



Australian Government

Australian Fisheries Management Authority

Southern and Eastern Scalefish and Shark Fishery (SESSF)

Species summaries 2022

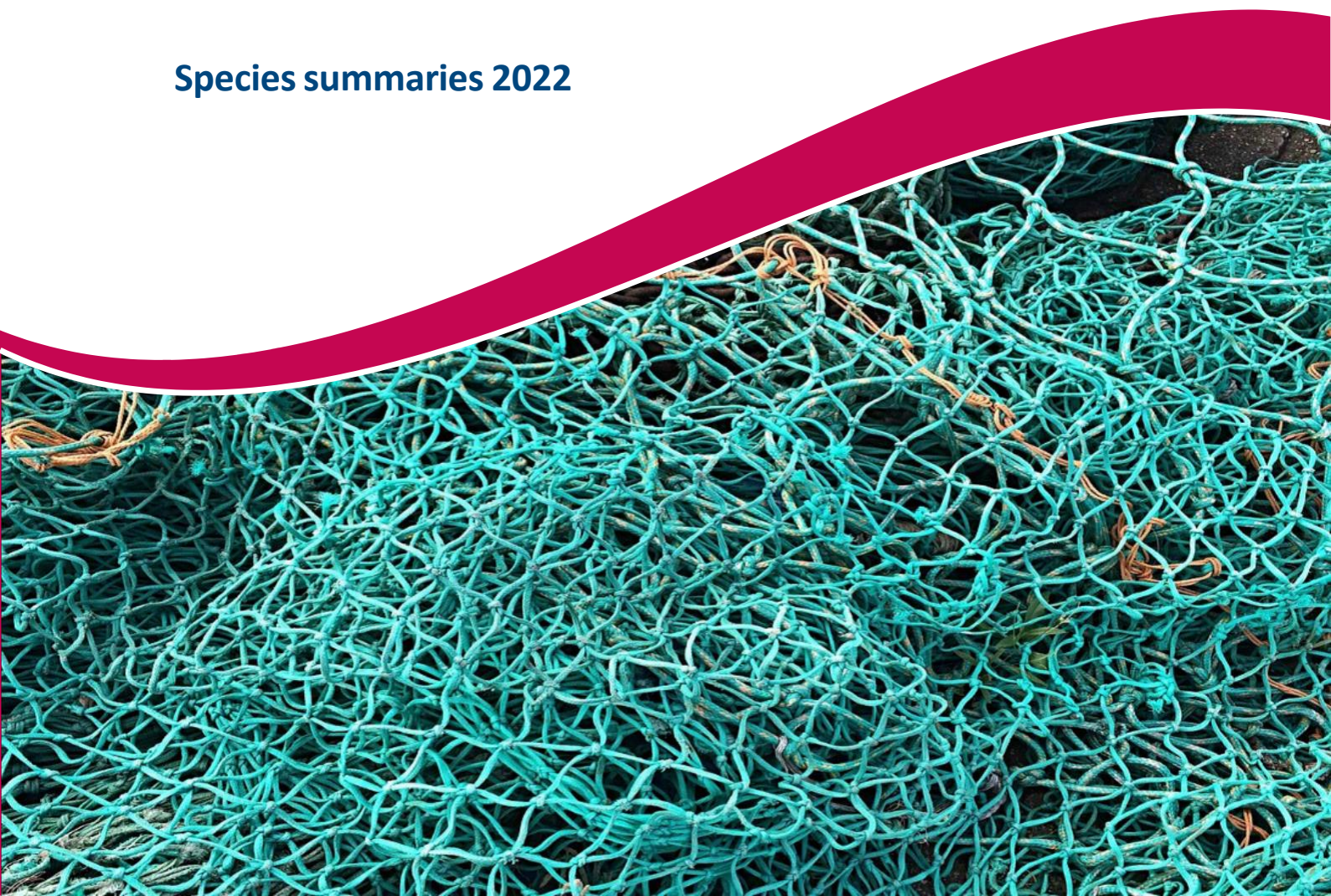


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Summary of Total Allowable Catch (TAC)

Species	2021–22 agreed TAC (t)	2022-23 Recommended TAC (t)	Change in TAC from 2021–22 (t)
Alfonsino	1,017	1,017	0
Bight redfish	893	890	-3
Blue eye trevalla	241 ¹	241	0
Blue grenadier	12,183	18,275	+6,092
Blue warehou	50 ²	50 ²	0
Deepwater flathead	1,238	1,238	0
Deepwater shark (eastern)	24	24	0
Deepwater shark (western)	235	235	0
Elephant fish	114	114	0
Flathead	2,333	2,333	0
Gemfish (eastern)	100 ²	100 ²	0
Gemfish (western)	343	340	-3
Gummy shark	1,672	1,672	0
Jackass morwong	463	20	-403
John dory	60 ²	60 ²	0
Mirror dory	144	129	-15
Ocean perch	304	305	+1
Orange roughy (Albany and Esperance)	50	50	0
Orange roughy (Cascade)	500	397	-103
Orange roughy (Eastern)	1,277	873	-404
Orange roughy (Southern) including Pedra Branca	127 (96 Pedra Brancs, 31 incidental)	98 (67 Pedra Branca, 31 incidental)	-29
Orange roughy (Western)	60 ³	60 ³	0
Oreo, basket	139	137	-2

¹ A limit applies for the seamount stocks of 108 t over the three-year period with no more than 54 t to be caught in a single year

² Incidental bycatch TAC

³ Incidental bycatch TAC and additional 200 t Research Catch Allowance

Pink ling	1,121 ⁴	1,568 ⁵	+447
Redfish	50	50	0
Ribaldo	396	397	1
Royal red prawn	605	651	+46
Sawshark	509	519	+10
School shark	194	225	+31
School whiting	917	917	0
Silver trevally	197	51	-146
Silver warehou	450	350	-100
Smooth oreo dory (Cascade)	150	150	0
Smooth oreo dory (other)	90	90	0

⁴ Including 427 t eastern notional catch limit

⁵ Includes 475 t eastern notional catch limit

Purpose

These species summaries provide information on quota species assessed by the various Resource Assessment Groups (RAGs) for the Southern and Eastern Scalefish and Shark Fishery (SESSF) including the Great Australian Bight RAG (GABRAG); South East RAG (SERAG) and SharkRAG.

The summaries contain basic information on stock status, catch trends, assessment details, Recommended Biological Catch (RBC) recommendations from the relevant RAG, and preliminary AFMA advice for the 2022-23 SESSF fishing year, 1 May 2022 to 31 April 2023. The AFMA advice was considered by the relevant Management Advisory Committees (MACs) and final recommendations from all sources to be considered by the AFMA Commission in making its decision in March 2022.

The summaries are designed to be a quick reference, and should be read in conjunction with relevant RAG and MAC minutes and the applicable species stock assessments – links to the relevant documents are provided throughout where available.

The [SESSF Harvest Strategy Framework 2009](#) (the SESSF Harvest Strategy) provides the basis for TAC calculations. Other relevant considerations are included in this paper.

TAC considerations

Ecological considerations

Fishery Harvest Strategy (commercial & byproduct)

A new SESSF Harvest Strategy is currently being developed. This follows the introduction of the [Commonwealth Fisheries Harvest Strategy Policy 2018](#) (HSP) and in response to significant changes in the fishery since the current Harvest Strategy was implemented in 2009 including:

- structural adjustment reducing the numbers of boats in the fishery;
- changing fisher behaviour with fewer species being targeted;
- greater use of multi-year TACs (MYTAC); and
- environmental change.

In the interim period, the SESSF will continue to operate under the current SESSF Harvest Strategy with the some changes proposed to be incorporated in 2022 to:

- address technical and editorial errors throughout the document;
- enable multispecies considerations in setting TACs;
- include considerations about the process to undertake when a species' assessment extends past the MYTAC period;
- enable application of discount factors for lower tier assessments to be the default approach, and that exceptions are only made where the relevant resource assessment group is satisfied there are alternative, equivalent precautionary measures in place;
- include the use of the FishPath tool to determine 'preferred' Tier 5 methods; and,

- include further information about how recommended biological catches (RBCs) are calculated at each assessment tier level.

Ecological Risk Assessment results (bycatch & protected species)

Ecological Risk Assessments (ERAs) were undertaken in 2019 for the sectors of the SESSF identified below, and were supported by the South East Management Advisory Committee (SEMAC) in [February 2020](#). The reports for the following sectors are available on the AFMA website:

- [Commonwealth Trawl Sector \(CTS\) otter board fleet](#)
- [CTS Danish seine fleet](#)
- [Great Australian Bight Trawl Sector \(GABTS\)](#)
- [Gillnet Hook and Trap Sector \(GHATS\) Shark Gillnet fleet](#)

A separate process is being undertaken to update the remaining SESSF ERAs for the GHATS scalefish automatic longline (ALL) and manual hook (MH) fleets. Draft reports were supported by SEMAC in February 2022 and will be subsequently finalised.

Other relevant considerations

Non-recovering species

The prevalence of non-rebuilding stocks in the SESSF is strongly suggestive that the various versions of the SESSF Harvest Strategy used are not as robust to uncertainties as we thought. The single species Management Strategy Evaluation (MSE) that have been relied on to test the effectiveness of the various harvest control rules have apparently failed to capture the full effects of fishing and/or the impacts of other processes (including but not only climate change) that have been important determinants of stock trajectories.

Discussions at RAG meetings so far have focussed on fishing mortality and climate change as the cause/solution for non-recovering stocks. While these are the obvious and significant drivers, what might be missing is an appreciation of the changes in ecosystem properties that might also be impeding recovery. For example, within the trophic structure of the ecosystem, these stressors might have non-intuitive ramifications such as release/increase of predation or competition that leads to non-recovery of a species. The stressors or drivers might be anthropogenic or “natural” causes – e.g. directly from extraction, climate change, rebuilding of higher trophic level predators to pre-exploitation levels (e.g. fur seals and whales) but now within a changed environment as a result of not only climate change, but also coastal development, aquaculture and associated activities.

