interest. Requirements concerning the declarations of interest are outlined in section 4.1.3 of *Fisheries Administration Paper No. 12*. The following conflicts of interest were declared in relation to the Agenda Items to be considered at the meeting:
 - a) Industry Members noted conflicts of interest for Agenda Items 2 and 3;
 - b) The Conservation Member noted a perceived conflict of interest for Agenda Items 2 and 3;
 - c) Mr Bromley noted a conflict of interest with Agenda Items 2 and 3.
4. The remaining members decided that RAG members with conflicts of interests are able to be part of discussions but not take part in the formulation of advice.

1.4. Status of Action Items

5. The AFMA member introduced the Agenda Item, noting many action items would be addressed at Agenda Items 2 and 3. In the interest of time, the RAG requested updates be provided at the December 2020 meeting of SharkRAG.

2. Saw Shark Tier 4 Assessment

6. Dr Sporcic introduced the Agenda Item, noting the presentation will cover the sawshark CPUE standardization and preliminary data to be used in the sawshark Tier 4 .
7. Dr Sporcic presented the sawshark data from the Shark CPUE report, noting the following key points:
 - a) The Tier 4 for sawshark uses the standardised trawl CPUE series.
 - b) 56 tonnes were landed by 29 trawl vessels in 2019, which was the lowest number of vessels to land sawshark since 1995.
 - c) The depth distribution of effort had remained stable throughout the time series.
 - d) The length frequency distribution had remained stable throughout the time series.
 - e) There looks to be an increasing trend in the standardised trawl CPUE series in recent years.
 - f) Data between 1995 and 2001 was sourced solely from Great Australian Bight trawl logbook data.
 - g) Since 2002, data has been sourced from Catch Disposal Records (CDRs). It was noted the reference period (2002 – 2008) for the 2020 assessment will use CDR data.
 - h) Discard data was not available for the reference period and this had not been used in previous Tier 4 assessments.
8. Dr Sporcic sought advice from SERAG as to the use of the proportion of discards (Pdiscard) data in the Tier 4 stock assessment. Dr Sporcic noted that discards of sawshark are known to occur in the SESSF, but there are currently no values for the reference period used in the assessment. Dr Sporcic clarified that the pdiscard data is used in calculations for the total removals from the fishery. She further noted discard rates are used to adjust the CPUE time series.
9. Dr Sporcic requested SharkRAG advice concerning whether or not pdiscard data should be included in the assessment and if so how missing discard data should be estimated.
10. The RAG discussed the following key points:
 - a) The RAG suggested the pdiscard values for 2009 - 10 are likely to be collected solely from trawl vessels. She noted that non-trawl vessels were not sampled for discards until 2010. The RAG requested Dr Sporcic check the 2009 value in the discard report.
 - b) The RAG noted that the Tier 4 uses trawl CPUE only, however the pdiscard data presented is representative of all methods combined.
 - c) Some RAG members noted the high levels of variation in the pdiscard values and suggested that back filling may not provide the most accurate values for years where discard data does not exist.

- d) The RAG noted that the pdiscards values would differ significantly between trawl and non-trawl methods. Industry members suggested there are high levels of discard for sawshark caught in the gillnet sector due to carcass damage.
- e) The RAG noted that if an assumption was made that there were no discards of sawshark for years with no available discard data, the total catch would be underestimated for that period.
- f) The RAG noted discard rates may vary due to observation error.
- g) The RAG questioned if the reference period could be shifted to a range where more reliable discard information is available. It was noted that the reference period had previously been considered and decided by the RAG and there was no clear justification for this to be revisited for this assessment.

11. SharkRAG recommended, consistent with the approach adopted by SERAG for other Tier 4 stocks, the following:

- a) Pdiscard values should be estimated for years where no data exists (inclusive of 2002 – 2008, the reference period);**
- b) These pdiscard values should be estimated by calculating the average value for years where data exists for this parameter;**
- c) The average pdiscard value should not include values which were forward filled from previous years (i.e. 2010, 2015 and 2019);**
- d) The 2009 pdiscard value is only to be used in calculating the average, subject to the following**
 - i. If the 2009 discard proportion estimate is for trawl only it will not be included in the calculation of an average discard estimate as it will not match the rest of the series**

12. The RAG noted that the justification for the reference period should be included in the final Tier 4 report.

13. Dr Sporcic presented updated catch data of sawshark in NSW, covering historical catch in NSW from 1995 – 2019.

14. The RAG sought clarification of the reason for the changes made to historical catches. Dr Sporcic advised that NSW maintains two data bases. One of the databases is data reported in logbooks by industry and the other database reflects data that undergoes adjustments.

