Australian Government
Australian Fisheries Management Authority

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

Data Meeting 2021

Meeting minutes

Date: 24-26 August 2021

via teleconference

Contents

Preliminary session (declarations of interests – member discussion)

1. The preliminary session commenced at 1300 (Australian Eastern Daylight Time (AEDT)) with: Cathy Dichmont, Cathy Bulman, Fiona Hill, Sarah Jennings, Lance Lloyd, Sandy Morison, Mike Steer, Daniel Corrie, Sally Weekes and Cate Coddington.

2. The RAG discussed potential conflicts of interest and participation under specific agenda items, noting:

    - members, invited participants and observers had already provided declarations of conflicts of interest as prescribed in *Fisheries Administration Paper 12* via email or phone, prior to the commencement of the meeting; and
    - declarations of interest are at **Attachment A**, and the outcomes of the deliberations with specific agenda items are outlined in Table 1 below.

Preliminary session finished – 1325

Day 1 started – 1335

3. Meeting participants joined the teleconference as outlined in the attendees list in Agenda Item 1a.

Agenda item 1 – Preliminaries

1a Welcome and apologies

4. Dr Cathy Dichmont, the Chair:

    - welcomed attendees to the meeting
    - made an Acknowledgement of Country statement recognising the Traditional Owners of the many lands in which we met, and payed respect to Elders past, present and emerging; and
    - commenced proceedings.

5. **Members**:

Dr Cathy Dichmont	Chair	All sessions
Dr Cathy Bulman	Scientific member	All sessions
Ms Fiona Hill	AFMA[1] member	All sessions
Dr Sarah Jennings	Economic member	All sessions
Mr Lance Lloyd	Scientific member (GABRAG[2] Chair)	All sessions
Mr Sandy Morison	Scientific member (SharkRAG[3] Chair)	All sessions
Dr Michael Steer	Scientific member (SERAG[4] Chair)	All sessions (Day 2 from AgI[5] 7b)

6. **Invited Participants**:

Dr Pia Bessell-Browne	CSIRO[6]	Days 1, 2 and 3
Mr Simon Boag	SETFIA[7] / SSIA[8]	Days 1, 2 and 3

[1] AFMA – Australian Fisheries Management Authority
[2] GABRAG - Great Australian Bight Resource Assessment Group
[3] SharkRAG – Shark Assessment Resource Assessment Group
[4] SERAG – South East Resource Assessment Group
[5] AgI – Agenda Item
[6] CSIRO – Commonwealth Scientific and Industrial Research Organisation
[7] SETFIA – South East Trawl Fishing Industry Association
[8] SSIA – Southern Shark Industry Alliance

Dr Paul Burch	CSIRO	Days 1, 2 and 3
Dr Jemery Day	CSIRO	Days 1, 2 and 3
Dr Ian Knuckey	Fishwell Consulting	Days 1, 2 and 3
Mr Kyne Krusic-Golub	FAS[9]	Days 1, 2 and 3
Mr Neil MacDonald	GABIA[10]	Days 1, 2 and 3
Mr Andrew Penney	Pisces Australis	Days 1, 2 and 3 (Day 2 – from 1030)
Dr Miriana Sporcic	CSIRO	Days 1, 2 and 3
Dr Kevin Stokes	Stokes.Net.NZ	Day 3 – AgI 11 and12
Dr Robin Thomson	CSIRO	Days 1, 2 and 3
Dr Geoff Tuck	CSIRO	Days 1, 2 and 3

7. **AFMA employees:**

Ms Lou Cathro	Senior Management Officer – Demersal and Midwater Fisheries	Day 3 – AgI 13
Ms Cate Coddington	Executive officer (EO)	All sessions
Mr Dan Corrie	South East Trawl and Great Australian Bight Trawl Manager	All sessions
Ms Natalie Couchman	Research Manager	Day 1 – AgI 4 and 5
Mr Aaron Puckeridge	Fisheries Management Officer – Demersal and Midwater Fisheries	Days 1, 2 and 3
Mr Tamre Sarhan	Observer Coordinator	Days 1, 2 and 3
Ms Sally Weekes	Gillnet Hook and Trap Manager	Days 1, 2 and 3

8. **Presenters/Observers:**

Dr Don Bromhead	ABARES[11]	Day 3 – AgI 13
Ms Toni Cannard	CSIRO	Day 2
Dr Sandra Curin Osorio	CSIRO	Day 3
Mr George Day	DAWE[12]	Day 3 – AgI 13
Dr Roy Deng	CSIRO	Day 2
Dr Natalie Dowling	CSIRO	Day 3
Dr Ryan Downie	CSIRO	Day 2
Ms Jo Elphinstone	DAWE	Day 3 – AgI 13
Dr Tim Emery	ABARES	Days 2 and 3
Dr Heath Folpp	NSW DPI[13]	Days 1, 2 and 3
Dr Beth Fulton	CSIRO	Day 3 – AgI 13
Dr Haris Kunnath	CSIRO	Day 2 – AgI 8
Dr Geoff Liggins	NSW DPI	Days 1, 2 and 3
Dr Rich Little	CSIRO	Day 3
Mr Tim Ryan	CSIRO	Day 2 – AgI 8
Mr Les Scott	Peter and Una Fishing Co Pty Ltd	Day 2 – AgI 6, 7 and 8
Dr Veronica Silberschneider	NSW DPI	Days 1, 2 and 3
Dr Ilona Stobutzki	DAWE	Day 3 – AgI 13
Mr James Woodhams	ABARES	Days 1, 2 and 3

[9] FAS – Fish Ageing Services
[10] GABIA – Great Australian Bight Industry Association
[11] ABARES – Australian Bureau Agricultural and Resource Economics and Sciences
[12] DAWE – Department of Agriculture Water and the Environment
[13] NSW Department of Primary Industries

9. **Apologies:**

Mr David Stone[14] Sustainable Shark Fishing Association

Agenda item 1b Declarations of interest

10. The Chair outlined the outcomes from deliberations regarding conflicts of interest (Table 1) and noted that if any additional conflict of interests arise, that participants have a responsibility to raise them as soon as they are aware.

11. Where conflicts of interest exist (Table 1), recommendations would be considered by members without a declared interest at the end of 24 August 2021 (the first day) and 26 August 2021 (the third day) when invited participants, presenters and observers are not participating in the meeting.

Table 1 Participation in items where there are declared conflicts of interest

Agenda Item	Potential conflicts of interest	Discussion Participation	Recommendation Participation
4. ERA Trigger Analysis	Industry / CSIRO / Andrew Penney[15]	Present	Not present for any substantive decisions
5. Five-year strategic research plan	CSIRO / ABARES / NSW DPI / Simon Boag / Kyne Krusic-Golub / Neil MacDonald / Ian Knuckey / Andrew Penney	Present	Not present for any substantive decisions
6. Data collection programs **a. ISMP annual report** **b. SIDaC annual report** **c. Fish ageing services annual report**	Simon Boag / Les Scott / Ian Knuckey / Kyne Krusic-Golub	Present	Not present for any substantive decisions
7. Catch & Discard Data **a. Depth modification** **b. SESSF Catch History** **c. 2021 Discard Reports (Data to 2020)**	Neil MacDonald / Industry	Present	Not present for any substantive decisions
8. MYTAC Analysis / Assessment data review	Simon Boag /Neil MacDonald / Les Scott / CSIRO	Present	Not present for any substantive decisions
9. Data collection programs **a. Draft 2021-25 Plan** **b. Recommended changes (incl. ISMP plan)**	Simon Boag / Neil MacDonald / Ian Knuckey / Kyne Krusic-Golub	Present	Not present for any substantive decisions
10. Fishery Independent Data Working Group report	Simon Boag / Ian Knuckey / Neil MacDonald	Present	Not present for any substantive decisions
11. SESSF Harvest Strategy	Simon Boag / Neil MacDonald / Veronica Silberschneider	Present	Not present for any substantive decisions
12. Orange roughy working group outcomes	Simon Boag / Neil MacDonald	Present	Not present for any substantive decisions

1c Adoption of agenda

12. The RAG adopted the agenda (**Attachment B**) as final.

[14] During the second day of the meeting, Simon Boag informed the RAG participants that David Stone had passed away. The RAG members expressed their sincere condolences and appreciated the contributions he had made to the fishery over many years.

[15] As Cathy Bulman has retired from the CSIRO, there is no longer a conflict of interest for items relating to ERAs.

1d Minutes of previous meeting

13. The RAG noted the final minutes of the SESSFRAG Chairs meeting of 17-18 March 2021 are available on the AFMA website SESSFRAG past meetings website page.

Agenda item 2 – Actions arising from previous meetings

14. The RAG noted the action items from previous meetings and the updates provided by the Executive Officer at **Attachment C**.

15. A list of new action items established at this meeting are listed in **Attachment D**.

16. The RAG's discussion regarding particular action items are:

Action Item #12 (Agenda Item 14.1 Chairs' meeting 2021) Mr Nate Meulenberg to follow up with Mr Tamre Sarhan regarding the status of employing a Portland based observer to collect port-samples under the ISMP[16].

- This action is now complete, a port sampler has been engaged to collect samples in Portland.

Action Item #12 (Agenda Item 11 Data meeting 2020) Paul Burch to provide the 'Discard Method Evaluation' report, an output from the Discard Estimation Working Group, to the SESSFRAG EO when finalised so that it may be distributed to SESSFRAG.

- Keep the action marked as complete, and include in the list that Paul Burch will present a model-based discard estimation approach at the World Fisheries Congress.

Action Item #15 (Agenda Item 11 Data meeting 2020) AFMA to investigate and compare logbook reported discards for school and gummy shark to observers for trawl boats and EM[17] for gillnet hook boats

- Remove this this action from the list as it has been referred to SharkRAG for consideration.

Agenda item 3 – SESSF TAC setting process guidelines and timeframes

17. The RAG noted the update provided by Dan Corrie about updates made to the *SESSF Total Allowable Catch (TAC) setting process – Guidelines for provision of data and stock assessment processes* relating to the:

- validation of AFMA data;
- timing for provision of data to research providers; and
- review of data used for assessment and management.

18. The RAG agreed[18] to adopt the proposed updates to the guidelines; with minor edits to the section on data timelines to reflect that most data should be agreed to at the SESSFRAG data meeting. Some may be considered at the first assessment SERAG, SharkRAG or GABRAG meeting (available on the AFMA website at this link: **total allowable catch (TAC) setting process – guidelines for provision of data and stock assessment processes**).

[16] ISMP – Independent Scientific Monitoring Program
[17] EM – Electronic Monitoring
[18] This decision was undertaken at the end of day one after those who had conflicts of interest left the meeting.

Agenda item 4 – ERA Trigger Analysis

19. The RAG noted the update provided by Dan Corrie on the Ecological Risk Assessment (ERA) trigger analysis undertaken by AFMA for the Danish seine and otter trawl methods in the Commonwealth Trawl Sector (CTS), the otter trawl method in the Great Australian Bight Trawl Sector (GABT), and from Sally Weekes for the shark gillnet method in the Gillnet Hook and Trap Sector (GHAT):

    - This is first time that this process (cleared by SESSFRAG at the Data meeting in 2020) has been undertaken.
    - While the ERAs for the above sectors were completed during 2019 and 2020, they used data for the period 2012 to 2016.
    - Trigger analyses were not done for scalefish automatic longline, shark hook and manual hook methods of the GHAT: ERAs are in progress for these sectors and results are expected to be available later in 2021.

20. The RAG considered the ERA trigger analyses, and discussed:

    - The risk status for species, including:
        - a potential change to a species' risk status is important if it is already close to the high-risk threshold.
        - where logbook or observer records only identify species to family level, the group is expanded to include all species in the area of the fishery, which may result in 'false positives' or overestimate actual risk.
        - there are two ways to address species that get classified as high risk – mitigate the risk to the species and just note that the risk has been mitigated, or update the ERA to take account of the mitigation applied.
        - while the ERA trigger checklist analyses suggest a potential decrease in the risk levels for some species, Management did not consider that it is enough to justify a reassessment of any of the ERAs.
    - the method used to analyse the trigger regarding 'annual fished area', including:
        - how to enable a comparison of fished area over time noting that any metric will need to be simple and should not increase the level of work excessively.
        - the most appropriate time period over which to analyse the trigger. Comparing the five-year period of the ERA to the next five-year period may not capture emerging issues early enough.
        - how to measure effort shift in the fishery, including fishing intensity or where effort may shift into highly susceptible habitats or ecosystem components.
    - The potential need for a review of e-logs in the next 6 months to ensure that e-logs are achieving needed outcomes, particularly in relation to the 'depth fished' field that has been made mandatory for fishers to enter each shot.
    - that information will be provided to the RAG on the process being considered by the ERA steering group to simplify the ERA. This includes automation work being undertaken by CSIRO.

- the increased catch of stingarees recorded in the GABT Fishery Independent Survey (FIS) that could indicate an increase in either species distribution or catchability.

21. The RAG agreed[19]:

    - that neither the CTS or GHAT sectors triggered an ERA review at the sector or species level;
    - that GABRAG should consider the need to review the otter trawl ERA on the basis of increased stingaree catches in the GABT FIS; and
    - to incorporate the following in future analyses:
        - comparing the most recent year's
            1. cells fished to those fished for the period of the ERA, including the 90 per cent Confidence Interval (CI), as per the guidance in the triggers document[20],
            2. effort to the effort included in the period of the ERA, and
        - Identifying the number of new cells fished.

Action Item 1: GABRAG

GABRAG to consider catches of wide stingaree in the 2021 GABFIS in the context of the species distribution ERA trigger for otter board trawl in the Great Australian Bight Trawl Sector.

Agenda item 5 – Five-year strategic research plan

22. AFMA introduced the agenda item, asking the RAG to consider the SESSF Five-year Strategic Research Plan for 2021-25 (the Plan) for adoption.

23. The RAG noted that the final draft of the Plan (and in particular the research priorities outlined in Section 5 of the Plan) was developed in consultation with SESSFRAG in December 2020, and SEMAC and GABMAC in March 2021.

24. The RAG agreed[21] to adopt the SESSF Five-year Strategic Research Plan for 2021-25 (available on the AFMA website at this link: **five year strategic research plan 2021-2025**).

Day 1 finished – 1630

Day 2 started – 0840

Agenda item 6 – Data collection programs

6a 2021 ISMP reports for quarters 1 & 2

25. The RAG noted and discussed the update provided by Tamre Sarhan AFMA about the collection of data during the first half of 2021 under the Integrated Scientific Monitoring Program (ISMP). Covid-19 outbreaks, state government-imposed lockdowns and restrictions have limited the availability of AFMA observers, increased the level of difficulty involved in moving observers to ports, and caused some reluctance for fishers to carry observers that are required to travel interstate.

Action Item 2: AFMA /CSIRO

AFMA and CSIRO to discuss further potential refinements to the ISMP sampling targets for some species to ensure representative sampling whilst avoiding broadscale changes to the plan.

[19] This decision was undertaken at the end of day one after those who had conflicts of interest left the meeting.
[20] Penney, 2018. *Guidelines for ERA re-assessment triggers for Commonwealth fisheries*.
[21] This decision was undertaken at the end of day one after those who had conflicts of interest left the meeting.

6b SIDaC annual report

26. The RAG noted and discussed the update provided by Simon Boag on biological data collected by the Shark Industry Data Collection (SIDaC) Program of five target species in the SESSF:

    - There is good achievement of the SIDaC plan and the collection of biological samples continues to improve, the main impediment to achieving some targets has been the restriction of fishing activity in key areas of the fishery by operators;
    - Every sample can now be directly linked to a fishery zone due to a change in the port sampling data schema (suggested by Fish Ageing Services (FAS));
    - Samples can now be collected in Tasmania as a person at a Tasmanian fish processor has been trained;
    - Samples for close-kin assessments need to be collected for school shark from deeper waters and blue eye trevalla from the western regions; and
    - A solution is being developed that will enable SIDaC data to be better linked with AFMA logbook data.

6c Fish ageing services annual report

27. The RAG noted and discussed the update provided by Kyne Krusic-Golub on the ageing services provided by FAS and on the progress in migrating the age-error data into a single built-for-purpose database:

    - New age data that is available for species being assessed this year, in particular:
        - Blue grenadier – there were sufficient numbers of otoliths aged across years and zones for both spawning and non-spawning for the 2018, 2019 and 2020 calendar years.
        - Orange roughy (eastern Tasmania) – given orange roughy are a long-lived species, the age and length composition of the 2020 ageing samples was consistent with the 2016 data and did not change very much (as expected).
        - Pink ling – While the number of age estimates available for fish samples in each of the last four calendar years (2017-20) is considered reasonable, they were predominantly collected from the eastern regions. The age and length composition of fish sampled for otoliths has remained reasonably consistent between 2017 and 2020. In the hook sector, the number of otoliths collected for each year was lower than for the trawl sector. The age composition remained similar between 2017 and 2020: and, when compared to the trawl samples, contains more older-age classes.
        - Jackass morwong – while there are fewer western than eastern samples, there are a reasonable number of samples. No strong patterns are evident in either the age composition or the length composition over time.
        - Silver warehou – the 2020 length frequencies show a few sampling modes in the east.
    - The ageing plan:
        - Blue grenadier –in addition to the proposed plan, it is important to include the ageing of spawning blue grenadier samples each year. Noting that work done on additional species could affect the capacity to undertake work for other species already proposed in the plan.
        - GAB orange roughy – consideration should be given to undertaking ageing work.

- Stock assessment schedule: AFMA and CSIRO will discuss scheduling and needs relating to the next three years as there are too many Tier 1 assessments, eight species, scheduled in 2024.

Action Item 3: Kyne Krusic-Golub (FAS)

FAS to provide a summary of GAB orange roughy otolith samples they hold to GABRAG.

Agenda item 7 – Catch & Discard Data

7a Depth modification

28. The RAG noted the update provided by Robin Thomson on the amendments to logbook depth data for boats that recorded invariant minimum and maximum depth values in logbooks for shots from 2016 onward;

    - In July 2020, SESSFRAG supported CSIRO amending erroneous logbook depth records for shots reported up to and including 2019 by using shot location and bathymetry data;
    - During 2021, CSIRO used a more sophisticated search algorithm and discovered that the issue extended to more boats than originally thought, and had continued during 2020 – instances of 20 or more consecutive invariant depth records by these boats were amended using the same methodology supported by SESSFRAG in 2019;
    - A summary of the recent changes, including some of the issues associated with using bathymetric data; and
    - AFMA have raised the depth reporting issues with electronic logbook providers and the issue has been resolved for 2021.

29. The RAG discussed the possibility of using an alternative method to estimating depth – using recorded location and historical logbook depth data – as it may provide data that are more accurate. This will be more important for some species and in areas where there can be vast differences in depth, for example slope areas.

Action Item 4: Robin Thomson (CSIRO)

Robin Thomson to present an options paper to SERAG and SharkRAG investigating the utility of historical logbook data to use average grid depth to adjust recent 'invariant depth' records.

Action Item 5: Robin Thomson (CSIRO)

Robin Thomson to provide Dan Corrie with the details of the boat reporting effort in depths outside the area of the sector.

7b SESSF Catch History

30. The RAG noted and discussed the presentation provided by Geoff Liggins about historical NSW data for species subject to Tier 1 and Tier 4 stock assessments:

    - The ease of providing rationalised NSW historical data to AFMA and CSIRO varies upon the activity of the fishery during certain time periods and species characteristics:
        - Before 1986, the provision of data is simple as data can be provide as reported.
        - The years from 1986 to 2000 are problematic; there are incidences of double reporting of catches by trawlers to both the Commonwealth and the State. Commonwealth logbook and catch disposal records of catch are available for various years within this 1986-2000 period. If these data are used as the primary source of Commonwealth

catch, then the catch data reported to NSW needs to be adjusted so that double-counted catches are removed.

- After 2001, catches reported in the NSW jurisdiction can be provided easily because they do not include any Commonwealth catch.
- The difficulties rationalising the data during the period 1986 – 2000 varies for different species. For example, pink ling is a deepwater species and it can therefore be assumed that there are no catches inside 3nm whereas silver trevally spans both deeper and shallower waters so accounting for double reported catches is more problematic.

- Data rationalisation work is still being undertaken, this is nearing completion for Tier 4 species with some final checks to be undertaken. There is significant work to be done for Tier 1 species.

31. The RAG recommended[22] that CSIRO continue to use the current agreed catch history series (including those accepted at SERAG in 2020) until an updated catch series is determined.

Action Item 6: CSIRO / NSW DPI / AFMA

Establish a subcommittee to drive the process for updating catch history data for both Tier 1 and Tier 4 species. Report to be provided at SESSFRAG Chairs' 2022 meeting for consideration and adoption.

Membership – Paul Burch (CSIRO - lead) Geoff Liggins (NSW DPI) and Dan Corrie (AFMA). A member to be included from Victorian Fisheries Authority if needed. Other agency members to be included if needed.

7c 2021 Discard Reports (Data to 2020)

32. The RAG noted the presentation provided by Roy Deng about the 2021 discard reports, including that the changes to the methodology adopted by SESSFRAG at the 2020 Data meeting were used to estimate discarded catches.

33. The RAG reviewed the estimates of discards in the 2021 SESSF ISMP Discards Report (2020 Data) including whether any changes are required prior to adopting the 2020 discard estimates for use in stock assessments and the TAC setting process for the 2022-23 SESSF fishing season:

- Discard estimates and their associated CVs for 46 species groups were calculated using Method A of Bergh et al. (2009)[23] with those used for assessment and management purposes presented in Table 2 of the report. For those species-groups where discarded catch estimates are obtained from stock assessment models, discards estimated using the Bergh method were also provided for comparative purposes in Table 3 of the report.
- Discard estimates for a greater number of species/stocks than usual failed the validity tests. The suspension of the onboard observer program in March 2020 until October 2020, due to the risk of COVID-19, impacted the collection of estimates of discarded weight during this period, and were likely the cause of many of these failed validity tests.
- The failed validity estimates will not be used for stock assessment or management purposes. Where a discard estimates is needed for an assessment, and has failed, these are replaced with the most recent valid estimate.