Taking a broader, cumulative ecosystem approach may explain the non-recovery of some species, and perhaps an acceptance of non-recovery or permanent change in state. To this end, ecosystem models are being produced which might allow exploration of various factors, including teasing apart the environmental factors from fishery driven factors, and which are most influential on stock dynamics. However, these are not used directly to inform the TAC setting process under the current SESSF Harvest Strategy.

Economic considerations

Key Economic Trends (Source: [ABARES](#))

Overall, the economic status of the SESSF has been mixed in recent years. The deterioration in economic performance in the GHATS that occurred in the period 2010–11 to 2013–14 has reversed (Figure 1). Surveys by ABARES show positive net economic returns (NER) for this sector between 2015–16 and 2016–17, and non-survey-based estimates indicate a significant improvement in NER for 2018–19. This change offsets an emerging negative trend in NER in the CTS in this period; meanwhile, the GABTS continues to pursue estimated biomass at maximum economic yield (B_{MEY}) targets for its key species.

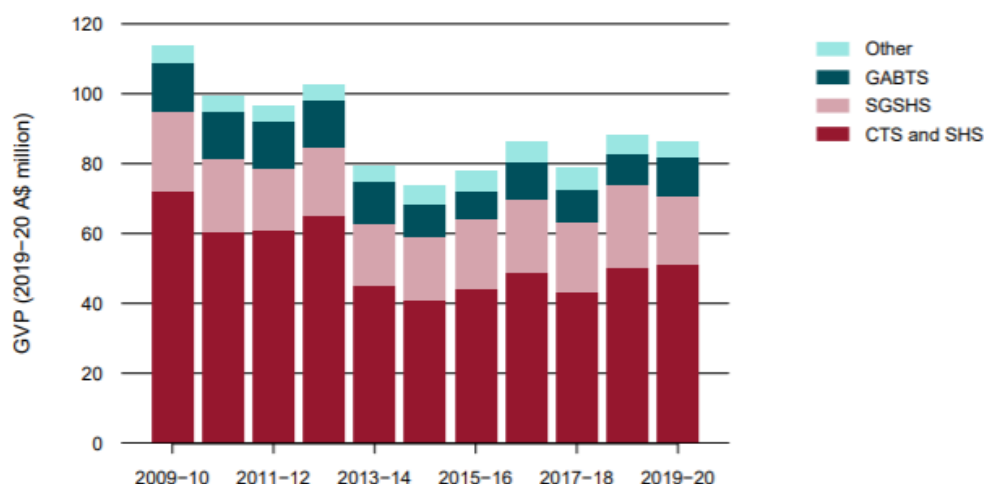


Figure 1: Real GVP in the SESSF by sector, 2009-10 to 2019-20

Note: 'Real' indicates that value has been adjusted for inflation. GVP for the SGSHS includes only gummy shark, school shark and sawshark, and elephantfish caught in the gillnet and hook sectors. GVP for other sectors includes non-scalefish product caught in the CTS and the SHS, non-shark product caught in the SGSHS, and product caught in the Victorian Inshore Trawl and East Coast Deepwater Trawl sectors of the SESSF.

Commonwealth Trawl Sector (CTS) and Shark Hook Sector (SHS) (Source: [ABARES](#))

The CTS and the Scalefish Hook Sector (SHS) contributed approximately 60% of total SESSF gross value of production (GVP) (\$86.26 million) in 2019–20. From 2008–09 to 2012–13, real GVP for the 2 sectors averaged \$66.69 million (in 2019–20 dollars; Figure 2). Since 2013–14, GVP has fluctuated around \$50 million per year. Tiger flathead, pink ling, blue grenadier and orange roughy are the most valuable species, and together have accounted for about 60% of the GVP since 2013–14.

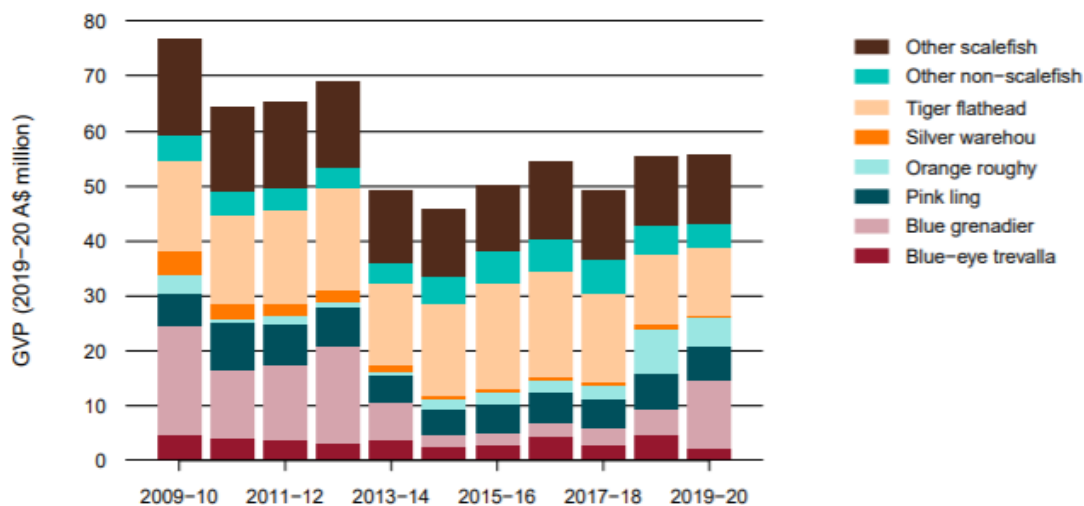


Figure 2: Real GVP, by key stocks, for the CTS and the SHS, 2009–10 to 2019–20 Note: GVP Gross value of production. 'Real' indicates that value has been adjusted for inflation.

Estimates of NER associated with scalefish catches for the CTS and the SHS combined are not available, because ABARES undertakes economic surveys of the CTS separately from the SHS (which is surveyed as part of the GHATS). However, with respect to value, the CTS accounts for most of the scalefish catch, so estimates of NER for the CTS are presented in this section.

The most recent ABARES economic surveys of the CTS illustrate a downward trend in NER (Figure 3). NER have fluctuated significantly since 2008–09, in part due to fluctuating terms of trade – that is, the relationship between input and output prices. The lowest estimated NER coincided with higher input prices and lower output prices (Mobsby forthcoming).

Total factor productivity has been estimated for the CTS for the period 2002–03 to 2016–17 using ABARES survey data (Mobsby forthcoming). During this period, as the size of the fleet decreased along with the catch, productivity has risen. This is because fishers have found ways to reduce input use by more than the reduction in catch.

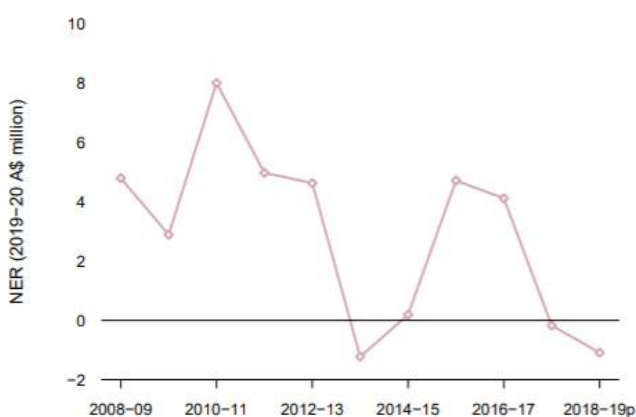


Figure 3: NER for the CTS, by financial year, 2008–09 to 2018–19. Note: NER Net economic returns. Results for 2017–18 and 2018–19 are preliminary, non-survey-based estimates

Great Australian Bight Trawl Sector (GABTS) (Source: [ABARES](#))

Over the period 2009–10 to 2015–16, gross value of production (GVP) in the GABTS declined by 42% to \$8.2 million. This reduction was largely attributed to a reduction in total landed catch volume. Since 2015–16, GVP has trended upwards, reaching \$10.76 million by 2019–20. Changes in the sector's total GVP in recent years have been driven by changes in GVP of deepwater flathead, the sector's most valuable commercial species, following increases in the landed beach price for the species (Figure 4). Bight redfish, the second most valuable species caught in the sector, has maintained a stable GVP over the same period. Together, these 2 species have accounted for between 62% and 74% of the sector's annual GVP over the past decade.

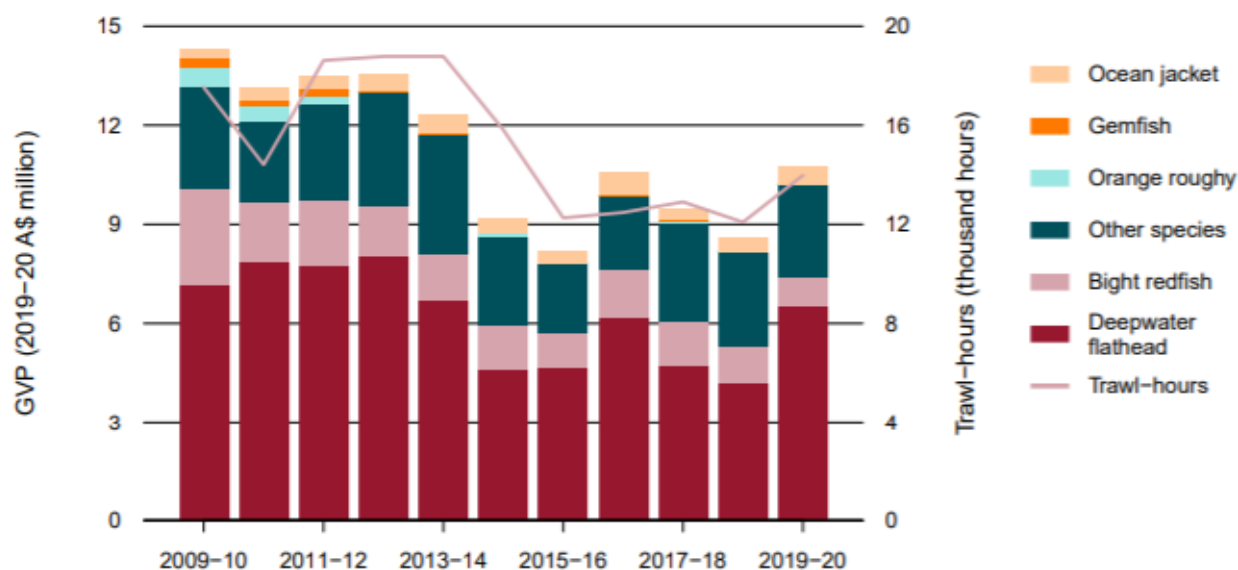


Figure 4: Real GVP for the GABTS of the SESSF, by key stock and trawl-hours, 2008–09 to 2019–20. Note: Trawl-hours do not include Danish seine effort. 'Real' indicates that value has been adjusted for inflation.

