PZJA Torres Strait Finfish Fishery Resource Assessment Group

FFRAG Meeting 8

4-5 November 2020 Novotel Oasis, Cairns

Meeting Record

Note all meeting papers and records are available on the PZJA webpage:

https://www.pzja.gov.au/torres-strait-finfish-groups



Australian Government

Australian Fisheries Management Authority

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Agenda Item 1 – Preliminaries

1.1 Preliminaries

The eighth meeting of the PZJA Torres Strait Finfish Fishery Resource Assessment Group (FFRAG) commenced at 0830 hrs. FFRAG Chairperson, Mr David Brewer, welcomed participants and acknowledged the Traditional Owners of the land on which the meeting was held and acknowledged the elders of the community past, present and those emerging.

Sunset sector Industry Member Tony Vass and QDAF Member Tom Roberts were noted as apologies received. Mr Bedford arrive at 0900 during item 1.3.

AFMA sought consent from the RAG to record the meeting for the purpose of ensuring an accurate record. AFMA advised that the recording is kept secure and is deleted once the final meeting record is published. There were no objections to the meeting being recorded.

1.2 Adoption of agenda

The agenda (**Attachment A**) was adopted as circulated by AFMA prior to the meeting. The RAG noted:

- a discussion on the review of the Western Line Closure had been added to the agenda as agenda item 4.2 as requested by an industry member; and
- a discussion on recording non-commercial catches would be added under agenda item 4.1 Review of TSFF Data Needs.

1.3 Declarations of interests

Each RAG member declared their interest in the fishery as documented in Table 1 (below).

Table 1. Attendance and declarations of interest - Finfish RAG 6 meeting men	nbers
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Name and position	Organisation	Declaration of interest
David Brewer, Independent Chair	Upwelling P/L (David Brewer Consultancy).	Director – Upwelling P/L (David Brewer Consulting). Honorary Fellow - CSIRO Chair - Torres Strait Finfish RAG Scientific member – Torres Strait Finfish Working Group Scientific member – Northern Prawn Fishery RAG Current consultancies with Quandamooka Yoolooburrabee Aboriginal Corporation. Co-investigator on Torres Strait non-commercial fish fishery project funded by TSSAC with RAG member Kenny Bedford.
Rocky Stephen, Industry Member	Chair, Kos and Abob Fisheries, Ugar Brother Bear Fisheries, Ugar Torres Strait Island Regional Council. Torres Strait Regional Authority	Councillor for Ugar, Chairperson of Kos and Abob Fisheries Ugar, Works with brother in a commercial fishing business on Ugar, Eastern cluster representative on the PZJA Finfish RAG & Working Group. Torres Strait Scientific Advisory Committee. Does not hold a TIB licence. TSRA Board member for Ugar TSRA Finfish Quota Management Committee member Member of Zeneth Kes Fisheries company.

Name and position	Organisation	Declaration of interest
Tenny Elisala. Industry Member	Industry member for Gudumalagal. Torres Strait Regional Authority	TSRA Ranger Dauan, TIB licence holder.
John Tabo Jr, Industry Member	Industry, Torres Strait Regional Authority Finfish Quota Management Committee.	Commercial coral trout fisher (TIB) Holds a Torres Strait Traditional Inhabitant Boat Licence. Member of the Torres Strait Regional Authority Finfish Quota Management Committee. Newly elected board member for MDW Fisheries Association on Mer Island. Member of the Zeneth Kes Fisheries company.
Kenny Bedford, Industry Member	Debe Mekik Le Consultancy	Runs a consultancy business which has delivered projects relevant to Torres Strait fisheries. Board member of Zeneth Kes Fisheries company,
Paul Lowatta, Industry Member.	Industry Member, Mailulagal	TIB industry member, Finfish RAG
Mark Anderson, TSRA Member.	Torres Strait Regional Authority	No personal pecuniary interests. TSRA holds finfish quota in trust on behalf of Traditional inhabitants and administers the annual leasing process to Sunset licence holders to generate revenue.
Michael O'Neill, Scientific Member	Queensland Department of Agriculture and Fisheries	Principal scientist for the current Spanish mackerel stock assessment project. Member of PZJA Finfish RAG and Working Group. Project team member for the Torres Strait (Spanish mackerel, coral trout) biological sampling program.
Ashley Williams, Scientific Member	CSIRO James Cook University	CSIRO employee, general interest in pursuing research in Torres Strait.
Rik Buckworth, Scientific Member	Sea Sense (Consultancy)	Director of Sea Sense Australia Pty Ltd and Aquatic Remote Biopsy Pty Ltd, Adjunct at Charles Darwin University, Honorary Fellow – CSIRO, ex Northern Territory Fisheries employee, AFMA Northern Prawn RAG Scientific Member, Principal Investigator on the Spanish mackerel stock assessment project. Chair of Northern Territory Aquarium Fish Management Advisory Committee. Recent appointment as Chair of NT Research Advisory Committee for FRDC. Interested in participating in research projects for the fishery as a consultant.
Selina Stoute	AFMA member	No interests. Manager of Andrew Trappett who is a co-investigator on two Torres Strait Finfish Fishery funded research projects. From mid November 2020, Mr Trappett will be, taking leave from AFMA to work with QDAF on the Torres Strait Torres Strait (Spanish mackerel, coral trout) biological sampling program.
Andrew Trappett, RAG Executive Officer	Australian Fisheries Management Authority	Co-investigator for AFMA on two TSSAC funded projects for Spanish mackerel stock assessment and biological data collection in a data services and industry liaison role. From mid November 2020 will be, taking leave from AFMA to work with QDAF on the Torres Strait (Spanish mackerel, coral trout) Biological Sampling Program.

Consistent with the Protected Zone Joint Authority Fisheries Management Paper No. 1 (FMP 1), which guides the operation and administration of PZJA consultative forums, the RAG noted the requirement to declare all interests, perceived or real. Each member declared their interest in the fishery as documented in **Table 1** (above). In line with the AFMA standard for declaring potential conflicts of interest in Commonwealth MACs and RAGs to best protect the integrity of advice, members with grouped interests (industry, research, TSRA, AFMA) were sequentially asked to leave the room to allow the remaining RAG members to:

- freely comment on the declared interests
- agree if the interests precluded the members from participating in any discussions and
- agree to any methods to treat the declared interest (e.g. the member provides preliminary input but leaves the room when any advice is formed).

The RAG noted that, in addition to the process under this item, it remained the obligation of all members to update their declarations throughout the meeting as required.

Industry members interests

Members with declared fishing interests in the fishery left the room to enable free discussion of these interests (Tenny Elisala, Rocky Stephen, John Tabo Jr, Paul Lowatta and Mark Anderson¹). As per previous RAG meetings the remaining members agreed that industry members could be perceived to have individual interests in the outcomes of advice put forward by the RAG. It was noted though that the members were engaged in the meeting to provide industry expertise and knowledge of the industry within their cluster nations. This expertise and knowledge were critical to the meeting provided industry members acted in the interest of the fishery as a whole. The remaining members advised that the industry members should participate in all agenda items and advice being formed. The industry members re-joined the meeting and were advised of the RAG consideration of their interests.

Research interests

Members with declared research interests left the room to enable free discussion of these interests (David Brewer, Rik Buckworth, Michael O'Neill, Ash Williams and Andrew Trappett). The RAG noted that these members could be perceived to have a personal interest in the outcomes of RAG advice relevant to research needs or funding. At the same time the scientific members were appointed to the RAG in recognition of their scientific expertise relevant to the fishery and hence research that might be undertaken. Whilst maintaining an awareness of the need to consider the interest of the fishery when advising on research needs and priorities, in particular, the remaining members agreed the scientific members should participate in all agenda items and advice being formed.

TIB industry members advised that feedback from the recent Fisheries Summit was that there is a strong need for ongoing participation of Traditional Inhabitants in research projects. The strong need for increased communication of science outcomes was also noted. Members with research interests re-joined the RAG and were advised of the RAG consideration of their declared interests.

TSRA interests

Members with interests related to the business of the Torres Strait Regional Authority left the meeting (Mark Anderson, Tenny Elisala, Rocky Stephen, Kenny Bedford). The remaining RAG members discussed the declared interests of the members and participants that had left the room. It was noted that the TSRA had declared their holdings of Sunset licences and revenue generated from leasing these entitlements for the benefit of Traditional inhabitants. It was further noted that

¹ Mr Bedford had not yet arrived at the meeting.

TSRA is investing in fisheries infrastructure, training and employment schemes in line with their functions. Members noted that having responsibility for the leasing program which is designed, in part, to generate revenue and for making fishery development investments, could mean a perceived interest in maximising the available TAC could exist. Consistent with advice from earlier RAGs, it was noted that it is important to maintain an awareness of this potential perceived conflict and ensure members acted in the interest of the fishery. The RAG agreed that TSRA views were important in forming advice to the PZJA and agreed for members with TSRA interests to participate in all agenda items and advice being formed. Members with interests in TSRA business re-joined the meeting and were advised of the RAG consideration of their declared interests.

AFMA interests

Selina Stoute and Andrew Trappett from AFMA left the meeting. The RAG noted AFMAs primary interest in the fishery was managing for sustainable fishing. AFMA members re-joined the meeting and were advised of the RAG consideration of their declared interests.

1.4. Review of action items from previous RAGs

The RAG noted an update from the RAG EO on status of actions as detailed in the agenda paper. It was agreed to remove any items marked 'ongoing' that had become part of business-as-usual work for the Fishery. Further, the RAG requested AFMA review the status classifications of 'ongoing', 'incomplete' and 'in-progress' to ensure they have clear and separate meaning. If not, these classification should be streamlined.

With regard to actions on acquiring climate change knowledge, an industry member queried whether any specific climate change work was occurring in Torres Strait. This was noted in the context of concern that Mer sardines might be disappearing and are a key bait source for trout fishing. AFMA advised that CSIRO have been funded to report on likely climate change impacts on Torres Strait Fisheries based on available information, including to advise on future data needs (what data needs be collected), options to downscale climate change information to the Torres Strait and model outputs for climate change impacts on Torres Strait fisheries. The CSIRO project team recently sought input from PZJA RAG Chairs and Scientific members on the projects' draft report. A final report is due in January 2020 and will be presented to the RAG.

Agenda Item 2 – RAG Updates

2.1 Industry and scientific updates

Industry members provided the following updates to the FFRAG on recent developments within the Torres Strait Finfish Fishery:

- Good catches of coral trout and other reef-line species have been taken by Mer fishers over recent weeks with October-November being described as the peak time for finfish catches. It was advised that commercial fishers were in the minority of total fishers catching finfish on Mer, with an estimated assessment thattwo dinghies might go commercially fishing for trout, while up to eight dinghies might go out targeting finfish for subsistence purposes.
- It was advised that the Mer community was in discussion about which community group would take responsibility for leasing and running the community freezer when in operation. In addition to the MDW Fishing Company, a new fishing company *Laru Zug Esrisili* attached to the PBC, was in the process being formed.
- Erub I community freezer (Darnley Deep Seafood) is back in operation and has seen a spike in Spanish mackerel catches over the past few weeks. Three recent barge shipments have left the business taking catch to the mainland to be processed. It was also noted that some coral trout were being exported to China.