[22] This recommendation was undertaken during the decision session on 26 August 2021.
[23] Bergh, M., Knuckey, I., Gaylard, J., Martens, K., and Koopman, M. (2009). *A revised sampling regime for the Southern and Eastern Scalefish and Shark Fishery – Final Report*.

34. The RAG discussed whether logbook recorded discarded catches of gummy shark, school shark and blue eye trevalla could be used for estimating discards.

- Removal of observers from the GHAT may mean that the SESSF-wide discard estimates for stocks with high proportions of the catch taken by the GHAT are biased.
- ABARES is in the process of updating an analysis comparing EM data to logbook for commercial and bycatch species in the GHAT that will be completed later in 2021. The previous analysis suggested reporting of both retained and discarded catch is better for commercial species, than bycatch.

35. The RAG recommended[24] SharkRAG and SERAG consider the outcomes of the ABARES review of GHAT EM versus logbook analysis, and whether discarded catch reported in logbooks can be used for estimating discards of gummy shark, school shark and blue eye trevalla.

Action Item 7: AFMA / CSIRO / SETFIA

AFMA/CSIRO/SETFIA to investigate the reason for discards of orange roughy in the Southern Zone (prior to SERAG meetings in 2021).

Action Item 8: CSIRO

CSIRO to include colour-coding in the discard tables in future discard reports to highlight the criteria for which discard estimates fail validity tests to enable easier consideration of these by SESSFRAG.

Action Item 9: CSIRO / AFMA

CSIRO and AFMA to discuss assessment scheduling and provide an out-of-session paper for SESSFRAG to consider; prior to the Chairs' meeting in March 2022.

Agenda item 8 – MYTAC Analysis / Assessment data review

36. The RAG noted:

- the outcomes of the review undertaken by the Multi-Year Total Allowable Catch (MYTAC) Working Group (the working group) who reviewed the fishery indicator data for:
    - species scheduled for assessments in 2021 (**Attachment E** – Table 1)
    - Species without scheduled assessments in 2021, but highlighted using the MYTAC Decision Tree Support Tool (**Attachment E –** Table 2);
- while a review of the fisheries indicators was needed for several species/stocks, after reviewing the indicators the working group did not recommend further review by SESSFRAG for most species/stocks. The species/stocks highlighted for RAG review were:
    - Deepwater shark (east and west) – advice required on a Tier 5 assessment approach
    - Jackass morwong (west) – data in the western zone may be insufficient to support a tier 1 stock assessment
    - Orange roughy (east) – advice needed on how to estimate natural mortality in the Tier 1 stock assessment
    - Blue grenadier – information to be provided to the RAG about the acoustic data collected in 2020 and 2021
    - Blue eye trevalla – advice required on:
        1. which CPUE series (zones) are included in the slope stock Tier 4 assessment

[24] This recommendation was undertaken during the decision session on 26 August 2021.

2. the seamount stock Tier 5 assessment approach including catch and zones
   - John dory – advice is required on which CPUE series to use and the Tier 4 stock assessment approach
   - Silver trevally – advice is required on which CPUE series to use and the Tier 4 stock assessment approach.

Further information about these species/stocks is outlined below.

- that fishery indicator data for species managed under rebuilding strategies (**Attachment E –** Table 3) will be considered formally by either GABRAG, SharkRAG or SERAG later in 2021 as part of the annual review of rebuilding strategies

37. The RAG discussed the approach undertaken by the working group and appreciated that the process had targeted the species that needed RAG review.

Action Item 10: AFMA

Consider how the outputs of uncertain Tier 1 assessments should be considered in the SESSF harvest strategy framework; including the application of discount factors when setting Total Allowable Catches (TACs) or inclusion of additional tier levels.

Action Item 11: Pia Bessell-Browne

Dr Pia Bessell-Browne to present the analysis of lengths by month for Tier 1 species to SERAG in 2021.

Deepwater shark – east & west

38. The RAG noted and discussed Robin Thomson's presentation on deepwater sharks:

- There are 18 species in the quota basket – however for the most part these are not recorded to species level by operators.
- The three species that are most commonly reported are brier shark, longsnout dogfish and black shark.
- Nearly all landed catch is from trawl methods.
- Landings do not reflect overall catch because more than 50 per cent are discarded; however, discard estimates are highly uncertain.
- While a depth limit is imposed on data presented in the Data Summary report and used for discard estimation (i.e. only catch from waters deeper than 600m); observer records confirm that there are notable landings in waters less than 600m depths.
- Deepwater sharks are being targeted in deeper waters.
- Estimated discards have lower CV when estimated separately for target/byproduct (less likely to be discarded) and bycatch (more likely to be discarded) components of the quota basket.
- The ERA has considered these species and there are biological parameter estimates for some species, or estimates that can be borrowed from related species. A Tier 4 analysis is not appropriate for this species because discard rates are so high that landings do not reflect total catch.

39. Further discussion of these stocks was deferred to Agenda Item 11b – Tier 5 decision rules.

Jackass morwong

40. The RAG noted and discussed assessment methods for determining a TAC for jackass morwong, where there are differing characteristics in the eastern and western areas of the fishery:

    - Jackass morwong is managed under a global TAC but assessed as western and eastern stocks - any decision about individual assessments will impact the global TAC.
    - The 2018 stock assessment estimated the eastern stock to be 35%B_0[25] and the western stock to be 69%B_0.
    - It is uncertain why the TAC is only 21 per cent caught.
    - There is sufficient data in the east for a tier 1 assessment; however, data in the west may be insufficient to support a Tier 1 assessment.
    - Catch in 2020 is the lowest ever in the east and the lowest since 2016 in the west.
    - The CPUE has been below the long-term average since 2000 in the east and since 2007 in the west.

41. The RAG recommended[26] that:

    - A tier 1 assessment of eastern jackass morwong be undertaken;
    - A weight-of-evidence approach be undertaken when recommending Recommended Biological Catches (RBCs) / TACs for western jackass morwong rather than a new or updated assessment. A discount factor, or a buffer, should be considered to account for time-induced risk; and
    - An alternative assessment approach be established for western jackass morwong by 2022.

Action Item 12: SERAG

SERAG to consider an alternative assessment approach for western jackass morwong for 2022.

Orange roughy – east

42. The discussion for this stock was deferred to Agenda Item 12 – Orange Roughy Steering Committee Outcomes.

Blue eye trevalla

43. The RAG noted and discussed the information presented about blue eye trevalla including the Catch per Unit Effort (CPUE) series available for use in a Tier 4 assessment of the slope stock:

    - While there was some evidence of separate stocks on the slope, previous scientific advice was to assess it as a single stock.
    - SERAG will consider orca depredation at upcoming meetings.
    - The biomass was estimated to be between the limit and target reference point under the 2020 Tier 4 assessment.

[25] B_0 – unfished, equilibrium biomass level

[26] This recommendation was undertaken during the decision session on 26 August 2021.

- It is unclear why the TAC is 49 per cent caught.

Slope –Tier 4

- The four-year average CPUE decreased between the 2018 and 2020 Tier 4 assessments, resulting in an RBC of 227 t from the 2020 assessment, compared to 439 t from the 2018 assessment.
- SERAG recommended a single year TAC, with the Tier 4 assessment to be updated in 2021.
- Industry requested that CPUE west of Tasmania be considered in the 2021 assessment to account for a shift in effort.
- Combined auto-line and drop-line CPUE from zones 20-85 shows a similar declining trend since 2014 to the series used in the 2020 Tier 4 assessment.
- A boat previously recorded as a 'manual-line' boat in the early part of the time series has been corrected and is now recorded as an 'auto-line' boat. The earlier part of the CPUE time series (approximately 2002-2006) has increased and, as a result, there is a steeper decline in the CPUE index.
- Industry expressed an interest in moving this stock to a higher level of assessment, rather than a Tier 4, and supported the collection of biological samples to assist this process. However, the RAG noted that a higher level of assessment has been attempted in the past but was unsuccessful.

44. The RAG recommended[27] the hook CPUE series that includes zones 83-85 should be used for the Tier 4 assessment of the slope stock.

John dory

45. The RAG noted and discussed the upcoming assessment of John dory:

- Given the uncertainties in historical catch and the status of the stock during the default reference period, SERAG recommended not applying a Tier 4 stock assessment analysis to John dory in 2020.
- A weight of evidence approach, including the outputs of the Catch-MSY and surplus production models (Tier 5 assessments), was used to recommend a TAC for the 2021-22 fishing year.
- SERAG requested that catch and effort be considered in Zone 30 (Z30) to determine whether Z30 could be included in the Tier 4 analysis: there is insufficient catch to include Z30 in the CPUE series.
- AFMA requested that a CPUE series, removing the boats that left the fishery during the fishery structural adjustment in 2007, be considered. The RAG discussed:
    - the current CPUE series already accounts for the structural adjustment using a vessel effect.
    - there is no reason to reject the current Tier 4 CPUE series. The depletion level of the stock at the beginning of the CPUE series and the reliability of the historical catch series (refer to Agenda Item 7b – SESSF catch history) are the main considerations; and

[27] This recommendation was undertaken during the decision session on 26 August 2021.

- the suggested CPUE series could be generated for consideration alongside the current series.

46. The RAG recommended[28] that:

- the current CPUE series be used to undertake a tier 4 assessment of John dory in 2021, and the default reference period in the SESSF Harvest Strategy Framework be adopted, noting that CPUE standardisations account for vessel effect;
- an alternative CPUE series excluding the boats that left the fishery through the 2007 buy-back process should also be developed and presented to SERAG and the AFMA Commission for information; and
- if the two CPUE series were different, it would not necessarily indicate an issue with the standardisation process.

Silver trevally

47. The RAG noted and discussed the upcoming assessment for silver trevally:

- silver trevally has been assessed by NSW as 'transitional depleting' using a weight-of-evidence approach, which includes a declining CPUE series for the NSW trawl fleet (state operators).
- There has been a reduction over the years in the size distribution of silver trevally; additionally, the Kapala surveys showed that there were larger silver trevally in the past.
- NSW stock assessment scientists will be engaged during the Commonwealth Tier 4 stock assessment this year.
- Commonwealth catches have been low for the last six years, with less than 15 per cent of the Commonwealth TAC caught since 2013. It is unclear whether the TAC is undercaught due to declines in abundance or for other operational reasons.
- The CPUE index is close to the limit reference point.

48. The RAG recommended[29]:

- The current CPUE series be used, noting that it accounts for vessel effects;
- An alternative CPUE series excluding targeting boats should be presented to SERAG and the AFMA Commission for information;
- If the two CPUE series are different, it would not necessarily indicate an issue with the standardisation process; and
- SERAG also consider the NSW silver trevally stock assessment when providing RBC advice.

49. The RAG supported the long-term aim to develop a joint silver trevally assessment between NSW DPI and AFMA.

Acoustic surveys

[28] This recommendation was undertaken during the decision session on 26 August 2021.
[29] This recommendation was undertaken during the decision session on 26 August 2021.

50. The RAG noted and discussed the presentation from Tim Ryan on the recent acoustic surveys undertaken for blue grenadier and Cascade Plateau orange roughy:

Blue grenadier

- Factory freezer boats have undertaken transects using a digital echo sounder on spawning blue grenadier during the processing of catch.
- Obtaining a reliable CPUE index is problematic where highly aggregated spawning populations are targeted.
- Echograms can provided a snapshot measurement that can be used to determine biomass.
- There are large inter-seasonal and inter-annual variability between surveys.
- These surveys can provide crucial data for stock assessments.

Orange roughy – cascade

- Three parties conducted acoustic surveys on the Cascade Plateau between 1999 and 2006.
- There have been benthic surveys on the Cascade Plateau in the past however there has only been limited analysis.
- In 2021 a New Zealand factory freezer trawler conducted transect acoustic surveys during the spawning season. Analysis of the surveys needs to be undertaken.

Agenda item 9 – SESSF Data Plan

9a Draft 2021-25 Plan

51. The RAG noted and discussed the update provided by Sally Weekes on the sampling targets in the Gillnet, Hook and Trap Sector:

- The data plan contains the information needed to undertake assessments etc. and part of the process is for the RAG to sign off on the plan annually.
- Updates made to the plan regarding the GHAT relate to:
    - A one off collection of partial and total length measurements of school and gummy shark to allow for some existing data to be converted correctly; and
    - the collection of tissue samples for school shark to support the close kin mark recapture assessment including samples from deepwater, western Tasmania and western GAB.

52. The RAG noted and discussed the update provided by Dan Corrie about the changes in the draft SESSF Data Plan 2021-23 relating to bycatch reporting in the trawl sector:

- The review of the bycatch groups was undertaken by AFMA based on recommendations from the March 2021 SESSFRAG Chairs meeting.
- The expanded grouping presented by AFMA adds complexity and is likely to cause difficulties for industry to report against accurately. A simplified list of species groups is required – AFMA will work with SETFIA to develop a revised bycatch group list.

53. The RAG[30]recommended:

- the existing bycatch discarding groups be retained in the data plan as the proposed changes to the trawl bycatch discarding groups were not supported.
- the Seine and Trawl Advisory Group be consulted to assist in refining the list to include only priority ERA species and a smaller list of bycatch groups from the proposed changes.
- the proposed changes made to the sampling regime for the GHAT be adopted.

54. The updated SESSF data plan 2021-23 is available on the AFMA website at this link: **Data Plan 2021-23**.

Action Item 13: AFMA / SETFIA

AFMA to work with SETFIA to develop a revised bycatch group list for consideration by SESSFRAG for inclusion in the data plan.

9b Recommended changes to ISMP and SESSF data plans

55. The RAG considered the previous agenda items – data collection programs in the SESSF (Agenda Item 6), catch and discard data (Agenda Item 7), MYTAC analysis and data summary review (Agenda Item 8) – and the need to include non-quota species in the ISMP sampling program and the collection of maturity information (which is important for Tier 1 assessments).

56. The RAG agreed[31]:

- to wait on the outcomes of the BET close-kin mark-recapture (CKMR) scoping work to be considered by SESSFRAG in March 2022. If CKMR is considered feasible, a sampling plan will be developed. If not feasible, the need to collect lengths and otoliths from zones 83 to 85 can be re-visited.
- that the collection of maturity information should be considered on a species-by-species basis as part of updating stock assessments.
- the inclusion of priority byproduct species in the ISMP sampling plan should be considered by individual RAGs. This may require a break-away group for SERAG given the volume of items on the 2021 draft agenda.

Day 2 finished – 1730

Day 3 started – 0900

Agenda item 10 – Fishery Independent Data Working Group report

57. The RAG noted and discussed the update provided by Dan Corrie about the Fishery Independent Data Working Group (FIDWG) meeting outcomes:

- FIDWG guidance was provided on the preferred options for collecting fishery independent data for key species and species groups in the SESSF at their second meeting on 6 August 2021 – this advice is still being finalised and tables about options for fishery independent data collection for key commercial and bycatch species are still in the process of being developed.

[30] This recommendation was undertaken during the decision session on 26 August 2021.
[31] This recommendation was undertaken during the decision session on 26 August 2021.

- FIDWG recommended developing an additional table that identifies data needs and sampling options to capture broader ecosystem and environmental dynamics across the fishery to mitigate the gap of environmental data in the SESSF data plan.
- The original CTS Fishery Independent Survey was discontinued as it was not considered a cost-effective approach to provide inputs to stock assessments and management decisions. The working group should be cautious about trying to develop a process that will not be adopted for the same reasons.
- Need to ensure a broader array of species are included in the list for independent data collection, and not just the top 10 species by gross value of production (GVP).

58. The RAG agreed[32] that FIDWG should continue to meet and develop advice around collection of fishery independent data in the SESSF. In doing so, the group should consider the effort that went into developing previous fishery independent surveys.

Agenda item 11 – SESSF Harvest Strategy

11a Updates to the SESSF Harvest Strategy Framework

59. The RAG noted the update provided by Dan Corrie on the latest revisions to the SESSF Harvest Strategy Framework (HSF). The revisions:
    - address technical and editorial errors throughout the document;
    - enable multispecies considerations in setting TACs;
    - include considerations about what to do when a species falls outside the MYTAC period without an updated stock assessment – the last base-case be re-run to incorporate the most recent catch and effort data to generate an additional year's RBC. Discount factors, and/or a buffer, should be also considered on a case-by-case basis;
    - require application of discount factors for lower tier assessments be the default process, and that exceptions are only made where the relevant resource assessment group is satisfied there are alternative equivalent precautionary measures in place;
    - update the description of how stock status is determined against reference points; and
    - include how RBCs are calculated at each assessment Tier level using harvest control rules (HCRs).

60. The RAG discussed the revisions.
    - The update to the HSF is intended as an interim measure until the new multi-species harvest strategy has been developed and implemented.
    - The definition of overfishing (contained in HSF – Section 6.2) could lead to confusion. The broader issue in defining overfishing should be considered outside this update to the HSF as it is ABARES responsibility to determine stock status. AFMA's responsibility is to develop the harvest strategy and the reference points contained therein.
    - Section 6.3 *determining RBCs using harvest control rules* was developed by CSIRO, it more accurately reflects the process that is currently used.

[32] This recommendation was undertaken during the decision session on 26 August 2021.

61. The RAG recommended[33] the revised HSF, which will guide TAC setting for the upcoming 2022/23 SESSF fishing season once adopted by the Commission, be adopted with the following changes (incorporated at **Attachment F**):

    - Consider removing the research priorities column from Table 1;
    - Section 6.2 – Delete the current added (yellow highlighted) text in the section. Provide information in this section about the definitions of stock status and reference points and refer to the ABARES reports for further information about status definitions;
    - Section 6.3 – no changes to this section, noting that any further comment on the section should be provided when reviewing meeting minutes;
    - Section 6.4.5 – Replace the words "*the last base case will be re-run to incorporate the most recent catch and effort data*" to "*the last base case may be re-run to incorporate reliable recent data*";
    - Section 6.4.9 – Insert the words: "*Discount factors will be applied unless the RAG advises otherwise*".

11b Tier 5 decision rules

62. The RAG noted Dan Corrie's update on the activities of the *Tier 5 Harvest Control Rule Working Group*, which was established by SESSFRAG at the 27 March 2020 meeting. The working group met on 12 February 2021 and developed a five-step approach to assist in the development of harvest control rules for converting Tier 5 assessment outcomes into TACs. These were supported by SESSFRAG at its March 2021 meeting. Further work has since been undertaken by CSIRO.

63. The RAG noted Natalie Dowling's presentation providing further advice on the use of Tier 5 assessment methods in the SESSF:

    - data limited assessments involve strong assumptions, which must be clearly understood when interpreting their results,
    - each stock needs to be evaluated separately, when selecting appropriate data limited approaches and associated harvest strategies. There is no one-generic-method that will be appropriate in all contexts. A decision support tool, such as FishPath, can be used to guide this process by identifying viable harvest strategy options tailored to the fishery's unique circumstances.
    - care should be taken to select methods appropriate to the stock under investigation and that, where possible, several methods be applied rather than relying on just one,
    - the use of a catch-only method must be within the context of a broader framework that includes a plan to move towards more robust methods (likely involving data collection to support those methods) and associated harvest strategies.
    - ERA can be a useful part of a broader harvest strategy framework.

64. The RAG discussed:

    - CSIRO advice that there is no one generic or "silver bullet" method that is applicable to all species or appropriate in all contexts, rather, each Tier 5 stock needs to be evaluated separately when selecting appropriate data limited approaches and associated harvest strategies.

[33] This recommendation was undertaken during the decision session on 26 August 2021.

- The CSIRO proposed general guiding principles for undertaking management in data limited situations:
    - Understand the reason(s) for which the species is data-limited, and whether or not these limitations (resources, research capacity, inherent characteristics of the species or the fishery's operations) can be realistically overcome, or whether these are likely to be insurmountable.
    - If data limitations can be overcome, devise an adaptive harvest strategy that is initially informed via a data-limited assessment, and determine a realistic timeframe as to when a more robust assessment may be able to be undertaken, given the improved data collection protocols. Also, explicitly define the alternate, more data-moderate assessment that will ultimately be undertaken.
    - If the data limitations cannot be overcome (at least immediately), consider the available data, life history and operational characteristics to make an informed choice about the most appropriate data poor assessment for the circumstances (ideally with the help of a decision support tool such as FishPath, which was built explicitly for this purpose).
        1. Do not prescribe a single/generic data limited assessment.
        2. Do consider all available information, and how this can be used to supplement or complement the interpretation of stock status (e.g. via a multi-indicator framework), or by using alterative, independent assessments (e.g. catch-only and length-only).
        3. If feasible, undertake more than one data-limited method – either with the same set of (e.g. alternate catch-only methods), or an independent set of data (e.g. a length-only vs. a catch-only method) – to determine whether the outcomes corroborate or contradict one another.
        4. Consider including explicit trigger reference points within the harvest strategy that, if breached, require a hard consideration of cost-effective ways to improve the data collection and hence the robustness of the assessment.
        5. To the extent possible, undertake MSE testing of harvest strategies incorporating data limited assessment methods.
        6. Build in regular formal reviews of the harvest strategy.
        7. For multispecies fisheries, consider the extent to which Tier 1 assessments on the data-rich species, and the associated harvest control rules, can vicariously manage the data-limited species.
- Guidance around Tier 5 assessment approaches is to be incorporated in the SESSF HSF, including the development of a decision support tool to support the process. These can be developed over time as more Tier 5 stocks are considered and the process becomes clearer. In the meantime, RAGs will provide TAC advice for specific stocks.
- The information presented and the context for the Tier 5 assessments that are needed to be undertaken this year for deepwater shark and blue eye trevalla (seamount). To ensure that the risk with undertaking a new process for the assessment of these stocks is reduced, the current process (using a weight-of-evidence approach) could be undertaken alongside the FishPath process (of identifying viable assessment options and linking these to harvest control rules). Both processes should be provided to SERAG for consideration.

- Context about the existing protection measures of deepwater shark stocks can be included in the species summary. These include limiting effort in the fishery via the fishery structural adjustment buyout in 2007 and the deepwater closure, which covers about 50 per cent of the historical fishery.

65. The RAG agreed[34] that the 2021 eastern and western deepwater shark RBC advice be based on the outputs of the 'preferred' Tier 5 methods identified using the FishPath tool. If harvest control rules cannot be specified, a weight-of-evidence approach may be used.