Trawling is the main method used. Overall, the number of hours trawled decreased by 20% during the past 10 years. Trawling is typically fuel-intensive, and fluctuations in the price of fuel are therefore likely to be a key driver of sector profitability. Since 2009–10, the Australian average off-road diesel price has fluctuated, falling sharply from 2013–14 and trending upwards from 2015–16.

There is a high and increasing level of quota latency for the 2 combined primary stocks caught in the sector, suggesting decreasing economic returns. Deepwater flathead represents around half of total landed catch annually in the GABTS, and the percentage of TAC remaining uncaught for this species has trended upwards during the past 10 years, averaging nearly 50% in the past 5 years. Quota latency for Bight redfish is higher, averaging 72% in the past 5 years, but trending downwards during the past decade. Market prices for Bight redfish are sensitive to supply (Kompas et al. 2012), so the high level of latency may be partly explained by fishers not wanting to land large volumes of Bight redfish that could drive down the market price.

Shark Gillnet and Hook Sectors (SGSHS) (Source: [ABARES](#))

The real gross value of production (GVP) in the SGSHS for the four shark species taken in the GHATS declined from a peak of \$28.6 million in 2008–09 to \$17.44 million in 2013–14 and then recovered to \$19.67 million by 2019–20 (Figure 5). This recent recovery is primarily the result of higher volumes and prices of gummy shark catch. Gummy shark accounts for the majority of GVP in the SGSHS (89% in 2019–20).

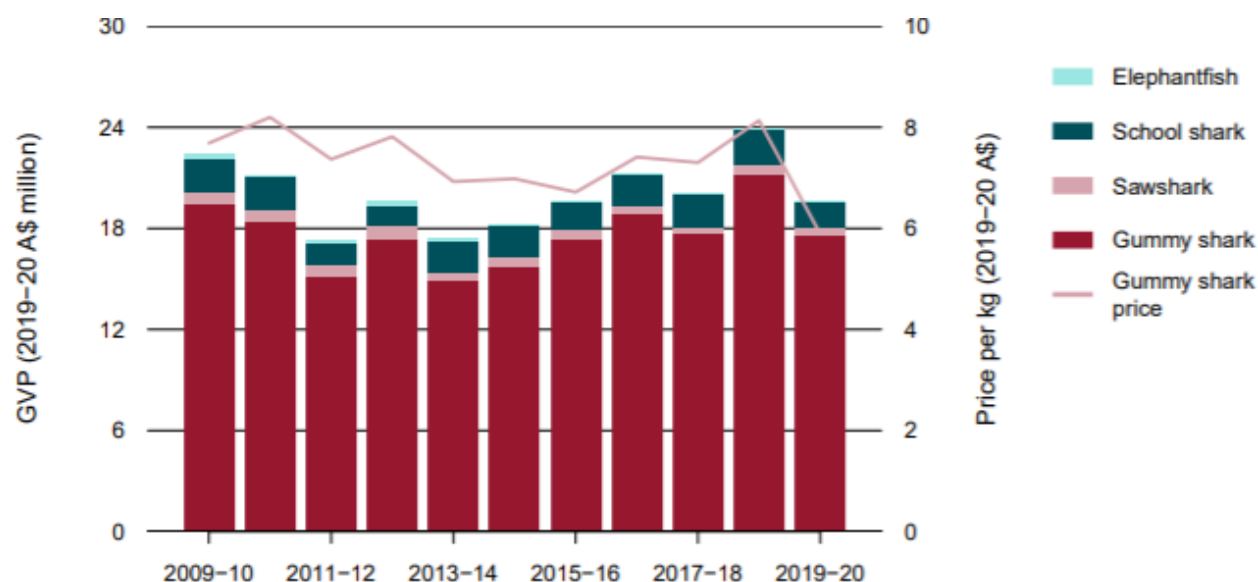


Figure 5: Real GVP for the SGSHS of the SESSF, by key species, and real price for gummy shark, 2008–09 to 2019–20. Note: ‘Real’ indicates that value has been adjusted for inflation.

The four shark species that make up the SGSHS – gummy shark, school shark, sawshark and elephantfish – accounted for around 76% of the GHTS GVP in 2019–20, with scalefish species making up the remainder.

Survey-based estimates of revenue, costs and net economic returns (NER) in the GHATS are available for 2016–17, and preliminary estimates are available for 2017–18 and 2018–19 (Figures 6 and 7). In 2017–18, non-survey-based estimates indicate that NER became negative (–\$3.4 million), potentially as a result of lower catch volume of gummy shark and higher unit fuel prices. In 2018–19, non-survey-based estimates showed a strong recovery, with NER estimated to have reached \$5.6 million, largely driven by a significant increase in fishing revenue from higher catch volumes and lower overall fishing costs.

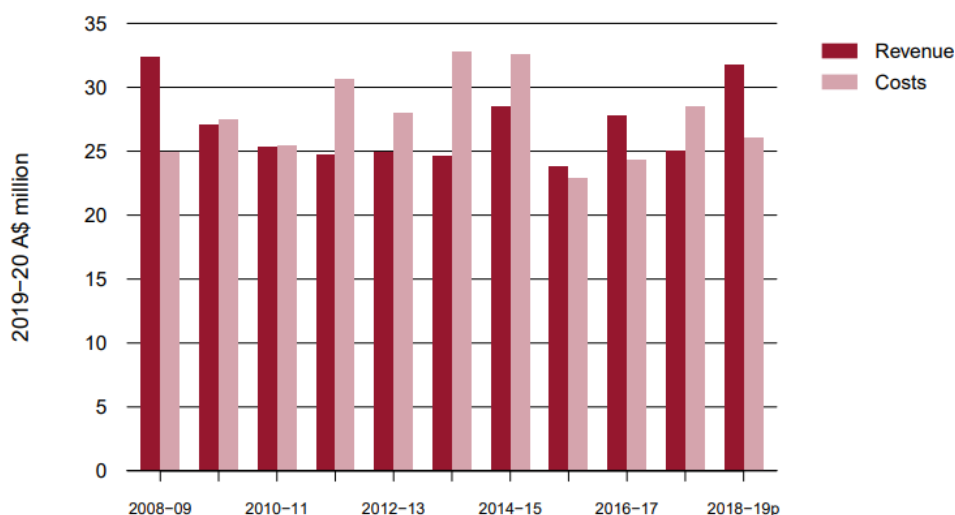


Figure 6: Real revenue and costs for the GHTS 2008–09 to 2018–19.



Figure 7: Real NER for the GHATS of the SESSF, 2008–09 to 2018–19. Note: NER estimates for 2018–19 are preliminary non-survey based estimates.

Significant spatial closures implemented in recent years have resulted in relocation of fishing intensity to other areas. Particularly affected were operators who had the full extent of their usual fishing grounds closed, and those who had to switch to use of hooks rather than gillnets in areas where gillnet closures are in place. Some South Australian gillnet fishers also operate in the South Australian Rock Lobster Fishery, which is considered to be profitable (Econsearch 2014) and could have supported some SGSHS operators affected by the closures. These changes would have reduced the profitability of gillnet operations in South Australia, contributing to the negative NER in the GHATS following the closures.

East Coast Deepwater Trawl Sector (ECDWTS) (Source: [ABARES](#))

Estimates of net economic returns are not available for the ECDWTS, and estimates of the sector's gross value of production are confidential. The long distance to fishing grounds for the CTS fleet and use of trawl gear for targeting this species means that fuel costs are likely to make up a higher proportion of total fishing costs in the ECDWTS than for the key CTS fishing grounds. Higher expected profit in the CTS and other fisheries that permit holders operate in may be a key driver of low levels of activity in the ECDWTS.

Social considerations

In November 2017, a new objective was introduced in the [Fisheries Management Act 1991](#) requiring AFMA to have regard to the interests of commercial, recreational and Indigenous fishers and ensure these interests are taken into account.

Commonwealth fisheries are a shared resource that provide a range of benefits to the Australian community. With many groups accessing Commonwealth fisheries, sharing these resources fairly has been a priority for the Government and Australian fishers for many years. To address this priority, the [Commonwealth Fisheries Resource Sharing Framework](#) (the Framework) was released in 2020. The Framework outlines the Government's approach to sharing fisheries resources across commercial, recreational, and Indigenous fishing sectors and between the Commonwealth, the States and the Northern Territory. The Framework provides a principles-based approach to creating resource sharing arrangements to manage access and allocation issues in Commonwealth fisheries. No resource sharing arrangements have yet been developed that impact the SESSF sectors.

Commercial fishers' interests

SESSF operators have raised concerns about resource sharing between sectors and jurisdictions and the potential impact on Commonwealth TACs.