- With improved weather over recent weeks, two fishing operations have been actively
 targeting Spanish mackerel at Ugar and are now moving across to targeting coral trout.
 During recent community visits by AFMA and QDAF, Ugar community members expressed
 concern than Spanish mackerel being taken for subsistence fishing (40-50 mackerel per
 week at times) were not being recorded through the Fish Receiver System (which records
 commercial catch only).
- Community members have recently embraced the need for data collection to support their fisheries and have a strong desire to capture traditional harvests of their resources through some kind of user-friendly reporting system. Communities are interested to hear the outcomes of the scoping study investigating options for monitoring traditional take catches being led by Kenny Bedford.
- Following the October 2020 Fisheries Summit convened by TSRA, Gudumalalgal communities have been emphasising the need to removing the Western Line Closure. They are keen to seek advice from eastern communities on rigging gear to target finfish ahead of the planned 2021 community freezer openings (Boigu, Saibai, Dauan) under the Waphill traineeships program.
- The Masig community are not presently active in commercial fishing for mackerel or trout and are awaiting the community freezer re-opening. Good Spanish mackerel catches have recently been taken for subsistence on Masig.
- Industry members expressed concern over the upcoming AMSA requirement to have a certificate of survey for commercial vessels and to have appropriate crewing, including the master holding a coxswains licence.
- Feedback on the recent Torres Strait Finfish Biological Sampling Program (QDAF and AFMA) community visits was positive with the presentation well received by communities and some volunteers being signed up to provide fish frames and length measurement to support the science of their fishery.

Science members provided the following update:

An informal national group of Spanish mackerel managers and scientists from jurisdictions across the top-end of Australia has been formed (WA Fisheries, NT Fisheries, QDAF – Gulf of Carpentaria and Qld East Coast, NSW Fisheries and AFMA – Torres Strait). The group has met twice via video conferencing and is co-chaired by NT Fisheries and AFMA. The group has identified that similar, but not identical, trends in catch rates to Torres Strait do appear to be occurring across the top-end of Australia suggesting that environmental factors might be influencing these fishers. Although in its early stages of analysis, it appears that WA fisheries may have evidence of sea surface temperature anomalies correlating with decreases in catch rates in their data set. It was noted that the committee would continue to meet and updates would be provided to the FFRAG.

2.2 TSRA update

The FFRAG noted the following updates from the TSRA Member:

- An exemption has been granted to industry members from holding a coxswains certification to fish commercially until 2022. TSRA is working on a Marine Pathways program to have all TIB licence holders trained and certified with 200 of the 465 licence holders certified to date.
- Building on the findings of the fisheries infrastructure review led by Kenny Bedford, the 'Waphill' (many fish) project was formed (co-funded by TSRA and QLD Government), with employment, construction and training outcomes for 14 Torres Strait communities. It was reported that Darnley Deep Seafoods on Erub I were recipients of the initial stage of the Waphill project with 15 trainees recruited. Each trainee is working with a host fisher/mentor

on fishing skills, completing their coxswains and a Certificate 1 in business. The project is aiming to have the trainees develop a business and savings plan. They will be able to apply to the TSRA at the end of the program for a grant of up to 50 percent of the cost of their own fishing vessel.

- The Waphill project has also seen the recruitment of three Erub I freezer based trainees who have completed part of their traineeship with Independent Seafood Producers Pty Ltd Fish Market in Cairns. ISP are also engaged to provide training in communities.
- The Fisheries Summit convened by TSRA in October had concluded the 2.5 year process \ to deliver on a long-term aspiration to move community-owned assets to a community-owned enterprise. The summit resolved to form the *Zenedth Kes* fishing company from 1 December 2020. The company will be limited by guarantee and registered through ASIC. It will be 100 percent indigenous owned and controlled. It will have 25 members, five from each cluster nation including the Northern Peninsula Area. The initial Board members will be appointed for 12-18 months. The company is designed to be a world class fishing operation with benefits going back to the community. Members will be unpaid. Revenue raised is to go back to communities through a beneficiary process. This has been part of a 70 year journey for communities to take back responsibility and ownership of their fisheries. TSRA will be working with PZJA to transfer licences TSRA currently hold to the *Zendth Kes* fishing company and \$1.8M of funds. Finfish Fishery access rights and Beche De Mer assets will also be moved. A separate PZJA allocation review process will be undertaken for Tropical Rock Lobster in accordance with the plan of management for that fishery.

2.3 AFMA update

The FFRAG noted the agenda paper from AFMA and the following additional updates:

- Good catch reporting of finfish is being received by AFMA through the Fish Receiver System. Recent community visits (October and November 2020) have been able to provide feedback on the data, and it is agreed to by participants that the data represents a good picture of harvests from around Torres Strait.
- AFMA has recently visited the Erub I Freezer to support new trainees engaged under the Whaphill project. The initial visit focused on filling out Catch Disposal Records, identifying trout down to species level, setting up trainees as registered agents under their host fisher's commercial licences and answering general questions on fisheries management. AFMA advised follow up visits were planned and could further discuss data collection and support for fishery research projects.

Agenda Item 3 – Stock assessments and RBC advice

3.1 Updated Spanish mackerel stock assessment 2020

The FFRAG reviewed a presentation on Spanish mackerel stock assessment and model predictions (**Attachment A**). The presentation reported results up to the 2019-2020 fishing year, including information to review good analysis fits to all model data inputs. The RAG noted advice that, with newly available data, the model results now show an increase in catch rates and modelled recruitment. As a result, the model shows that the abundance (spawning biomass) of Torres Strait Spanish mackerel has increased since the last assessment performed in 2019.

The stock assessment

The RAG noted:

- a) that the stock assessment was based on the same annual age structured model (referred to as the 1940 model) as the last 2019 assessment, which uses all available harvest, catch rate data and fish age-frequency data. The update to this model included an additional year of harvest data (fishing year 2019-20) and an additional eight years of age-frequency data (this includes historical² age-frequency data);
- b) that treatments to all data inputs into the assessment were applied in line with recommendations from FFRAG 7 (<u>data meeting 8 October 2019</u>). This included advice on reconstructing a catch history for the fishery prior to 1989, including harvests for Illegal, Unreported and Unregulated foreign fishing, treating standardised catch rates (tender data to be excluded, fishing power to be included) and advice on using all newly available fish agefrequency data as inputs;
- c) in line with FFRAG recommendations, nine specific agreed model analyses were performed rather than the 35 model scenarios run for the previous 2019 stock assessment update (summary table at **Attachment C**). Six of these model runs were for the 1940 model and three model runs were for the alternative exploratory model referred to as the 1989 model;
- d) the exploratory 1989 model was developed and investigated by the project team in line with recommendations from FFRAG7. The purpose of this investigation was to examine whether the model would be informative if it only included data from the time when compulsory Sunset logbook data reporting commenced. That was from 1989;
- e) confidence intervals were calculated to show the uncertainty of each analysis over 1000 simulated model runs. This was achievable in this assessment round, partly because more time was available due to the reduced number of model scenario runs requested.

Having considered the results of the 1989 model and advice from all scientific members, the RAG agreed that the 1989 model remained exploratory but worthy of further development overtime (refer to more detail below on the 1989 model). The RAG agreed that the 1940 model run provided the most reliable assessment of the stock and an acceptable basis to evaluate the status of the stock and to calculate a Recommended Biological Catch (RBC) for the 2021-22 fishing season.

The stock assessment results

Based on the six agreed 1940 model runs, the RAG noted that the results of the updated 2020 stock assessment show:

a) The estimated 2019-20 median spawning biomass of Torres Strait Spanish mackerel was 30% (B₃₀), ranging between 26% (B₂₆) and 35% (B₃₅), of unfished biomass in 1940 (B₀). This represents a seven percent increase from the 2019 estimated spawning biomass for 2018-19 of 23 (B₂₃) percent (ranging between 14-37%) of unfished biomass in 1940 (B₀);

² Newly available age-length data for analysis included: 1974-75, 1978-79, 1983-84, 1998-99, 1999-00, 2004-05, 2005-06 along with the new year of data from 2019-20 season.

- b) None of the median biomass estimates from the six model scenarios were below the agreed limit reference point (B_{LIM} is defined as 20% of the 1940 biomass level (0.2 x B₀)) although the lower confidence intervals of some model runs were below B_{LIM};
- c) Unlike the declining trend since 2009-10, the standardised catch rate (number of fish per operation day) of legal-sized Spanish mackerel, using logbook data from Sunset fishing operations, increased in 2019-20 (a statistically significant increase);
- d) Age-frequency data now available from 2019-20, shows estimates of recruitment have returned to around the average;
- e) Recent fishing pressure is not exceeding F_{MSY} (the harvest rate for Maximum Sustainable Yield (MSY) from the stock). This means overfishing is not occurring.

RAG considerations

a) 1989 exploratory model: From previous assessments, it was noted that results were dependent on the estimated annual harvests prior to 1989. This pre-1989 harvest data was estimated from a mix of historical fisher and Queensland fish board reports, plus a level of assumed Illegal, Unregulated and Unreported Taiwanese gillnet harvests. FFRAG suggested that the project team investigate the exclusion the pre-1989 harvest data, to test if the model could function with just the modern data set (1989 to present).

The project team performed this work and advised that the 1989 model runs were not able to produce consistent and meaningful results without some prior information being set in the model. The analyses highlighted a need to define bounds on the pre-1989 harvest rates, and results were influenced to whether the pre-1989 age length data were included.

The RAG agreed that 1989 model was a good approach in principle but has limited value at this time and requires further development. The project team advised that further development work was required on the model settings prior to 1989 (these are known as the 'prior' terms).

It was advised that when model aspects and settings are clearer, the RAG might expect to see more consistent comparisons between the 1989 and 1940 models. Only then and after FFRAG review, should this alternate model be included in the range of results used to set a median RBC.

- b) 'Paper' fish: The project team reminded the RAG of the initial examination carried out in 2019 into the effect of possible over reporting of Sunset catch, ahead of the 2007 industry buyout. The 2019 stock assessment tested certain high points in the harvest data series. It was reported that adjusting the high points down had little effect on the outputs of the model biomass trends (see 2019 FFRAG power point report).
- c) **Hyper-stability in catch rates**: The project team advised that historical catch rates are not stable, but varies overtime with an evident pattern. This suggests that hyper-stability may not be an overpowering factor in the available data, and that increases in fishing power are considered each year. Nevertheless, noting that the fishery mostly targets the Bramble Cay spawning aggregation, the RAG agreed that further investigation is still warranted into this issue;
- d) **Retrospective analyses**: The project team noted RAG advice that performing retrospective analyses, whereby the model works backwards through time in a stepwise manner to test how the model performs, will be a powerful tool for examining how well the model performs. The

team advised that this has not yet been actioned but would attempt to include this analysis in the final report;

e) **Environmental factors**: The RAG noted advice from the project team that environmental factors have not been incorporated into the assessment for FFRAG 8. The RAG agreed that this work remained a high priority to understand the factors for consideration in RBC settings.

3.2 Spanish mackerel RBC for 2021-22

Selecting an appropriate RBC calculation method

To guide advice on an RBC for the 2021-22 fishing season, noting there is no agreed harvest strategy in place for the Torres Strait Finfish Fishery, the FFRAG considered a range of RBC calculations. These are described in **Table 2** and outlined below.