Action Item 14: CSIRO

Establish a working group to develop the deepwater shark and blue eye trevalla (seamount) Tier 5 assessments and provide advice to SERAG in 2021.

Membership: lead from CSIRO (Natalie Dowling, Geoff Tuck & Robin Thomson), AFMA (Dan Corrie), SERAG independent scientific (Andrew Penney) & Colin Simpfendorfer (for deepwater shark – AFMA to check his availability).

Agenda item 12 – Orange Roughy Steering Committee outcomes

66. The RAG noted and discussed the update provided by Paul Burch on the 2021 eastern zone orange roughy stock assessment process and considerations and advice from the Orange Roughy Steering Committee (ORSC), which met on 13 August 2021:

- the inclusion of the latest data to produce a base case, found that:
    - the population status is slightly lower in the updated assessment for 2017 than was found in the 2017 assessment;
    - total biomass continues to increase;
    - the status in 2021, assuming natural mortality of M=0.04 yr^{-1}, is approximately 35 per cent of B_0; and
    - the ORSC supported the preliminary base case with recommendations (see point 67).
- the base case will be provided to SERAG for feedback and adoption.
- the method used to develop a prior for natural mortality (M):
    - while imperfect, the prior is it is the best available and is based on very similar stocks with similar data and model assumptions. Additionally, although data is not always available from the most useful time-period, it is the available data and fits with preconceptions from multiple orange roughy stocks. The development of a prior used data from quantitative stock assessments of New Zealand orange roughy.
    - other methods of developing priors were discussed. Life history methods tend to be quite uncertain. Generally, they are designed for situations when there is little age data but much length data.
    - refer to point 67 for ORSC recommendations regarding the development and use of an informative prior for estimating M within the eastern zone orange roughy assessment.
- the process to construct a decision table (cross-catch risk assessment), should the process to estimate M fail:
    - there is no formal procedure within the SESSF for selecting scenarios to undertake risk assessments;

[34] This recommendation was undertaken during the decision session on 26 August 2021.

- the cross-catch risk assessment was undertaken in 2018 using a low productivity and a high productivity scenario; and
- there was no scenario that used a *M* value that was lower than the estimate from the likelihood profile on *M* from the 2017 assessment.
- ideally a decision table would have a small number of states of nature and management actions, and should contain the mean or the median of the parameter that has been varied and be bounded by an even amount to each side. Once developed, such a decision table would then be available for use in similar situations in the future.
- refer to point 68 for ORSC recommendations on the specification of a decision table for eastern zone orange roughy.

67. The RAG agreed[35] that the process recommended by the ORSC for undertaking the eastern orange roughy Tier 1 stock assessment in 2021 be adopted for:

- base case
    - explore increasing the number of age-classes in the assessment to 100 and 120 as this is likely to impact the estimation of *M* (when *M* is estimated);
    - undertake a sensitivity to the assessment removing the 1992 egg survey;
    - correct an error in the retrospective analysis; and
    - plot age-specific maturity and selectivity on the same figure to identify the magnitude of the difference between maturity and selectivity.
- natural mortality
    - the Cordue[36] prior is relatively uninformative between plausible values of M=0.03yr^{-1} - M=0.045yr^{-1};
    - it assumes the data and model assumptions of the New Zealand orange roughy assessments are correct;
    - weighting of the data within the assessment is likely to be influential as Francis weighting
        1. gives more weight to the biomass indices, that suggest a lower M;
        2. less weight to the age data that suggest a higher M; and
    - the ORSC did not suggest that the 2021 assessment move away from Francis weighting as it is considered best practice.

68. The RAG endorsed[37] the ORSC advice on the orange roughy decision table, noting it will likely be used to inform the risk of adopting various TACs even if *M* can be estimated in the model:

[35] This recommendation was undertaken during the decision session on 26 August 2021.
[36] P.L. Cordue. *A Management Strategy Evaluation for orange roughy*. ISL Client Report for Deepwater Group Ltd (2014)
[37] This recommendation was undertaken during the decision session on 26 August 2021.

- the decision table with five values of *M* taken from the 5, 12.5, 87.5 and 95 per cent quantiles (90 and 75 per cent bounds) from the likelihood profile on *M*;
- a small number of sensible catch scenarios be chosen to reduce the complexity of the table;
- there was no information in the likelihood profile to inform the steepness of the stock recruitment relationship (*h*);
    - the decision table for eastern orange roughy should use a fixed value of *h*=0.75 for all scenarios in the decision table; and
    - the impact of varying *h* should be explored as a sensitivity to the base case assessment.

Action Item 15: CSIRO (Paul Burch)

Develop a consistent approach for constructing decision tables for consideration at the SESSFRAG Chairs' 2022 meeting.

Agenda item 13 – Climate Change impacts on the SESSF

69. The RAG noted the update provided by Dan Corrie on the outcomes of the *climate change and non-rebuilding species working group*, which met on 13 July 2021. While the working group was convened to consider questions that were developed by SESSFRAG, it recommended that a stocktake of current related research be provided to SESSFRAG and that the fishery could undertake the process in the climate change adaptation handbook.

70. The RAG noted and discussed the presentations from:

- Andrew Penney on the project *implementation of dynamic reference points and harvest strategies to account for environmentally-driven changes in productivity in Australian fisheries*;
    - Four SESSF stocks were chosen as the main case studies – redfish, jackass morwong east, silver warehou and blue grenadier. These stocks show a wide variety of recruitment patterns and different historical trends in dynamic B_0 (B_{noF}, or B unfished). Periods of departure of B_{noF} from static B_0 indicates that factors other than fishing mortality affected production at those times.
        1. The use of dynamic B_0 would have been a more sensible approach than the regime shift applied to jackass morwong east, and would have resulted in less variable TACs for blue grenadier.
        2. Silver warehou appears to have been subject to non-fishing effects in recent years.
        3. Little departure between static and dynamic B_0 for redfish indicates that the decline of this stock appears to be mainly attributable to fishing[38].
    - The application of the SESSF harvest control rule will depend on differences between depletion curves for both static and dynamic reference points. For example: there would be a difference in recent RBCs for silver warehou due to differing depletion estimates, whereas for redfish there would be no difference between depletion estimates and the RBC would be zero under both scenarios.
    - To justify the use of dynamic reference points, RAG participants observed that there needs to be:

[38] The information presented were draft findings and used a different assessment model and data inputs to that used by Fulton. The RAG noted the different findings between Penney and Fulton with regards to redfish (refer to point 72).

1. evidence to distinguish between the effects of fishing and other factors, and that non-fishing effects have a substantial influence on stock status;
2. demonstration that dynamic reference points achieve the conservation and economic objectives of the Commonwealth harvest strategy policy; and
3. safeguards to prevent dynamic limits from decreasing stocks to below some minimum sustainable biomass level.

- Rich Little on the project *development and evaluation of multi-species harvest strategies in the SESSF*;
    - The aim of the project is to develop a fit for purpose harvest strategy that meets the intent of the Commonwealth Fisheries Harvest Strategy Policy, is cost effective and maximises net economic returns. Several critical issues that are confronting the SESSF need to be considered, and which have also been addressed in other projects: monitoring and assessment review, declining indicators (undercaught TACs, declining CPUEs and non-recovering stocks), fishery independent survey design review and climate change adaptation.
    - The project is currently developing, and will evaluate, multi-species harvest strategies (MSHS) by exploring options in five areas: species, data, assessment, reference points and harvest control rules. Three approaches are being considered to address those areas (in addition to the current status quo approach): pretty good multi-species yield, indicator species approach, and key-commercial species approach.
    - A steering committee is providing oversight of the project with several wider stakeholder workshops (there have been delays due to the impacts of COVID-19)
    - The current focus of the project is
        1. the assessment of evaluation tools such as *Atlantis* or *Ratpack* (model preparation)
        2. developing a refined list of harvest strategies
        3. current working groups:
            a. Harvest strategy design working group
            b. Close-kin harvest strategy development working group
            c. *Atlantis*/*Ratpack* modelling coordination working group; and
            d. Ecosystem cap working group.
- Beth Fulton on a range of ecosystem projects relevant to the SESSF, these include:
    - the development and implementation of a handbook to help guide fisheries through climate adaptation;
        1. The handbook sets out the steps to understand:
            a. the climate driven changes to ocean variables;
            b. the potential sensitivity of individual fisheries to that physical and ecological change; and
            c. if the fishery can easily and rapidly autonomously adapt, whether:
                i. fishers can change how they fish or their business practices to relieve the pressure on their business or the ecosystem; or
                ii. a longer process is required that involves changing management plans and modifying management methods.
        2. The following became evident while developing the handbook:

a. increased variability in environmental conditions is very likely. These shifting ecosystem states may go unnoticed, which could undermine sustainability;
b. all AFMA fisheries have valuable species that are sensitive to climate change;
c. bycatch and threatened, endangered and protected (TEP) species are likely to be highly sensitive to climate change, it will be important to understand how that interacts with any fishing effects;
d. cross-jurisdictional management coordination will be needed;
e. catch information will not be the only thing that should be relied on for fishery information. Monitoring and forecast capacity will support evidence-based decision making for fishery sustainability and business profitability and will be key to understanding ecosystem change; and
f. there will be both positive and negative significant implications for fishing industries from climate change effects, these include operational issues, community impacts and economic consequences.

- the development of ecosystem structure and function indicators that can assist ecosystem approaches to fisheries management. A working group, funded by CSIRO and the Lenfest Oceans Program, considered social, economic and ecological indicators (with a focus on ecological indicators). These indicators were tested in models and were also tested using data from four case study regions around the world – Kerala (India), East Bering Sea (USA), Central Chile and South East Australia (SESSF).
    1. The global reference point did not account for how low productivity is in Australia, as such it was corrected for local production levels (climate change is also reducing capacity).
    2. It is likely that catches in the SESSF regions breached system capacity thresholds through the 1990s to 2000s (in terms of the biomass removed from the system relative to the level of primary production). Evidence of this breach is from a range of sources, including:
        a. economic drop and fish size related indicators (usually a sign of excess pressure).
        b. SESSF logbook data – there has been a clear depth expansion of catch contribution through time.
        c. under a multivariate analysis of species composition and distribution versus trophic level the east showed a system pattern that it had been overfished and is now recovering (the west has a similar pattern but not as pronounced).
    3. The conglomeration of information provides an understanding of the ecosystem, including its resilience to any distortive pressure that might be applied:
        a. Connections within the food web are important, especially critical nodes where, without them, the whole ecosystem collapses (for example supporting species and those that are highly connected such as higher-level predators). There are already some perturbations evident in the ecosystem.

b. Currently the SESSF is a partially resilient ecosystem – fishing the system already changes it from a fully resilient system. Perturbations could move the system towards a systemic collapse, e.g. heatwaves.
c. Distortive pressure –the pressure that is placed on the ecosystem versus what the ecosystem has evolved to withstand.
    i. Single species assessments used in traditional fisheries management (based on a 0.5 production line in Figure 1) may apply enough pressure to deviate the system away from a structure that the ecosystem needs to remain structurally on target (the green band in Figure 1).
    ii. The structural adjustment of the SESSF in 2007 helped move the ecosystem towards a structurally on target system – the system is still recovering with many species still structurally overfished.
    iii. Many species that are important to SESSF ecosystem structure are either structurally on target or under-fished (e.g. mesopelagic species).

- Expanded toolboxes that can help with the process and provide rapid way of looking at the whole ecosystem, these include: statistical models, single species models that can be linked to dynamic B_0, multi-species models, MICE like models, size-based models and trophic-based models.

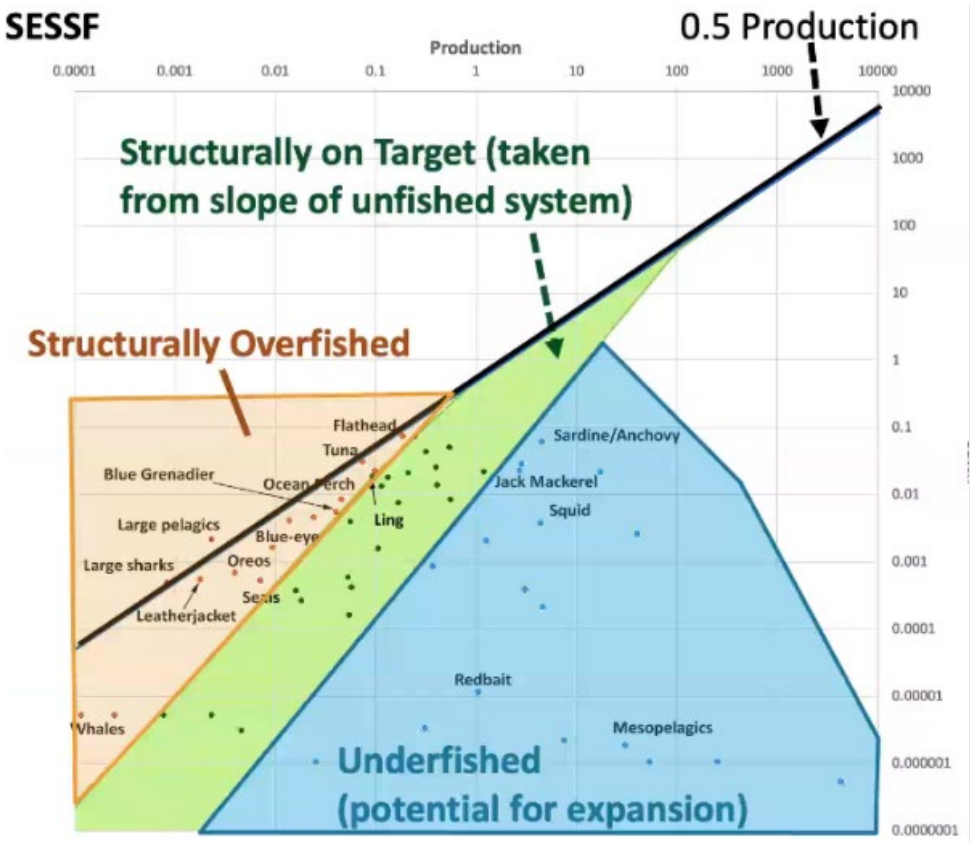


Figure 1: the SESSF evolved ecosystem structure.

71. The RAG discussed the importance of ensuring that climate change considerations are integrated into management decisions:

- Dynamic B_0 for Tier 1 species can be implemented into assessment processes; it may be also be possible to integrate this approach into the MSHS.
- Information such as anticipated season environmental conditions, or other ecological indicators (via the use of plankton recorders or environmental DNA), could be incorporated for consideration into Commission TAC setting papers.
- Modelling work could be crucial to ensure that management decisions do not lead to worse outcomes for the fishery.
- AFMA is considering how to implement the climate change handbook – a paper will be provided to resource assessment groups.
- It is not possible to run two separate systems on the current cost or resource base. To ensure that climate change considerations are progressed, AFMA could consider undertaking a risk assessment to determine business as usual activities that could be cancelled or postponed to redirect funds to this process.

72. The RAG discussed the possibility that redfish could be impacted by climate change – noting that the ecosystem approaches model (Fulton) came to different conclusions than the dynamic B_0 process (Penney) with regards to the impacts of fishing and the environment on stock status.

73. The RAG discussed the multispecies harvest strategy presentation:

- Métiers rely on accurate discarding data – if using data that includes only landed catches require some assumptions to be made.
- It may not be possible to maintain all stocks at a default target biomass – some may be higher or lower. The indicator species that will be used to monitor a functional group of other species have not yet been determined.
- The impact of a newly developed MSHS on the TACs at this stage is unknown. To achieve optimum outcomes for a MSHS there may be some compromises, allowing some rebuilding species to be landed but this may extend the time it takes for the populations to recover.
- The use of potential biological removals (PBRs) are not possible under current policy or legislation. This issue is not appropriate for this forum.

Action Item 16: AFMA

AFMA to provide SESSFRAG with an update about the process of operationalising the climate change handbook, particularly with respect to the SESSF, at the SESSFRAG Chairs' 2022 meeting.

Agenda item 14 – 2022 Chairs' meeting dates

74. The RAG agreed to hold the SESSFRAG Chairs' 2022 meeting on 15-17 March 2022 in Canberra, subject to COVID-19 circumstances

Agenda item 15 – Other business

SESSFRAG membership

75. The RAG thanked Mike Steer for his contribution to SESSFRAG, noting that he is resigning his position as SERAG Chair and as such there will be a new scientific member (SERAG Chair) at the SESSFRAG Chairs' meeting 2022.

76. The Chair thanked the participants for their contribution to the meeting and closed the meeting.

Day 3 finished – 1510

Decision session started – 1520

Decision session (member discussion)

77. Decision session participants: Cathy Dichmont, Cathy Bulman, Fiona Hill, Sarah Jennings, Lance Lloyd, Sandy Morison, Mike Steer, Daniel Corrie, Sally Weekes and Cate Coddington.

78. Decisions from this session are recorded in the main body of the meeting.

End of meeting – 1730.

Attachment A – Register of interest

Participant	Declared Interest
Chair	
Dr Cathy Dichmont	Director of Cathy Dichmont Consulting. Chair of ComRAC (FRDC) Contracted by various state and Commonwealth agencies to undertake various reviews and consultancies not related to SESSF. No pecuniary interest in the SESSF.
Members	
Dr Cathy Bulman	Honorary Fellowship, Ecological Modelling Team, Oceans and Atmosphere CSIRO (Dr Fulton is Dr Bulman's fellowship supervisor). No interest, pecuniary or otherwise.
Ms Fiona Hill	Employed by AFMA, Senior Manager of Demersal and Midwater Fisheries. No interest, pecuniary or otherwise.
Dr Sarah Jennings	Adjunct Senior Researcher, TSBE Economics member of SERAG Economic member of SEMAC Member of AFMA EWG Independent economics consultant No pecuniary or other interest in the SESSF.
Mr Lance Lloyd	GABRAG Chair Member of GABMAC Board Member, AwF – Aquaculture without Frontiers (Australia) Director; Lloyd Environmental Pty Ltd. Research Fellow; Federation University Australia No pecuniary interest.
Mr Sandy Morison	Director of Morison Aquatic Sciences Chair of SharkRAG Contracted by government departments, non-government agencies and companies for a range of fishery related matters including research and for MSC assessments of AFMA managed and other Australian and international fisheries. No pecuniary or other interest in the SESSF.
Dr Michael Steer	Research Director SARDI (Aquatic Sciences) Chair of SERAG Scientific Member of SEMAC Member SARAG (FRDC) No pecuniary interest in the SESSF.
Executive Officer	
Ms Cate Coddington	Employed by AFMA. No interest, pecuniary or otherwise.
Invited Participants	
Dr Pia Bessell-Browne	Employed by CSIRO, Assessment scientist. Acquiring funding for research purposes.

Participant	Declared Interest
Mr Simon Boag	EO SETFIA (trawl) EO SSIA (sharks) EO SPFIA (SPF) Non-beneficiary Director of two fishing companies in the SESSF one of which is a significant quota owner. Industry member on both SERAG and SEMAC. SSIA is engaged by AFMA to collect shark industry biological data SETFIA is the PI on the orange roughy east AOS and ORS Cascade survey SETFIA is engaged by participants within the W ORS research fishery to collect biological samples SETFIA is engaged by AFMA under co-management to undertake a variety of tasks including snapper management, ling management and consultation
Dr Paul Burch	Employed by CSIRO, assessment scientist. CSIRO representative on the Fisheries Statistics and Information Working Group. Acquiring funding for research purposes. PI on data services contract.
Dr Jemery Day	CSIRO, assessment scientist. Acquiring funding for research purposes Scientific member of the Sub-Antarctic Resource Assessment Group (SARAG) Interests in promoting good science.
Dr Ian Knuckey	**Positions:** Director – Fishwell Consulting Pty Ltd Director – Olrac Australia (Electronic logbooks) Chair – Northern Prawn Fishery Resource Assessment Group Chair – Tropical Rock Lobster Resource Assessment Group Chair – Victorian Rock Lobster and Giant Crab Assessment Group Chair – Victorian Central Zone Abalone Fisheries Resource Advisory Group Chair – Gulf of St Vincent's Prawn Fishery MAC Research Scientific Committee Scientific Member – Northern Prawn Management Advisory Committee Scientific Member – SESSF Shark Resource Assessment Group Scientific Member – SESSF Great Australian Bight Resource Assessment Group Scientific Member – Gulf of St Vincent Prawn Fishery Management Advisory Committee Scientific Member – Tropical Tuna Resource Assessment Group Member – Victorian Marine and Coastal Council Member – The Agri Collective **Current projects:** DAWE Project – Multi-sector fisheries capacity building AFMA 2020-0807 – Bass Strait Scallop Fishery Survey – 2020-22 AFMA 2019-0836 – Information the Bass Strait Central Zone Scallop Fishery Harvest Strategy and TAC setting process with economic data and MEY proxies FRDC 2019-027 – Improving and promoting fish-trawl selectivity in the SESSF and GABTS FRDC 2019-072 – A survey to detect change in Danish Seine catch rates of Flathead and School Whiting resulting from CGG seismic exploration. FRDC 2019-129 – Potential transition of shark gillnet boats to longline fishing in Bass Strait - ecological, cross-sectoral, and economic implications FRDC 2018-021 – Development and evaluation of SESSF multi-species harvest strategies Traffic Project – Shark Product Traceability NT Fisheries – Design and implementation of a tropical snapper trawl survey Sea Cucumber Ass. – Design and implementation of various sea cucumber dive surveys. Australia Bay – Queensland Gulf of Carpentaria Developmental Fin Fish Trawl Fishery Tas. Abalone – Scientific Advisor for Tasmanian Abalone Council Ltd PEMSEA – Developing EAFM Plan for Red Snapper in Arafura and Timor Seas