The concerns raised are in relation to the take of key Commonwealth managed species including gummy shark and school shark in South Australia (SA) and eastern school whiting in New South Wales (NSW). AFMA is working with SA to strengthen measures to constrain the catches of shark to within SA's agreed allocation. AFMA has also worked closely with NSW to develop complementary management arrangements for shared stocks, including participating in meetings held by the NSW Department of Primary Industries (DPI) in relation to developing harvest strategies for relevant fisheries, including the NSW Trawl Whiting Sector (first Harvest Strategy to be developed). The draft strategy was released for public comment with the consultation period closing on 31 October 2021. The final harvest strategy will be submitted to CommFish NSW before being provided to the Minister for Agriculture and Western NSW for formal adoption.

Recreational fishers' interests

Recreational fishing members on SEMAC and SERAG contribute recreational fishing knowledge and expertise to committee deliberations, including the catch-setting processes.

The SESSF Harvest Strategy provides for recreational catches to be deducted from the RBC to produce a TAC, where recreational catches are known and included in the assessment.

Recreational catch information is listed in the relevant species summary below. Estimates for most species are currently uncertain and not available consistently through time. For species in this category, recreational catches have not been incorporated into the assessment and TAC calculations. Where reliable data is available, such as recreational survey information, it may be considered by the relevant RAG as a line of evidence when recommending RBCs and TACs and / or incorporated into the assessment.

There is a paucity of recreational catch data; particularly for recreationally important species such as gummy shark, school shark, blue-eye trevalla and silver trevally. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) continues to liaise with each of the state agencies to obtain all available state data, and emphasise the need for regular and ongoing surveys to obtain reliable data to inform assessments and management decisions.

Indigenous fishers' interests

AFMA is in the process of establishing how best to consider Indigenous fishers' interests and ensure that they are taken into account appropriately. In 2012, the Fisheries Research and Development Corporation (FRDC) established an Indigenous Reference Group (IRG) to assist in working towards a Fisheries Research, Development and Extension (RD&E) plan for indigenous Australians.

In February 2020, the [*Integrating indigenous fishing: extending adoption pathways to policy and management*](#) project (FRDC 2019-168) commenced, which will identify impediments and opportunities for Indigenous engagement and adoption of IRG project outputs across fisheries management jurisdictions in Australia.

As at the date of this paper, no Indigenous fishers' interests have been identified that would impact on SESSF TACs for the 2022–23 fishing year.

Intersection with State and International fisheries

Where State catches are included in an assessment, estimates of State catches for the upcoming fishing year are deducted from the RBC to produce a Commonwealth TAC. Future State catches are estimated using a four-year weighted average of catches reported by the relevant State fisheries agency. However, the impact of management changes in State fisheries can be considered in forecasting the State catch in the upcoming fishing year.

In 2019, a NSW TAC was introduced for a range of species. Many of these species are also subject to a Commonwealth TAC⁶. When accounting for total mortality of a species in the stock assessment and then calculating the Commonwealth TAC, the key consideration is actual catches, not the NSW TAC. For this reason, the four-year weighted average for NSW catches is considered when making Commonwealth TAC recommendations in this paper for species where NSW State catches are deducted.

No developments in fisheries on the high seas or other countries' exclusive economic zones have impacted on these Commonwealth TAC recommendations.

Fishery wide data and analysis considerations

Data uncertainty and impacts on TACs under the Harvest Strategy

The absence of complete or up to-date observer data can create uncertainty around stock assessments. Historically, the Southern and Eastern Scalefish and Shark Fishery Resource Assessment Group (SESSFRAG) has highlighted concerns about significant underachievement of the Integrated Scientific Monitoring Program (ISMP) observer sampling targets over a number of years. ISMP coverage has continued to improve in recent years, however the impacts of COVID-19 have restricted AFMA's ability to deploy observers. Species-specific issues are detailed in the summaries below.

Electronic monitoring (EM) was introduced across the GHAT in 2015. The use of data collected through EM is being investigated for assessments for key species in this sector. An industry-based data collection program commenced in October 2018 to supplement the GHAT EM program. The program, run by the Southern Shark Industry Alliance (SSIA), employs trained crew members and undertakes port sampling to collect biological information for target species.

Key fishery projects and developments relating to TACs

A number of research projects relevant to stock assessments and the TAC setting process are underway, many of which are interlinked and at various stages of completion. A summary of relevant projects is provided below.

Climate change adaptation handbook

- [*Adaptation of fisheries management to climate change handbook*](#) has been developed to help fishery managers understand the climate driven changes to ocean variables; the potential sensitivity of individual fisheries to that physical and ecological change; and if the fishery can easily and rapidly autonomously adapt. For example, whether fishers can change how they fish or their business practices to relieve the pressure on their business or the ecosystem, or a longer

⁶ This includes the following species relevant to the SESSF: big eye ocean perch, blue eye trevalla, gemfish, hapuku, pink ling, blue spotted flathead, eastern school whiting and stout whiting (combined), silver trevally and tiger flathead.

process is required that involves changing management plans and modifying management methods.

The SESSF resource advisory groups will be considering adaptation handbook during 2022.

Ecosystem structure and function indicators

The development of ecosystem structure and function indicators can assist ecosystem approaches to fisheries management. A working group, funded by CSIRO and the [Lenfest Oceans Program](#), considered social, economic and ecological indicators (with a focus on ecological indicators). These indicators were tested in models but also explored using data from four case study regions around the world including the SESSF. For the SESSF this has involved looking at the fisheries data in ways not done in any depth before for the region.

The conglomeration of information provides an understanding of the ecosystem, including its resilience to any distortive pressure that might be applied on the ecosystem against the conditions the ecosystem has evolved to withstand. The next step (beyond the end of the current project) is working to take this understanding into operational management such as through harvest strategies. The understanding of the system derived from this analysis (and parallel analysis on Fishery Independent Survey (FIS) data) is being used to inform work on multispecies harvest strategies and work of the “biological parameters project”.

Revisiting biological parameters

- [*Revisiting biological parameters and information used in the assessment of Commonwealth fisheries: a reality check and work plan for future proofing*](#) (FRDC 2019-010) will identify best practice methods for updating high risk/high impact parameters and develop a prioritised workplan for updating these parameters. The FRDC have expressed interest in maintaining the database of parameters that has been developed as a “live” resource that could be regularly updated and accessible to assessment scientists and fisheries managers.

Many assessment models rely on biological parameters/inputs that are now getting quite out-dated, have an unknown provenance, are based on datasets that are no longer accessible or useable, and/or use parameters that are borrowed from other species where information is not available. There is evidence that life histories of some fish populations have shifted in response to pressures caused by exploitation and changing environmental conditions. The reliance of current assessments on information that could be out-of-date or does not reflect the biology of the species being assessed leads to increased uncertainty in the information underpinning management decisions.

Dynamic reference points and harvest strategies

- [*Understanding factors influencing under-caught TACs, declining catch rates and failure to recover for many species in the SESSF*](#) (FRDC 2016-146) made a number of recommendations including incorporating the potential impacts of climate change on species abundance into assessments and developing an approach to determine if there has been a productivity change in a species. These issues are being further considered as part of the development of a new Harvest Strategy and a number of other initiatives.
- [*Implementation of dynamic reference points and harvest strategies to account for environmentally-driven changes in productivity in Australian fisheries*](#) (FRDC 2019-036). This project is considering the use of dynamic reference points and will make recommendations on

future stock assessment approaches, data requirements, harvest control rules and management approaches incorporating environmental indicators and dynamic productivity and dynamic reference points. The project uses four SESSF stocks⁷ as the main case studies covering a variety of different recruitment patterns and historical trends in dynamic B_0 .

RBC and TAC calculations explanations

RBC and TAC recommendations

For the relevant species summaries below, the way in which the RBCs are applied depends on the assessment tier and whether a MYTAC has been recommended, as follows:

- Tier 1: The RBC is based on modelled-projections from the most recent stock assessment, as either single-year or multi-year RBCs, for the year following the stock assessment through to the end of the recommended MYTAC period, if a MYTAC is recommended, or until the next scheduled assessment.
- Tier 4: The RBC is recommended based on the single-year RBC from the most recent stock assessment, for the following year through to the end of the recommended MYTAC period, if a MYTAC is recommended, or until the next scheduled assessment.
- Tier 5 and ‘weight-of-evidence’ approach: RBCs are based on the outputs of the ‘preferred’ Tier 5 methods identified using the [FishPath](#) tool. If harvest control rules cannot be specified using this approach, a weight-of-evidence approach may be used without an RBC being recommended. TACs are recommended either as single-year TACs or MYTACs.

Where a MYTAC has been recommended, the RBC/TACs for that period are included in the tables below. Where a single-year TAC has been recommended, only the 2022 RBC/TAC is included in addition to the previous two years’ RBC/TAC.

Discount factor

Consistent with the HSP, which establishes a more precautionary approach to harvest control rules for species subject to more uncertain assessments, the SESSF Harvest Strategy provides for application of a 15 per cent discount factor to RBCs derived from Tier 4 assessments, however exceptions may be considered where demonstrable alternative equivalent precautionary measures are in place. Detail relevant to the application of the discount factor is included in each of the individual species summaries below.

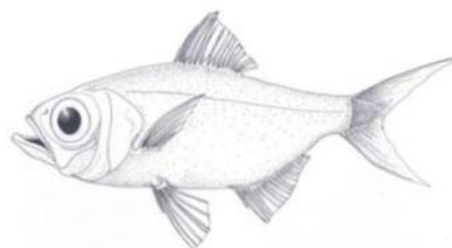
Discards, State and recreational catch and research catch allowance

When other sources of mortality arising from discarded catch, catch taken by States, recreational or research catch allowance are included in an assessment, they are subtracted from the RBC to produce a Commonwealth TAC.