15. The RAG noted the following:

- a) There are small differences in the new data when compared to the old data for the catch of sawshark from 1998 – 2009 (<6 tonnes) and very small differences between the new and old data (<1.6 tonnes) for 2010 – 2019.
- b) There were previously no estimates of catch for 1995/96 however these estimates are now available.
- c) The new data for 1997 has a difference of 15 tonnes.

16. Dr Sporcic noted that there are potential errors in the data prior to 2000, the errors being i) Potential double reporting of NSW and Commonwealth Catch , and ii) potential mis-reporting of Commonwealth catch as NSW catch.

17. Dr Sporcic requested RAG advice on which data to use in the assessment, noting NSW have suggested stock assessments use the updated data series.

- 18. The RAG recommended that the old data source be used until clarification concerning the identified data issues is received.**
19. The RAG questioned the reasoning for a low TAC in 2010 and 2011. The AFMA member agreed to clarify this at the December meeting.

Action Item 1 - Dr Sporcic to check if the 2009 discard estimate for sawshark is from trawl only or multiple methods.

Action Item 2 – Dr Sporcic to check if it is possible to get discard data for trawl vessels only.

Action Item 3 – Dr Sporcic to include the justification for the reference period for sawshark in the final Tier 4 report.

Action Item 4 - Dr Sporcic to use the old State catch values in the sawshark Tier 4 unless the issues concerning the NSW State catch data are resolved.

Action Item 5 - CSIRO to check with NSW concerning the double count issues and report to SharkRAG.

Action Item 6 – AFMA to examine justification for low sawshark TACs in 2009 and 2010.

3. Gummy Shark Base Case Model

20. Dr Thomson introduced the Agenda Item noting the purpose is for the RAG to advise on a final base case model for the 2020 Tier 1 assessment for gummy shark.
21. Dr Thomson provided an overview of the Tier 1 gummy shark assessment model, noting the following:
- a) The gummy shark Tier 1 assessment model is similar to that developed for other Tier 1 species in the SESSF (noting it is constructed in a different modelling package).
 - b) The model models three distinct gummy shark stocks (Bass Strait, Tasmania, South Australia), however, the stock boundaries are arbitrary.
 - c) The model uses commercial CPUE data as an index of abundance and is informed by previous tagging work.
 - d) For the gillnet method a linear relationship is not assumed between catch and abundance, an effort saturation factor is included in the model.
22. Dr Thomson noted the CPUE time series for the three gillnet fleets (per state) are composite time series:
- a) Previous models used a standardised gillnet CPUE series using data from a subset of vessels which SharkRAG had identified as dedicated shark vessels (the old series). The last assessment to use this approach was in 2014.
 - b) For the 2016 stock assessment, a standardised gillnet CPUE series was created from all vessels in the fleet (the new series). Dr Thomson noted shots yielding less than 30 kg of gummy shark were excluded from the new series in the standardisation process. The time series was made to have

same average overlap period (1997-2012), then the old series to 1997 was used to re-scale the new series after that.

23. The RAG discussed the implications of removing shots that have less than 30 kg of gummy shark from the CPUE series. Industry members noted it was not uncommon to have a shot of less than 30 kg of gummy shark.
 - a) Dr Sporcic noted that removing shots that have less than 30 kg of gummy shark reduces some of the noise in the CPUE series. She further noted this is a common approach used to standardise CPUE time series for SESSF species.¹
24. The RAG suggested that the inclusion of all shots that capture gummy shark in the CPUE series be investigated for the next gummy shark Tier 1 assessment.
25. Dr Thomson presented graphs illustrating the effects of gear saturation on the CPUE for gummy shark.
 - a) The RAG noted an increase in gear saturation will reduce the predicted CPUE value i.e. more overall effort in the fishery reduces CPUE.
 - b) The RAG further noted that a change in density dependence from 0 – 0.5 has greater effect on CPUE than a change in density dependence from 25 – 50.
26. Dr Thomson explained the density dependence factor included in the model. She noted each of the three stocks have a density dependence factor so the when abundance drops (e.g. due to fishing or natural mortality) the stock is able to recover.
27. Dr Thomson noted density can be measured through how many sharks there are aged one and over or how many mature sharks are in the stock.
28. Dr Thomson summarised previous approaches to the inclusion of density dependence in gummy shark stock assessments:
 - a) The 2005 report (Pribac et al, 2005) notes that when density dependence is modelled only on pups it leads to unrealistic oscillatory behaviour in pup production trajectory.
 - b) The 2010 report (Walker et al, 2010) notes that the mortality of sharks of all ages is likely to be affected by density dependence
 - i. It is also likely to be a function of all biomass, not just mature biomass
 - ii. the 2010 assessment model was run with varying density dependence scenarios which were averaged to provide a RBC
 - c) Since the 2013 assessment there has only been one base case model which gives a result close to the average
 - d) In the 2016 assessment report it was noted that models that varied the natural mortality on a more narrow range of ages (i.e. just the younger animals) fitted the data better. Dr Thomson noted however that these look to be the more unstable models, showing larger oscillations in future projections.
29. The RAG discussed the following key points concerning density dependence:

¹ Dr Sporcic provided clarification out of session that catches < 30 kg are not removed during CPUE analysis

- a) The RAG noted the only scientific evidence available is from Walker et. al. (2010) which suggests density dependence affects all age groups not just juveniles. The RAG noted that density dependence is very difficult to estimate, noting the suggestion from Walker et. Al. (2010) that if density dependence effects are occurring, they are likely being masked by other factors.
 - b) The RAG noted scientific literature of other shark species suggests that the most likely life stages to be affected by density dependence is the juvenile stage.
 - c) The RAG noted that while the density dependence factor for 0-2 year olds fit the data best, based on Walker et. al. (2010), the model should use a density dependence factor that affects a broader range of age groups (e.g. 0-30 or 0-15).
 - i. Dr Thomson noted that the model fits the data best when density dependence affects the natural mortality of the 0-2 years old age bracket, however advised that she was yet to examine the model to determine why.
30. Dr Thomson noted the inclusion of age data in the stock assessment model. She highlighted that Fish Aging Services recently finished aging six more years of data not previously included in the modelling.
31. Dr Thomson explained there are two approaches to collecting age data:
- a) Randomly, which requires a larger sample size, likely to undersample cohorts at either end of the age curve, inefficient.
 - b) The approach used by the ISMP program to sample across the entire age curve, including at each tail end (i.e. very small and very large animals) to get improved information on the less often caught individuals.
32. Dr Thomson further explained there are two methods of incorporating age data into the model:
- a) Age composition - use an age length key multiplied by length frequencies which gives an age composition. Dr Thomson noted that this is how SharkRAG has previously utilised age data.
 - b) Conditional age at length - use the model to fit the data using a growth curve fitted to the selectivity of the gear. This is the modern method.
33. Dr Thomson noted in the 2016 assessment there were four years of age data (1995, 1997, 2002 and 2003) that were not used in previous assessments. She further noted that she was unable to apply the conditional age at length method to some of the data as sample by sample age-length information was not collected.
34. The RAG sought clarification as to whether conditional age at length is more robust for data that was sampled completely at random. Dr Thomson confirmed that it would be a robust method in this situation.
35. Dr Thomson presented graphs illustrating the relationship between age and length incorporating the new age data. Dr Thomson noted the following key points:
- a) The collected length data for females is lower than the models predict for older females.
 - b) The growth curve does not fit well for the older larger males.
 - c) Data for animals aged 10+ is combined and treated as a single age group.
 - d) The growth curves are different to previous growth curves and suggested that the method for measuring shark length may have changed.

36. The RAG discussed the following key points concerning the presented age data:
- a) The male growth curve does not fit well to the data for older animals, but noting this may not be a big issue as not many large animals are being caught. The fit of the model for females between 75 cm – 150 cm is also poor, noting this group represents a majority of retained catch in the fishery.
 - b) The RAG noted a lack of data for individuals in the 10 + age group however further noted that data for this age group is likely to increase if gear shifts towards hook methods. For this reason, the RAG suggested the growth curves to be revisited for the next assessment in 2023.
 - c) The RAG suggested if the growth curve was to be recreated, effort should be put towards investigating variability in growth rate between regions and over time and ensure that selectivity and availability are correctly represented as well.
37. Dr Thomson presented bridging analysis results noting the following key points:
- a) analysis was started with the 2016 base case model with updated data sets added one set at a time to assess the extent of the change each contributed to the estimates of pup depletion.
 - b) the additional data resulted in changes to pup depletion estimates in the late 1990s, however pup depletion remain similar in 2019 (except in Bass Strait).
 - c) The model assumes higher gear competition in Bass Strait compared to South Australia.
 - d) Gear competition in Tasmania is estimated to be zero in the model.
38. The RAG agreed that the next stock assessment should have a gear saturation factor that also considers the effects of longline effort.
39. Dr Thomson presented the results of the sensitivities that were run. The RAG discussed the following key points:
- a) The RAG noted the sensitivities presented are the same as the sensitivities run for the 2016 base case model.
 - b) The RAG noted the 2016 base case model used a fixed selectivity value (i.e. selectivity was not estimated within the model). In 2016, SharkRAG requested the selectivity value for gillnets be estimated within the model. The improvement to the model fit was not large enough to justify inclusion of this as an additional parameter.
- The RAG noted that the density dependence sensitivities resulted in significant changes to pup depletion for the Bass Strait (lower) and South Australian (higher) stocks. Dr Thomson noted exploration of the data is needed to explain why. The RAG recommended this work be undertaken.
- c) The RAG noted the outputs of the model do not appear to be significantly affected by the way data is weighted in the model. The RAG recommended the method of data weighting in the gummy shark Tier 1 model be examined for future assessments.
40. Dr Thomson noted that she examined data for the Danish Seine fleet and suggested it can be included in the next assessment due 2023.
41. The RAG discussed how density dependence would be included in the model:
- a) The RAG noted a change from the 2016 base case (density dependence effects animals aged 0 – 30 B1+) must be able to be clearly justified.