Participant	Declared Interest
	Beach Energy – BACI study of Prion Marine Seismic Survey impacts relative biomass of scallops on beds in the immediate vicinity. BCI Minerals – Potential impacts on commercial fishing and aquaculture operations resulting from the Mardie Project development Expert Witness – Gladstone Harbour development impacts
Mr Kyne Krusic Golub	Director at Fish Ageing Services Fish Ageing Services is contracted to undertake fish ageing for the SESSF. Kyne Krusic-Golub has no pecuniary interest within the fishery other than the potential for obtaining future funding for research or service provision.
Mr Neil MacDonald	Executive officer of the Great Australian Bight Industry Association Executive officer of Surveyed Charter Boat Owners and Operators Association South Australia Executive officer of Southern Fishermen's Association Executive officer of Saint Vincent Gulf Prawn Boat Owner's Association Executive officer of Marine Scale Net Fishers Association Committee support South Australian Rock Lobster Advisory Council Director NMAC(SA) P/L Director Australian Council of Prawn Fisheries Ltd. Chair CGG SAC Gippsland MSS
Mr Andrew Penney	Director of Pisces Australis Pty Ltd, an Australian registered marine and coastal research and management consultancy based in Canberra. As such, I have an interest in any opportunities in this regard. Currently principal investigator on FRDC Project: 2019-036 Implementation of dynamic reference points and harvest strategies to account for environmentally-driven changes in productivity in Australian fisheries. Scientific Member of AFMA Tropical Rock Lobster RAG and Small Pelagic Fishery RAG Currently serve as deputy to the Fisheries Scientist member on the NSW Total Allowable Fishing Committee. No shareholding and hold no positions relating to any other companies, including any fishing companies or industry associations
Dr Miriana Sporcic	Employed by CSIRO, Assessment scientist. Acquiring funding for research purposes
Dr Kevin Stokes	Director of Stokes.Net.NZ Ltd No interest, pecuniary or otherwise.
Dr Robin Thomson	Employed by CSIRO, Assessment scientist. Scientific member of SharkRAG Acquiring funding for research purposes PI on a gulper shark monitoring project PI on close kin project for school shark. PI on blue-eye trevalla close kin scoping project
Dr Geoff Tuck	Employed by CSIRO. Involved in Stock assessments. Interest in obtaining funding for future research. Principle investigator on the SESSF stock assessment project. Project leader CSIRO Marine Visual Technologies project team on automated catch detection and species identification

Participant	Declared Interest
AFMA	
Ms Lou Cathro	Employed by AFMA. No interest, pecuniary or otherwise.
Mr Dan Corrie	Employed by AFMA, South East Trawl &Great Australian Bight Trawl Manager. No interests, pecuniary or otherwise.
Ms Natalie Couchman	Employed by AFMA, Research Manager. No interests, pecuniary or otherwise.
Mr Aaron Puckeridge	Employed by AFMA. No interest, pecuniary or otherwise.
Mr Tamre Sarhan	Employed by AFMA, Observer Coordinator. No interest, pecuniary or otherwise.
Ms Sally Weekes	Employed by AFMA, Gillnet, Hook and Trap Manager. No interest, pecuniary or otherwise
Observers / Presenters	
Dr Don Bromhead	Employed by ABARES. No interest, pecuniary or otherwise
Ms Toni Cannard	Employed by CSIRO, Assessment researcher. Acquiring funding for research purposes
Dr Sandra Curin-Osorio	Student at CSIRO. No interest, pecuniary or otherwise
Mr George Day	Employed by DAWE, Assistant Secretary, Fisheries. No interest, pecuniary or otherwise.
Dr Roy Deng	Employed by CSIRO, Senior Experimental Scientist - doing SESSF related research work. Acquiring funding for research purposes
Dr Natalie Dowling	Employed by CSIRO, Senior scientist PI on various projects developing harvest strategies for data-limited fisheries in Australia and internationally
Dr Ryan Downie	Employed by CSIRO, Experimental Scientist. Involved in research projects relating to the fishery.
Ms Jo Elphinstone	Employed by DAWE, Director – Commercial Fisheries Policy. No interest, pecuniary or otherwise.
Dr Tim Emery	Employed by ABARES. No current interest pecuniary or otherwise. Any potential future interest in research funding will be declared as necessary.
Dr Heath Folpp	Employed by NSW DPI – Program leader Resource Management. No conflicts of interest.
Dr Beth Fulton	Employed by CSIRO, ecosystem and climate scientist, Portfolio Leader for Integrated Marine Management. Adjunct with the University of Tasmania (Deputy Director for the Centre of Marine Socioecology). Acquiring funding for research purposes
Dr Haris Kunnath	Employed by CSIRO, Research Scientist. Acquiring funding for research purposes

Participant	Declared Interest
Dr Geoff Liggins	Employed by DPI NSW. Representative of state jurisdiction / potential competing interests regarding research priorities etc. No pecuniary interests.
Dr Rich Little	Employed by CSIRO, assessment scientist. Acquiring funding for research purposes. Member of the Total Allowable Fishing Committee for NSW, conflicts with all items with state fisheries and in particular involved with setting the TAC for school whiting. Principal Investigator of the SESSF Multi-species Harvest Strategy project Project leader CSIRO Marine Visual Technologies project team on automated catch detection and species identification.
Dr Tim Ryan	Employed by CSIRO, Senior experimental scientist / Team Leader – Acoustics and Pelagic Ecosystems. Acquiring funding for research purposes
Mr Les Scott	CEO – Peter and Una Fishing Co P/L an Australian resident company which holds various fishing rights in, and operates longline vessels in the SESSF (GHAT), Coral Sea and International fisheries operating a vessel under an Australian Flag. Advisor to PG&UM Rockliff – who hold various fishing rights in the SESSF, GHAT, Commonwealth and State (Tasmania) Scallop Fishery, East Coast Tuna Fishery, and Tasmanian State Fisheries Pecuniary interest is limited to the extent of: an employee of the company and partnership disclosed.
Dr Veronica Silberschneider	Employed by NSW DPI NSW. Representative of state jurisdiction / potential competing interests regarding research priorities and management actions affecting NSW fisheries. No pecuniary interests.
Dr Ilona Stobutzki	Employed by DAWE, Assistant Secretary, Protected Species and Communities Branch. No interest, pecuniary or otherwise.
Mr James Woodhams	Employed by ABARES. A/g Director. Steering committee member – multispecies harvest strategy project. A minor element (funding) on the DRPs project. Has been involved in conversations of the FIDWG and higher-level project steering committee for the FRDC-CSIRO project biological parameters used in Commonwealth fishery assessments. No pecuniary interest.

Attachment B – Agenda: SESSFRAG Data Meeting: 24-26 August 2021

Preliminary session: Tues 24 August 2021 / Time: 1300 to 1330

Time	Item	Purpose
1300	**Preliminary session (members and AFMA only)** Declarations of interest	For decision

Day 1: Tues 24 August 2021 / Time: 1330 to 1730

Time	Item	Purpose
1330	**1. Preliminaries** a. Acknowledgement of Country, welcome and apologies b. Declarations of interest c. Adoption of Agenda d. Minutes from previous meetings	
1445	**2. Actions arising from previous meetings**	For information
1530	*Afternoon Tea – 15 min break*	
1545	**3. SESSF TAC setting process guidelines and timeframes**	For information
1615	**4. ERA Trigger Analysis** (Review data against ERA triggers)	For advice
1700	**5. Five-year strategic research plan**	For advice
1730	*End of Day 1*	

Day 2: Wednesday 25 August 2021 / Time: 0830 to 1730

Time	Item	Purpose
0830	**6. Data collection programs** a. ISMP annual report b. SIDaC annual report c. Fish ageing services annual report	For information
1000	*Morning Tea – 15 min break*	
1015	**7. Catch & Discard Data** a. Depth modification b. SESSF Catch History (Geoff Liggins – NSW Tier 4) c. 2021 Discard Reports (Data to 2020)	For advice
1245	*Lunch – 30 min break*	
1315	**8. MYTAC Analysis / Assessment data review** incl. presentation: • Tim Ryan – blue grenadier & orange roughy acoustic surveys	For advice
1545	*Afternoon Tea – 15 min break*	
1600	**9. SESSF Data Plan** a. Draft 2021-25 Plan b. Recommended changes (incl. ISMP plan)	For advice
1730	*End of Day 2*	

Day 3: Thursday 26 August 2021 / Time: 0900 to 1530

Time	Item	Purpose
0900	**10. Fishery Independent Data Working Group report**	For discussion
1000	*Morning Tea – 15 min break*	
1015	**11. SESSF Harvest Strategy** a. Updates to the SESSF Harvest Strategy Framework b. Tier 5 decision rules	For advice
1115	**12. Orange roughy Steering Committee outcomes**	For advice
1200	*Lunch – 30 min break*	
1230	**13. Climate Change impacts on the SESSF** Incl. presentations: • Andrew Penney – Dynamic B_0 • Rich Little – Multispecies Harvest Strategy • Beth Fulton – Ecosystem modelling and adaptation handbook	For discussion
1500	*Afternoon Tea – 15 min break*	
1515	**14. 2022 Chairs' meeting dates**	For decision
1520	**15. Other business**	
1530	*End of main meeting Day 3*	

Decision session: Thursday 26 August 2021 / Time: 1530 to 1730

Time	Item	Purpose
1530	**Decision session (members and AFMA only)**	**For decision**
1630	*End of Day 3*	

Attachment C – SESSFRAG action items

Complete/Redundant	Underway	Need SESSF RAG advice	Not yet started

No.	Ag. Itm / Mtg Date	Action Item	Agency / Person	Timeframe	Progress as of SESSFRAG Data meeting 2020
4	4 SESSFRAG Chairs' 2019	AFMA to obtain and include in its database the following data sets: • Great Australian Bight (GAB) and South East Trawl Fishery Independent Surveys • crew collected data (incl. GABT and the GHAT) • historic blue warehou industry collected data	AFMA	As soon as practicable	FIS collected data – Complete – added into the database. Crew collected data – Complete –Crew collected data for the GAB is still recorded on paper and sent to AFMA for entering. This is done in batches and is dependent on staff resourcing. AFMA/GABIA are investigating options for collecting this information electronically. SIDaC data is now in the database. Blue warehou data – Not yet started - AFMA to follow up.
21	15 SESSFRAG Chairs' 2019	AFMA and CSIRO to develop a detailed project proposal for a comparison of GHAT EM and observer data for submission to the ARC / ABARES.	AFMA and CSIRO	September 2019	Redundant This is not a priority for AFMA.AFMA has however, commissioned ABARES to update its analysis comparing EM and logbook data. This is expected to be considered by SharkRAG in October 2021.
26	15 SESSFRAG Chairs' 2019	Data exclusion to investigate the effect of biennial sampling to be undertaken during the next gummy shark assessment to determine the impact of biennial data collection by removing every second year of length and age data.	CSIRO – Dr Thomson	During the gummy shark assessment in 2020	Complete If twice as much length/age data is collected every second year there is a very small reduction in power (i.e. you can biennial sampling can be done, however twice as many samples need to be collected every second year).
4	6 SESSFRAG Data 2019	AFMA to seek advice from the Economic Working Group (EWG) about which KPIs are being adopted and what data are to be collected and presented. Following this, add an information item to the 2020 SESSFRAG Chairs' meeting agenda regarding economic KPIs.	AFMA / Sarah Jennings	SESSFRAG Chairs' meeting 2020	Complete A Fisheries Management Paper is being developed that will articulate how AFMA interprets the economic objective and how performance against the objective will be measured. A template will be included that will assist RAGs and MACs to assess and interpret trends, external factors and economic risks influencing a fishery's net economic returns.
42	19 SESSFRAG Data 2019	AFMA to update the logbooks to include 'live' status of released school sharks	AFMA	As soon as practicable	Complete Both paper logbooks and e-logs have been updated to make it clear how fishers report live discards of school shark. Letter sent

					to industry advising them of the changes on 6 June 2021.
3	8 SESSFRAG Data 2020	The RAG to discuss the implications of the MSHS project on the ageing plan and the inclusion of non-quota species, such as leatherjackets, at the Chairs' 2021 meeting.	SESSFRAG	Chairs' meeting 2021	Underway A summary of non-quota species collections held was provided at Agenda Item 6c (FAS annual report).
5	10 SESSFRAG Data 2020	AFMA and the SIDaC program to report to SharkRAG at their September 2020 meeting regarding costs for collecting school shark length samples at sea as part of a crew-based program. In addition to the sampling requirements across the strata (method and location), the SIDaC program should consider: • ensuring lengths are linked to the tissue samples, as lengths alone are not used in the assessment; and • including sampling targets for the trawl fleet, particularly from deeper water.	SIDaC	September 2020	Redundant The costs side of this action was not completed. However, the sampling aspects are either done (lengths are link to tissue samples) or were picked up via SharkRAG input into the SESSF data plan.
7	10 SESSFRAG Data 2020	Subject to SharkRAG advice, the SESSF data plan and ISMP plan to be updated to include the collection of school shark lengths and vertebrae from otter board trawl boats in the CTS.	AFMA	January 2021	Complete The collection of school shark samples from otter board trawl boats is included in the SESSF data plan. Once data plan is approved, the most appropriate method of collection will be determined (i.e. ISMP or SIDAC).
12	11 SESSFRAG Data 2020	Paul Burch to provide the 'Discard Method Evaluation' report, an output from the Discard Estimation Working Group, to the SESSFRAG EO when finalised so that it may be distributed to SESSFRAG.	Paul Burch	As soon as practicable	Complete The report was provided to SESSFRAG. Paul Burch is scheduled to present the model-based approach to the World Fisheries Congress in September.
13	11 SESSFRAG Data 2020	AFMA to evaluate the benefits of undertaking another analysis of discard reporting for fisheries that have EM to determine if there are continuing improvements in reporting (as per the review that ABARES undertook).	AFMA	As soon as practicable	Underway AFMA has engaged ABARES to update its analysis comparing logbook data to EM data for the GHATF. SharkRAG will consider the analysis at its October meeting.
15	11 SESSFRAG Data 2020	AFMA to investigate and compare logbook reported discards for school and gummy shark to (1) observers for trawl boats, and (2) EM for gillnet/hook boats.	AFMA	As soon as practicable	Complete Obtaining updated estimates of discards was discussed at SharkRAG March 2021. AFMA is currently looking to outsource an analysis of discard rates and size composition of discarded sharks, including interannual variability, from all methods in the SESSF. The outcome of this work will inform the sampling regime and frequency required to ensure reliable estimates of discards of sharks that can be used for assessment and the TAC setting process. The item has been referred to SharkRAG.

17	12 SESSFRAG Data 2020	AFMA and CSIRO to liaise with the states regarding estimates of discards for SESSF quota species and consider establishing a discard and recreational fishing working group to consider a set of decision rules, in particular: a. whether to apply Commonwealth discard rates to state catches when Commonwealth and state gear types or management controls differ; b. how to estimate state discard rates and total catches where Commonwealth discard rates are not applied because of differences in gear type or management controls; and c. whether the approach used to determine recreational catch weights for shark species should be extended to other SESSF species as part of the 2021-22 Data Services Contract.	AFMA / CSIRO	As soon as practicable	a-b: Underway AFMA is progressing this work. Information about the outcome of this work will be provided to SESSFRAG at the Chairs' meeting in 2022. c: Complete This was discussed at SERAG in November 2020, and it was decided not to extend the approach to other SESSF species at this stage – state catches are either low, or not provided to CSIRO. Dr Burch will continue to request recreational catch data from state agencies each year and include the figures in the Catch and Discards report.
21	14 SESSFRAG Data 2020	SharkRAG to discuss the new approaches for estimating CPUE in the gillnet sector, in particular those that investigate zero catches such as the Tweedie GLM.	SharkRAG	SharkRAG September meeting 2020	Complete Scheduled for discussion at the October 2021 SharkRAG meeting, as part of the workplan for the next gummy shark assessment.
23	14 SESSFRAG Data 2020	Provide a plot of annual gillnet length deployed in the GHAT over time to SharkRAG for their information.	CSIRO	SharkRAG September meeting 2020	Complete
25	14 SESSFRAG Data 2020	Miriana Sporcic and Natalie Couchman to discuss historical management changes (e.g. ASL closures) that have been made in the gillnet sector which may influence CPUE, including whether these changes can be accounted for in the analysis, as this can change the overarching approach to CPUE standardisation.	AFMA / CSIRO	As soon as practicable	Complete Scheduled for discussion as part of gummy shark assessment work plan at next SharkRAG meeting in October 2021.
41	17 SESSFRAG Data 2020	Tamre Sarhan to check the logbooks with the CDRs for silver trevally as the 2019 catch at depth records are inconsistent with previous years and could be due to misreporting or misidentification.	Tamre Sarhan	SERAG 1 2020	Complete Several issues have been found: • Logbook data and CDR data for silver trevally does not match up for ten vessels in 2019 and/or 2020. The cause is likely to be due to unintentional misreporting. • Some boats may have had issues with their Elogs. One skipper informed AFMA that he could not change the depth on his form so it kept reporting at 405m, from that boat all fish were shallow water species and clearly not from that depth. • Silver trevally are only caught on rare occasions at depths up

					to around 150m (as explained by several skippers). There have been ongoing issues with depth reporting in logbooks. This was resolved by CSIRO using bathymetry and location details. There should be accurate depth reporting from now on.
44	17 SESSFRAG Data 2020	Ian Knuckey to provide the 2007-2012 length data from the industry survey on orange roughy (east) data to John Garvey for incorporating into the database.	Ian Knuckey / AFMA	As soon as practicable	Complete Data provided to AFMA. Matt Koopman (Fisheries Scientist, Fishwell) and Gus Verzosa (Manager, Business Intelligence, AFMA) to discuss data format needs for incorporating into the database (16 August 2021).
48	18 SESSFRAG Data 2020	AFMA to work with Robin Thomson to include the collection of school shark samples from deeper water in the 2021 ISMP plan – consider whether these are collected from trawl boats (see also action item 5).	AFMA / Robin Thomson	January 2021	Complete The collection of school shark samples from otter board trawl boats is included in the SESSF data plan. Once data plan is approved, the most appropriate method of collection will be determined (i.e. ISMP or SIDAC).
1	1.5 SESSFRAG Chairs' 2021	AFMA to provide SESSFRAG Members with the AFMA Commission Outcomes (March 2021) related to the implementation of the SESSFRAG Terms of Reference once they become publicly available.	AFMA	As soon as available	Complete – emailed to SESSFRAG on 7 July 2021 The Commission endorsed the revised SESSFRAG TOR, specifying a quorum appropriate to the current membership. www.afma.gov.au/news-media/news/76th-afma-commission-meeting-chairmans-summary
2	2 SESSFRAG Chairs' 2021	AFMA to investigate the delay in updating logbooks (paper and e-logs) to include 'live' status of released school sharks; noting that this action item was first raised at the 2019 SESSFRAG Data Meeting and had been previously identified as an issue by SharkRAG in 2017.	AFMA	August 2021 meeting	Complete Amendments have been made to both paper and e-logs to allow for this. AFMA wrote to industry in June advising them on how to report live discards.
3	4 SESSFRAG Chairs' 2021	Fiona Hill (AFMA) to investigate the progress and timeframe for completing the following action item from the Economic Working Group – September 2020 – Agenda Item 5: *AFMA Management to finalise the agreed KPIs and develop a paper for EWG review and Commission approval. The paper will need to provide guidance relating to the timing of reporting and use of economic KPIs by AFMA for performance reporting.*	Fiona Hill (AFMA)	August 2021 meeting	Complete AFMA are currently developing a Fisheries Management Paper (FMP) that will articulate how AFMA interprets the economic objective and how performance against the objective will be measured. A key component of the policy will include a template for RAGs and MACs to complete that assists them assess and interpret trends, external factors and economic risks influencing a fishery's net economic returns. The template will be developed in consultation with the economic working group and take account of work by that committee on developing economic indicators.

4	5 SESSFRAG Chairs' 2021	AFMA to provide SESSFRAG Members with the outcomes relating to the review of the TAC setting process 2021-22, from the March 2021 AFMA Commission Meeting once publicly available.	AFMA	August 2021 meeting	Complete – emailed on 7 July 2021 The Commission agreed to determine the TACs for the SESSF quota species for the 2021-22 fishing year as recommended by AFMA Management, except: • The Commission agreed to apply a 15 per cent discount for silver trevally; and • While the Commission approved the recommendation for 100 per cent undercatch for orange roughy (East) for 2021/22, the Commission also agreed that this would be reviewed for the 2022/23 season. The Commission also agreed to AFMA Management recommendations for: a) TAC limits for SESSF non-quota species for the 2021-22 fishing year; b) amounts and percentages for overcatch and undercatch for SESSF quota species; c) RCA for orange roughy (western) and orange roughy (GAB Albany and Esperance) for the 2021-22 fishing year. www.afma.gov.au/news-media/news/76th-afma-commission-meeting-chairmans-summary
5	6 SESSFRAG Chairs' 2021	AFMA to liaise with Dr Robin Thomson (CSIRO) to ensure that sampling targets for shark species (particularly trawl caught gummy shark) are accurately captured in the 2021 ISMP Plan.	AFMA / CSIRO	August 2021 meeting	Complete The SESSF data plan has been updated to reflect SharkRAG advice regarding shark-sampling targets. Once approved, the best method of collection will need to be determined, i.e. ISMP or SIDAC.
6	6 SESSFRAG Chairs' 2021	AFMA to confirm with Tamre Sarhan (Observer Program Coordinator) to determine whether maturity data can be collected by observers and, if so, provide SESSFRAG with a list of species for which this data can be collected.	AFMA	August 2021 meeting	Complete This data can be collected. RAG to provide advice on species of interest.
7	9 SESSFRAG Chairs' 2021	AFMA to incorporate the process for periodic review of stock assessments in the document 'Total Allowable Catch (TAC) setting process – Guidelines for provision of data and stock assessment processes' for further consideration by SESSFRAG. Timeline is subject to other priorities.	AFMA	As soon as practicable	Underway A discussion was held at the SESSFRAG March Chairs 2021 meeting to establish a process for reviewing stock assessments. This item will be further considered at the March 2022 Chair's meeting.