⁷ redfish, jackass morwong east, silver warehou and blue grenadier

Alfonsino

Beryx splendens



ABARES (2012): Line drawing – William Murray

Species summary					
Common names	Golden-eye perch				
Stock assessment	Tier 3 species - last assessed by SlopeRAG in 2013.				
Stock structure	<p>Little is known about the stock structure of alfonsino in the SESSF. It is acknowledged that it is a straddling stock between the Australian Fishing Zone (AFZ) and the high seas.</p> <p>This assessment summary pertains only to the ECDWT Sector, as this is the only resource under quota management.</p>				
Stock status against reference points (F_{48}/F_{20})	Tier	Year	F_{Current}	F_{48}	F_{20}
	3	2013	0.022	0.149	0.479
	3	2010	0.025	0.149	0.479
	3	2008	0.283	0.149	0.479
Stock trend and other indicators	<p>Catches remain well below the TAC as no boats have been fishing the stock. When last assessed, the age structure indicated that the stock had not been greatly impacted by fishing. There has been very little fishing since then, with the first catch recorded in 2019 (~6 t).</p> <p>Tier 3 species use estimates of fishing mortality (F) that will reduce spawning biomass to a given level (reference points).</p> <p>The Tier 3 target reference point for alfonsino is the level of F that will produce a spawning biomass of 48% of unfished levels.</p> <p>The Tier 3 limit reference point for alfonsino is the level of F that will produce a spawning biomass of 20% of unfished levels.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	7 th of 3-year			No	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	1,017	1,119	-	
	2020-21	1,017	1,119	0	
	2019-20	1,017	1,119	6	

	2018-19	1,017	1,119	12
Economics (Byproduct) East Coast Deepwater Trawl	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	Confidential	Confidential	Confidential
	2018-19	Confidential	Confidential	Confidential
	2017-18	Confidential	Confidential	Confidential
ABARES Status (2021 Report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	N/A			
Significant changes to data inputs	Calculation of the RBC only uses AFZ data, and so pertains only to the AFZ.			
Data and RAG comments	Tier 3 assessments are no longer used under the SESSF Harvest Strategy, and there is little new data available due to lack of fishing for operational reasons.			
Stock assessment information and RAG comments	In March 2018 , SESSFRAG recommended delaying the next assessment until 2019 due to low catches and a lack of data. RBC calculations used to set TAC are taken from the AFZ only.			
Species specific research and priorities				
There is no species-specific research currently underway or identified as future priorities.				
RAG Recommendations				
SlopeRAG (November 2013) recommended a three- year MYTAC using the RBC of 1,070 t from the 2013 Tier 3 assessment.				
In August 2020 , SESSFRAG recommended continuing the MYTAC, with future assessment needs to be reviewed when catches increase.				
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?	
	2022	1,070*	No SERAG will continue to provide RBC advice on an annual basis.	
	2021	1,070*		
	2020	1,070*		

	* High seas catch was deducted from the RBC (1,228 t, Tier 3 assessment 2013) resulting in an AFZ RBC of 1,070 t.			
Discount factor (t)	53.5	The default Tier 3 discount factor of 5 per cent continue to be applied		
State catch (t)	N/A	There are no estimates of State catch, rarely caught in State fisheries.		
Discards (t)	N/A	There are no estimates of discards.		
Recreational catch (t)	N/A	There are no estimates of recreational catches.		
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		1,017 t		
MAC Recommendations				
Commercial fishers' interests	No specific commercial fisher interests have been identified.			
Species specific management (target, companion and bycatch)	There are no identified implications for target, companion or bycatch species.			
MAC advice and any dissenting views	2022-23 TAC recommendation 1,017 t - eighth year of a three-year MYTAC SEMAC advice and any dissenting views There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	1,017	
AFMA Advice				
AFMA Management recommends a TAC of 1,017 t for the 2022-23 fishing year, under the third of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
1,017	1,017	10	2	0

Bight redfish

Centroberyx gerrardi



Species summary						
Common names	Bight redfish, redfish, nannygai, golden snapper, red snapper, red squirrel-fish					
Stock assessment	Tier 1 Species - last assessed by GABRAG in 2019.					
Stock structure	Assessed as a single stock.					
Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2019	63	64	41	20
	1	2015	63	60		
	1	2011	90	52		
Stock trend and other indicators	Modelling suggests a slow decline in abundance, consistent with the fish-down of a developing fishery to near the target in 2009, with a steady increase to an estimated biomass of 64%B ₀ at the start of 2020. Depletion of the stock occurred more rapidly in the mid-2000s, when substantial fishing effort occurred, but the stock has never fallen below the Maximum Economic Yield (MEY) biomass target. The current biomass is higher than the target biomass.					
Multi-Year TAC	Year of MYTAC (2021-22)				Has the MYTAC advice been revised?	
	2 nd of 5-year				Yes GABRAG (October 2021) recommended scheduling the next Tier 1 stock assessment for 2022 noting concerns about continued low catches in the 2021 Great Australian Bight Fishery Independent Survey (GABFIS).	
Catch and TAC (t)	SESSF fishing year	Agreed TAC (t)		TAC (t) after unders/overs		Cth Retained Catch
	2021-22	893		982		-
	2020-21	893		953		202
	2019-20	600		680		170

Economics (Primary)	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
Great Australian Bight Trawl	2019-20	0.93	10.76	8.64
	2018-19	1.07	8.48	12.62
	2017-18	1.30	9.16	14.19
ABARES Status (2021 Report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	Single stock (Zone 80). Two sex model. One fleet: Trawl (separated for different sources of length data – ISMP, Industry, GABFIS). Selectivity allowed to vary between GABFIS trawl fleet. Discards: minimal (ignored). Natural morality rate (<i>M</i>): estimated at 0.1017 (well estimated, range 0.093-0.11). Recruitment: estimated (1960-2003).			
Significant changes to data inputs	The catch series was revised to include catches up to 2018–19, including replacing the estimated catch data used in the last assessment with actual catch. The standardised CPUE series was updated to April 2018. Length frequency data up to 2018–19, and age-at-length data up to 2017–18 (including GABFIS age-at-length data from 2008) was included using an updated age error matrix. The final year of recruitment estimation changed to 2003.			
Data and RAG comments	Standardised catch rates only include data up to April 2019. Errors detected during processing of the data prevented inclusion of additional data to June 2019 in the catch rate standardisation and including this updated catch rate series as a sensitivity. Recruitment was only estimated up to 2003 (previously to 2005). The variance was high on the last few recruitment events in the previous assessment, and selectivity suggest recruitment at age 15 is more appropriate than at age nine. The likelihood profile for natural mortality indicates that <i>M</i> is reasonably well estimated. The age data are most influential, with biomass index data (higher mortality) and length data (lower mortality) showing some conflict. The likelihood profile for steepness (<i>h</i>) is uninformative The likelihood profile for spawning stock biomass (<i>SSB</i> ₀) is broad and hence is not precisely estimated. The biomass index and trawl age data are most influential. The likelihood profile for spawning stock biomass at the end of the time series (<i>SSB</i> ₂₀₁₈) is broad and not precisely estimated. The index and recruitment data are most influential, though there is a conflict between the two.			

	<p>The likelihood profile for relative stock status (depletion at 2018-19) is broad and hence relative stock status is not precisely estimated. The index and recruitment data are the most influential, though there was conflict between the two.</p> <p>GABRAG (December 2018) noted concerns with decreases in commercial catches and a continuing decline in the GABFIS index of abundance.</p> <p>GABRAG recommended that the RBC for Bight redfish for the 2019–20 fishing year be reduced to 600 t and that the stock assessment be moved forward from 2020 to 2019.</p> <p>GABRAG (November 2019) noted the following:</p> <ul style="list-style-type: none"> - CPUE is unlikely to be an accurate index of abundance for Bight redfish, as catches are taken from aggregations over only a few months. - There are no clear cohorts apparent in the ISMP data, concerns regarding the decrease in number of large fish (in the length compositions) over the past few years. <p>GABRAG (October 2021) noted concerns relating to the estimate of relative abundance and length frequencies from the 2021 GABFIS, which has shown a consistent decline in abundance since the 2011 survey, and a reduction in the number of larger fish sampled - this is indicative of a declining stock.</p> <p>GABRAG also noted the large catches of stingarees in the 2021 FIS, and whether this had influenced the performance of the gear, and the estimates of relative abundance for deepwater flathead and Bight redfish as a result.</p> <p>GABRAG recommended maintaining the RBC for Bight redfish for the 2022-23 fishing year, noting catches are well below the current TACs, and bringing the assessment forward from 2024 to 2022 in light of the GABFIS results. In doing so, GABRAG agreed to postpone the 2022 deepwater flathead assessment to 2024, and agreed to consider time-based discount factors as a result of extending the MYTAC.</p>
Stock assessment information and RAG comments	<p>November 2019</p> <p>The model was not adequately able to fit the decline in the initial part of the CPUE series (i.e. 1987–1994) and the model fits to commercial CPUE are generally poor.</p> <p>The inter-annual variation in CPUE over time is unexpected for such a long-lived species; this may be driven by availability, rather than changes in biomass.</p> <p>The market value of Bight redfish could also influence CPUE if targeting is not occurring.</p> <p>Seven out of the last ten recruitments are above average.</p> <p>While the standardised CPUE series and GABFIS abundance indices may be influenced by availability, GABRAG urged caution, noting a similar instance for the eastern redfish stock; where the model and stock indicators suggested the stock was sustainable, and was later assessed to be overfished.</p>

Projected biomass

The projected 2020 spawning stock biomass is estimated to be 64%B₀ (Figure 8). The biomass is expected to reach the target reference point beyond 2040, assuming average recruitment and the RBC is fully caught.