In forming their RBC advice, the FFRAG:

- a) considered five different constant (non hockey-stick) harvest rates applied to the six results from the 1940-model. Each level of harvest rate related to building the stock to different target reference points (F_{MSY} through to F₆₀);
- b) agreed to forecast the stock biomass to the 2021-22 fishing season based on an assumed level of harvest in 2020-21 (55 t = 39 t sunset, 4 t TIB harvest (based on the mean of the past three TIB fishing seasons), 10 t subsistence, 2 t recreational and 0 t for charter catches) and assuming average recruitment occurring. Therefore the RAG discounted approaches based on the 2019-20 estimate of biomass (Table 2, Approaches 7, 8, 9, 10 and 11);
- c) agreed to assume average, rather than depressed recruitment in future fish population riskprojections. Unlike the findings from last stock assessment, the most recent recruitment deviations for each of the model runs were all positive (**Attachment C**). The RAG therefore agreed there was insufficient basis to assume below average recruitment in the future projections. Therefore the RAG discounted all approaches that assumed reduced recruitment (Table 2, Column 5);
- d) reviewed fish population projections to evaluate risk to the stock. Consistent with the 2019 approach used by the RAG, it was agreed to consider how many years in a model run and simulation the stock would drop below the limit reference point (B₂₀ or 20% of the unfished spawning biomass level in 1940) during a 12 year-time period (three times the age of full sexual maturity)³. The RAG agreed, in line with the *Commonwealth Harvest Strategy Policy*, that if more than 10% of model runs (based on over 1000 simulations), dropped the stock below B_{LIM} that this would represent unacceptable risk to the stock. Therefore the RAG discounted approaches which represented unacceptable risk to the stock (Table 2, Approach 1 Constant F_{MSY} and Approach 2, Constant F₄₀);
- e) considered industry member advice at the meeting and the principles recommended by industry for developing a harvest strategy for the fishery to be conservative by '*hastening slowly*' and by '*banking*' fish if the biomass is increasing. A summary of the guiding

³ The RAG reviewed and agreed to the rationale of the 12-year timeframe being three times the full age of maturity i.e., based on age-length information by four years of age most fish are fully mature and contributing to the stock.

principles is in **Attachment D** (as tabled at FFRAG 5). Therefore the RAG discounted Approach 3 (Constant F_{48}) with an RBC calculation of 112 t as this represented too great of an increase in RBC over the 2019-20, 71 t RBC level. Likewise, the RAG discounted Approach 5 (constant F_{60}) with an RBC calculation of 75 t as it offered little increase from the current season 71 t RBC noting that the assessment outcomes did suggest an increase in RBC was warranted based on improvements in CPUE and modelled recruitment;

- f) noting that 75 t RBC (constant F₆₀) was considered too low, and 112 t RBC (Constant F₄₈) was considered too high the RAG requested the project team to present a compromise approach of an RBC based on the mean point between F48 and F60. This approach (Table 2, Approach 6) would represent an RBC of 94 t;
- g) reviewed fish population projections for 105 t and 94 t harvests to evaluate the likelihood of the stock building to B₄₈ over the 12 year projected time period (three times the average age of sexual maturity) projection graphs considered are at Attachment E;
- h) The RAG considered B₄₈ or B₅₀ to be a sensible interim target reference point, noting that B₄₈ is the default proxy for B_{MEY} when no economic data are available (under the *Commonwealth Harvest Strategy Policy*). B_{MEY} measures the biomass of fish to yield the sustainable maximum-economic-yield (MEY) from the stock. B_{MEY} also relates to the long-term aspirational target reference point of B₆₀ recommended by industry under the harvest strategy work completed to date (see Attachment D).
- i) The RAG noted that only one of the six 1940-model runs would be reaching the reference point of B₄₈ (with a constant harvest of 105 tonnes) after 12 years. Therefore, the RAG discounted the approach labelled 4 (Constant F₅₀) as although the harvest poses acceptable risk to the stock, this level of harvest will likely not build the stock to the interim B₄₈ target reference point within 12 years. However, the constant harvest of 94 t did build the stock to B₄₈ by 12 years.

RBC advice

In line with the agreed RBC calculation method described above of removing less appropriate RBC options (summarised in Table 2 below), **the RAG recommended** a 94 tonne RBC for Spanish mackerel for the 2021-22 season. The RAG agreed that this RBC:

- a) is based on the application of a constant harvest rate equivalent to the mean point between F48 and F60 to the estimated biomass in the 2020-21 fishing season;
- b) would build the stock on average to the interim target reference point (for F₄₈) within a reasonable timeframe of 12 years (three times the age of sexual maturity) and assuming average recruitment to be occurring (Attachment E);
- c) poses an acceptable low risk of the stock falling below the limit reference point (less than 10% of model runs and simulations dropping the stock below 20% of unfished spawning stock biomass in 1940); and
- d) reflects the preference of industry members to have a harvest strategy that is balance and careful by '*hastening slowly*' by '*banking*' fish if the biomass is increasing.

Table 2. Summary of options presented to the FFRAG as outputs from the 1940 model runs in the 2020 Spanish mackerel stock assessment update. Yellow highlighted approaches were those considered by the RAG as potentially appropriate RBCs for recommendation.

	Name of RBC approach	Name of RBC oproachBiomass% runs below S20 over 12 years and 6 analyses		Median	
No.	1940-model	RBC calculation	Assuming average recruitment	Assuming reduced recruitment	2021-22 RBC (tonnes)
1	Constant F _{MSY}	2021-22	12%	24%	146
2	Constant F ₄₀	2021-22	12%	23%	145
3	Constant F ₄₈	2021-22	9%	15%	112
4	Constant F ₅₀	2021-22	8%	13%	105
5	Constant F ₆₀	2021-22	7%	9%	75
6	Mean of F ₄₈ and F ₆₀	2021-22	8%	N/A	94
7	Constant F _{MSY}	2019-20	8%	12%	99
8	Constant F ₄₀	2019-20	8%	12%	97
9	Constant F48	2019-20	7%	9%	77
10	Constant F50	2019-20	7%	9%	73
11	Constant F ₆₀	2019-20	6%	8%	53

RAG consideration: Forecasting an RBC for the fishing season ahead

The FFRAG noted advice from the project team that a lag existed between when the data was available to support the model (30 June 2020), when the stock assessment was considered (November 2020) and when the RBC takes effect on the stock (2021-22 fishing season). AFMA advised that common practice in other AFMA managed fisheries to address this issue was to set an RBC based on what the stock was predicted to be a year in advance of when data was available, and to assume the full TAC was to be taken along with average recruitment occurring in the intervening year. It was noted that this was the general approach but RAGs would deviate from it if evidence existed to do so.

The project team advised that outputs from the stock assessment model had been prepared as an option that would assume that the 2019-20 fishing season had proceeded with average recruitment (based on the stock recruitment curve), removing natural mortality and removing predicted fishing mortality (55 t, 39 t sunset harvest, 4 t TIB harvest (based on the mean of the past three TIB seasons), 10 t subsistence, 2 t of recreational and 0 t of charter catches). Based on this additional year of information the model can produce a forecast for the level of biomass and RBC for 2021-22.

The RAG noted project team advice that, as Spanish mackerel recruits need two years of growth before they enter the fishery, the assumed recruitment within the forecast period will have very little effect on the constant F RBC outputs.

Estimating non-commercial catches

The Finfish RAG reviewed the available information to support estimates of non-commercial

catches available to the PZJA in setting a Total Allowable Catch from the RBC. The RAG noted advice from Dr O'Neill and the Chairperson that the QDAF recreational fishing for 2019-20 had concluded however, the survey did not sample the Torres Strait to form a meaningful estimate of recreational catches for the region.

The RAG noted that 10,000 kg of catch estimated for subsistence catch by Traditional inhabitants, at 7.3 kg average weight per fish (based on the most recent biological sampling), would represent 1400 fish from all communities. This roughly translates to an average take of a few hundred fish from each Torres Strait community per year. Applying the same average weight, the previously assumed two tonne catch⁴ for recreational fishing represented around 280 fish.

Industry members and the TSRA member considered that both the subsistence and recreational estimates were a likely underestimate for the coming season.

- The TSRA member advised that, based on consultation on the Waphill trainee project, fishers in eastern communities are reportedly catching good numbers of Spanish mackerel for subsistence. The TSRA member has been advised by fishers that Spanish mackerel is not being sold due to the current lack of infrastructure.
- Industry members advised that along with having periods of good catches, many eskies of frozen Spanish mackerel are regularly shipped south to friends and family and are also used as barter/trade in communities. By way of example, industry members advised that within one community over the last three weeks, around eight boats have been fishing twice daily and landing 5-7 Spanish mackerel each fishing session per boat.
- Industry members were of the view that the recreational boat numbers have increased over time, with a lot more contractors resident in Torres Strait taking boats out to communities to fish in their spare time.
- Industry members advised that along with the rollout of fisheries infrastructure in the near future there is a likelihood that with more fishers commercially targeting mackerel, more catch will be retained also for subsistence.

The RAG discussed the potential for recent observations to cause bias in the perception of seasonal trends, noting earlier advice from industry that there had been limited fishing most of the year due to poor weather. An industry member also commented that Spanish mackerel was not a preferred subsistence species with communities preferring species like Siganids (rabbitfishes) instead. However, on balance, the RAG accepted member advice that the previous estimates were likely an underestimate and, in line with the objectives of the Treaty, traditional fishing needed to be protected and have priority over harvesting for commercial purposes.

The RAG recommended increasing non-commercial catch estimates for Spanish mackerel for calculating TACs for the 2021-22 season (that is reducing the RBC by the total estimate to derive the TAC). Increases were recommended from 10 tonnes for subsistence to 15 tonnes and from 2 tonnes for recreational to 5 tonnes. Consistent with previous years, the RAG agreed that charter fishing catches were likely to be minimal and accepted AFMA advice that Australia and PNG were unlikely to enter into catch sharing arrangement under the Treaty in 2021-22 fishing season. Both were subsequently left unchanged for the 2021-22 fishing season.

⁴ The Spanish mackerel stock assessment team advised that the model used the 2013 point estimate of 2 t for recreational sector harvest with error bars ranging from 2-4 t (the model alternates between 2, 3 or 4 tonnes).

Agenda item 3.3 Coral trout recommended biological catch

The RAG recommended maintaining the coral trout RBC at 135 t for the 2021-22 season noting:

- a) catches remain low in the fishery (catches for the 2018-19 fishing season were 34.3 tonnes);
- b) the preliminary stock assessment undertaken in 2019 indicated that the stock biomass is likely to be high (the preliminary stock assessment estimated the biomass to be around 80 percent of estimate virgin biomass (B₀), with all of the model estimates of spawning biomass being above B₆₅);
- c) although there is the potential for catches with further fisheries infrastructure development under TSRA funded programs, industry members did not forecast significant increases by 2021-22 fishing season; and
- d) it was not a priority at this time to estimate catches taken outside the fishery. However, the RAG recommended that AFMA under work next year to support RAG consideration of likely catches ahead of the following fishing season.

The RAG re-iterated that the data priority for the fishery remained as, improving the accuracy of catch and effort data (for example reporting catches by species rather than a basket of the four trout species) and biological sampling.

Noting that the fishery has remained under-utilised for some time, the TSRA member sought RAG advice on what information is needed to support a more accurate/reliable stock assessment which could then be used to adjust the TAC. The RAG noted that the research priorities to address gaps in the preliminary stock assessment were identified by the RAG in 2019. The priorities being to undertake further habitat mapping work, analyse the mid-90s CSIRO dive survey data, improve catch and effort data from TIB fishers and collect fishery independent data, such as an underwater survey and/or biological sampling.

The RAG noted previous advice that there a significant advantage to undertaking a fishery independent dive survey of abundance prior to any significant fishing pressure being applied. Such a survey would act as a baseline to measure the potential productivity of the fishery.

RAG consideration – likely industry development

An industry member advised that there will likely be increased interest in coral trout fishing with further infrastructure development in Torres Strait as more community freezers commence operations. It was reported that the Erub I Freezer (Darnley Deep Seafood) was back in operation with good demand for both fillet and whole trout being shipped to Cairns and then exported to China. An industry member from Mer advised that fishers were fishing trout and processing through a small scale private freezing operation to supply mainland buyers for good profit.

It was further noted that the *Seaswift* freight company was investigating installing recirculating live tanks to their Torres Strait cargo vessels. This would allow live trout and reef-fish to be sent to Cairns and other ports from Torres Strait. If cost-effective, this could support industry growth into the live trade market.