8	10 SESSFRAG Chairs' 2021	Dr Paul Burch (CSIRO) to liaise with Dr Ian Knuckey (Fishwell Consulting) and Fish Ageing Services, to determine the spatial and temporal data associated with Cascade Plateau orange roughy otolith samples.	Dr Paul Burch	August 2021 meeting	Underway
9	11 SESSFRAG Chairs' 2021	AFMA to consult with a geneticist regarding the design of a sampling protocol that could be used during upper-slope dogfish survey, that could be analysed in the future to assist answering some of the knowledge gaps in relation to dogfish, thereby maximising the value out of the survey.	AFMA	As soon as practicable	Complete Input provided into the project proposal.
10	13 SESSFRAG Chairs' 2021	AFMA, CSIRO and ABARES to establish a Climate Change & Non-Rebuilding Species Working Group, with SESSFRAG to provide the Working Group with questions (out-of-session), for consideration at a meeting, to be scheduled prior to the SESSFRAG Data Meeting (August 2021).	SESSFRAG	August 2021 meeting	Complete Working group established – membership comprises: Dan Corrie, Don Bromhead, James Woodhams, Geoff Tuck, Beth Fulton, Fiona Hill, Sally Weekes, Natalie Couchman and Ryan Murphy. The group met on 13 July 2021 and considered SESSFRAG question. Refer to Agenda item 12 – further work is recommended.
11	14.1 SESSFRAG Chairs' 2021	AFMA and SIDaC to amend the SIDaC sampling plan to remove the otolith sampling targets for ribaldo, noting that otolith samples are no longer collected.	AFMA / SiDaC	August 2021 meeting	Complete AFMA has updated the SESSF data plan to remove the requirement for ribald otolith collection and in the interim, advised SIDAC to stop collecting otoliths for ribaldo.
12	14.1 SESSFRAG Chairs' 2021	Mr Nate Meulenberg to follow up with Mr Tamre Sarhan regarding the status of employing a Portland based observer to collect port-samples under the ISMP.	Nate Meulenberg (AFMA)	August 2021 meeting	Complete A Portland-based observer is being trained to collect port samples.
13	14.2 SESSFRAG Chairs' 2021	CSIRO to assess potential impacts of no ISMP coverage between 23 March and mid-October, on Tier 1 species scheduled for assessment in 2021. CSIRO to plot length distributions by month to investigate any seasonality in lengths, and present outcomes to the SESSFRAG Data Meeting (August 2021).	CSIRO	August 2021 meeting	Complete CSIRO has undertaken an analysis and will present the results, refer to Agenda item 8: MYTAC analysis
14	15 SESSFRAG Chairs' 2021	AFMA to liaise with their Eastern Tuna and Billfish Fishery Management Team, to determine whether they have investigated the possibility of installing stereo video cameras on their vessels, and/or whether such technology is available through current providers.	AFMA	August 2021 meeting	Complete The ETBF has not formally used either stereo video or other techniques to measure individual fish. Over the last few years the CSIRO has been working on artificial intelligence and machine learning elements to seek to both identify catch item 'events' and then looking at possibility of using technology to identify catch items from electronic monitoring data.

					In addition, the recent funding that AFMA received is also partly to investigate development of additional technology to deliver efficiencies or additional elements to data integration and analysis, such as that described above.
15	15 SESSFRAG Chairs' 2021	AFMA to liaise with Industry and CSIRO to discuss the potential for implementing EM collection of fish lengths within the SESSF, for vessels fitted with cameras (i.e. GHAT Sector), noting that length estimation is not currently a feature of the current software.	AFMA	August 2021 meeting	Redundant This arose from a discussion around the potential capability of EM. AFMA/Industry/CSIRO will discuss at the appropriate time.
16	16 SESSFRAG Chairs' 2021	AFMA to compare discard data reported in logbooks, to those recorded by the ISMP program, to determine the accuracy of operator reported discards.	AFMA	Include in future discard reviews to SESSFRAG	Underway AFMA is currently developing the reporting templates
17	16 SESSFRAG Chairs' 2021	AFMA to liaise with CSIRO (Dr Miriana Sporcic and Dr Cathy Bulman) to identify non-quota species to remain as discard reporting options in e-logs, outside of the bycatch discard groups (i.e. those that are high-risk as identified through the ERA).	AFMA / CSIRO	August 2021 meeting	Underway Refer to Agenda Item 7.
18	20.1 SESSFRAG Chairs' 2021	AFMA to liaise with the Multi-Species Harvest Strategy Project Committee to address the following questions raised by SESSFRAG at their March 2021 Chairs' Meeting: 1. Testing of approaches: Would it be possible to use a retrospective approach to testing alternatives, to see how the fishery might have progressed if they were first applied in the late 90s or early 2000s? 2. Metrics of success: Is this determined solely by total yield or will the number/proportion of species that remain at Target or above Limit Reference Points also be considered? 3. Will the Candidate Harvest Strategies only consider the current Harvest Strategy Policy settings (B_{MEY} = 48%, LRP = 20%), or will they consider potential performance if alternative (higher or lower) settings were applied? Could an alternative have worked well under different Harvest Control Rules?	AFMA	August 2021 meeting	Complete 1. Testing of approaches: This has been flagged as a request and the project team will consider this approach, if not as part of the formal project then possibly as an additional piece of work. 2. Metrics of success: There are multiple metrics of success, which will include profitability, cost, performance against the objectives of the relevant policies 3. Will the Candidate Harvest Strategies only consider the current Harvest Strategy Policy settings: The basis of the MSHS is varying targets reference points, including what combination will max economics to the fishery. The limit reference point in the current policy will be the basis of the candidate harvest strategies, however alternative limits, or triggers, can also be explored.

Attachment D – Action items arising from the meeting

No.	Agenda Item / Meeting Date	Action Item	Agency / Person	Timeframe
1	4 SESSFRAG Data 2021	GABRAG to consider catches of wide stingaree in the 2021 GABFIS in the context of the species distribution ERA trigger for otter board trawl in the Great Australian Bight Trawl Sector.	GABRAG	Next GABRAG meeting
2	6a SESSFRAG Data 2021	AFMA and CSIRO to discuss further potential refinements to the ISMP sampling targets for some species to ensure representative sampling whilst avoiding broadscale changes to the plan.	AFMA /CSIRO	January 2022
3	6c SESSFRAG Data 2021	FAS to provide a summary of orange roughy otolith samples they hold to GABRAG.	Kyne Krusic-Golub (FAS)	Next GABRAG meeting
4	7a SESSFRAG Data 2021	Robin Thomson to present an options paper to SERAG and SharkRAG investigating the utility of historical logbook data to use average grid depth to adjust recent 'invariant depth' records.	Robin Thomson (CSIRO)	Next SERAG and SharkRAG meeting
5	7a SESSFRAG Data 2021	Robin Thomson to provide Dan Corrie with the name of the details of the boat reporting effort in depths outside the area of the sector.	Robin Thomson (CSIRO)	As soon as practicable [complete – the boat was nominated under both VIT and SET – no issue as depths were from SET]
6	7b SESSFRAG Data 2021	Establish a subcommittee to drive the process for updating catch history data for both Tier 1 and Tier 4 species. Report to be provided at SESSFRAG Chairs' 2022 meeting for consideration and adoption. Membership – Paul Burch (CSIRO - lead) Geoff Liggins (NSW DPI) and Dan Corrie (AFMA). A member to be included from Victorian Fisheries Authority if needed. Other agency members to be included if needed.	CSIRO / NSW DPI / AFMA	SESSFRAG Chairs' 2022 meeting
7	7c SESSFRAG Data 2021	AFMA/CSIRO/SETFIA to investigate the reason for discards of orange roughy in the Southern Zone (prior to SERAG meetings in 2021).	AFMA / CSIRO / SETFIA	SERAG September 2021 meeting
8	7c SESSFRAG Data 2021	CSIRO to include colour-coding in the discard tables in future discard reports to highlight the criteria for which discard estimates fail validity tests to enable easier consideration of these by SESSFRAG.	CSIRO	SESSFRAG Data 2022 meeting

No.	Agenda Item / Meeting Date	Action Item	Agency / Person	Timeframe
9	7c SESSFRAG Data 2021	CSIRO and AFMA to discuss assessment scheduling and provide an out-of-session paper for SESSFRAG to consider; prior to the Chairs' meeting in March 2022.	CSIRO / AFMA	SESSFRAG Chairs' 2022 meeting
10	8 SESSFRAG Data 2021	Consider how the outputs of uncertain Tier 1 assessments should be considered in the SESSF harvest strategy framework; including the application of discount factors when setting Total Allowable Catches (TACs) or inclusion of additional tier levels. Provide to SEMAC for consideration as soon as possible.	AFMA	Next SEMAC meeting 2021
11	8 SESSFRAG Data 2021	Dr Pia Bessell-Browne to present the analysis of lengths by month for Tier 1 species to SERAG in 2021.	Pia Bessell-Browne	SERAG September 2021
12	8 SESSFRAG Data 2021	SERAG to consider an alternative assessment approach for western jackass morwong for 2022.	SERAG	SERAG 3 2021
13	9a SESSFRAG Data 2021	AFMA to work with SETFIA to develop a revised bycatch group list for consideration by SESSFRAG for inclusion in the data plan.	AFMA / SETFIA	As soon as possible
14	11b SESSFRAG Data 2021	Establish a working group to develop the deepwater shark and blue eye trevalla (seamount) Tier 5 assessments and provide advice to SERAG in 2021. Membership: lead from CSIRO (Natalie Dowling, Geoff Tuck & Robin Thomson), AFMA (Dan Corrie), SERAG independent scientific (Andrew Penney) & Colin Simpfendorfer (for deepwater shark – AFMA to check his availability).	CSIRO	SERAG September 2021
15	12 SESSFRAG Data 2021	Develop a consistent approach for constructing decision tables for consideration at the SESSFRAG Chairs' 2022 meeting.	CSIRO (Paul Burch)	SESSFRAG Chairs' 2022 meeting
16	13 SESSFRAG Data 2021	AFMA to provide SESSFRAG with an update about the process of operationalising the climate change handbook, particularly with respect to the SESSF, at the SESSFRAG Chairs' 2022 meeting.	AFMA	SESSFRAG Chairs' 2022 meeting

Attachment E – Considerations about the MYTAC decision tree from the MYTAC Working Group

Table 1: Species/stocks being assessed in 2021.

Species	MYTAC year	Stock biomass (or proxy) above TRP?	TAC <50% caught	TAC <50% caught for operational reasons only?	Comments	Continue with 2021 assessment?	SESSFRAG advice
Deepwater shark – east (Last assessed as Tier 4 in 2018 but will be assessed as Tier 5 in 2021)	3rd of 3yr MYTAC	No (2018) C_{targ}: 1.1592 C_{lim}: 0.483 **C_{cur}: 0.5332**	No 75% 18 t of 24 t TAC	-	The group did not review data for this species – this will be reviewed by SESSFRAG at the data meeting.	Yes	A working group to be established to provide advice to SERAG.
Deepwater shark -west (Tier 5 - 2018)	3rd of 3yr MYTAC	Yes (2018) C_{targ}: 0.6073 C_{lim}: 0.253 **C_{cur}: 0.7292**	Yes 41% 96 t of 235 t TAC	Uncertain	The group did not review data for this species – this will be reviewed by SESSFRAG at the data meeting.	Yes	A working group to be established to provide advice to SERAG.
Flathead (Tier 1 - 2019)	2nd of 3yr MYTAC	No (2019) Target: 40% B_0 Limit: 20% B_0 **34% B_0**	No 108% (Within TAC after under/overs) 2183 t of 2010 t TAC	-	The AFMA Commission requested that the Tier 1 assessment is updated in 2021 with recent catch and CPUE due to concerns about decreasing CPUE in multiple zones. Trawl Z30 annual standardised CPUE trend was noisy and flat between 1986 and 2001, and after a transitional period between 2002 and 2006 during which catches surged, was noisy and flat from 2007 to 2020. Trawl Z10-20 annual standardised CPUE appears cyclical above and below average, has remained below average in 2017-2018 and increased to the long-term average in 2019 and 2020. Danish seine Z10/60 annual standardised CPUE appears cyclical above and below average and has remained below average since 2012. There has also been an overall decrease over the 2007-2020 period, with the point estimates from 2018-2020 being the lowest in the series. The 2020 catch by Danish seine in zones 20 and 60 (791.2 t) is the second lowest since 1997. There were very small amounts of Danish seine catch in zone 30 up until 2016, increasing to 125-165 t since 2017. When catch/effort from zone 30 are added to the Danish seine CPUE series, it makes very little difference (Sporcic, pers comm).	Yes Assessment will be updated with recent CPUE and catch in 2021.	N/A
Jackass morwong (Tier 1 - 2018)	3rd of 3yr MYTAC	No (2018) **West** Target: 48% B_0 Limit: 20% B_0 **68% B_0** **East** Target: 48% B_{1988} Limit: 20% B_0 **35% B_{1988}**	Yes 21% 98 t of 468 t TAC	Uncertain	**East** Catch in 2020 is the lowest ever – 57.1 t. Trawl Z30 annual standardised CPUE has been below the long-term average since about 2001. More recently, the relative CPUE trend has been low and flat since at least 2015. Trawl Z10-20 annual standardised CPUE has been below the long-term average since about 2000 with an increase to close to the long-term average in 2008, and then declining to 2020. Catch at depth distribution in 2020 shows more catches in deeper water. Discards have increased in 2019 and 2020 and are above 35%. There are no discarded lengths available for Trawl Z10-20 or Danish seine. **West** The recorded catch (7.8 t) and number of records (128) in 2020 was the lowest since 2016.	East – Yes West - TBC	West: A weight-of-evidence approach be undertaken. A discount factor, or a buffer, should be considered to account for time-induced risk.

Species	MYTAC year	Stock biomass (or proxy) above TRP?	TAC <50% caught	TAC <50% caught for operational reasons only?	Comments	Continue with 2021 assessment?	SESSFRAG advice
					Since 2007, standardised CPUE has been below the long-term average, decreased to 2014, increased to 2017 and decreased in 2018, 2019 and 2020. There are no port based length frequencies in the west.		
Orange roughy – east (Tier 1 - 2017)	4th of 3yr MYTAC	No (2017) Target: 48% B_0 Limit: 20% B_0 **33% B_0**	No 103% (Within TAC after under/overs) 1319 t of 1276 t TAC	-	The group did not review data for this species – this will be reviewed by SESSFRAG at the data meeting.	Yes	Adopt the process recommended by the ORSC
Pink ling (Tier 1 - 2018)	3rd of 3yr MYTAC	No (2018) **West** Target: 48% B_0 Limit: 20% B_0 **84% B_0** **East** Target: 48% B_0 Limit: 20% B_0 **30% B_0**	No 69% 910 t of 1310 t TAC	-	**East** Annual standardised CPUE has been below average corresponding to a relatively flat trend over the 2001-19 period, with the most recent estimate exceeding the long-term average. **West** Annual standardised CPUE reached a minimum in 2005 and has increased since then to the long-term average from 2013 to 2016, increased to above average in 2017 to 2018, decreased to the long-term average in 2019 and then increased above the long-term average in 2020.	Yes	N/A
Silver warehou (Tier 1 - 2018)	3rd of 3yr MYTAC	No (2018) Target: 48% B_0 Limit: 20% B_0 **31% B_0**	No 64% 289 t of 450 t TAC	-	**East** Discards are high in the east and increasing, with modelled estimates as high as 80% in 2020, and 60% in 2019. There are ten on board retained length frequencies in the east, and 1268 discarded lengths frequencies. **West** Annual standardised CPUE has declined since 2005, and since 2008 have been below the long term average. The influence of the vessel factor was high from 1999 to about 2006 after which it was less influential. The 2020 catch (163.5 t) of silver warehou in the west was the lowest in the series.	Yes	N/A
Blue grenadier (Tier 1 - 2018)	3rd of 3yr MYTAC	Yes (2018) Target: 48% B_0 Limit: 20% B_0 **122% B_0**	No 98% 11,890 t of 12,183 t TAC	-	**Non-spawning** Non-spawning annual standardised CPUE has been below average between 1993 - 2013, with two apparent cycles, each peaking in 1999 and 2008 respectively. Between 2014 and 2017, these indices were above average and on average in 2018. Also, there has been a consistent increase since 2018. Non-spawning discards have been consistent at around 40% since 2012. **Spawning** There is no CPUE series for the spawning aggregation and the acoustic data collected in 2020 and 2021 surveys will not be available as an index of abundance for the 2021 stock assessment.	Yes	Tim Ryan provided an overview of the acoustic data collected in 2020 and 2021.
Blue eye trevalla (Tier 4 – Slope - 2020)	Single year TAC (slope) 3rd of 3yr MYTAC (seamount)	No (2020) **Slope** C_{targ}: 1.2321 C_{lim}: 0.5134 **C_{cur}: 0.7656** **Seamount**	Yes 49% 225 t of 458 t TAC	Uncertain	**Slope** The four-year average CPUE decreased between the 2018 and 2020 Tier 4 assessments, resulting in an RBC of 227 t from the 2020 assessment, compared to 439 t from the 2018 assessment. SERAG recommended a single year TAC, with the Tier 4 assessment to be updated in 2021. Industry requested that CPUE west of Tasmania be considered in the 2021 assessment to account for a shift in effort.	Yes	Tier 4 The hook CPUE series that includes the zones 83-85 should be used.

Species	MYTAC year	Stock biomass (or proxy) above TRP?	TAC <50% caught	TAC <50% caught for operational reasons only?	Comments	Continue with 2021 assessment?	SESSFRAG advice
(Tier 5 – Seamount - 2018)		N/A – see comments			Combined auto-line and drop-line CPUE from zones 20-85 shows a similar declining trend since 2014 to the series used in the 2020 Tier 4 assessment. A vessel previously recorded as a 'manual-line' boat in the early part of the time series has been corrected and is now recorded as an 'auto-line' boat. The earlier part of the time series (approximately 2002-2006) has increased as a result i.e. there is a steeper decline in the CPUE index. **Seamount** Catches have been split in the catch history report for SESSFRAG consideration (Agenda Item 7b)		Tier 5 A working group to be established to provide advice to SERAG.
John dory (Assessed as Tier 3 in 2017, and weight of evidence approach used in 2020 including Tier 5)	Single year TAC	N/A – weight of evidence	Yes 14% caught 63 t of 452 t TAC	Uncertain	Given uncertainties in historical catch and the status of the stock during the default reference period, SERAG recommended not applying a Tier 4 analyses to John dory in support of recommending an RBC for 2021-22. A weight of evidence approach, including the outputs of the Catch-MSY and surplus production models (Tier 5 assessments), was used to recommend a TAC for the 2021-22 fishing year. SERAG requested that catch and effort be considered in Z30 to determine whether Z30 could be included in the Tier 4 analysis. There is insufficient catch to include zone 30 in the CPUE series. SESSF advice on CPUE series and Tier 4 approach is required.	Yes	The current CPUE series be used
Mirror dory (Tier 4 - 2019)	Single year TAC	No (2019) **East** C_{targ}: 1.1808 C_{lim}: 0.492 **C_{cur}: 0.729** **West** C_{targ}: 1.0054 C_{lim}: 0.4189 **C_{cur}: 0.6798**	No 74% caught 102 t of 137 t TAC	-	East Discards a low in 2020 (3 t) West Discards a low in the west (4 t), though these are not considered in the Tier 4.	Yes	N/A
Smooth oreo-other (Weight of evidence inc. SAFE - 2020)	Single year TAC	Yes (2019) $F < F_{MSY}$	Yes 35% 47 t of 135 t TAC	Yes	SERAG (2020) recommended maintaining the 90 t TAC for a single year, and reviewing catches in 2021.	Yes	N/A
Silver trevally (Tier 4 - 2020)	Single year TAC	No (2020) C_{targ}: 0.9221 C_{lim}: 0.3842 **C_{cur}: 0.5642**	Yes 9% 25 t of 289 t TAC	Uncertain	Assessed by NSW as 'transitional depleting' using a weight of evidence approach including declining CPUE from state boats. NSW stock assessment scientists to be engaged as part of the Commonwealth tier 4 stock assessment in 2021. Commonwealth catches have been low for the last six years, with less than 15 per cent of the Commonwealth TAC caught since 2013. It is unclear whether the TAC is undercaught due to declines in abundance or operational reasons.	Yes	Use the current CPUE series. SERAG to consider the NSW stock assessment in providing RBC advice.
Oreo smooth – Cascade (Tier 4 – 2010)	Single year TAC	Yes (2010) C_{targ}: 0.4989 C_{lim}: 0.1996 **C_{cur}: 1.3575**	Yes 4% 6 t of 150 t TAC	Yes	When last assessed, CPUE had been extremely variable and the fluctuations were considered to not be indicative of changes in stock status.	Yes	N/A

Table 2: Species not due for stock assessment in 2021, considered under the Decision Tree. Highlighted red cells illustrate that a review of fisheries indicators was undertaken by the working group.