- b) The RAG noted there was not a clear option to change the density dependence parameter from the 2016 Base Case model.

42. The RAG recommended retaining the density dependence parameter used in the 2016 base case model in the 2020 base case model.

43. The RAG requested Dr Thomson produce confidence intervals around the projections

44. The RAG requested the following projections be completed for the December 2020 meeting of SharkRAG:

- a) *long term RBC*
- b) *annual RBCs*
- c) *5 year average over recent RBCs*
- d) *3 year average over recent RBCs*

45. The RAG agreed to discuss future work to be done before the next assessment (in 2023) at the December meeting of SharkRAG.

Action Item 7 - The RAG suggested that the inclusion of all shots that capture gummy shark in the CPUE series be investigated for the next gummy shark Tier 1 Assessment

Action Item 8 - The RAG agreed that the next stock assessment should have a gear saturation factor that also considers the effects of longline effort.

Action Item 9 – CSIRO to investigate why significant changes to pup depletion are occurring in the models where density dependence is affected by 0-2 and 0-4 year olds.

Action Item 10 – SharkRAG to discuss the method of data weighting in the gummy shark Tier 1 model be examined for the next gummy shark assessment in 2023

Action Item 11 - Dr Thomson to include a Danish Seine fleet in the next gummy shark assessment in 2023

Action Item 12 – Dr Thomson to produce confidence intervals around the following projections for the next meeting of SharkRAG

- long term RBC
- annual RBCs
- 5 year average over recent RBCs
- 3 year average over recent RBCs

Action Item 13 – SharkRAG to discuss future work to be completed before the next gummy shark assessment

46. Other Business

47. The Chair invited RAG members and participants to discuss any further business. The RAG noted no further items to discuss.

48. Dates for next meeting

49. The Executive Officer noted the next meeting will be held 03 – 04 December 2020.

Signed (Chairperson):

Date:

References

Pribac, Fred & Punt, André & Taylor, B & Walker, Terence. (2005). Using Length, Age and Tagging Data in a Stock Assessment of a Length Selective Fishery for Gummy Shark (*Mustelus antarcticus*). Journal of Northwest Atlantic Fishery Science. 37. 267-290. 10.2960/J.v35.m521.

Walker, T. I. (2010). Population biology and dynamics of the gummy shark (*Mustelus antarcticus*) harvested off southern Australia. PhD thesis, Science - Zoology, The University of Melbourne.

Moulton PL , Walker TI Saddler SR (1992) Age and growth studies of Gummy Shark, *Mustelus antarcticus* Gunther, and School Shark, *Galeorhinus galeus* (Linnaeus), from Souther Australian Waters. Marine and Freshwater Research 43, 1241-1267.

Attachments

SharkRAG 8 Agenda

06 November 2020 10:00 AM – 2:15 PM AEDT

Agenda item	Purpose	Paper / presentation	Time (AEDT)
Acknowledgement of country		Chair	Open
1. Preliminaries			
1.1 Welcome and apologies	For information	Chair	5 mins
1.2 Adoption of agenda	For action	Chair	5 mins

1.3 Declarations of interest	For action	Chair	30 mins
1.4 Status of action items	For information	AFMA	15 mins
2. Saw Shark Tier 4 Assessment	For advice	Dr Sporcic	15 mins
3. Gummy Shark Base Case Model	For advice	Dr Thomson	2 hr 30
4. Other Business	For discussion	Chair	15 mins
5. Dates for Next Meeting	For noting	Chair	5 mins