The RAG noted advice from TSRA Finfish Quota Management Committee members present at the RAG that there was little interest from Queensland east coast operators leasing access to the Torres Strait Reef Line Fishery. This was noted as likely being due to the cheap lease price on the

east coast line fishery, operators there focusing on live trout trips and the readily available quota in that fishery. With low Torres Strait Spanish mackerel quota in 2020-21 it was noted that there was some increased interest in leasing trout by Sunset licence holders that mainly target mackerel. It was noted that the healthy level of the trout stock and large available TAC would represent an opportunity for the new *Zenedth Kes* fishing company to lease trout and grow the company should there be interest in leasing or fishing within the TIB sector.

The RAG reiterated its support for the Torres Strait Fish Receiver System and the work AFMA was doing in communities to encourage fishers to report trout catches down to species level rather than as a basket. It was noted that the species-split issue posed a challenge for management and science. Further, it was noted that as trout grow to the larger sizes they turn into males, meaning they contribute less to the spawning biomass, which represents another challenge for management as the fishery develops.

Agenda Item 4 – Management

Agenda item 4.1 Logbook review TSF01

The RAG noted an update from the AFMA EO on the data presently collected through the AFMA *TSF01 Torres Strait Finfish Fishery Daily Fishing Logbook.* AFMA outlined a number of issues identified by the RAG over time to improve the quality of catch and effort data coming from Sunset fishers. The RAG noted that this agenda item was to get general advice from the RAG ahead of some succinct project work with industry members in 2021 with a view to implementing a new logbook for the 2021-22 season.

It was noted that advice was sought on tactical changes to TSF01 to improve data from the Sunset sector as well as broader changes that might facilitate adoption by TIB sector fishers, noting that it is not mandatory for these fishers to complete a daily fishing logbook at this time.

The RAG agreed with the general principle that both Sunset and TIB sectors should be completing the same daily fishing logbook.

Logbooks changes recommended to improve Sunset sector catch and effort data:

Dory driver name

The RAG supported the AFMA suggestion to modify TSF01 to have a clear "*first name and surname*" field for dory driver name noting advice from the Spanish mackerel project team that analysing older historic dory driver data has been unsuccessful due to unclear data; e.g. dory driver name can be recorded as 'James', 'Jim', 'Jimmy' and cause confusion.

Shark depredation

The RAG supported modifying TSF01 to quantify the impact on catch rates over time from shark taking catch from lines (shark depredation). The RAG noted that industry have raised shark depredation as an issue that could be affecting the interpretation of catch rates. It was noted that Western Australian Fisheries have changed their logbook to ask fishers to record "*how many fish did you lose to sharks in this fishing operation?*" RAG members suggested that this part of the logbook should be a simple box where fishers should write the number of fish lost to shark depredation. The instructions should make it clear for fishers to write a zero when no interaction occurred and to not leave this field blank.

Tender data including location for both Spanish mackerel and coral trout

The RAG supported modifying TSF01 to better collect finer scale information about where fishing occurred for both Spanish mackerel and trout operations. It was noted that, for coral trout, it is important to know the number of reefs visited per fishing session.

The RAG noted that TSF01 records the location for where a primary boat is operating per fishing day and records catch taken per dory for Spanish mackerel. The RAG noted that Spanish mackerel dories generally operate nearby to the primary vessel meaning that the location of fishing operation is generally well recorded. However, for coral trout, the RAG noted advice that tenders in this fishery may travel over a wider range and visit a number of coral reefs in a fishing session meaning the location of fishing effort was poorly captured in TSF01.

Industry members advised of a concern that Sunset fishing tenders may be fishing inside the 10nm radial closures (while the primary is anchored outside) around eastern communities and collecting finer scale fishing effort data may help address this risk.

Michael O'Neill advised that, in the Queensland East Coast Spanish mackerel fishery, the data needs include the hours fished per day and the number of sites fished within a zone. It was advised that QDAF is investigating whether Vessel Monitoring Systems (VMS) fitted to dories can be used to meet this data need rather than changing their logbooks. Research is being done on how VMS data can be integrated into the stock assessment model to get information about fishing operations and where they occurred.

Fish weights: logbooks vs. CDRs

The RAG support AFMA working to update their systems to automatically link the Finfish logbook and Catch Disposal Record (CDR) data through a 'Trip ID' or fishing event. This would make is more time efficient to link the CDRs with verified weights with the numbers fish caught per trip.

The RAG noted that a data need for the fishery is to be able to link each fishing event in the daily fishing logbook to the corresponding CDR to best determine the average weight per fish landed. The RAG noted that generally, weights recorded in Daily Fishing Logbooks are back-deck estimates with CDRs completed in port on accurate scales are being used to verify these logbook weights. The RAG noted that CDRs are used by AFMA to deduct catches from catch holdings, not daily fishing logbooks.

The RAG noted that the reef-line portion of the logbook had data fields for 'number' and 'weight' of fish. It was noted that the mackerel section only requires fishers to record the numbers of fish and average weight/number of cartons. The RAG suggested working with industry to understand their practices for estimating or weighing fish at sea and how this varies between reef-line and mackerel fishers.

Species splits for trout

The RAG supported amending TSF01 to remove the percentage species splits estimates for coral trout and have fishers record each species individually line by line including number and kilogram.

RAG members reiterated concerns that a challenge for science and management in the reef-line fishery was the fishery catching a basket of four coral trout species and not recording them at species level. The RAG noted that fishers at present could report a basket of trout (e.g. 100 kg) and provide a percentage split to estimate the number of common, bar-cheek, blue-spot and passionfruit (e.g. 85 % common, 15 % bar-cheek).

Spatial reporting – including TIB fishers

The RAG supported redesigning the logbook, if appropriate, to help make it more user friendly for both Sunset and TIB sector fishers to fill out. The suggestion was made that have one page represent a single fishing day might make the logbook less cluttered and easier for new fishers to fill out.

RAG science members supported the extra effort fishers are going to through the FRS Catch Disposal Records (TDB02) to volunteer the broad area fished, noting the reporting zones are very large in the CDR book. However, it was advised that, to best support stock assessments, a finer scale measure of where fishing effort occurred would be needed from TIB fishers, particularly for trout, which are known to be generally found in only a small area of reef.

The RAG noted concerns from TIB industry members that reporting an exact location fished is not traditional practice within communities and was a part of Traditional Knowledge and needed to be respected. Industry members advised that this would be a challenging issue as fishers want to volunteer data to help their fishery science and management but do not want their Traditional Knowledge released to outsiders.

RAG members advised that the key to help adoption will be education, awareness and engagement with industry around the firm confidentiality requirements of the daily fishing logbook program. It was noted that, while a CDR is filled out by both a fisher and fish receiver, the daily fishing logbook is confidential and is sent straight to AFMA where it is housed securely. AFMA advised that strict information disclosure rules are in place to protect the commercially sensitive nature of these data; where data from a single fisher should never be able to be discerned from looking at any data publication.

The RAG noted advice from TIB fishers to AFMA that recording latitude and longitude co-ordinates would be another challenge in adopting daily fishing logbooks. The RAG considered the AFMA suggestion that fishers (TIB and Sunset) could be given the simpler option to report location fished as an 11 x 11km square 'hill-grid' with a grid and then a site recorded within this grid (noting the logic of these were that a hill-grid was 1/10th of a degree of longitude and equated to 6 x 6 nm). RAG members noted that the hill-grid system would be well suited to Spanish mackerel and might be suitable for coral trout based on reef site fidelity, noting sub-populations tend to stay on a single reef with some reefs spanning more than one hill-grids. It was noted that this could be further explored with industry during project work and consultation.

Non-commercial fishing data needs for the fishery

RAG industry member Kenny Bedford provide the RAG with an update on the AFMA funded project *Developing an approach for measuring non-commercial fishing in Torres Strait.* The RAG noted that RAG Chairperson David Brewer was a co-investigator on the project alongside their colleague Dr Tim Skewes.

Mr Bedford advised that a clear shift within industry was apparent over recent years with communities embracing the need for data collection and stewardship including the need for data to support their fisheries. This includes a growing sense of responsibility for all natural resources including non-commercial species such as rabbitfish.

The project is reflecting on past strategies to collect non-commercial catch data that have not been successful, as well as focusing on the stakeholder needs for such data. It was advised that there is a need for a 'critical mass' within a community to support a system given it is a shared responsibility. The project is focused on recommending a straightforward method to collect these important data with a draft report near completion.

The project is likely to recommend an education campaign to help communities understand why the collection of these data is important especially as part of an ecosystem based management system rather than considering a single species at a time.

Recognising that collecting data on non-commercial catches is a key issue for the fishery, the RAG recommended that 2021 rounds of community visits and any consultation by AFMA/TSRA should add communicating the outcomes of the non-commercial catch project to the agenda to help communities' understanding.

4.2 Western line closure

The RAG noted an update from AFMA on the status of the Western Line Closure review as outlined in the agenda paper. Industry members advised that a clear outcome of the October 2020 fisheries summit was industry support for the removal of the reef-line closure for the fishery north of Numar Reef. This was recommended to provide economic opportunities for Dauan and Boigu communities to enter the reef-line fishery and target inshore species such as Barramundi and jewfish, but also crab, mussels, garfish, mackerel and coral trout. Retaining the closure south of Numar Reef was considered to be a compromise that would remove interaction of the reef-line fishery with the Tropical Rock Lobster fishery in mid-western Torres Strait communities.

The RAG noted the following risks and considerations with lifting the northern part of the closure:

- General uncertainty on the nature and extent of fishing expected once the closure is removed. Industry members advised that around 6 operators per community in Gudumalalgal (Boigu, Dauan, Saibai) were interested and able to fish in the finfish fishery. Species of interest are Barramundi, jewfish, garfish, 'zarum' and coral trout
- Impacts on traditional fishing: The RAG noted that commercial fishing in and around the relatively small near shore habitats may impact traditional fishing catch rates and sought advice from industry members on the likely interaction between the two sectors (commercial and traditional). Industry member advice was that the impact could be managed as it would likely be a relatively small number of fishers working commercially per community.
- *IUU incentives:* It was noted that the opening may have impacts on incentives for Illegal, Unregulated and Unreported fishing, with jewfish swim bladder being a particularly valuable commodity. Dr O'Neill advised that, on the Queensland East Coast, jewfish have proven to be a challenging species to manage with substantial management actions in place to regulate both commercial and recreational fishing for the vulnerable species.
- Potential targeting of less productive species: Dr O'Neill advised that, due to netting impacts, another inshore species King Threadfin Salmon were also in a vulnerable position at present due to overfishing.
- Shared stocks with PNG: Noting the proximity of Gudumalalgal communities to identified key PNG spawning habitat for Barramundi and likely connectivity between the stocks, the RAG noted that AFMA will need to work closely with the PNG National Fisheries Authority on proposed changes. The PZJA will also need to consider obligations under the Treaty alongside any proposed changes to Australian management arrangements for Barramundi. The RAG noted that under the Torres Strait Treaty commercial fishing for Barramundi is limited to only Australian Traditional Inhabitants and only in the Torres Strait within a

defined area surrounding six islands within the 'top-hat' of the Protected Zone. Under the Treaty PNG retain the right to fish Barramundi in the waters surrounding these communities within the top-hat.

- *Gillnetting in PNG:* The RAG noted AFMA advice previously tabled in the FFWG by PNG NFA, that fishers in PNG Western Province have had issues with their catch rates using gillnets to target Barramundi and jewfish. As a result PNG NFA have investigated whether fishers can effectively move to line fishing with lures.
- Community freezer: An industry member advised that the infrastructure review had suggested a small portable freezer would best be suited to support these communities in the short term during the opening. It was advised that this could be a low risk, cost-effective investment as it could be relocated should the infrastructure not have sufficient usage.
- *Fishery independent survey:* RAG science members advised that a fishery independent stock survey would be the ideal science to understand the finfish stocks in this area noting though that this is an expensive option.