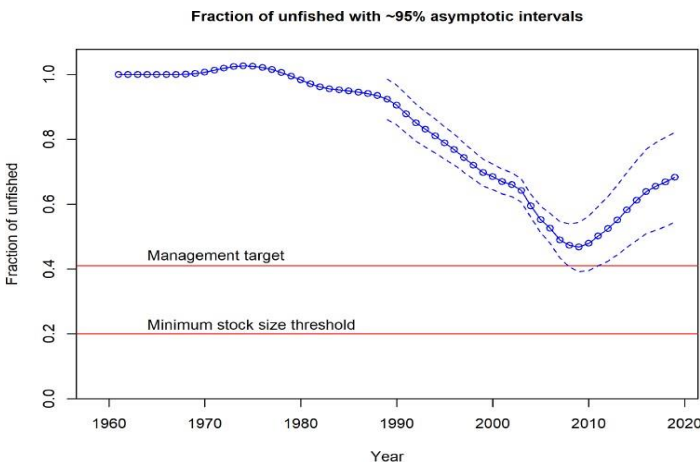


Figure 8: Time-trajectory of spawning biomass depletion (with approximate 95% asymptotic intervals) corresponding to the maximum posterior distribution (MPD) estimates for the base case analysis for Bight redfish (Sporcic, Day and Burch 2019).

Species specific research and priorities

There are no species-specific research priorities identified.

RAG Recommendations

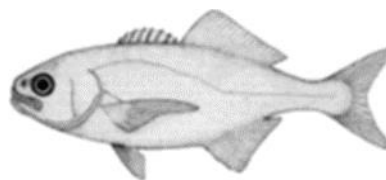
GABRAG ([October 2021](#)) recommended maintaining the RBC from the 2019 stock assessment, subject to the stock assessment being brought forward to 2022.

	Year	RBC (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2024	813	No Single-year TAC with assessment to be updated in 2022.
	2023	856	
	2022	905	
	2021	961	
	2020	1,024	
	5-year average	912	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.	
State catch (t)	22.5	Estimates of State catches from SA.	
Discards (t)	N/A	Estimates of discards are considered to be low and are not deducted from the RBC.	

Recreational catch (t)	N/A	Estimates of recreational catch available for SA, 19 t in 2014, and Western Australia (WA), 13.3 t in 2008. Recreational catch is not included in the assessment and are not deducted from the TAC.		
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		890 t		
MAC Recommendations				
Commercial fishers' interests	No specific commercial fisher interests have been identified.			
Species specific management (target, companion and bycatch)	GABRAG has noted concerns regarding the lower catches of Bight redfish in recent years; with the species being taken as bycatch when targeting deepwater flathead.			
MAC advice and any dissenting views	2022-23 TAC recommendation 890 t - single-year TAC SEMAC advice and any dissenting views GABMAC (November 2021) supported updating the stock assessment in 2022. There were no dissenting views and GABMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	890	
AFMA Advice				
AFMA Management recommends a TAC of 890 t for the 2022-23 fishing year – a single year TAC with the stock assessment to be updated in 2022 – with overcatch and undercatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
893	890	10	2	-3

Blue-eye trevalla

(*Hyperoglyphe antarctica*)



ABARES (2012): Line drawing – FAO

Species summary					
Common names	Bluenose, big-eye, blue-eye, blue-eye cod, bluenose warehou, deep sea trevalla, sea trevally				
Stock assessment	Tier 4 assessment for slope stock were considered by SERAG in 2020 and 2021. Catch-Maximum Sustainable Yield (MSY) and age-structured stock reduction analyses for the seamount stock were considered by SERAG in 2018 and 2021.				
Stock structure	<p>Blue-eye trevalla is managed as a single stock in the SESSF.</p> <p>Variation in age and growth, otolith chemistry and potential larval dispersal, indicate there is likely to be one stock on the continental slope (from which most of the catch is taken) which is separate from the stock(s) found on the east coast seamounts.</p> <p>Fish on the seamounts are assumed to be reproductively isolated from the slope stock. Potential stock structure among the seamounts is not clear.</p> <p>Separate RBCs were determined for the slope and seamount stocks for the first time in 2018, however - a single, combined TAC continues to be set for blue-eye trevalla.</p>				
<u>SLOPE</u> Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2021	0.901	1.2287	0.512
	4	2020	0.7656	1.2321	0.5134
	4	2018	0.9994	1.2288	0.512
<u>SEAMOUNT</u> Stock status against reference points (%B_0)	Tier	Year	Stock status	Target	Limit
	5	2021	33*		
	5	2018	33*	48	20
	<p>No assessment prior to 2018.</p> <p>*Current depletion for the seamount stock was estimated to be about 0.33B_0 although the uncertainty about that value is extreme. SERAG (November 2021⁸) considered the available data and agreed there was no basis on which to revise the outputs of the 2018 catch-MSY analysis.</p>				

⁸ Minutes from this meeting are currently being finalised

<p>Stock trend and other indicators</p> <p>See CPUE Report</p> <p>See Data Summary</p>	<p>Total blue-eye trevalla catches have declined from 652 t in 2004 to 223 t in 2020.</p> <p><u>Slope</u></p> <p>Overall, standardised CPUE has decreased since 2014, despite an increase in 2018 relative to the previous year. The 2020 assessment, which was brought forward one year due to concerns regarding decreasing CPUE, suggested the CPUE index in 2020 was very close to the limit reference point (i.e., 0.53 vs 0.51), and the last time it was last above the target occurred in 2014 (see Sporcic 2020a). The assessment was updated again in 2021 to closely monitor relative standardized CPUE. The 2021 assessment, which incorporates a revised catch history time series and standardised CPUE that includes SESSF zones 83 to 84 in the Great Australian Bight (GAB), resulted in a higher more recent four-year average standardized CPUE compared with the corresponding average standardized CPUE from the previous assessment, although still an overall downward trend since 2014 (Sporcic, 2021).</p> <p><u>Seamount</u></p> <p>Catch from the seamounts has been less than 40 t for the past three years.</p> <p>A weight of evidence based on the use of data-limits methods ('Tier 5') approach is used to assess the seamount stock using two data-limited methods, Catch-MSY and an age structured Stock Reduction Analysis.</p> <p>While strongly driven by assumptions, the 2018 catch-MSY analysis generated an MSY of about 45-50 t with associated depletion estimate of which the median was 33%B₀ but that ranged from below the limit to above the target reference point. Constant catches of 40 t lead to the mean and median depletion estimate remaining stable, lower catch would allow the median stock status to approach the proxy target of 48%B₀ provided the stock is not already at a sufficiently low level to prevent rebuilding under those catches. The age-structured stock reduction analysis suggested that stock status would be relatively stable under a catch of 25 t for low productivity scenarios or 48 t for high productivity scenarios.</p> <p>SERAG (November 2021⁹) considered the available data and agreed there was no basis on which to revise the outputs of the 2018 catch-MSY analysis.</p>			
<p>Multi-Year TAC</p>	<p>Year of MYTAC (2021-22)</p>		<p>Has the MYTAC advice been revised?</p>	
	<p>Single year TAC</p>		<p>N/A</p>	
<p>Catch and TAC (t)</p>	<p>SESSF fishing year</p>	<p>Agreed TAC</p>	<p>TAC after unders/overs</p>	<p>Cth Retained Catch</p>
	<p>2021-22</p>	<p>241</p>	<p>283</p>	<p>-</p>
	<p>2020-21</p>	<p>448</p>	<p>493</p>	<p>225</p>
	<p>2019-20</p>	<p>458</p>	<p>499</p>	<p>217</p>
	<p>2018-19</p>	<p>462</p>	<p>502</p>	<p>377</p>
<p>Economics</p>	<p>Financial Year</p>	<p>Species GVP (\$m)</p>	<p>Fishery GVP (\$m)</p>	<p>% Fishery GVP</p>

⁹ Minutes from this meeting are currently being finalised

(Primary) Commonwealth Trawl and Scalefish Hook	2019-20	2.21	51.34	4.30
	2018-19	4.65	49.47	9.40
	2017-18	2.94	41.86	7.02
ABARES Status (2021 Report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	<p>The Tier 4 assessment assumes there is a linear relationship between standardized CPUE and exploitable biomass, and that the character of the estimated CPUE has not changed significantly since the reference period to the end of the most recent year.</p> <p>Both assessments assume that biomass was unfished prior to 1985 (when fishing started).</p> <p><u>Slope</u></p> <p>In September 2015, SlopeRAG agreed to use a revised catch per hook metric in the Tier 4 analysis in place of the previously used catch per record/day. SlopeRAG considered the updated analysis to be a better reflection of CPUE in the early part of the fishery.</p> <p><u>Seamount</u></p> <p><i>Catch-MSY</i></p> <p>The catch-MSY assessment is a data-poor approach which makes assumptions about unfished biomass as well as a range of other assumptions around carrying capacity, intrinsic growth, maximum harvest rate, and current stock status, and requires a time series of known catches that have not been impacted by management.</p> <p><i>Age-structured stock reduction analysis</i></p> <p>Noting that not all seamounts would be fished in a given year, the model has assumed that harvest rates do not exceed 50 per cent in a single year. This adds constraints to the analysis and assumes that there must have been at least twice the biomass relative to what was caught in any year. Known biological parameters (length at age, length at maturity, weight at length) are used and plausible ranges are assumed for steepness, natural mortality, unfished stock size and current stock status.</p>			
Significant changes to data inputs	<p><u>Slope</u></p> <p>The CPUE series was updated in 2021 to include catch and effort from -SESSF zones 10 to 85 (Sporcic 2021a) when previously only SESSF zones 10 to 50 had been used (Sporcic, 2020). The 2021 Tier 4 assessment also used a revised catch—history time series (see Sporcic and Day, 2021 and Sporcic, 2021b).</p> <p><u>Seamount</u></p> <p>The 2021 update to both data-poor methods included catches from the Tasmanid seamounts plus the Lord Howe Rise whereas the 2018 assessment did not include the Lord Howe Rise.</p>			