Species	MYTAC year	Stock biomass (or proxy) above TRP?	TAC <50% caught	TAC <50% caught for operational reasons only?	Comments	Maintain current MYTAC?	SESSFRAG Advice Required?
Elephant fish (SAFE - 2020)	1st of 3yr MYTAC	Yes (Jan 2020) $F<F_{msy}$	Yes 32% 37 t of 114 t TAC	Yes	Recognising issues with the Tier 4 assessment, SESSFRAG (2019) recommended setting the 2020-21 TAC for elephant fish using a weight of evidence approach, including recent catches and the outcomes of the most recent ERA. RAG industry members have previously expressed that a precautionary long term TAC should be set for elephant fish as the TAC level does not influence landings. Considering the outcomes of the ERA, SharkRAG (2020) recommended a three year MYTAC of 114 t.	Yes	N/A
Gemfish – west (Tier 4 - 2019)	1st of 3yr MYTAC	Yes (2019) C_{targ}: 0.9942 C_{lim}: 0.4143 **C_{cur}: 1.0418**	Yes 28% 96 t of 300 t TAC	Yes	Results of a recent genetic study (Ovenden *et al, 2020*) found that gemfish from ISMP zones 82, 83 and 84 (GABT) are the western gemfish stock. Zone 50 (CTS) is an overlap zone between eastern and western stocks, and zone 40 (CTS) are eastern gemfish.	Yes	N/A
Ocean perch (Tier 4 - 2020)	1st of 3yr MYTAC	Yes (2020) **Offshore:** C_{targ}: 0.9273 C_{lim}: 0.4637 **C_{cur}: 0.1.076**	No 79% caught 189 t of 239 t TAC	-	Catches are lower in 2020, but CPUE trend has continued to increase.	Yes	N/A
Oreo basket (Tier 4 - 2020)	1st of 3yr MYTAC	No (2020) C_{targ}: 0.4855 C_{lim}: 0.2023 **C_{cur}: 0.3986**	No 75% 138 t of 185 t TAC	-	Catches are high in 2020 and CPUE trend has continued to increase.	Yes	N/A
Ribaldo (Tier 4 - 2020)	1st of 3yr MYTAC	Yes (2020) C_{targ}: 0.3728 C_{lim}: 0.1864 **C_{cur} :0.7894**	Yes 31% 132 t of 422 t TAC	Yes		Yes	N/A
Royal red prawn (Tier 4 - 2020)	1st of 3yr MYTAC	Yes (2020) C_{targ}: 0.9463 C_{lim}: 0.3943 **C_{cur}: 1.6045**	Yes 8% 33 t of 403 t TAC	Yes		Yes	N/A
Saw shark (Tier 4 - 2020)	1st of 3yr MYTAC	Yes (2020) C_{targ}: 0.7293 C_{lim}: 0.3646 **C_{cur}: 0.9476**	Yes 40% 172 t of 432 t TAC	Yes		Yes	N/A
School whiting (Tier 1 - 2020)	1st of 3yr MYTAC	No (2020) Target: 48% B_0 Limit: 20% B_0 Current: 41% B_0	No 66% 519 t of 788 t TAC	-	Danish seine CPUE has continued to decline in zone 60, consistent with the recent trend – this is only one of the series used in the assessment. It is unclear what impact the seismic survey in 2020 has had on CPUE. Otter trawl CPUE series has increased since 2018, and is above the long-term average. Catches in depths 50-150 m for board trawlers have disappeared in the last two years, as have the number trawlers, from 15 in 2018 to 8 in 2020. However, catches are small ~ 50 t. NSW catches have decreased in 2020 (893) from 2019 (1291 t). Commonwealth TAC is 66 per cent caught. *Monitor the CPUE series in zone 60 for 2021.	Yes	N/A

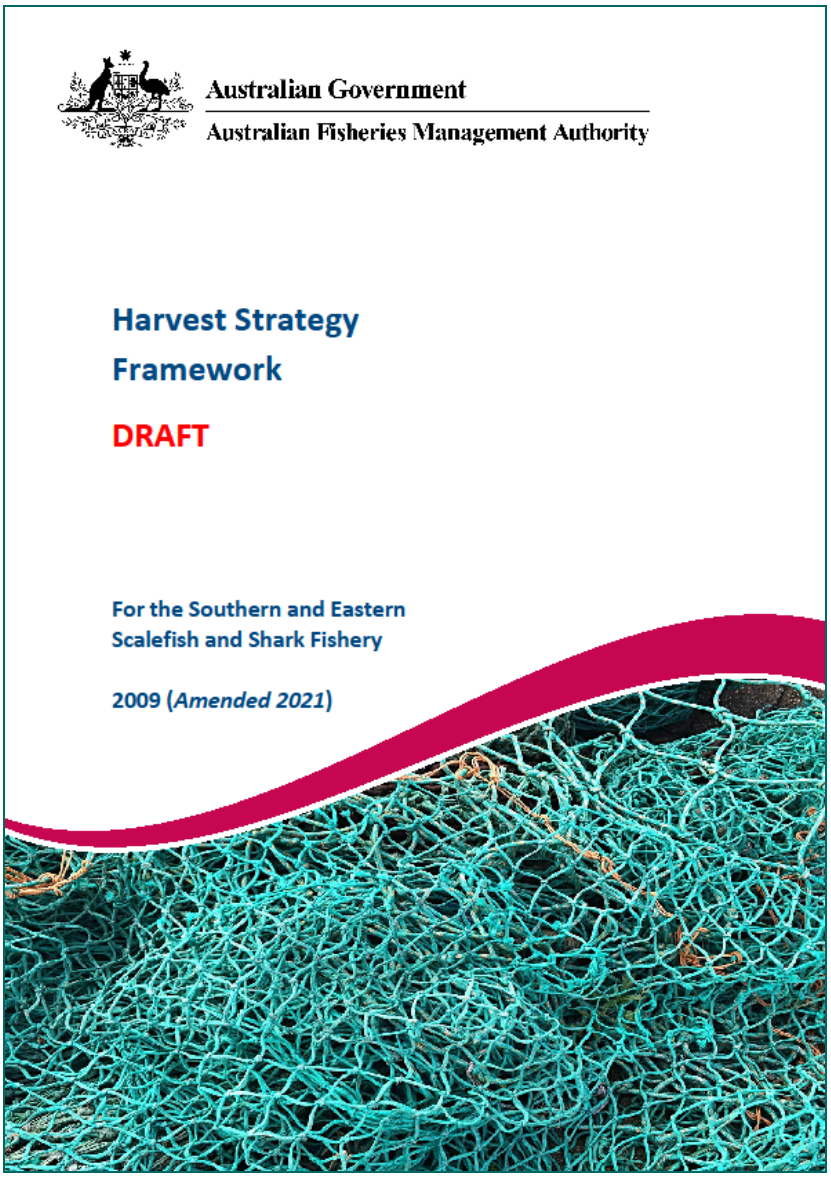
Species	MYTAC year	Stock biomass (or proxy) above TRP?	TAC <50% caught	TAC <50% caught for operational reasons only?	Comments	Maintain current MYTAC?	SESSFRAG Advice Required?
Gummy shark (Tier 1 - 2020)	1st of 3yr MYTAC	Yes (2020) Target: 48% B_0 Limit: 20% B_0 **Bass Strait: 48% B_0** **Tas: 69% B_0** **SA: 66% B_0**	No 106% (Within TAC after under/overs) 1874 t of 1775 t TAC	-	SA Gillnet CPUE has declined since 2016, consistent with the trend when the assessment was updated in 2020. Gillnet Bass Strait CPUE has increased since 2018, however is cyclical over the time series and reaching the long term average in 2020. Gillnet CPUE in Tasmania a noisy and flat over time, though has increase since 2019. Bottom line CPUE is relatively flat and noisy since 2000, and is above the long term average in 2020. **Note**: Line CPUE selects a wide age range, whereas gillnet selects a limited range of juvenile cohorts. SA catches have decreased in 2020, which is consistent with changes in management arrangements. Length frequencies were collected (SIDaC), but were not available to CSIRO for the purpose of the Data Summary.	Yes	N/A
Alfonsino (Tier 3 - 2013)	6th of 3yr MYTAC	Yes (2013) F_{48}: 0.149 F_{20}: 0.479 **F_{cur}: 0.022**	Yes 0% caught 0 t of 1017 t TAC	Yes	There is 0 t caught against the TAC, which only applies in the ECDWT sector. There was approximately 5.7 t caught in other sectors of the SESSF and there are also high seas catches. The TAC has been set at 1017 t since 2013 – it is unlikely to be caught, however if catches increase, the TAC should be reviewed.	Yes	N/A
Bight redfish (Tier 1 - 2019)	1st of 5yr MYTAC	Yes (2019) Target: 41% B_0 Limit: 20% B_0 **64% B_0**	Yes 23% 202 t of 893 t TAC	Unsure	GABRAG have requested that fishery indicators are reviewed annually. Catch was low in 2020 however likely due to one of the boats not fishing for several months. Annual standardised CPUE trend is flat since 1992 and oscillating above and below average. The GABFIS was completed in March 2021 – this will be considered along with catch data by GABRAG in later 2021. Industry collected lengths were not available for the Data Summary in time for SESSFRAG, but will be included in time for GABRAG.	Yes, subject to GABRAG review	N/A
Deepwater Flathead (Tier 1 - 2019)	1st of 3yr MYTAC	Yes (2019) Target: 43% B_0 Limit: 20% B_0 **45% B_0**	No 51% 628 t of 1238 t TAC	-	GABRAG have requested that fishery indicators are reviewed annually. Catch was low in 2020 however likely due to one of the boats not fishing for several months. The GABFIS was completed in March 2021 – this will be considered along with catch data by GABRAG in later 2021. Industry collected lengths were not available for the Data Summary in time for SESSFRAG, but will be included in time for GABRAG. Annual standardised CPUE has been cyclical in the early years following the increases and decreases in catches (prior to 2007) and relatively flat and mostly below average since 2005.	Yes, subject to GABRAG review	N/A

Table 3: Stocks/species managed under a rebuilding strategy not being assessed in 2021 – to be discussed by the individual RAGs.

Species	MYTAC year	Stock biomass (or proxy) above TRP?	Incidental catch <50% caught	TAC <50% caught for operational reasons only?	Comments
Redfish (Tier 1 - 2020)	N/A - Rebuilding species	No (2020) Target: 48% B_0 Limit: 20% B_0 4% B_0	No 52% 26 t of 50 t TAC	-	Reviewed by SERAG under the Redfish Rebuilding Strategy.
Blue warehou (Tier 4 - 2013)	N/A - Rebuilding species	No (2013) **East**	Yes 2%	No	Reviewed by SERAG under the Blue warehou Rebuilding Strategy

Species	MYTAC year	Stock biomass (or proxy) above TRP?	Incidental catch <50% caught	TAC <50% caught for operational reasons only?	Comments
		C_{targ}: 2.0717 C_{lim}: 0.8287 **C_{cur}: 0.1861** **West** C_{targ}: 1.9249 C_{lim}: 0.7699 **C_{cur}: 0.2681**	2 t of 118 t TAC		
Gemfish - east (Tier 1- 2009)	N/A - Rebuilding species	No (2009) Target: 48% B_0 Limit: 20% B_0 **16% B_0**	No 56% 56 t of 100 t TAC	-	Reviewed by SERAG under the Eastern Gemfish Rebuilding Strategy
Orange roughy - south (Tier 1 – 2000) Pedra Branca (Tier 1 – 2017)	N/A - Rebuilding species	No (2009) Target: 48% B_0 Limit: 20% B_0 **Southern Zone <20% B_0** **Pedra Branca 33% B_0**	No 94% 117 t of 125 t TAC	-	Reviewed by SERAG under the Orange Roughy Rebuilding Strategy
Orange roughy - west (Tier 1 – 2002)	N/A - Rebuilding species	No (2009) Target: 48% B_0 Limit: 20% B_0 **<30% B_0**	Yes 15% 9 t of 60 t TAC	Yes	Reviewed by SERAG under the Orange Roughy Rebuilding Strategy
Orange roughy – Albany and Esperance (Tier 1)	N/A - Rebuilding species	Unknown	Yes 0% 0 t of 50 t TAC	Yes	Reviewed by SERAG and GABRAG under the Orange Roughy Rebuilding Strategy
Orange roughy – Cascade Plateau (Tier 1 – 2009)	N/A - Rebuilding species	Yes (2009) Target: 60% B_0 Limit: 20% B_0 **64% B_0**	Yes 42% 211 t of 500 t TAC	Yes	Reviewed by SERAG under the Orange Roughy Rebuilding Strategy.
School shark (Tier 1 (close kin mark recapture or CKMR) – 2018)	N/A - Rebuilding species	No (2018) Target: 48% B_0 Limit: 20% B_0 **Unknown**	No 94% 184 t of 195 t TAC	-	Reviewed by SharkRAG under the School Shark Rebuilding Strategy. SharkRAG. Outcome of expert review of CKMR assessment found that the approach is suitable to inform management decision but identified key areas to focus on to reduce uncertainty. SharkRAG and AFMA have adopted recommendations and identified actions to address the areas of uncertainty. The CKMR assessment will be updated in 2024. In the interim, SharkRAG at its March 2021 agreed: • updating the current assessment with one more year of catch data would not produce substantially different results to the previous assessment; • to use the métier analysis and trawl CPUE to inform the TAC for 2022.

Attachment F – Updated SESSF Harvest Strategy Framework



Australian Government

Australian Fisheries Management Authority

Harvest Strategy Framework

DRAFT

For the Southern and Eastern Scalefish and Shark Fishery

2009 (*Amended 2021*)

Contents

Version	Updates	Author	Date
Version 1.1 to 1.2	Drafting the Harvest Strategy Framework into template	Sharon Koh, Steve Auld	22 September 2009
Version 1.3	Redraft following outcomes of SESSFRAG meeting February 2011	Sharon Koh	July 2011
Version 2	Updates to web links and accessibility changes. Integration of GAB section, multi-year TACs, consistent application of discards and discount factor guidance. Removal of Catch per Unit of Effort (CPUE) multiplier. Research needs, now included in the strategic research plan and the annual research plan, have been removed.	George Day	February 2014
Version 3	Providing for alternative TACs to those produced by the Tier 1 harvest control rule in defined circumstances. Removal of the small change limiting rule. Clarification of how to apply the discount factor. Documenting the limit placed on the Tier 3 harvest control rule multiplier as recommended by SESSFRAG in March 2013. Specifying the approach for setting TACs when the Recommended Biological Catch is 0. To provide guidance on 'step down' and 'step up' TACs.	George Day	February 2015
Version 4	Providing for alternative assessment methods in defined circumstances. Adopting a weighted average of state catch rather than a simple average for the purposes of TAC calculation.	George Day	March 2017
Version 5	Apply a weighted average of state catches to gummy shark as is the case for other SESSF species. Clarification of treatment of discards and state catch in Tier 4 assessments and Recommended Biological Catch (RBC) calculations. Review of GABT triggers at Appendix A.	George Day	March 2019
Version 6	To incorporate SESSFRAG agreed approaches into the SESSF Harvest Strategy Framework. Largely, the revisions will enable species assessments to be transitioned between tiers or where the current assessment tier does not work. In particular, where: • species have high discards • CPUE does not index biomass	Cate Coddington	March 2020

Version	Updates	Author	Date
	• tier 1 assessments are rejected, and TACs may be rolled over (subject to sustainability concerns) • regime shift/productivity change needs to be considered for some species.		
Version 7	To incorporate SESSFRAG agreed approaches into the SESSF Harvest Strategy Framework: • Address technical and editorial errors throughout the document; • enable multispecies considerations in setting TACs • include considerations about what to do when a species falls outside the MYTAC period without an updated stock assessment. Discount factors, and/or a buffer, should be also considered on a case-by-case basis. • enable application of discount factors for lower tier assessments be the default process, and that exceptions are only made where the relevant resource assessment group is satisfied there are alternative equivalent precautionary measures in place • include the use of the FishPath tool to determine the 'preferred' Tier 5 methods. • include how RBCs are calculated at each assessment Tier level using harvest control rules (HCRs).	AFMA / CSIRO	August 2021

Table 1: Harvest Strategy Summary

Tier level (species vary)	Reference point / trigger point	Reference point function*	Information requirements to monitor reference point	Control rule
Tier 1	B_{20}	Limit	Catch, CPUE, discards, age, length, relative abundance, information from: - Logbook and catch landing records - ISMP - fishery independent data	<B_{20}: No targeted fishing; rebuilding strategy will be developed
	B_{35}	Harvest Control Rule (HCR) inflection	Same as above	<B_{35}: TACs are set at levels that allow stocks to rebuild to target levels
	B_{48}	Target	Same as above	<B_{48}: Rebuild stocks towards B_{48} >B_{48}: At or above target, fish at F_{48}.
Tier 3	F_{20}	Limit	Catch, discards, age, length information from: - Logbook and catch landing records - ISMP	>F_{20}: No targeted fishing, rebuilding strategy will be developed
	F_{40}	MSY proxy	Same as above	>F_{40}: TACs are set at levels that allow stocks to rebuild to target levels
	F_{48}	Target	Same as above	>F_{48}: Rebuild stocks towards F_{48} <F_{48}: At or above target, fish at F_{48}.

Tier level (species vary)	Reference point / trigger point	Reference point function*	Information requirements to monitor reference point	Control rule
Tier 4	$CPUE_{20}$	Limit	Catch, effort, discards information from: - Logbook and catch landing records - ISMP	<$CPUE_{20}$: No targeted fishing, rebuilding strategy will be developed
	$CPUE_{40}$	MSY proxy	Same as above	<$CPUE_{40}$: TACs are set at levels that allow stocks to rebuild to target levels
	$CPUE_{48}$	Target	Same as above	<$CPUE_{48}$: Rebuild stocks towards $CPUE_{48}$ >$CPUE_{48}$: At or above target, fish at proxy for F_{48}.
Tier 3	5%	Discount factor (metarule)	Same as for Tier 3 – applies for assessments which are more uncertain	Reduces the TAC derived from the RBC – applied on an individual species basis[1]
Tier 4	15%	Discount factor (metarule)	Same as for Tier 4 – applies for assessments which are more uncertain	Reduces the TAC derived from the RBC applied on an individual species basis.
All Tier levels	50%	Large Change Limiting rule (metarule)	Same as above	TACs between fishing seasons to change by no more than 50% where this will not pose a significant risk to stock status.

N.B. The Harvest Strategy Policy allows alternative reference points to the recommended defaults - B_{MEY}, B_{MSY}, B_{LIM} - to be used where they better pursue the objectives of the Policy.

[1] SESSFRAG 4-5 March 2014 recommended guidance for the Commission for when the Tier 3 and Tier 4 discount factors are not applied - see below at section 6.4.1.

Glossary

Types of reference points

Reference point	Description
Metarule	a rule that describes how the RBCs obtained from an assessment should be adjusted in calculating a recommended TAC
Target	relates to a target reference point as per the Harvest Strategy Policy. May be expressed in terms of biomass, fishing mortality or CPUE
Limit	relates to a limit reference point as per the Harvest Strategy Policy. Fishing stops at this reference point. May be expressed in terms of biomass, fishing mortality or CPUE
MSY	maximum sustainable yield
MEY	maximum economic yield
Override	under exceptional circumstances, enables adjustment to a recommended TAC where certain conditions are met; e.g. to take advantage of a “boom” period of highly variable species, or to impose additional restrictions when stocks are thought to under threat.
Inflection point	the reference point below which TACs are adjusted to allow stocks to rebuild to target levels. Also known as a breakpoint

Notation

Notation	Description
B	spawning biomass level
B_{CUR}	the current spawning biomass level
B_0	the unfished spawning biomass (determined from an appropriate reference point)
B_x	the biomass level representing x% of the unfished spawning biomass B_0
F	fishing mortality rate
F_{CUR}	the current fishing mortality rate
F_x	the fishing mortality rate which would achieve a spawning biomass level of B_x
M	the natural stock mortality rate
$CPUE_x$	catch per unit effort which would achieve a spawning biomass level of B_x

Other acronyms

Acronym	Description
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
CDR	Catch Disposal Record
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CPUE	Catch per unit of effort
ERA	Ecological Risk Assessment
FIS	Fishery Independent Survey
GAB	Great Australian Bight
GABMAC	Great Australian Bight Management Advisory Committee
GABTS	Great Australian Bight Trawl Sector
GHAT	Gillnet, Hook and Trap
HSP	Commonwealth Fisheries Harvest Strategy Policy 2007
HSF	Harvest Strategy Framework
HCR	Harvest Control Rule
ISMP	Independent Scientific Monitoring Program
MAC	Management Advisory Committee
MSE	Management Strategy Evaluation
RAG	Resource Assessment Group
RBC	Recommended Biological Catch
SEMAC	South East Management Advisory Committee
SESSF	Southern and Eastern Scalefish and Shark Fishery
TAC	Total Allowable Catch
TEP	Threatened, Endangered and Protected

1 Overview of the SESSF harvest strategy

1.1 The Harvest Strategy Policy

The objective of the *Commonwealth Fisheries Harvest Strategy Policy 2018* (2018 HSP) is the sustainable and profitable use of Australia's Commonwealth commercial fisheries resources (where ecological sustainability takes priority) through the implementation of harvest strategies that maintain key commercial fish stocks, on average, at the required target biomass to produce maximum economic yield from the fishery.

To meet this objective, harvest strategies are designed to pursue an exploitation rate that keeps fish stocks at a level required to produce maximum economic yield (MEY) and ensure stocks remain above a limit biomass level (B_{LIM}) at least 90% of the time. Alternative target reference points may be adopted for some stocks to account for the multi-species nature of the fishery and to better pursue the objective of maximising economic returns across the fishery as a whole.

The HSP provides for the use of proxy settings for reference points to cater for different levels of information available and unique fishery circumstances. This balance between prescription and flexibility will encourage the development of innovative and cost-effective strategies to meet key policy objectives. Proxies must ensure stock conservation and economic performance as envisaged by the HSP. Such proxies, including those that exceed these minimum standards, must be clearly justified.

With a harvest strategy in place, fishery managers and industry are able to operate with greater confidence, management decisions are more transparent, and there are fewer unanticipated outcomes necessitating hasty management responses.

Further detail on how to use harvest strategies is provided in the *Guidelines for the implementation of the Commonwealth Fisheries Harvest Strategy Policy 2018* (*HSP* Guidelines).

1.2 The SESSF Harvest Strategy Framework

The SESSF Harvest Strategy Framework (HSF) sets out the management actions necessary to achieve defined biological and economic objectives, and describes the indicators used for monitoring the condition of stocks, the types of assessments conducted and the rules applied to determine the recommended total allowable catches.

The HSF was developed in 2005. Since that time, it has been reviewed in line with the *Commonwealth Fisheries Harvest Strategy Policy* 2007 (2007 HSP) which was developed to help give effect to the requirements of the Ministerial Direction (2005). A new harvest strategy is in the process of being developed for the SESSF to take into account the objectives of the 2018 HSP. Until the new harvest strategy has been developed, this framework will continue to be implemented (with revisions).

The HSF uses a tiered approach designed to apply different types of assessments and cater for different amount of data available for different stocks. The HSF adopts increased levels of precaution that correspond to increasing levels of uncertainty about stock status, in order to reduce the level of risk associated with uncertainty. In this approach, each stock is assessed using one of three types of assessment depending on the amount and type of information available to assess stock status, where Tier 1 represents the highest quality of information available (i.e. a robust integrated quantitative stock assessment). The previous Tier 2 analysis, which applied to species and/or stocks that have a less robust quantitative assessment, is no longer being used but the Tier remains for future use.

Each Tier has its own HCR that is used to determine a recommended biological catch (RBC). The RBCs provide the best scientific advice on what the total fishing mortality (landings from all sectors plus discards) should be for each species/stock. For all Tier levels, once the RBC is determined from the results of the assessment and the application of the relevant HCR, a recommended total allowable catch (TAC) is calculated based on the TAC setting rules described in section 6.4.