The FFRAG supported the suggestion that a targeted round of consultation occurs in Gudumalulgal to discuss the following three options with communities to support opening the reefline fishery in this area:

Option	Detail
1: Opening with data collection and monitoring	Noting that it would likely only be a few fishers from each community active in the short term, the fishery could be opened with an agreed obligation from these fishers to contribute to monitoring. Monitoring will help form an understanding of what the fishery might look like (who is fishing where, what species, fishing effort) with annual review. The RAG suggested the following options for monitoring to be discussed with communities:
	 CDRs (fish receiver system) status quo arrangement Daily Fishing Logbooks Onboard scientific observers (catch comp, bycatch, discards, TEPs, invasive fish species) Port sampling for biological sampling / verification (potential indicator for future decision rules).
2: Survey before opening	Fishery Independent Survey before opening to inform what the fishery stock is (standing stock biomass), noting that it is good to assess natural mortality while the stocks are relatively unfished.
3: Adaptive management	Run an adaptive management approach which could allow fishing in a part of the fishery. AFMA/RAG are able to then consider the results/risks and apply the learnings to the rest of the fishery (smaller scale experiment first, low level fishing ahead of heavier fishing).

Plan of action

AFMA advised that they would engage top-western community members through upcoming community consultations. AFMA advised they could give information for communities to consider and seek their views on:

- aspirations for the fishery community expectations on what the fishery will look like (number of operators, location, targeted species);
- likely impacts on subsistence fishing;

- likely high risks associated with targeting jewfish;
- data needs monitoring that would be possible against indicators to support how the fishery is responding to fishing; and
- the need to review the opening after one year to check whether enough data has been captured to feel safe and continue the opening.

AFMA noted the request from industry Tenny Elisala and the offer from industry members Cr. Rocky Stephen and John Tabo to support the Top-Western consultation with lessons learned from the beche-de-mer Harvest Strategy and eastern community advice.

Fishery history – Torres Strait Spanish mackerel fishery

The RAG noted the management history document AFMA has drafted for the Spanish mackerel fishery. Members noted that the document is intended to be a 'living document' that is updated through time. The RAG agreed for members to consider the document in more detail out-of-session and provide comment to AFMA. Initial feedback from members on events to add include:

- a) QDAF long-term monitoring program dates;
- b) stock structure work performed by Buckworth and Ovenden;
- c) community freezer dates of operation;
- d) the JCU Island Freezer work; and
- e) attaching the age length key graph which gives a good visual summary of sampling for mackerel over time.

Agenda Item 5 – Research

5.1 Update: Outcomes of the TSSAC meeting

The AFMA member provided an update the outcomes of the TSSAC meeting on 2 November 2020. The AFMA member advised that TSSAC had supported the four finfish fishery research scopes (biological sampling, Spanish mackerel stock assessment, alternate index of abundance and development of harvest strategy). The TSSAC did so noting that the expected AFMA budget would not cover the total costs of projects needed to address all four scopes. The TSSAC noted that AFMA and TSRA would continuing to pursue options to increase available research funding and noted TSRA would be able to better assess their available budget following the appointment of new TSRA Board in February 2021. The four finfish fishery scopes will be included in the public call for research funding proposals for the 2021/22 financial year.

5.2 Update: Coral trout and Spanish mackerel biological sampling

The RAG noted an update from Principle Investigator Jo Langstreth (QDAF) on the TSSAC funded project "*Torres Strait Finfish Fishery: Coral trout and Spanish mackerel biological sampling*" AFMA project number 20202/0803. A copy of the presentation is provided at **Attachment F**. The RAG thanked Ms Langstreth for the successful sampling program in 2019/20 fishing season and welcomed industry advice on how supportive communities are of the project.

Agenda Item 6 – Other business

6.1 Other business

No other items of business nominated or discussed.

6.2 Next meeting and meeting close

The RAG noted the meeting schedule and priorities outlined in the agenda item paper. The RAG noted that the meeting schedule may vary if further research projects are commissioned for the Fishery in 2021-22. In particular, finalising a harvest strategy for the fishery will require additional RAG/industry workshops. In closing the meeting the chair and industry members thanked the outgoing executive officer, Andrew Trappett, for his years of excellent service and dedication to the RAG and Torres Strait fisheries.

Meeting closed at 1630 hrs Thursday 5 November 2020

Attachments

Attachment A: FFRAG 8 agenda as adopted.

Attachment B: Spanish mackerel 2020 stock assessment presentation

Attachment C: Table of 2020 stock assessment model runs, advice from FFRAG 7.

Attachment D: 94 and 105 t projections of biomass from the 2020 Spanish mackerel stock assessment model.

Attachment E: Draft Harvest Strategy advice from industry as proposed at two harvest strategy workshops in 2019.

Attachment F: Presentation on the Torres Strait Finfish Biological Sampling Program, Jo Langstreth, QDAF.

EIGHTH MEETING OF THE PROTECTED ZONE JOINT AUTHORITY TORRES STRAIT FINFISH FISHERY RESOURCE ASSESSMENT GROUP

4-5 November 2020 (8:30 am – 5:00 pm), Novotel Oasis Cairns

DRAFT AGENDA

The meeting will open at 8.30am on Wednesday 4th November 2020 at 8:30 am.

AGENDA ITEM 1 PRELIMINARIES

1.1 Acknowledgement of Traditional Owners, welcome and apologies

The Chair will welcome FFRAG members, permanent observers, invited participants and any casual observers to the eighth Torres Strait Finfish Resource Assessment Group meeting.

1.2 Adoption of agenda

The FFRAG is invited to consider and adopt the draft agenda.

1.3 Declarations of interest

FFRAG members must declare any real or potential conflicts of interests to the group and determine whether a member may or may not be present during discussion of, or decisions made, on the matter which is the subject of the conflict.

1.4 Action items from previous meetings

The FFRAG will note the status of action items arising from recent RAG meetings.

AGENDA ITEM 2 FFRAG UPDATES

This part of the agenda is an opportunity for the FFRAG to develop a common understanding of the Torres Strait Finfish Fishery including recent fishing, economic, biological and ecological trends.

2.1 Industry and scientific updates

Industry members are asked to provide a brief verbal update on any recent developments relevant to the fishery. Science members are asked to provide an updates on any research projects underway in Torres Strait or adjacent fisheries that may have relevance to the Torres Strait Finfish Fishery.

2.2 Member updates

The FFRAG will note updates from each of the PZJA government agency members on the latest developments relevant to the Torres Strait Finfish Fishery. The FFRAG will note a verbal update from the Malu Lamar representative

AGENDA ITEM 3 STOCK ASSESSMENT and RBC ADVICE

3.1 Updated Spanish mackerel stock assessment 2020

Expected outcome: FFRAG are to **discuss and provide advice** to the Finfish Working Group and PZJA on the outcomes of the updated 2020 stock assessment for Spanish mackerel delivered by Dr. O'Neill and Dr Buckworth.

3.2 Torres Strait Spanish mackerel Recommended Biological Catch for 2021-22 season

Expected outcome: FFRAG are to **recommend a 2021-22 season Recommended Biological Catch** to the Finfish Working Group and PZJA based on the outcomes of the 2020 stock assessment update (Agenda Item 3.1)

3.3 Coral trout Recommended Biological Catch for 2021-22 season.

Expected outcome: FFRAG are note any updated catch and effort information available for coral trout and are to **recommend a 2021-22 season Recommended Biological Catch** to the Finfish Working Group and the PZJA.

AGENDA ITEM 4 MANAGEMENT

4.1 Review of TSFF data needs including daily fishing logbooks

The FFRAG are asked to review the past and present daily fishing logbooks in use in the Torres Strait Finfish Fishery and the information this provides. RAG are asked to **DISCUSS** and **PROVIDE ADVICE** to AFMA on issues raised with the present logbook with a view to updating the logbook ahead of the 2021/22 fishing season.

4.2 Western line closure

The FFRAG are asked to provide further advice on removal of the part of the Western line in the 'top-hat' area of the Torres Strait Protected Zone north of Numar Reef.

4.3 Fishery management history – Torres Strait Spanish mackerel fishery

FFRAG are asked to **DISCUSS** and **PROVIDE ADVICE** to AFMA on a table summarising recent RAG work on capturing the history of active fishing boats and IUU fishing incidents on the earlier stages of the Torres Strait Spanish mackerel fishery.

AGENDA ITEM 5 RESEARCH

5.1 Outcomes from Torres Strait Scientific Advisory Committee (TSSAC) meeting

The FFRAG will note an update on the outcomes of the 2 November 2020 TSSAC meeting which considered whether four research projects relevant to the Torres

Strait Finfish Fishery will be included in the December 2020 public call for research funding proposals for the 2021/22 financial year.

5.2 Update: Coral trout and Spanish mackerel biological sampling project

The FFRAG will note an update from Principle Investigator Jo Langstreth (QDAF) on the TSSAC funded project "*Torres Strait Finfish Fishery: Coral trout and Spanish mackerel biological sampling*" AFMA project number 20202/0803.

AGENDA ITEM 6 OTHER BUSINESS

6.1 Other Business

The FFRAG is invited to nominate any other business for discussion.

6.2 Meeting schedule and priorities - date and venue for next meeting

The FFRAG will confirm arrangements for FFRAG 9 and 10, tentatively scheduled for September and October 2021.

CLOSE OF MEETING



Torres Strait

Scomberomorus commerson

Spanish mackerel The 2020 stock assessment

FFRAG meeting #8, November 2020





Introduction









Stock assessment



Opening points



- Catch rates have *increased* and we have new data.
- The results are **higher** compared to last year.
- Nine analyses run, and two models compared:
 - Previous **1940-model**.
 - New 1989-model outputs depend on pre-1989 information.
- RBCs for 2019-20 and 2021-22 years.



Preliminaries from the 1940-model

Indicator	Median results
Current 2019-2020 spawning biomass/unfished biomass	33 per cent
Limit spawning biomass / unfished biomass	20 per cent
Potential MSY from the B ₂₀₁₉ exploitable biomass	99 tonnes
Potential MSY from the B ₂₀₂₁ exploitable biomass	146 tonnes
Current harvest (tonnes 2019-2020 all sectors)	69 tonnes



Preliminaries from the 1940-model

Indicator	Median results
Potential F ₄₀ harvest from the B ₂₀₁₉ exploitable biomass	97 tonnes
Potential F ₄₀ harvest from the B ₂₀₂₁ exploitable biomass	145 tonnes
Potential F ₄₈ harvest from the B ₂₀₁₉ exploitable biomass	77 tonnes
Potential F ₄₈ harvest from the B ₂₀₂₁ exploitable biomass	112 tonnes
Potential F ₆₀ harvest from the B ₂₀₁₉ exploitable biomass	53 tonnes
Potential F ₆₀ harvest from the B ₂₀₂₁ exploitable biomass	75 tonnes



Section 1 – recap on key data inputs





Estimated harvests (all fishing sectors)



Standardised catch rates



SM02 and TSF01 logbooks; CIs \approx ± 2 fish



Fish age frequencies





ies



Section 2 – Some methods and model evaluation

- What were the two (1940 and 1989) stock assessment models?
- What were the analyses?
- What do the model estimates suggest?