<p>Data and RAG comments</p>	<p><u>Slope</u></p> <p>In 2020, revised NSW annual catches were provided from 1986 onwards, noting the assessment used catches from only 1997 onwards. There remains some uncertainty in the early catch series with regards to state catches which need to be resolved.</p> <p>Early records of high discards are likely from trawl. There are no significant recent discards and as such are not included in the Tier 4 assessment.</p> <p>SERAG supported the modifications to logbooks to require longline operators to routinely report the presence of orcas and evidence of depredation, to allow for this issue to be taken into account in future assessments.</p> <p><u>Seamount</u></p> <p>Catch data were provided by NSW fisheries and the Commonwealth logbooks. Discard rates are negligibly low. SERAG agreed that data should be collected to move this stock out of the Tier 5 assessment method, noting that the Close Kin Mark Recapture scoping project currently underway may provide a reasonable avenue to do this.</p>
<p>Stock assessment information and RAG comments</p>	<p><u>Slope</u></p> <p>The CPUE analysis assumes there is mixing throughout the stock, however the stock is understood to be broadly distributed but localised.</p> <p>A downward trend is apparent in the standardized CPUE series that includes the GAB (z2085) over the 2018-2020 period. Since 2016, standardized z2085 CPUE indices are greater than the z2050 CPUE indices. All analyses have limited numbers of observations and hence are relatively uncertain (Sporcic 2021a).</p> <p>The 2020 estimate of standardised CPUE (0.7865) is above the limit reference point (0.512). The 2021 Tier 4 assessment resulted in an RBC of 349.32 t (Sporcic, 2021), a 54 per cent increase from the 2020 RBC of 227.03 (Sporcic, 2020).</p> <p>While standardized CPUE indices that include logbook catch and effort information from the GAB are greater than the corresponding indices that exclude this information over the last five years (see Figure 10; Sporcic 2021a), SERAG noted that overall CPUE continues to decline, particularly on the east coast. One Industry member attributed the ongoing decline in the east to Orca depredation which is not being accounted for in the CPUE standardization.</p> <p><u>Seamount</u></p> <p><i>Catch-MSY Analysis (2021)</i></p> <p>Without an index of relative abundance, results can only be presented for a wide range of possible parameter values and these include current stock status. The 2018 Tier 5 assumed initial stock status of 50%B₀ – 97.5%B₀ and current status of 5%B₀ – 50%B₀. The 2021 work also presented alternative assumptions of 80%B₀ – 100%B₀ initial and 5%B₀ – 100%B₀ current stock status.</p> <p>For all other assessments, SERAG would typically use parameter set that has greatest support from the data (the maximum likelihood estimate) in generating RBC advice, however data-poor methods are not fitted to data and there is no Maximum Likelihood Estimate (MLE) estimate. All possible results therefore have equal weight of evidence. Dr Haddon suggested treating the median as a summary rather than the ‘best estimate’ of stock status.</p> <p>While highly uncertain, the catch-MSY analysis generates an MSY of about 45-60 t but note that MSY is a sustainable level of catch only if stock status is above BMSY (50% for the C-MSY model).</p>

	<p><i>Age-structured stock reduction analysis (2021)</i></p> <p>SERAG (November 2021¹⁰) considered more recent catch data and supported including catches from the Lord Howe rise, which were not included in the 2018 assessment. Including this additional catch in the Catch-MSY resulted in a lower range of estimated depletion, with 4% and 27% falling below the limit reference point for the two alternative selectivity curve scenarios.</p> <p>The assumptions made by the 2018 modelling work were varied: an alternative selectivity curve that allows capture of younger fish was used, and initial and current depletion ranges were altered. An alternative growth curve was also used, but this had little influence on the results. A Tier 1 like HCR was used to calculate an RBC for every biomass trajectory calculated (across the ranges of assumed parameter values, stock status, and maximum harvest rates) and the resulting RBC estimates were plotted as histograms for alternative catch time series, and for each assumed selectivity curve. RBCs ranged from zero to almost 200t with several histograms showing peaks in the 50-100t range.</p> <p>While several plots also showed large numbers of zero RBCs, especially for the selectivity curve that takes younger fish, an annual catch in the range of 30-40 t appears likely to be sustainable, even conservative. SERAG agreed the current TAC of 36 is within the range of RBCs produced when a harvest control rule is applied to the outputs of the SRA and that there was no basis for revising the previous TAC advice.</p> <p>Because trevalla seem likely to suffer from localised depletion, it was advised that catches be spread across seamounts rather than concentrated in a small area.</p>			
Projected biomass (Tier 5)	The Tier 5 assessment suggested that constant catches of 36 t would maintain stock stability or slow stock changes.			
Species specific research and priorities				
<u>Blue-eye trevalla close-kin scoping study (funded)</u>				
Blue-eye trevalla is one of the few target species not assessed at a Tier 1 level. A close kin study could help to determine population characteristics and provide more certainty to the advice underpinning management. The proposed study will provide a sample design and costing for a sampling study.				
RAG Recommendations				
SERAG (November 2021 ¹¹) recommended a three-year MYTAC combining the RBC of 349 t from the 2021 Tier 4 assessment for the slope stock and the RBC of 36 t from the 2021 Tier 5 assessment of the seamount stock, and that the discount factor be applied to the Slope Tier 4 RBC.				
SERAG also supported the modifications to logbooks to require logline operators to routinely report the presence or orcas and evidence of depredation, to allow for this issue to be taken into account in future assessments.				
Recommended Biological Catch (t)	Year	RBC (t): Slope	RBC (t): Seamount	Is a MYTAC recommended?

¹⁰ Minutes from this meeting are currently being finalised

¹¹ Minutes from this meeting are currently being finalised

	2022	349 t	36	Yes SERAG recommended a 3-year MYTAC combining the RBC from the seamount and slope stocks - 385 t
	2021	227	36	
	2020	449	36	
Discount factor (t)	52 t (applied to Tier 4 RBC)	SERAG (November 2021 ¹²) supported the application of the 15 per cent discount factor to the Tier 4 slope stock RBC. The discount factor was previously not applied because of the level of protection thought to be provided by closures, and that orca depredation resulted in a more conservative CPUE series. However, at its recent meeting, in light of a continued decline in CPUE despite some level of protection afforded by closures, and ongoing changes to data inputs, SERAG agreed that further work is required to understand the impact of orca depredation on catch rates, and whether closures are affording a level of protection that sufficiently offsets the application of a discount factor. Regarding the seamount stock, in comparing the outcomes of the SRA to the current TAC, SERAG considered that the current TAC is "adequately precautionary", in effect amounting to implementing an appropriate discount factor		
State catch (t)	12.3			
Discards (t)	N/A	Estimates of discards are considered to be low, 8.2 t, and are not used in assessment. As such, they are not deducted from the RBC.		
Recreational catch (t)	N/A	There are no records of recreational catch.		
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		321 t		
MAC Recommendations				
Commercial fishers' interests	Industry have noted that the seamount stock of blue eye trevalla is an episodic fishery with high operating costs given the travel time. Some operators may visit the seamounts as part of operations on the high seas. Other operators may fish			

¹² Minutes from this meeting are currently being finalised

	<p>the seamounts until catch rates are no longer economically viable and then not fish the area for a number of years.</p> <p>An Industry member expressed concern regarding the low catch rates in the east and believe the TAC should reflect the current catch rates to avoid local depletion.</p>		
Species specific management (target, companion and bycatch)	<p>Auto longline operators catch pink ling and blue-eye trevalla together. There may be implications for pink ling catches due to changes in blue-eye trevalla TAC. Trigger to be implemented for the seamount stocks, with no more than 54 t to be taken in any fishing year. SSIA manage an industry agreement under which seamount catches are tracked and monitored.</p>		
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>241 t – single year TAC</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted an assessment was conducted in 2018, however due to concerns from an Industry member regarding declining catch rates in the east, the updated assessment was brought forward to 2020. The 2020 assessment resulted in a decrease to the RBC and was the basis for the 2021-22 TAC of 241 t.</p> <p>In preparation for the 2021 Tier 4 assessment, some of industry requested that the assessment include data from the west in the Great Australian Bight to account for a shift in effort in recent years. Including the catch and effort data from the west in the revised CPUE series led to an increase in the recommended RBC for the slope stock to 349 t for 2022. This 54% increase in RBC between assessments can be mostly attributed the use of the new standardized CPUE series, which resulted in a higher most recent four-year average, as well as the scaling factor applied to the target catch to account for the additional catch.</p> <p>An industry member expressed concern that whilst the revised CPUE series accounts for catches in the west, and produces a higher RBC as a result, it still shows a declining CPUE trend across the fishery. Increasing the TAC despite a long-term decline in CPUE across the fishery could lead to further declines, particularly if the TAC were to be mostly caught in the east.</p> <p>Members recognised the basis for the increase in the RBC, however expressed concerns that the TAC was reduced in the 2021-22 fishing year to account for declining CPUE, and is proposed to increase in the 2022-23 fishing year despite ongoing declines across the fishery. The AFMA member explained that the increase in RBC accounts for a larger stock, driven by additional catch in the CPUE series, and that any future declines in CPUE would be accounted for in subsequent updates to the Tier 4 assessment.</p> <p>While some members, including AFMA, supported the recommended RBC from SERAG, the majority recommended that the TAC should not be increased due to ongoing CPUE declines in the east. SEMAC recommended that the 2021-22 fishing year TAC of 241 t is maintained for a single year.</p>		
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)
10	10	2	241
AFMA Advice			

The decline in stock status for a number of SESSF stocks on the east coast is an ongoing cause for concern and, while the basis for a higher RBC from the revised Tier 4 assessment is understood, AFMA Management does not support increasing the TAC in the face of a declining CPUE.