The HCRs for the three tier levels differ depending on the types of indicators used. For Tier 1, the HCR is based on the following reference points:

- *The limit biomass* B_{LIM} – represents the spawning biomass level below which the risk to the stock is unacceptably high and the stock is defined as "overfished". The default B_{LIM} proxy is B_{20} = 20% of the unfished spawning biomass.
- *The* B_{MSY} – represents the spawning biomass level which would result in a maximum sustainable yield (MSY), which is the point at which additional fishing effort is most likely to decrease the total catch and any profit. The default B_{MSY} proxy is B_{40} = 40% of the unfished spawning biomass.
- *The target biomass* B_{TARG} – represents the spawning biomass level which would result in a MEY, which is the point at which the sustainable catch or effort level for the fishery maximises profits. B_{TARG} is generally equal to B_{MEY}, for which the default proxy is approximated by $1.2*B_{MSY}$. If the default B_{MSY} proxy is used, this results in B_{48} = 48% of the unfished spawning biomass.

Tier 3, Tier 4 and Tier 5 assessments use other indicators (relating to fishing mortality, catch rates and catches respectively) and reference points, which are taken as proxies for the biomass reference points for Tier 1. The HCRs for each tier level are outlined below.

Under some circumstances, an assessment tier or approach that has previously been used for determining a species/stock RBC is no longer appropriate and options are provided below as to possible alternative actions. These circumstances include:

- that CPUE is no longer an index of abundance (1.2.3);
- the data available does not enable an acceptable assessment (6.4.11);
- productivity shifts (6.4.10); and

- where species are no longer targeted (by-product) and have high discards (6.4.2).

1.2.1 Tier 1

A Tier 1 stock assessment uses an integrated biological and statistical approach that combines a wide variety of data inputs, generally including CPUE, other abundance indices and size and age composition. The Tier 1 harvest control rule applies to species and/or stocks where there is a robust quantitative assessment that provides estimates of current biomass levels, and where estimates or appropriate proxies are available for B_{LIM}, B_{TARG} and F_{TARG}. The default targets and limits are set to comply with the HSP. The RBC is calculated by applying target fishing levels determined from the harvest control rule to the current biomass, to calculate the total catch (including discards) in the next year, using the agreed base case assessment model.

In some circumstances, a different TAC to that produced by the Tier 1 HCR may be set - refer to section 6.4.7.

1.2.2 Tier 3

A Tier 3 stock assessment uses information available on the age structure of annual catches and annual total catch weight, as well as knowledge of basic biological parameters, e.g. natural mortality, length at age, weight at length, fecundity at age and selectivity at age. The estimation of current fishing mortality is made using all this information. The catch control rule uses the ratio of the target exploitation rate to the actual exploitation rate as a multiplier on the current average catch to determine the RBC. The previous Tier 3 analysis is no longer being used but the Tier remains for possible future use.

Limit and target reference points, which may be estimated using a yield-per-recruit analysis, are applied to the fishing mortality and are comparable to the limit and target reference points used in the Tier 1 harvest control rule. The period over which average current catch is estimated is chosen to match the period to which the estimated fishing mortality applies. The estimate of fishing mortality is limited to not less than 0.1 of natural mortality.

1.2.3 Tier 4

The Tier 4 assessment is based entirely on catch and CPUE.

The Tier 4 analysis determines an RBC by selecting CPUE reference points that are taken as proxies for the estimated B_{LIM} and B_{TARG}. This is done by assuming that the CPUE is proportional to stock abundance, an assumption that is made in most SESSF assessments. If the stock was at unexploited equilibrium at the start of fishing, then the initial CPUE level at the start of the time series would correspond to the unexploited biomass or B0, and the other reference points are the appropriate fractions of this (e.g. 20% for B_{20}). For most SESSF stocks there is not a full CPUE time series back to the start of fishing, so it is necessary to choose a reference period from the data series that we do have where we think we can make a reasonable estimate of the level of depletion of the stock. Most

SESSF species are considered to be fully exploited by 1986, so a reference period against which current rates are compared is chosen around this time when CPUE levels and catches were relatively stable. The default period is 1986-1995, but other periods are used for some species and fisheries which were not fully developed in 1986.

It is then assumed that during the reference period the stock was at the level that will provide maximum economic yield, i.e. the CPUE corresponds to B_{MEY} (which as a default is assumed to be B_{48}). This is why, for these stocks, the Tier 4 rule uses the average CPUE in the reference period as a CPUE target, and the average catch in that period as a catch target.

Where CPUE does not index the biomass of the stock the application of a tier 5 assessment method should explored.

1.2.4 Alternative assessment methods

Alternative assessment methods, including tier 5 or a weight-of-evidence / risk-based, approach may be adopted in certain circumstances as outlined in paragraph 6.3.4 below.

1.3 Alignment of the HSF with the HSP

The HSF meets the requirements of the 2018 HSP by applying a precautionary approach, standards for reference points, and measures to be implemented in accordance with the reference points as specified in the 2018 HSP. These are reflected in the use of a tiered approach to control rules, and decreases in exploitation rates as the stock size decreases below a target reference point. Discount factors will also be applied at lower Tiers to account for the inherent uncertainty with these approaches. Exception will only be considered where the resource assessment group is satisfied there are alternative equivalent precautionary measures in place. The HSF involves the use of MEY as a target, a biomass limit reference point to trigger no further targeted fishing, and the proxies B_{LIM} = 20% of B_0, B_{MSY} = 40% of B_0, and B_{MEY} = 1.2B_{MSY}. The HSF also requires rebuilding strategies for stocks below B_{LIM}, and TACs are set an appropriate level to rebuild stocks to B_{MSY} or B_{MEY} in line with the HSP.

For multi-species fisheries, the HSP requires MEY to be applied to the fishery as a whole and optimised across all species in the fishery. This means that not all species can be maintained at an MEY target, and some species may be fished at levels that will result in their biomass remaining below B_{MEY}, but above B_{LIM}. The SESSF will continue to move towards applying MEY at fishery level, but the way that this can be best achieved may develop over time.

1.4 Governance

The status of fish stocks in the SESSF, and how they are tracking against the HSF, is reported to the RAGs, MACs and AFMA Commission as part of the yearly TAC Setting process (see section 6.1). Stock assessments for each quota species, produced by the RAGs each year, include consideration of the

catch rates for each quota species in the current and previous fishing years, how catches compare to the TAC, where the stock status indicators sit in relation to the reference points, and a RBC for the upcoming fishing year. The TACs are determined by the AFMA Commission on the basis of the RBCs and advice from the RAGs, MACs, and AFMA Management.

2 Background to the SESSF

An overview of the fishery can be found in the latest SESSF Management Arrangements booklet, which is available on the AFMA website at: https://www.afma.gov.au/fisheries-services/fisheries-management-plans

3 Commercial species or stocks and ERA priority

This HSF applies to all 34 species subject to quota (including target and non-target species) in the SESSF. An Ecological Risk Assessment (ERA) was first conducted for the SESSF in 2007 to assess the impact of fishing on those species not subject to stock assessments under this HSF. The ERA was updated in 2012 to include distribution and effort data from 2007-2010 in the fishery, and again in 2019 for the period 2012-2016. Further information can be found in the Guide to AFMA's Ecological Risk Management Framework.

4 Objectives of the SESSF Harvest Strategy

4.1 Biological

- To maintain stocks at (on average), or return to, a target biomass point B_{TARG} or equivalent proxy (e.g. F_{TARG} or $CPUE_{TARG}$) equal to the stock size that aims to maximise net economic returns for the fishery as a whole.
- To maintain stocks above the limit biomass level, or an appropriate proxy, at least 90% of the time.
- A reduced level of fishing if a stock is below B_{TARG} but above B_{LIM} (or an appropriate proxy).
- To implement rebuilding strategies, no-targeting and incidental bycatch TACs if a stock moves below B_{LIM} (or an appropriate proxy).
- To ensure the sustainability of fisheries resources, including consideration of the individual fishery circumstances and individual species or stock characteristics, when developing a management approach.

4.2 Socio-economic

- To maintain stocks at (on average), or return to, a target biomass point B_{TARG} equal to the stock size that aims to maximise net economic returns for the fishery as a whole.

- To maximise the profitability of the fishing industry and the net economic returns to the Australian community.
- To minimise costs to the fishing industry, including consideration of the impacts on the industry of large or small changes in TACs and the appropriateness of multi-year TACs.

4.3 Ecosystem

To be consistent with the principles of ecologically sustainable development, including the conservation of biological diversity, and the adoption of a precautionary risk approach.

5 Monitoring

The biological and economic conditions in the fishery are monitored by the following three methods:

5.1 Logbooks and catch records

AFMA requires fishers to record catch and effort information in logbooks at sea, and in catch disposal records (CDRs) which record the actual landed catch at port. CDRs are considered more accurate than logbook records.

The following data is recorded for each fishing operation: the port and date of departure and return; gear type and fishing method; number of fish kept and discarded; and resultant catch including what is included in the weight (e.g. trunked, gutted, filleted, whole). Further information on logbooks and CDRs is available at: www.afma.gov.au/fisheries-services/logbooks-and-catch-disposal

5.2 The Integrated Scientific Monitoring Program (ISMP)

A key component of the ISMP is the sampling and recording of catches at ports and on board fishing vessels using fishery-independent observers. The purpose of the ISMP is to provide reliable, verified and accurate information on the fishing catch, effort and practice of a wide range of vessels operating inside and, periodically, outside the Australian Fishing Zone.

Biological and environmental data are collected on: catch composition including size and weight; amount and type of incidental catch; number of fish kept and discarded; fate of target and non-target species; interactions with (Threatened, Endangered and Protected) TEP species; and fishing effort. Further information on the Observer program is available at: www.afma.gov.au/fisheries-services/observer-services

5.3 Fishery independent data

The Fishery Independent Surveys (FIS) are industry-based fishery-independent resource surveys that provide a time-series of relative abundance indices for key target species. A FIS trawl survey has been conducted for deepwater flathead and Bight redfish in the GABTS every two to three years since 2005. And for other areas in the SESSF, these were conducted for key target species biannually from 2008 to 2016.

Biological and environmental data are collected such as: target species; catch rate (kg/shot); fishing method; and fishing depth. Information which provides a relative abundance index of other main byproduct and incidental catch species is also obtained.

Current methods of collecting fishery independent data in the SESSF include (but not limited to):

- acoustic surveys of the eastern zone and Cascade Plateau orange roughy stocks and the blue grenadier spawning aggregation;
- trawl surveys in the Great Australian Bight Trawl Sector for deepwater flathead and Bight redfish; and
- close-kin mark recapture is currently applied for school shark and is being explored for other species.

Other methods for collecting fishery independent data in the SESSF are begin explored.

5.4 Data Availability

The ability to meet the objectives of the HSF relies on obtaining the required data in time for stock assessments to be carried out.

Future information and ongoing monitoring requirements are identified through regular reporting from the above monitoring programs, and regular meetings of RAGs which are responsible for overseeing and managing the stock assessment process under the HSF.

6 Reference points and decision rules

6.1 TAC setting process

The data used for input into the stock assessment process are collected by the ISMP, AFMA logbooks and CDRs and independent data sources (such as FISs, acoustic surveys, close-kin). Otoliths from the biological sampling are provided to a private contractor for ageing. All catch, effort, sampling and age data along with fishery independent data sources are provided to stock assessment scientists for analysis or reporting. The analyses are then discussed by RAGs, which produce final stock assessment reports for quota species in the SESSF at the end of each calendar year.

The stock assessment reports provide RBC amounts for each quota species. Each stock is assessed under the appropriate Tier level as advised by the RAGs and SESSFRAG.

In mid-December, AFMA produces a position paper with recommended TACs for quota species for the upcoming fishing season, based on the stock assessments and RAG advice. The paper is distributed to interested parties and undergoes a public comment period. For some GAB species, TAC recommendations are conducted according to a pre-agreed set of decision rules, which are associated with the FIS or CPUE and incorporated into the TAC-setting cycle.

In early February, a SEMAC TAC Setting meeting is held where TAC recommendations are made. The GABMAC also provides advice on TAC recommendations.

The outcomes of RAGs, SEMAC and GABMAC, together with the AFMA position paper and any public comments received, are then sent to the AFMA Commission to determine TACs for the upcoming fishing season in mid-February. In determining the TACs, the AFMA Commission may provide AFMA with direction in instances where there is concern that current management strategies for depleted or at risk stocks may not meet the objectives of the HSP in a timely manner. The TACs for Bight redfish and deepwater flathead are set using the decision rules outlined in section 6.5 under co-management arrangements with the Great Australian Bight Fishing Industry Association.

6.2 Stock status and reference points

Stock status is expressed in relation to the reference points prescribed in the HSP, and is measured in terms of biomass (B, the size of the stock) and fishing mortality (F, the level of fishing pressure on a stock).

Reference points in the HSP Guidelines are:

- Target reference points: express the desired status of stocks (B_{TARG}) and desired fishing intensity (F_{TARG}). The biomass target level for individual stocks may vary in order to achieve overall maximum economic yield from the fishery and are generally set at:
    - B_{MEY} (the stock biomass required to produce maximum economic yield from the fishery); or
    - B_{MSY} (average biomass that corresponds to maximum sustainable yield).
- Limit reference points (B_{LIM} and F_{LIM}) express situations to be avoided because they represent a point beyond which the risk to the stock is regarded as unacceptably high.

The target fishing mortality rate F_{TARG} represents the fishing mortality rate that would result in a spawning biomass of B_{TARG} (equal to B_{MEY}). The default value for F_{TARG} is F_{48}, the value of *F* corresponding to a B_{TARG} of B_{48}.

The HSP Guidelines provide that in multi-species fisheries MEY applies to the fishery as a whole and is optimised across all species in the fishery. As a result alternative target reference points may be adopted for some stocks to account for technical interactions and the multi-species nature of the

fishery, and to better pursue the objective of maximising economic returns across the fishery as a whole. In such circumstances, the estimated biomass of these stocks must be maintained above their limit reference point, B_{LIM}. Consideration should also be given to:

- demonstrating that economic modelling and other advice clearly supports such action;
- no cost-effective, alternative management options (e.g. gear modification or spatial management are available); and
- the associated ecosystem risks have been considered in full.

Consideration should also be given to whether the quota species is targeted, its contribution to the value of the fishery, any sustainability concerns and the level of quota latency for that species.

Further information about how stock status is assessed is contained in the ABARES Fishery Status Reports[2].

6.3 Determining RBCs using harvest control rules (HCRs)

Harvest control rules (HCRs) use target, limit and trigger reference points, and an indicator/s of stock status (biomass, depletion, CPUE), to guide management decisions relating to future catch (or other management measure). HCRs are often depicted as a phase diagram comparing fishing mortality against biomass, or variants of this, such as recommended catch versus catch rate (for example, the SESSF Tier 4). A generic HCR is provided in Figure 1 (from Haddon *et al*. 2012[3]), that shows the elements of a HCR (but is not the one used in the SESSF). In general, the key elements of these control rules are:

- that fishing mortality reduces to zero (or is greatly limited) once the biomass is estimated to be below an agreed biomass limit reference point;
- that fishing mortality is reduced if above the target fishing mortality rate; and
- that the recommended fishing mortality when above the target biomass is constant at the fishing mortality that will reduce the stock to the target biomass. This allows increased catches when above the target biomass.
- there is a linear decline in recommended fishing mortality from the biomass breakpoint to the limit. This is designed to promote rebuilding to the target biomass.

HCRs also often include a buffer region due to the potential imprecision in assessment of stock status as the input to the control rule (Haddon *et al.,* 2012). The HCR of Figure 1 assumes that once

[2]Patterson, H, Larcombe, J, Woodhams, J and Curtotti, R 2020, *Fishery status reports 2020*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0.

[3] Haddon, M., Klaer, N., Smith, D.C., Dichmont, C.D. and A.D.M. Smith (2012) *Technical reviews for the Commonwealth Harvest Strategy Policy*. FRDC 2012/225. CSIRO. Hobart. 69 p.

the estimated stock status is below the target, it immediately reduces fishing mortality (and thereby catch). Due to natural fluctuation in abundance, even a perfect assessment of status would lead to biomass estimates that move between being under and over the target biomass – resulting in considerable reductions in fishing mortality when below target. To improve stability, the point at which the fishing mortality rapidly declines can be less than the target biomass – allowing a buffer to assessment imprecision and natural variation in stock size (Tier 1; **Figure 2**; see Day, 2009[4]).

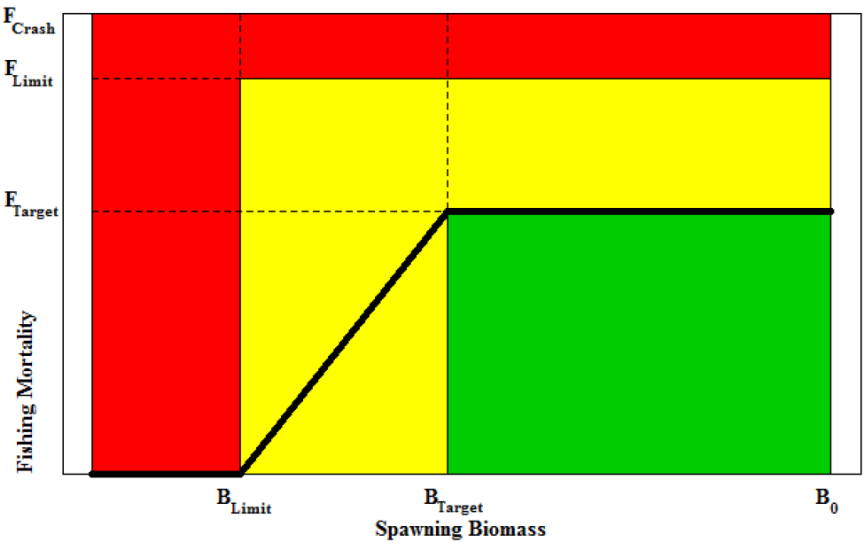


Figure 1. A generic HCR showing the relationship between fishing mortality and spawning biomass related reference points. The red area reflects situations where a stock would be experiencing overfishing and be overfished. The green area would be considered as under-fished and under-fishing, while the yellow areas reflect areas where the harvest control rule (thick black line) would act to reduce catches and fishing mortality to move the stock back towards the targets[5] (from Haddon et al., 2012).

6.3.1 Tier 1

The Tier 1 HCR applies to species and/or stocks where there is a robust quantitative assessment that provides estimates of current biomass levels (B_{CUR}) and where estimates are available for B_{35}, B_{20} and F_{48}.

The maximum recommended fishing mortality rate from the Tier 1 HCR is F_{MEY} (the default proxy for which is F_{48}) (**Figure 2**). The HCR inflection point occurs at B_{35} (see Table 1 and section 6.3). The breakpoint, or HCR inflection point, at B_{35} occurs at the intersection of the 20:40:40 trajectory and F_{48} (**Figure 2**). The F determined by the HCR is constant at F_{48} when biomass is between B_{35} and B_{48} to allow a 'buffer' to account for the uncertainty in the outputs of a Tier 1 assessment, and only

[4] Day, J. (2008) Modified breakpoint for the 2008 Tier 1 harvest control rule, report to the Shelf Resource Assessment Group 6 November 2008.

[5] Haddon, M., Klaer, N., Smith, D.C., Dichmont, C.D. and A.D.M. Smith (2012) *Technical reviews for the Commonwealth Harvest Strategy Policy*. FRDC 2012/225. CSIRO. Hobart. 69 p.

reduces fishing mortality once the stock is below B_{35}. If $B<B_{35}$ or $F>F_{48}$, the control rule reduces fishing mortality to limit catch (Haddon *et al.,* 2012).

The formula for calculating F_{TARG} is as follows:

F_{TARG}	**Biomass level**
$F_{TARG} = F_{48}$	where $B_{CUR} > B_{35}$
$F_{TARG} = F_{48} * (B_{CUR}-B_{20})/(B_{35}-B_{20})$	where $B_{35} > B_{CUR} > B_{20}$
$F_{TARG} = 0$	where $B_{CUR} < B_{20}$

The RBC is calculated by applying F_{TARG} to the current biomass B_{CUR} to calculate the total catch (including discards) in the next year, using the agreed base case assessment model:

$$RBC = Catch[F_{TARG} \rightarrow B_{CUR}]$$

At Tier 1, $B_{LIM} = B_{20}$, the maximum value for $F_{TARG} = F_{48}$ and the breakpoint in the HCR occurs at B_{35}. Alternative reference points may be adopted for some stocks to account for the multi-species nature of the fishery and to better pursue the objective of maximising economic returns across the fishery as a whole.

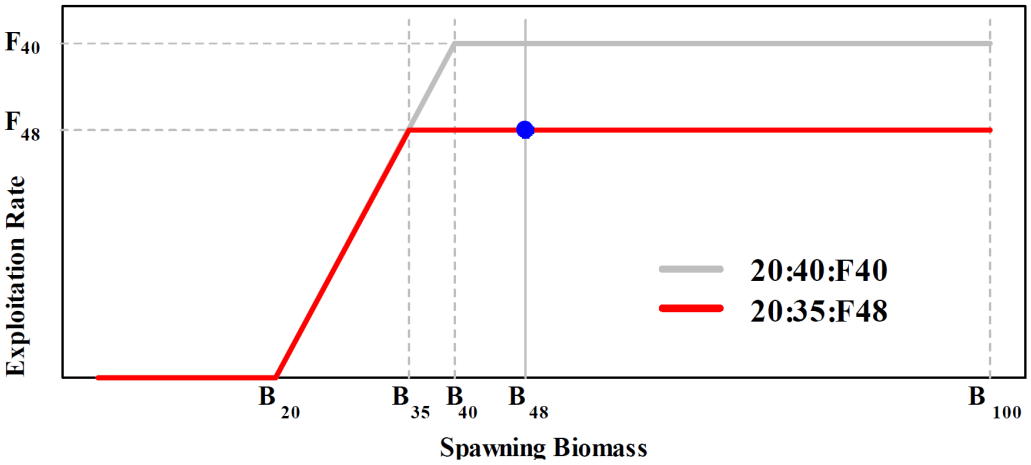


Figure 2: The harvest control rule for Tier 1 assessments in the SESSF, with a breakpoint at *B35* as a modification of the older 20:40:40 rule to become 20:35:48. The blue dot represents the biomass and fishing mortality targets (Day, 2009)[6].