What were the two models? (brief)

Model aspects and assumptions	1940-model assumptions	1989-model assumptions		
Model start year of harvest	1940, the equilibrium unfished start year	Equilibrium fished start in 1989		
Representation of total harvests	From 1940 onwards	From 1989 onwards. But a pre 1989 mean harvest rate is estimated.		
Total number of estimated parameters	34	35		
Prior on pre 1989 harvest rate	None	Upper penalty bound of 0.2		

What were the analyses? (brief)



Data	A1	a2	a3	a4	a5	a6	a7	a8	a9
Catch rate	No Tenders, FP	No Tenders, FP	No Tenders, FP	No Tenders, FP	No Tenders, FP	No Tenders, FP	No Tenders, FP	No Tenders, FP	No Tenders, FP
Pre 1989 Harvest	Yes, Polynomial,F IUU	Yes, Polynomial, IUU	Yes, Polynomial, IUU	Yes, Logistic, IUU	Yes, Logistic, IUU	Yes, Logistic, IUU	No, mean F	No, mean F	No, mean F
Start year of harvest data	1940	1940	1940	1940	1940	1940	1989	1989	1989
Natural Mortality M	0.3	0.35	0.4	0.3	0.35	0.4	0.3	0.35	0.395
Catch rate negLL	-42.0	-46.2	-52.3	-43.3	-48.0	-54.4	-33.2	-33.6	-26.0
Fish age negLL	-162.6	-164.2	-164.9	-162.3	-163.7	-164.3	-174.6	-177.6	-184.9
Spawning ratio S ₁₉₈₉ / S ₀	0.397	0.432	0.467	0.366	0.401	0.437	0.522	0.526	0.55
Spawning ratio S ₂₀₁₉ / S ₀	0.28	0.314	0.353	0.26	0.294	0.333	0.362	0.374	0.403

1989-model is uncertain



Legend – 3 lines for each analysis setting, high M to low M





Section 3 – The models predictions

- Spawning biomass ratios.
- Harvest rates.
- Recruitment deviations.

Spawning biomass (egg) ratios











isheries



Recruitment deviations





Section 4 – recommended biological catch (RBC)

- What are our principles for interpreting results?
- What are our forecast methods for calculating RBCs?



What should our guiding principles be for choosing an RBC?

- Which stock assessment model do we use?
- Type of reference points for the RBC:
 - 1. Constant fishing mortality: F_{MSY} , F_{40} , F_{48} , F_{50} , F_{60} .
 - 2. Hockey stick (ramp) adjusted F on the above.
- Forecast years for the RBC:
 - 0 years, 2 years.
- Recruitment deviations for RBC and projections:
 - Mean = 1, or Mean = last 5 or 10 years, or other?
- Risk of falling below S_{20} , the limit reference point:
 - The primary overriding decision principle?
 - Less than 10%?
 - Measured over simulations and 12 year projections.

How do we calculate the RBC?



- **Issue**: time lag between the assessment year and the RBC year.
 - Analyses produce results for the 2019-20 fishing year.
 - Results can be 1 to 2 years behind the year they are applied.



- Proposal:
 - Should we model forecast 2 years ahead to set the RBC?
 - If YES, then what years, recruitment and harvest levels do we choose?
 - Recruitment: S/R average, 2019-20, average last n years, other ideas?
 - Harvest: assume the 2020-21 RBC is fully caught?
 - If NO, we assume the actual RBC fishing year is like 2019-20.



Section 5 – recommended biological catch (RBC)

• The decision tables.



Table 1. Summary of potential RBC's for all fishing sectors

No.	Name of approach 1940-model	Biomass year for the RBC calculation	% runs below S ₂₀ over 12 years and 6 analyses Assuming average recruitment	% runs below S ₂₀ over 12 years and 6 analyses Assuming reduced recruitment	Median 2021-22 RBC tonnes
1	Constant F _{MSY}	2021-22	12%	24%	146
2	Constant F ₄₀	2021-22	12%	23%	145
3	Constant F ₄₈	2021-22	9%	15%	112
4	Constant F ₅₀	2021-22	8%	13%	105
5	Constant F ₆₀	2021-22	7%	9%	75
	Mean $\rm F_{48}$ and $\rm F_{60}$	2021-22	8%		94
6	Constant F _{MSY}	2019-20	8%	12%	99
7	Constant F ₄₀	2019-20	8%	12%	97
8	Constant F ₄₈	2019-20	7%	9%	77
9	Constant F ₅₀	2019-20	7%	9%	73
10	Constant F ₆₀	2019-20	6%	8%	53 rtment of Agriculture and Fisheries



94t





105 t





Table 2. Potential RBC's for all sectors

	Harvest rule = F for B 2021											
			Harvest reference points (t)									
	Model 1940 1	137	105	98	68	154			260			
	Model 1940 2	149	115	108	77	152			240			
	Model 1940 3	159	125	118	85	151			240			
	Model 1940 4	129	99	92	65	140			220			
AodelAnalysis	Model 1940 5	140	109	102	73	140			200			
	Model 1940 6	149	119	112	81	141			180			
	Model 1940 Median	145	112	105	75	146		-	160			
~	Model 1989 1	193	140	129	87	279		-	140			
	Model 1989 2	194	144	134	92	223		-	120			
	Model 1989 3	212	158	147	101	227		-	100			
ļ	Model 1989 Median	194	144	134	92	227		-	80			
		F40	F48	F50 RefPt	F60	MSY						



Table 3. RBC risks, if normal recruitment

Harvest rule = F _{constant} for B ₂₀₂₁												
	Risk S _f	uture < S ₂₀	for mean r	ecruit vari	ation =1	0.2						
Model 1940 1	0.14	0.11	0.1	0.09	0.14	0.2						
Model 1940 2	0.13	0.1	0.09	0.08	0.13	- 0.16						
Model 1940 3	0.1	0.07	0.07	0.06	0.1	0.14						
. <u>ເຮັ</u> Model 1940 4	0.13	0.09	0.09	0.08	0.13	0.12						
Model 1940 5	0.12	0.09	0.09	0.08	0.12	0.1						
Model 1940 6	0.08	0.07	0.06	0.05	0.09	- 0.08						
Model 1989 1	0.17	0.07	0.07	0.05	0.28	- 0.06						
Model 1989 2	0.21	0.13	0.12	0.09	0.29	- 0.04						
Model 1989 3	0.18	0.12	0.11	0.09	0.24	0.02						
	F40	F48	F50 RefPt	F60	MSY	J. J						
	145 t	112 t	105 t	75 t	146 t	Department of Agriculture and Fisheries						



Table 4. RBC risks, if recruitment is reduced like the last 10 years

	Harvest rule = F _{constant} for B ₂₀₂₁												
Risk S _{future} < S ₂₀ for mean recruit variation =0.8													
Model 1940 1	0.28	0.17	0.15	0.11	0.28	0.18							
Model 1940 2	0.24	0.16	0.14	0.11	0.24	- 0.16							
Model 1940 3	0.19	0.12	0.11	0.08	0.19	- 0.14							
ເອັ Model 1940 4	0.28	0.16	0.15	0.1	0.28	- 0.12							
elAng Model 1940 5	0.25	0.15	0.14	0.1	0.25	0.1							
o Model 1940 6	0.18	0.11	0.1	0.07	0.19	- 0.08							
Model 1989 1	0.42	0.18	0.15	0.07	0.53	- 0.06							
Model 1989 2	0.4	0.22	0.19	0.12	0.51	- 0.04							
Model 1989 3	0.34	0.19	0.17	0.12	0.45	- 0.02							
	F40	F48	F50 RefPt	F60	MSY	0							
	145 t	112 t	105 t	75 t	146 t 🛛	Department of Agriculture and Fisheries							



Section 5 – Forecasts

• Spawning biomass 12 year projection plots

Spawning biomass forecast for the F_{48} RBC and normal recruitment: 112 t in the 1940-model, analyses 1 to 6 144 t in the 1989-model, analyses 7 to 9





Spawning biomass forecast for the F_{48} RBC and reduced recruitment: 112 t in the 1940-model, analyses 1 to 6 144 t in the 1989-model, analyses 7 to 9



Spawning biomass forecast for the F_{60} RBC and normal recruitment : 75 t in the 1940-model, analyses 1 to 6 92 t in the 1989-model, analyses 7 to 9





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Spawning biomass forecast for the F₆₀ RBC and reduced recruitment : 75 t in the 1940-model, analyses 1 to 6 92 t in the 1989-model, analyses 7 to 9





End of main sections







Supplementary slides For section 2

What were the two models? (detailed)



Model aspects and assumptions	1940-model assumptions	1989-model assumptions
Single unit stock	Yes	Yes
Annual age-structured dynamics	Yes	Yes
Female and male dynamics	Combined	Combined
Model start year of harvest	1940, the equilibrium unfished start year	Equilibrium fished start in 1989
Accurate representation of total harvests	Yes, from 1940	Yes, from 1989. But a pre 1989 a mean harvest rate (F) is estimated.
Spawner recruitment relationship	2 parameters estimated	2 parameters estimated
Annual recruitment deviations	1989 - 2019, 30 parameters estimated Deterministic (=1) pre 1989	1989 - 2019, 30 parameters
Natural mortality (M per year)	1 parameter, fixed constant in time	1 parameter, fixed constant in time
Fish length and weight at age	Fixed constant in time	Fixed constant in time
Fish maturity at age	Fixed constant in time	Fixed constant in time
Fish fecundity at age	Fixed constant in time	Fixed constant in time
Fish vulnerability at age	2 parameters estimated, logistic	2 parameters estimated, logistic
Catch rate proportional to Vulnerable fish abundance	Yes, from 1989, 31 years	Yes, from 1989, 31 years
Representative fish age frequencies	Yes, 11 yrs of data	Yes, 11 yrs of data
Total number of fixed parameters	1	1
Total number of estimated parameters	34	35
Prior on pre 1989 harvest rate	None	Upper penalty bound of 0.2



What were the analyses? (detailed)

Data	a1	a2	a3	a4	a5	a6	a7	a8	a9
Catch rate	No Tenders, FP	No Tenders, FP	No Tenders, FP	No Tenders, FP					
Pre 1989 Harvest	Yes, Polynomial, IUU	Yes, Polynomial, IUU	Yes, Polynomial, IUU	Yes, Logistic, IUU	Yes, Logistic, IUU	Yes, Logistic, IUU	No, mean F estimated	No, mean F estimated	No, mean F estimated
Post 1988 Harvest	Same data, IUU	Same data, IUU	Same data, IUU	Same data, IUU					
Fish age data (n yrs)	all 11 years	all 11 years	all 11 years	all 11 years					
Start year of Harvest data	1940	1940	1940	1940	1940	1940	1989	1989	1989
Natural Mortality M	0.3	0.35	0.4	0.3	0.35	0.4	0.3	0.35	0.395
Steepness h	0.468 (0.42 : 0.521)	0.399 (0.361 : 0.442)	0.346 (0.317 : 0.379)	0.449 (0.405 : 0.498)	0.385 (0.349 : 0.427)	0.336 (0.307 : 0.37)	0.591 (0.495 : 0.688)	0.468 (0.393 : 0.555)	0.42 (0.355 : 0.5)
Unfished Recruitment R0	0.113 (0.101 : 0.126)	0.151 (0.134 : 0.171)	0.201 (0.175 : 0.232)	0.121 (0.109 : 0.134)	0.162 (0.143 : 0.182)) 0.215 (0.187 : 0.246)	0.088 (0.074 : 0.105)	0.123 (0.098 : 0.155)	0.154 (0.122 : 0.195)
Vulnerability age 50%	1.782 (1.573 : 1.99)	1.78 (1.579 : 1.983)	1.77 (1.589 : 1.967)	1.782 (1.563 : 2.005)	1.777(1.582:1.97)	1.765 (1.566 : 1.977)	1.783 (1.583 : 1.992)	1.802 (1.601 : 1.997)	1.821 (1.625 : 2.021)
Vulnerability age 95%	2.508 (2.204 : 2.832)	2.494 (2.195 : 2.811)	2.462 (2.191 : 2.75)	2.507 (2.196 : 2.841)	2.487 (2.195 : 2.784)) 2.452 (2.187 : 2.726)	2.495 (2.202 : 2.807)	2.514 (2.219 : 2.825)	2.517 (2.229 : 2.816)
Mean pre 1989 harvest rate F	0.07 (0.059 : 0.085)	0.069 (0.057 : 0.086)	0.067 (0.054 : 0.083)	0.07 (0.059 : 0.085)	0.069 (0.057 : 0.086)) 0.066 (0.054 : 0.083)	0.201 (0.122 : 0.282)	0.201 (0.122 : 0.284)	0.201 (0.12 : 0.283)
Mean pre 1989 harvest (t)	57 (6 : 237)	57 (6 : 237)	57 (6 : 237)	56 (4 : 259)	56 (4 : 259)	56 (4 : 259)	126 (97 : 146)	129 (97 : 155)	128 (95 : 154)
Log recruitment stddev (~CV)	0.365 (0.306 : 0.434)	0.354 (0.299 : 0.417)	0.359 (0.305 : 0.414)	0.369 (0.313 : 0.433)	0.362 (0.306 : 0.422)) 0.365 (0.309 : 0.422)	0.341 (0.224 : 0.414)	0.322 (0.262 : 0.393)	0.295 (0.238 : 0.366)
Catch rate negLL	-42	-46.15	-52.304	-43.277	-48.032	-54.367	-33.213	-33.641	-25.998
Fish age negLL	-162.581	-164.243	-164.88	-162.276	-163.698	-164.259	-174.558	-177.561	-184.902
Fish age, annual eff sample size	137(11:574)	135(14:582)	132(18:587)	136(11:569)	133 (14 : 582)	130 (18 : 585)	165 (23 : 571)	163 (29 : 524)	209 (37 : 639)
Spawning ratio S1989 / S0	0.397 (0.342 : 0.447)	0.432 (0.372 : 0.485)	0.467 (0.406 : 0.524)	0.366 (0.318 : 0.411)	0.401 (0.345 : 0.453)) 0.437 (0.378 : 0.491)	0.522 (0.415 : 0.651)	0.526 (0.399 : 0.66)	0.55 (0.406 : 0.695)
Spawning ratio S2019 / S0	0.28 (0.032 : 0.463)	0.314 (0.034 : 0.497)	0.353 (0.066 : 0.547)	0.26 (0.033 : 0.437)	0.294 (0.038 : 0.472)	0.333 (0.089 : 0.508)	0.362 (0.071 : 0.523)	0.374 (0.031 : 0.56)	0.403 (0.031 : 0.6)



Example: analysis 6 catch rate fit negLL = -54.367





Example: analysis 9 catch rate fit negLL = -25.998



Example: analysis 2 age fit. negLL = -164.243





Example: analysis 9 age fit. negLL = -184.902





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Supplementary slides For section 4



Fisheries

RBC₂₀₂₁ - recruitment deviation test on the constant harvest rate 2020 Harvest assumption = 55 t; TIB = 4, Sunset = 39, Traditional = 10, Recreational = 2 Mean recruitment deviations = 1; last 5 years = 0.99; last 10 years = 0.84; Result = no recruitment effect on RBCs

						• • •			
	Г	1	154	152	151	140	140	141	
SMSY		<u>uo</u> 2	154	152	151	140	140	141	- 150
14131		npt s	154	152	151	140	140	140	140
	ř	4 Inss	137	149	159	129	140	149	- 140
S ₄₀	4	c a:	137	149	159	129	140	149	- 130
		ner o	137	149	158	128	140	149	
	Γ	ruiti	105	115	125	99	109	119	- 120
S ₄₈	4	8 Lec	104	115	125	99	109	119	- 110
		and 6	104	115	125	99	109	118	
	Γ	t <u>i</u> 10	98	108	118	92	102	112	- 100
S ₅₀	4	d 11	97	108	118	92	102	112	
	Ļ	^อ ัน 12	97	108	117	92	102	111	- 90
S		ere 13	68	77	85	65	73	81	- 80
J ₆₀	1	e 2 14	<mark>68</mark>	77	85	65	73	81	
	L	15	68	76	85	65	73	81	- 70
			1	2	3	4	5	6	
					Ana	lysis			

RBC yields (t)



RBC₂₀₂₁ – recruitment deviation test on the hockey stick harvest rate

2020 Harvest assumption = 55 t; TIB = 4, Sunset = 39, Traditional = 10, Recreational = 2 Mean recruitment deviations = 1; last 5 years = 0.99; last 10 years = 0.84;

RBC vields (t)

						itee yi					
	_		1	127	138	143	96	104	119		
ς		ion	2	122	134	141	92	101	118		140
JMSY	٦	mpt	3	113	124	131	84	93	108		140
		Inse	4	97	128	159	75	104	139		
c		nt as	5	92	124	159	72	101	138	-	120
3 ₄₀		mer	6	86	115	151	66	93	126		
		ruiti	7	52	71	93	41	58	79	-	100
S ₄₈	4	rec	8	50	69	92	39	56	78		
		and	9	47	64	85	36	52	72	-	80
	Γ	int	10	46	62	81	36	51	69		
•	4	bo	11	44	60	80	34	49	69	_	60
S ₅₀	L	nce	12	41	56	75	31	45	63		
		fere	13	24	33	44	19	27	38	-	40
ς	1	Re	14	23	32	43	18	26	37		
J ₆₀			15	21	30	40	17	24	34	-	20
				1	2	3	4	5	6		
						Ana	ysis				

Result = significant recruitment effect on RBCs

Definitions – What do the harvest control rules look like? a) constant harvest rate applied to all biomass levels – flat line b) hockey stick (ramp) adjusted harvest rate Figure – example from the 2019 stock assessment



Attachment C: FFRAG 7 advice on agreed model runs to be used in the 2020 Spanish mackerel stock assessment

Table 1. Analyses/ model runs agreed by FFRAG 7 to be used in the 2020 Spanish mackerel stock assessment. Values highlighted in yellow reflect out of session changes to the natural mortality rate values based on findings by the project team.

Label	Fish weights	Catch rate series	Natural mortality rate (M)	Harvest pre-1989	Ageing data	Starting year for catch data
1	Weighted average	No tenders and fishing power included	0.3	Historic catches actual + polynomial model + IUU tapered	All years	1940
2	Weighted average	No tenders and fishing power included	<mark>0.35 (was 0.375)</mark>	Historic catches actual + polynomial model + IUU tapered	All years	1940
3	Weighted average	No tenders and fishing power included	<mark>0.4 (was 0.45)</mark>	Historic catches actual + polynomial model + IUU tapered	All years	1940
4	Weighted average	No tenders and fishing power included	0.3	Historic catches actual + logistic model + IUU tapered	All years	1940
5	Weighted average	No tenders and fishing power included	<mark>0.35 (was 0.375)</mark>	Historic catches actual + logistic model + IUU tapered	All years	1940
6	Weighted average	No tenders and fishing power included	<mark>0.4 (was 0.45)</mark>	Historic catches actual + logistic model + IUU tapered	All years	1940
7	Weighted average	No tenders and fishing power included	0.3	n/a	All years	1989
8	Weighted average	No tenders and fishing power included	<mark>0.35 (was 0.375)</mark>	n/a	All years	1989
9	Weighted average	No tenders and fishing power included	<mark>0.4 (was 0.45)</mark>	n/a	All years	1989

Attachment D: Further detail on Spanish mackerel RBC projections



Figure 1. Stock projections for a constant harvest of **94 t** over the next 12 years, note that in all six model runs the stock is projected to be at, or very close to, the target reference point of **F48**.



Figure 2. Stock projections for a constant harvest of 105 t over the next 12 years, note that although the stock will be building in a positive direction only one of the six model runs is predicted to build the stock to the target reference point of B48 within 12 years.
Attachment E Status of Spanish mackerel draft harvest strategy components.

Guiding principles and key fishery attributes – factors that helped shape the development of the Harvest Strategy		
Recommended	Consistent with the Commonwealth Fisheries Harvest Strategy Policy and Guidelines (HSP, 2018). This is consistent with objectives of the <i>Torres Strait Fisheries Act 1984</i> (the Act).	
	Have regard for Traditional knowledge and the ability of communities to manage fishery resources locally, through acknowledging and incorporating customary and traditional laws, recognising; Malo Ra Gelar, Gudumalulgal Sabe, Maluailgal Sabe, Kulkalgal Sabe.	
	Recognise commercial fishing by Traditional inhabitants is important for local employment, economic development and for the passing down of traditional knowledge and cultural lore. Enough fish needs to be left in the water for fishers to make money and to protect the traditional way of life, livelihoods and cultural values.	
	TACs should vary according to stock status (up and down):	
	 If biomass decreases be cautious. Stock is not to go below the limit; If biomass is increasing be conservative; 'bank' fish. 	
	Having regard for the current stock size (B ₃₁) and that B ₆₀ is not quickly achieved (possibly greater than 12 years) without significant reductions in catch which may in turn cause significant economic and social impacts on the Fishery, a shorter-term target reference point is first required.	
	Torres Strait Spanish mackerel stock are assumed separate from other regional stocks. They do not mix with the Queensland East Coast and the Gulf of Carpentaria stocks (see Buckworth et al. 2007 and Newman et al. 2009).	
	There is potential for variations in availability and abundance of Spanish mackerel, due to their movement, schooling and aggregation patterns for feeding and spawning.	

	Spanish mackerel are a shared resource important for subsistence, commercial, traditional, charter and recreational sectors.
Outstanding	None identified at this time. Subject to any further FFRAG and Working Group advice

Operational objectives What we want the harvest strategy to achieve.		
Recommended	Maintain the stock at (on average), or return to, a target biomass point (B _{TARG}) equal to a stock size that aims to protect the traditional way and life and livelihood of traditional inhabitants and is biologically and economically acceptable.	
	Maintain stocks above the limit biomass level (BLIM), or an appropriate proxy, at least 90 percent of the time.	
	Reduce fishing levels if a stock is below BTARG but above BLIM.	
	Implement rebuilding strategies, if the stock moves below BLIM.	
Outstanding	None identified at this time. Subject to any further FFRAG and Working Group advice	

Indicators Indicators provide inform addressed below and ar	nation on the state of the stock and how the stock is doing against agreed reference points (reference points are re a specified level of these indicators)
Recommended	Biomass – Catch and effort data from daily fishing logbooks is used as a proxy for abundance in the stock assessment model which is used to calculate biomass of the stock as a proportion of unfished biomass (B ₀).

Outstanding (1)	Fishing mortality (B) based indicators. The stock assessment model can estimate a level of F to move the stock
towards the target. There was some consideration from the FFRAG of using an F-based indica	
	strategy. Advice is sought from the FFRAG on whether there is value in further exploring this as an option.

Reference points

A reference point is a specified level of an indicator used as a basis for managing a stock or fishery. Reference points will generally be based on indicators of either the total or spawning stock size (biomass) or the amount of harvest (fishing mortality). Reference points show where we want (target) and don't want (limit) the stock levels in the fishery to be.

Recommended	Unfished biomass (B_0) = B_{1940} = 100%.	The year 1940 is considered the start of the commercial operations in the Fishery. The unfished biomass B0 therefore is the model-estimate of spawning stock biomass in 1940.
	Short-term target (B _{TARG}) reference point = B ₄₈	B_{48}^5 is the default target (a proxy for B_{MEY} biomass at maximum economic yield) in the Commonwealth HS Policy and the project team advise that B48 is less than BMEY.
	Limit reference point (BLIM) = B20	B_{LIM} is the spawning biomass level below which the ecological risk to the stock is unacceptable and the stock is defined as 'overfished'. This is an agreed level which we do not want the stock to fall below. B_{20} is the default limit proxy in the Commonwealth HS Policy ⁶ .

⁵ Comm HSP: The target reference point for key commercial fish stocks is the stock biomass required to produce maximum economic yield from the fishery (BMEY). For multispecies fisheries, the biomass target level for individual stocks may vary in order to achieve overall maximum economic yield from the fishery. In cases where stock-specific BMEY is unknown or not estimated, a proxy of 0.48 times the unfished biomass, or 1.2 times the biomass at maximum sustainable yield (BMSY), should be used. Where BMSY is unknown or poorly estimated, a proxy of 0.4 times unfished biomass should be used. Alternative target proxies may be applied provided they can be demonstrated to be compliant with the policy objective.