[6] Haddon, M., Klaer, N., Smith, D.C., Dichmont, C.D. and A.D.M. Smith (2012) *Technical reviews for the Commonwealth Harvest Strategy Policy*. FRDC 2012/225. CSIRO. Hobart. 69 p.

6.3.2 Tier 3

The Tier 3 HCR applies to species and/or stocks that do not have a quantitative stock assessment, but where estimates of fishing mortality and other biological information are available[7].

Yield per recruit calculations are used to calculate *F* values that will reduce the spawning biomass to 20% (F_{20}), 40% (F_{40}) and 48% (F_{48}) of the unexploited level. The relationship given in **Figure 3** is then used to assign a value for F_{RBC} using F_{CUR}. This relationship has properties similar to the Tier 1 harvest control rule, with the default proxies of F_{20} as the limit and F_{48} as the target fishing mortality rate.

The recommended maximum fishing mortality rate from the Tier 3 HCR is F_{MEY} (the default proxy for which is F_{48}) (see **Figure 3**). This represents the fishing mortality rate that would cause the spawning biomass to equilibrate at a biomass of B_{MEY} (the default proxy for which is B_{48}).

The following formula, which adjusts the current catch C_{CUR} according to the ratio of the intended and current exploitation rates, is then used to calculate the recommended biological catch C_{RBC}:

$$C_{RBC} = \frac{(1 - e^{-F_{RBC}})}{(1 - e^{-F_{CUR}})} C_{CUR}$$

where F_{CUR} is the estimated current fishing mortality, and F_{RBC} is the selected *F* for the recommended biological catch from the control rule. The estimate of fishing mortality is limited to be no less than 0.1 of natural mortality.

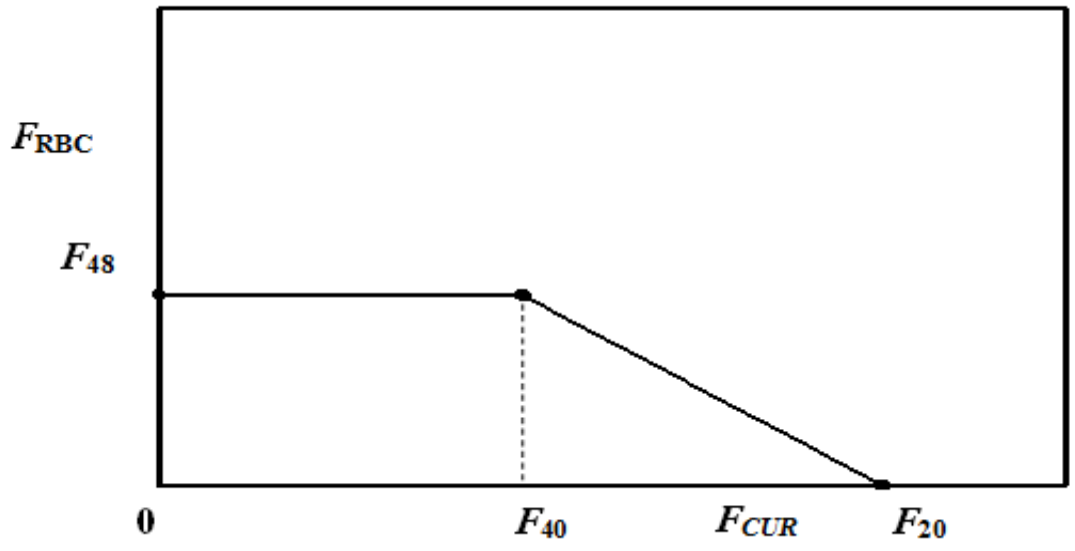


Figure 3. Method for selecting F_{RBC} based on F_{48} target and estimated F_{CUR}

[7] Tier 3 HCR is not currently applied to any of the SESSF species.

6.3.3 Tier 4

The Tier 4 HCR applies to species and/or stocks where there is no reliable information available on either the current biomass or current exploitation rate. It is assumed that there is a time series of total catches and of standardised CPUE, along with an agreed reference period and reference points.

The Tier 4 control rule is of the form:

$$RBC = C * \max\left(0, \frac{\overline{CPUE} - CPUE_{\lim}}{CPUE_{t\arg} - CPUE_{\lim}}\right)$$

where:

$CPUE_{targ}$	is the target CPUE for the species
$CPUE_{lim}$	is the limit CPUE for the species
$\overline{CPUE}$	is the average CPUE over the most recent *m* years
*C**	is a catch target derived from a historical period that has been identified as a desirable target in terms of CPUE, catches and status of the fishery, e.g. 1986 – 1995. It is an average of the total removals for the selected reference period, including any discards.

The form of the rule is shown in Figure 4. The linear form of this control rule can theoretically result in large catches at high CPUE levels, however Management Strategy Evaluation (MSE) testing has shown that the large change limiting meta-rule does not allow changes of more than 50% of the previous RBC (in either direction) adequately controls fishing mortality. The multiplier is set to zero when the CPUE is below the limit, thereby setting an RBC of zero.

6.3.4 Alternative assessment methods

The RAG may make RBC recommendations based on alternative assessment methods where it considers the method:

- is more appropriate for a quota species than the assessment method outlined for Tier 1 or Tier 4; and
- meets the intent of the HSP.

In such circumstances, the RAG should provide advice on any discount factor to be applied and the expected reliability of any associated harvest control rule.

A variety of 'Tier 5' approaches have been used to inform TAC setting, which include weight-of-evidence approaches (incorporating expert judgement and multiple indicators), indicators derived from data-limited stock assessments, or indicators derived from risk assessments. These may be applied when Tier 1 or 3 assessments are unable to be undertaken, and when CPUE is unavailable or does not index the biomass of the stock.

Figure 4: Graphical representation of the Tier 4 harvest control rule. $\overline{C}$ is the average catch over the most recent m years.

In August 2021, SESSFRAG advised that the performance indicators informing the RBC advice be based on the outputs of Tier 5 methods identified using the FishPath tool. If performance indicators cannot be agreed upon given the assessment options identified using FishPath, then an independent weight-of-evidence approach may be used. The resulting performance indicators can then be used in a harvest control rule analogous to the Tier 1-4 rules described above, provided appropriate (in some cases, proxy) target and limit reference points can be identified.

6.4 Determining TACs from RBCs

The following metarules are applied to the RBCs that are derived from the application of the Harvest Control Rules. The metarules for discount factors, state catch, discards, research catch allowance and the large change limiting rule are applied in the order below. The other metarules may be applied in the circumstances described. On the basis of the RBCs, TACs may be reduced to support stock recovery and prevent stocks from becoming overfished in the future. Note that the TACs for Bight Redfish and Deepwater flathead are set using the decision rules outlined in section 6.5 (GABTS decision rules) under co-management arrangements with the Great Australian Bight Fishing Industry Association.

6.4.1 Discount Factor

Consistent with the HSP, which establishes a more precautionary approach to harvest control rules for species for which assessments are more uncertain, it is considered appropriate to apply a discount factor to the RBCs derived from Tier 3 and 4 assessments. The discount factors to be applied are 5% for Tier 3 and 15% for Tier 4. These values take account of the relative uncertainties in the assessments and reference points at each of these Tier levels.

The application of the rule can be shown as follows:

Tier 3: $$RBC_{DISC} = RBC\left(1 - \frac{5}{100}\right)$$

Tier 4: $$RBC_{DISC} = RBC\left(1 - \frac{15}{100}\right)$$

While the application of discount factors is the default process, exceptions may be considered where a RAG is satisfied that demonstrable alternative equivalent precautionary measures are in place.

When other sources of mortality arising from discarded catch, or catch taken by other jurisdictions (e.g. state, recreational and indigenous sectors) or research catch allowance are included in assessments, they are subtracted from the RBC to produce a Commonwealth TAC.

The quantity of discards to be deducted should be based on the best available data whether this is derived from observers, logbooks verified by electronic monitoring or other sources.

The discarded catch and state catch are generally estimated for the following fishing season using a four year weighted average. Estimates are weighted in the ratio of 8:4:2:1 for the most recent four years, with most weight given to the most recent year.

For Tier 4 assessments, if discards or state catches are included in the reference period catches, *C*,* they should be deducted from the RBC to calculate the TAC (see section 6.3.3. above).

When estimating state catch, the impact of management changes in state fisheries (e.g. new spatial closures) are to be considered to forecast the state catch in the following year.

Where appropriate, the methods used to estimate future discards and state catches may be varied if an alternative method is expected to provide a more reliable estimate. This may be appropriate if there are management changes in state fisheries.

To ensure consistency between the RBCs derived through stock assessment models and the resultant TAC, where a stock assessment model is used to estimate a future discard rate, this estimate should be used in determining the TAC.

Species that have high discards (by-product species) should be assessed using a risk-based methodology. TAC setting should be based on the existing TAC (since the TAC is not controlling catch), subject to sustainability concerns and the consideration of whether the TAC is restricting catches of that or other species. Annual monitoring should be undertaken of available fishery indicators on a weight of evidence basis, including SAFE assessments, where available. If fishing mortality needs to be constrained, management measures other than output controls should be considered by SEMAC and AFMA.

The total research catch allowance (RCA) is set by the AFMA Commission when determining TACs for the season and must be consistent with the species/fishery harvest strategy. The RCA is typically deducted from the RBC but may also be set even if the RBC is zero to support research. Research catch allowance is deducted from the RBC as determined by the Commission in accordance with AFMA's *Research Catch and Effort Allowance Policy 2007.*

6.4.2 Latest CPUE Multiplier Rule

This rule is no longer applied.

6.4.3 Large Change Limiting Rule

This rule is designed to limit large changes (up or down) in the TACs from year to year. It is applied last in the sequence of rules and compares the recommended TAC derived after applying the first three rules, with the actual TAC for the previous fishing year.

To limit excessive changes from season to season in the TACs, an override may be applied for some species in setting TACs for the next fishing season, such that the TACs will not change up or down by more than 50% from the previous fishing season where this will not pose a significant risk to stock

status. For multi-year TACs, the large change limiting rule may be applied for each year of the period until the RBC is achieved.

6.4.4 Multi-year TACs

Multi-year TACs are to be applied for all Tier 1, Tier 3 and Tier 4 species where suitable. In determining whether a multi-year TAC applies, the following criteria should be considered:

- if the current biomass (B_{CUR}) is higher than the maximum sustainable yield (B_{MSY}) OR if B_{CUR} is below B_{MSY} but higher than the biomass limit (B_{LIM}) and B_{CUR} does not show a decreasing trend over a time period relevant for that species
- if fishable biomass (Tier 1) or a proxy (Tier 3 and Tier 4) can be predicted at an acceptable precision for the multiyear TAC period
- if the fishery is expected to be stable in terms of the level, method and spatial distribution of effort for the multi-year TAC period.

For Tier 1 species, multi-year TACs should be set using Tier 1 assessment projections and probability estimates. Multi-year TACs for Tier 3 and Tier 4 species are to be determined on a per species basis by the individual RAGs

In setting a multi-year TAC, the multi-year RBC is applied for each year in the period, with updated state catches, discards and research catch allowance to be deducted annually for the purposes of determining the TAC.

Each year, the relevant resource assessment group should review fishery indicators, such as catch and effort or size and age structure, to monitor changes to a species or stock that is managed under a multi-year TAC. Further guidance is provided in the document Monitoring MYTAC species in the SESSF.

Where a species' assessment has not been updated within the proposed MYTAC period, the last base case may be re-run to incorporate reliable recent data, to generate an additional year's RBC. Discount factors and/or a buffer, to account for time-induced risk, should be considered on a case-by-case basis.

6.4.5 Step up or step down TACs

A different TAC to that produced by applying the HCR and the meta-rules above may be adopted in limited circumstances. This may occur where there is a step up or step down in the TAC to achieve the RBC over a number of years. A step up or step down TAC may be set to reduce the economic impact of a significant change in RBC and allow fishers time to adjust their operations where the:

- TAC best pursues AFMA's objectives and the objectives of the HSP
- RAG provides advice on the biological risk to the stock of adopting a step up or step down TAC.

6.4.6 Setting a TAC outside the Tier 1 Harvest Control Rule

In some circumstances it may be appropriate to set a TAC different to that produced by the Tier 1 HCR, for example, where the Tier 1 HCR produces a TAC below the incidental bycatch of the species. A TAC different to that produced by the Tier 1 HCR may be set where the:

- stock is estimated to be above B_{LIM} but below B_{TARG}
- probability of the stock being below $B_{LIM,}$ both at the date of the assessment and in future years, is assessed to meet the HSP objective of ensuring that the stock stays above B_{LIM} at least 90% of the time (i.e. less than a 1 in 10 year risk that stocks will fall below B_{LIM})
- relevant RAG considers that the time that the stock is estimated to take to rebuild to B_{TARG} under the proposed TAC is appropriate given the HSP and biology of the stock.

6.4.7 Incidental bycatch TACs where the RBC is zero

Where the RBC is zero, an incidental bycatch TAC may be set after considering:

- the impact of incidental catches on rebuilding of the stock
- non-targeted catch based on:
    - landed catch
    - logbook discards
    - ISMP estimates of discards
- RAG or MAC advice on whether the incidental bycatch TAC should be adjusted to account for any inefficiency in the quota market for that stock
- RAG or MAC advice on their understanding of the level of targeting and the ability of operators to avoid catching the stock (informed by a companion species analysis)
- whether other management arrangements (including those in the relevant Rebuilding Strategy) have been, or are proposed to be, implemented to prevent targeting.

6.4.8 Other provisions

Other provisions in addition to those above may be considered, including:

- agreed transition rules for TAC setting in the next fishing year, where harvest strategy rules have been revised
- rolling over TACs in the absence of updated stock assessments based on a weight-of-evidence approach
- Discount factors will be applied unless the RAG advises otherwise
- companion species TACs (rules still to be determined).

Table 6 shows the current or suggested Tier levels for species/stocks in the SESSF.

Table 2: Suggested Tier Levels for SESSF species and stocks (2021)

Species/stocks	Tier level	Comments
Alfonsino	TBC	Was assessed as Tier 4 in 2007, as Tier 3 in 2008 with the availability of ageing data, and then as Tier 3 in 2013.
Blue eye trevalla	4 & 5	Tier 4 for the slope stock, and Tier 5 for the seamount stock.
Blue grenadier	1	
Blue warehou	4	
Tiger flathead	1	For the 2013 assessment, Shelf RAG agreed that the default RBC for tiger flathead is calculated under the 20:35:40 strategy
Eastern gemfish	1	
Western gemfish	4	
Jackass morwong	1	The 20:35:48 harvest control rule was applied in the 2008 assessment
John dory	4	
Mirror dory	4	
Ocean perch	4	Applies only to the offshore ocean perch species.
Pink ling	1	
Redfish	1	
Royal red prawn	4	
School whiting	1	
Silver trevally	4	
Spotted (silver) warehou	1	
Orange roughy east	1	
Orange roughy south	1	
Orange roughy west	1	
Orange roughy Cascade	1	
Bight redfish	1	
Deepwater flathead	1	
School shark	1	
Gummy shark	1	
Elephant fish	4	
Saw shark	4	
Ribaldo	4	
Smooth oreo (other)	5	
Smooth oreo (Cascade)	4	
Other oreo	4	
Deepwater sharks	5	

6.4.9 Variability, regime shift and climate change

Until the new SESSF harvest strategy is developed if there is evidence of a productivity change, recent recruitment scenarios should be used to set TACs (rather than average recruitment), as recommended by the RAG[8].

6.4.10 Setting a TAC where Tier 1 assessments have been rejected

For species without an accepted assessment, the TAC should be set using the existing TAC, subject to sustainability concerns. For future assessments, the assessor will present the RBCs for three years with longer-term projected RBCs used if the assessment is not run at the end of the MYTAC period (applied retrospectively to assessments if possible). Consideration should be given to collecting more data, dropping the tier of the assessment, or considering alternative assessment approaches for future use while ensuring that agreed approaches for considering new assessment methodologies is followed.

6.5 GABTS Decision Rules

The GABTS operates under a different set of decision rules to the other sectors of the SESSF. These separate arrangements have been agreed to under co-management arrangements. The FIS and the collection of age and frequency data as well as the monitoring of catch and effort information obtained will be analysed and presented to the RAG each year prior to the date at which a decision on the TAC for the next year is made.

- When the FIS has been conducted in two consecutive years, the catch rates from the first leg of the survey will be the indicator of abundance used to make any adjustment to the default TAC.
- In a year when the FIS has not been conducted in two consecutive years, the standardised commercial catch rate for the period July to February inclusive is the indicator of abundance used to make any adjustment to the default TAC.
- If there is a change of ≥20% to the indicator of abundance, a 10% (increase or decrease) to the default TAC will occur.
- If the RAG is concerned with any indicators over the period between stock assessments (length frequency distributions, standardised commercial catch rates, age distributions etc.), then it can decide to undertake a full assessment in that year.
- Multi-year TACs have been agreed to using the same rules outlined in section 6.4.5.

The GABTS has a development strategy for species not currently under a TAC, with actions occurring at specified catch triggers (**Appendix 1**). This strategy is designed to improve the data collected and the knowledge of these species as catch increases.

[8] Unless a regime shift has been identified.

- The initial catch triggers (set at 400 t for blue grenadier and gemfish, and 100 t for pink ling, blue-eye trevalla, ribaldo and hapuku) require data collection and analysis, and the development of an assessment plan.
- Exceeding the second trigger level requires that fishing for that species cease.
- The third trigger level applies to total catches across the three most recent years and requires a formal stock assessment.

6.6 Evaluation of reference points and decision rules

The HSF expresses the objectives of the Harvest Strategy in the form of quantifiable reference points based on the HSP. These reference points are used to guide management decisions, which are pre-agreed actions linked directly to the status of the fishery relative to those reference points.

The reference points and harvest control rules have been tested and refined through a MSE project conducted by CSIRO during 2006 and 2007. The MSE evaluated the choice of targets and thresholds for all Tier levels of the HSF. A key result of the project was improvements to the Tier 3 and Tier 4 rules, which now have well defined target harvest levels analogous to those used in the Tier 1 assessments for the major commercial species, recognising that Tier 3 and Tier 4 assessments are based on less information than Tier 1.

A copy of the final report "Evaluation of new harvest strategies for SESSF species" is available at: www.afma.gov.au/sites/default/files/uploads/2010/06/HSE-AFMA-Report-June20091.pdf.

Currently, climate change is not explicitly considered in the HSF. However, changes in the status, composition and population dynamics of the stock is reflected in the data collected – for example, age and length frequencies, catch and effort, stock recruitment, mortality and biomass data and trends.

Both biological and economic targets have been explicitly considered in developing the reference points and decision rules. However, while biological indicators and parameters have been included, economic indicators and parameters are still under development.

Evidence that the decision rules will maintain or move the stock to the biomass targets (or equivalent proxy) within a reasonable timeframe, and that the HSF will ensure that the stocks stay above the limit biomass level (or equivalent proxy) at least 90% of the time, have been provided by MSE testing.

For stocks below B_{LIM}, rebuilding strategies have been implemented in accordance with the HS. The strategies outline measures for rebuilding the stocks to above B_{LIM} (or equivalent proxy), and then additional measures to rebuild the stocks to B_{TARG} (or equivalent proxy) and monitor and maintain the stocks at the target level. The rebuilding strategies include an objective to ensure that the stocks stay above the limit biomass level (or equivalent proxy) at least 90% of the time.

7 Review

Under certain circumstances, it may be necessary to amend harvest strategies between reviews. These circumstances may arise if:

- there is new information that substantially changes the status of a fishery, leading to improved estimates of indicators relative to reference points; or
- drivers external to management of the fishery increase the risk to fish stock/s; or
- it is clear the strategy is not working effectively and the intent of the HSP is not being met.

Further explanation can be found in section 15 of the HSP Guidelines. The consultative and technical processes for amending harvest strategies are set out in the HSP Guidelines in section 2.5.

The SESSF Harvest Strategy Framework underwent MSE testing by CSIRO in 2006-2007. The project identified problems with the initial implementation of the HSF, developed improvements to the TAC setting procedures, and then tested these using the MSE approach. A MSE procedure was developed and used to test each Tier rule of the HSF.

A final report on the outcomes of the MSE was produced in 2009, entitled “Evaluation of new harvest strategies for SESSF species”. Key outcomes of the project were:

- a discussion paper with nine recommendations for modifications to the HSF
- demonstration that the HSF is consistent with, and meets the requirements of, the Commonwealth Harvest Strategy Policy
- demonstration that the Tier 1 rule achieves its aims for a range of species with differing life histories
- improvements to the Tier 3 and Tier 4 harvest control rules. The revised rules were presented to and approved by the RAGs during 2008, and applied (where appropriate) to setting the RBCs for 2009
- an evaluation of proposed rules for changing the TAC in response to the most recent year’s CPUE.

The MSE testing framework developed in the project is available for further testing of any future proposed revisions to elements of the HSF.

8 Appendix

GABTS Trigger limits

Species	Trigger to collect biological data	Trigger for analysis of biological data (inc. ageing of otoliths)	Cease fishing for that species	Commence stock assessment
Gemfish	Currently collected	400t	500t/year	1000t/3 years
Blue grenadier	Currently collected	400t	500t/year cease fishing. If a spawning aggregation is found, trigger an acoustic survey (500t) and operator collects 100 whole fish.	1000t/3 years
Ling	Currently collected	100t	250t	250t
Blue-eye trevalla	Currently collected	100t	250t	–
Ribaldo	Currently collected	100t	250t	–
Hapuka	Currently collected	100t	250t	–
Gulper sharks		–	Code of practice by industry to not target these species in addition to area closure.	–
Deepwater sharks (black/brier)		–	Code of practice by industry to not target these species in addition to area closure.	–
Chinamen leatherjacket		–	Management measures on Bight redfish and deepwater flathead influence catch.	–
Angel shark		–	Management measures on Bight redfish and deepwater flathead influence catch.	–
Jackass morwong		–	Management measures on Bight redfish and deepwater flathead influence catch.	–