⁶ Comm HSP: All stocks must be maintained above their biomass limit reference point (BLIM) at least 90 percent of the time. Where information to support selection of a stock-specific limit reference point is not available, a proxy of 0.2 times unfished biomass should be used.

Outstanding (2)	B48 is less than BMEY	The HS project team advise the current target of B48 is less than BMEY. FFRAG discussion and advice on this calculation is required to ensure a common and clear understanding.
Outstanding (3)	Long term B TARG = B ₆₀	Advice from the HS project team and RAG scientific members is sought on the suitability of B60 in comparison to other target biomass levels above B_{MSY} having regard for the biology of the species and performance of the HS in meeting its objectives.
		Stakeholders have recommended that the HS ensures enough fish are left in the water to support commercial fishing but also protect the traditional way of life and livelihoods of traditional inhabitants.
		Advice to date is that a higher target biomass level (referring to 60%), would increase catch rates and improve profits in the fishery over other lower reference points, such as B_{48} . Having regard for any advice from the HS project team advice is sought however, RAG advice on the suitability of of B_{60} against other possible higher target biomass levels. There are likely to be trade-offs between medium-term returns from the fishery (significantly reduced TAC) and longer-term returns (more fish in the water meaning less cost to catch and therefore higher returns. Also there would be more fish in the water for other users).
		Quantitative analysis and/or evidence from comparable fisheries is sought to enable more evidence based advice and decision making on the longer-term target.

Decision Rules (also These rules are design	called Harvest Control Rated to maintain and/or retur	ules) In the stock to the target reference point.
Recommended	If stock falls below the limit reference point (BLIM).	The Fishery is closed (all commercial fishing for Spanish mackerel is to cease) and subject to a rebuilding strategy. The nature of the rebuilding strategy will be determined on the basis of the stock assessment (to be applied immediately) and the rate of recovery (i.e. number of years to achieve a biomass greater than BLIM).

	Re-opening the Fishery ⁷	Following closure of the Fishery, the Fishery can only be re-opened when a stock assessment determines the Fishery to be above the biomass limit reference point.
Outstanding (4)	If the stock is above the limit reference point but below the target reference point.	The RBC is to be set at level that allows for the stock to build towards the target. Importantly the decision rule can be designed to build the stock at different rates (e.g. the number of years for the stock to build to the target reference point or the rate of building near the target or limit).
		An outstanding action has been for the FFRAG to consider scenarios with multiple timeframes to build the stock to reach B ₄₈ . Specifically to examine a 12 year recovery time (equivalent to 3 times the average age of maturity) and explore 10 and 8 year recovery periods as alternatives.
		Having regard for any advice from the HS project team, advice is sought from the RAG on appropriate building rates to incorporate into the HS decision rules and/or a work plan for examining options noting scenarios will be examined and presented by the Spanish mackerel stock assessment team (<i>AFMA funded project 2019/0831</i>) as part of the next stock assessment update to be presented at the FFRAG planned for 27-28 November 2019.
Outstanding (5)	If stock is overfished (below B⊔M)	Consistent with the Commonwealth HS policy the FFRAG and FFWG have recommended that commercial fishing for Spanish mackerel should cease if the stock falls below B_{LIM} . Further FFRAG discussion and advice is now sought to consider additional decision rules and actions required to guide rebuilding and to trigger any necessary reviews of the HS, noting the HS should be designed to avoid the stock breaching the limit.

⁷ Comm HSP: Once a stock has been rebuilt to above the limit reference point with a reasonable level of certainty, it may be appropriate to recommence targeted fishing in line with its harvest strategy, which will continue to rebuild the stock towards its target reference point.

		 FFRAG are to note and discuss the HS policy requirements to be included in the Spanish Mackerel HS if the stock falls below B_{LIM}: a) that targeted commercial fishing for Spanish mackerel will cease, b) a rebuilding strategy will be developed to build the stock above B_{LIM} with a reasonable level of certainty. c) If B_{LIM} is breached while the fishery is operating in line with HS, the HS must be reviewed. FFRAG to provide advice on: a) A process to understand how the stock has rebuilt above B_{LIM} with certainty in the absence of commercial fishing e.g. model projections. b) whether a decision rule with a lower level of fishing pressure would be appropriate if the stock is above but close to B_{LIM}.
Outstanding (6)	Utilisation related Decision Rules (desired fishing intensity) noting a fishery may have indicators and reference points including spawning stock size (biomass) or the amount of harvest (F or fishing mortality i.e. utilisation of the resource).	Decision rules have yet not been established for harvest related performance metrics such as future 'target' catches or 'target' catch rates desired by industry per primary vessel or per TIB dory day. Given that limited catch and effort data has only recently become available from TIB sector, the HS focus has been on agreeing biomass based reference points and decision rules. Additionally at the last FFRAG/FFWG meeting with regard to considering various longer-term target biomass reference points, industry expressed a strong preference for management to focus on building the biomass back to BTARG in the coming years, before exploring any other scenarios. FFRAG are asked to confirm this approach and consider how future decision rules may incorporate increased growth of the TIB sector.
Outstanding (7)	Precautionary increases to total allowable catches.	Stakeholders recommended that if the stock assessment outcomes suggested increases in the TACs, these increases should only occur slowly through some kind of change limiting rule, noting that an increased TAC would likely not affect the TIB sector with a low present

level of utilisation. Stakeholder advised a preference for 'banking' these fish to contribute to the biomass and future catch rates rather than harvesting this extra stock.
At the last FFRAG/WG meeting a number of challenges were identified with applying a change limiting rule for possible TAC increases. Instead the RAG/WG placed priority on examining different building rate scenarios which may achieve this desired precautionary outcome. FFRAG are asked to confirm this approach and provide advice on how to progress change-limiting rules if necessary.

Monitoring and assessment cycle		
Recommended	Based on the most recent estimate of the stock status (0.31 times unfished biomass) and declining biomass (and CPUE) trend, a stock assessment should be performed annually until the biomass is estimated to be above B ₄₀ .	
Outstanding (8)	 Subject to any further advice from the HS project team, FFRAG advice is sought on: a. An appropriate assessment cycle when the stock is above B₄₀ and/or methods for evaluating future assessment cycles. b. Likely data needs to support monitoring stock performance under the Strategy over time, noting that some biological data is to be sampled in 2019 and 2020 as a snapshot to augment our understanding and assessment of the stock but no monitoring program advice has been developed or presented to date. c. Standard procedures for applying the decision rules to the stock assessment outcomes and any other minimum stock assessment scenarios and/or sensitivities that should be examined e.g. to support 2019-20 season TAC setting the FFRAG (meeting 4) used a methodology of selecting the median of a range of plausible stock assessment scenarios to recognise a range of uncertainty. 	

Attachment F Biological Project

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Torres Strait FinFish Fishery: coral trout and Spanish mackerel biological sampling

Jo Langstreth (DAF)



Collaborators: Torres Strait fishers and communities, Fish Receivers, Fisheries Qld (QDAF), AFMA, TSRA, PZJA FinFish RAG members, TS stock assessment team



Project objectives

- Design a cost effective sampling program
- Engage with traditional and non-traditional fishing sectors
- Collect fish length measurements
- Collect and process fish samples for length, sex and age data
- Deliver length and age frequency



Methods

- Project design & methods
 - coverage across fishery areas, season and sectors
 - target sample sizes (1500 lengths from 50 catches,
 500 otoliths)
 - lengths: measuring board datasheets, fish frames, staff collection
 - ages: head and frame collection
- Engagement
 - workshops held on island communities
 - phone calls and one-on-one meetings with TVH fishers



Methods

Spatial data resolution –broad areas – AFMA reporting grids

AREAS FOR TORRES STRAIT DOCKET BOOK



Workshops

- Erub
- Masig
- Ugar







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Workshops

- Erub
 - workshop
 - community freezer
- Training sample and data collection







Sunset fishery

- Sampling kits with 4 vessels
- Samples being received in Cairns
- Lab processing of samples and data

Sampling kit



Sampling instructions



Length recording Fishers, please mark the fork length of all of your Spanish mackerel catch on each of the chosen days. Use the measuring data sheets and the metal end-piece provided. Please use pencil on the 1. Write the DATE and LOCATION (reef or island name) of catch on the label 2. Mark the length of all the Spanish mackerel caught on the data sheet. Mark each fishing day session and location separately a.g. Session 1 = 26/10/19 morning session & Session 2 = 26/10/19 afternoon session gr. Session 1 = 05/10/19 reef 1 & Session 2 = 05/10/19 reef 2 Session 1 Session 2 Place each Spanish mackerel on the sheet with the nose touching the end-piece and make a pencil stroke mark a the FORK LENGTH on the sheet (bottom of the notch Mark each fish on the sheet s we can see they have been measured, don't group or summarise or rewrite as this cannot be used 5. Fill out the labels on the sheet with your details (your name and island name), and the catcl etails (date caught, location caught, total number caught and number reco

Please place completed sheets in with frozen fish samples when they are freighted to Cairns with Seaswith, or they can also be posted back to: Northern Fisheries Centre using the reply paid enrelopes provided to PD Box 5390, Cairns 4870.

Thank you for your assistance.

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Progress: data and samples











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- August 2019 to May 2020
- 1, 592 fish measured from 41 catches/days
- 11 t sampled
- 57 t caught (TIB & sunset) \rightarrow ~ 20% catch measured





Areas sampled

- main fishing grounds (most fish) 95%
- central and eastern areas (14 and 16) 5%



AREAS FOR TORRES STRAIT DOCKET BOOK



Fish size

- 77 158 cm TL
- Average fish was 108 cm TL
- Fish size very similar between TIB & sunset



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Sex of fish

- Small mostly MALE
- Large mostly FEMALE



male female









Fish age-length key (ALK)



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Fish length frequency: age groups 1 - 5





Fish age

- 1 13 years old
- oldest fish was caught from Bramble (128cm TL)
- most fish were

2 to 4 years old (83%)

 fish age structures very similar between TIB & sunset





2020-21 project

Challenges:

- low fleet size participation
- late start to sampling, some limit on period to sample
- TIB largely whole fish sample collection limitations

Opportunities:

- previous engagement with fishers
- sunset mostly fillet at sea potential for samples to be collected at sea
- Erub freezer & trainee program

2020-21 project

Sample sizes (realistic)

- coral trout
 - 1000 rep. lengths (5% sampling)
 - ~ 300 otoliths
- Spanish mackerel
 - 20% sampling 1000 lengths from 30-40 catches
 - otoliths > 250

Progress: fish samples and data

Sunset fishery

- Sampling kits with sunset fishers
- Samples and length data been collected for SM & CT
- Samples being freighted back to lab in Cairns

TIB fishery

- Sampling from Erub (SM & CT)
- Samples collected from Ugar fishers (SM)

Progress: data and samples

- Lengths measured
- fish frames for length, sex and age data
- genetics samples collected (SM only) for future close-kin project

Progress: samples

- One large SM sampled from Erub
- TL: 157 cm
- Sex: Female





Progress: samples

 One large SM sampled from Erub



- TL: 157 cm
- Sex: Female
- Age: 12



Progress: data and samples

- Another large SM sampled from Erub
- TL: 151 cm
- Sex: Female
- Age: 5 years



Next steps

- Continuation of sampling
- Continued communication with fishers
 - regular contact (phone calls)
 - follow up community visits (Dec, Feb)
- Lab processing of samples (wet lab, blocking of CT)
- Data entry
- Ageing of samples (Feb-Apr 2021)
- Data analysis (Mar/Apr 2021)
- Reporting (June 2021)
- Communication of results (from June 2021)