AFMA Management recommends maintaining the 2021-22 TAC of 241 t for the 2022-23 fishing year – a single year TAC, with the stock assessment to be updated in 2022.

2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
241	241	10	2	0

Blue grenadier

Macrurus novaezelandiae

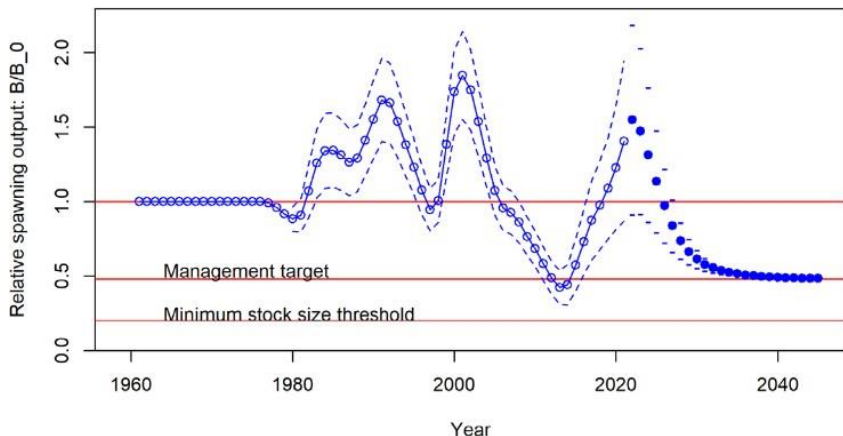


ABARES (2012) Line drawing - Rosalind Poole

Species summary						
Common names	Hoki, blue hake, whiptail					
Stock assessment	Tier 1 Species - last assessed by SERAG in 2021.					
Stock structure	Blue grenadier is assessed as one stock, however there is some evidence of separate stocks occurring across the SESSF. There are two defined sub-fisheries, the spawning fishery dominated by catches off western Tasmania and the widely spread catches of the non-spawning fishery.					
Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2021	155	155	48	20
	1	2018	122	109		
	1	2013	94	44		
Stock trend and other indicators	The biomass has increased since the mid-2000s, driven by above average recruitment. Under the revised base case assessment, virgin female biomass is estimated to be 155%B ₀ in 2022, compared to 122%B ₀ for 2019 in the 2018 stock assessment.					
Multi-Year TAC	Year of MYTAC (2021-22)				Has the MYTAC advice been revised?	
	3 rd of three year				N/A – Assessment updated in 2021	
Catch and TAC (t)	SESSF fishing year		Agreed TAC		TAC after unders/overs	Cth Retained Catch
	2021-22		12,183		13,040	-
	2020-21		12,183		13,316	11,891
	2019-20		12,183		11,964	7,044
	2018-19		8,810		9,636	1,809
Economics (Primary)	Financial Year		Species GVP (\$m)		Fishery GVP (\$m)	% Fishery GVP
	2019-20		12.47		51.34	24.29
	2018-19		4.55		49.47	9.20

Commonwealth Trawl and Scalefish Hook	2017-18	2.80	41.86	6.69
ABARES Status (2021 Report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	2 sex model, age-structured Steepness (h) is fixed at 0.75 Recruits estimated between 1974 and 2017 Maturity: 50% female maturity at 63.7 cm The base case estimates natural mortality for females to be $M_f = 0.23$ and males $M_m = 0.24$			
Significant changes to data inputs	CTS FIS non-spawning abundance index is no longer included in the base case as it was not believed to be indexing blue grenadier non-spawning abundance. The base case now estimates both female and male natural mortality, and not just female natural mortality.			
Data and RAG comments	There has been a large increase in catch from the spawning aggregation since the factory freezer boats commenced fishing in 2019. Acoustic data was collected from the spawning aggregation during the 2019-20, 2020-21 and 2021-22 fishing years, however this data was not available to be used as an index of abundance for the 2021 assessment.			
Stock assessment information and RAG comments	<p>SERAG (November 2020) considered the potential impacts of catching a large proportion of the TAC from the spawning aggregation and noted the following:</p> <ul style="list-style-type: none">- The model projections assume that the full RBC is caught, and there are different selectivity functions for the spawning fleet and the wet boat fleet, which accounts for a large proportion of the TAC potentially being taken from the spawning aggregation.- SERAG was not concerned that catching a large proportion of the TAC from the spawning aggregation would have any long-term impacts on sustainability. <p>SERAG (October 2021¹³) considered the updated Tier 1 stock assessment and recommended adopting the proposed base case and estimating M for both sexes.</p> <p>There has been consistent high recruitment since 2010, and adding an additional three years of data improved fits to the recent CPUE increase when additional recruitment were included.</p> <p>There are good fits to age and length and discard data, and while fits to non-spawning CPUE is poor, it has improved in recent years and follows the recent increasing trend.</p> <p>The biomass has increased since the mid-2000s, driven by above average recruitment. Under the revised base case assessment, virgin female biomass is estimated to be 155%B₀ in 2022, compared to 122%B₀ for 2019 in the 2018 stock assessment, with a 2022 RBC of 23,777 t and a three year average of 21,365 t. Discards are estimated to be 245 t and need to be deducted from the RBC to produce the TAC.</p> <p>Retrospective patterns suggest an over-optimistic estimation of biomass, and there is considerable uncertainty around the estimate of fishing mortality (F), virgin stock biomass and</p>			

¹³ Meetings minutes are currently being finalised

	<p>relative biomass, with likelihood profiles of B_{2022} suggesting a range of $80\%B_0$ to $170\%B_0$. All sensitivities to the base case model estimate stock status to be above $135\%B_0$.</p> <p>Given the uncertainty in the assessment, SERAG (November 2021¹⁴) recommended updating the assessment in 2022 to include the acoustic data collected in 2019, 2020 and 2021 which should decrease uncertainty in final year stock status and potentially reduce the retrospective patterns in the model.</p>		
Projected biomass	<div></div> <p>Figure 9: Relative spawning biomass, including projected biomass, with 95% asymptotic intervals (Tuck, 2021)</p> <p>The biomass is not expected to reach the target reference point until 2043 when catches are projected under the harvest control rule (Figure 9).</p>		
Species specific research and priorities			
An acoustic survey is scheduled for 2022, and the stock assessment is scheduled to be updated in late 2022 to include acoustic data collected in 2020 and 2021.			
RAG Recommendations			
Given high estimates of absolute and relative spawning abundance, but also associated high uncertainty in those estimates, SERAG (November 2021 ¹⁴) recommended a single year RBC of 23,773 t and recommended updating the stock assessment in 2022. The large change limiting rule will constrain the TAC for the 2022-23 fishing year.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2024	18,712	No SERAG (2021) recommended updating the assessment in 2022.
	2023	21,605	
	2022	23,777	
	3-year average	21,365	

¹⁴ Meeting minutes are currently being finalised

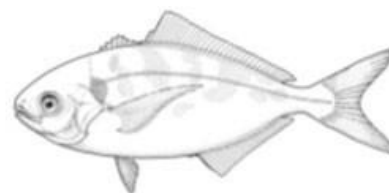
Discount factor (t)	N/A	A discount factor was not applied, however the large change limiting rule will limit the TAC in 2022-23.	
State catch (t)	N/A	There are no estimates of State catches since 2013, and none greater than 0.6 t since 2000.	
Discards (t)	245	Model estimated discards in 2022.	
Recreational catch (t)	N/A	There are no estimates of recreational catch.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		18,275 t – large change limiting rule applied.	
MAC Recommendations			
Commercial fishers' interests	The proportion of the agreed TAC caught has increased over the last three fishing years due to deemed factory freezer boats fishing the winter spawning aggregation. 98 per cent of the 2020-21 agreed TAC was caught, as of 1 February 2022, approximately 86 per cent of the 2021-22 agreed TAC had been caught (with little more expected). Industry noted that the increased catches by the factor freezer boats has not impacted the domestic fleets' ability to market their product.		
Species specific management (target, companion and bycatch)	There are no identified implications for target, companion or bycatch species.		
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>18,275 t - single-year TAC</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC supported undertaking annual acoustic biomass surveys and stock assessments, subject to factory freezer boats fishing the winter spawning aggregations, to improve stock assessments while TACs are being fully caught. A survey and stock assessment are scheduled for 2022.</p> <p>SEMAC noted there are inherent uncertainties in the Tier 1 stock assessment, however given the current status of the stock, there is little risk to the sustainability of the stock if the agreed TAC was fully caught. SEMAC noted that the large change limiting rule would constrain the agreed TAC for the 2022-23 fishing year at 18,275 t</p> <p>There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.</p>		
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)
10	10	2	18,275
AFMA Advice			

Noting application of the large change limiting rule, AFMA Management recommends a TAC of 18,275 t for the 2022-23 fishing year, a single year TAC, with the stock assessment to be updated in 2022 to include acoustic data collected in 2019, 2020 and 2021. AFMA recommended overcatch and undercatch provisions are set at 10 per cent, and a determined amount of 2 t.

2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overtake & undercatch (%)	Determined amount (t)	Change in TAC (t)
12,183	18,275	10	2	+ 6,092

Blue warehou

Seriolella brama



ABARES (2012): Line Drawing – Rosalind Poole

Species summary					
Common names	Black trevally, sea bream, snotty trevala				
Stock assessment	Tier 4 Species - last assessed by ShelfRAG in 2013.				
Stock structure	There is good evidence that there are two stocks of blue warehou, east and west of the Bass Strait; however the stock is managed under a single TAC.				
East Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2013	0.1861	2.0717	0.8287
	4	2012	0.2214	2.0055	0.8022
	4	2011	0.2219	1.939	0.7756
West Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	Biomass	Target	Limit
	4	2013	0.2681	1.9249	0.7699
	4	2012	0.307	1.8679	0.7472
	4	2011	0.349	1.8175	0.727
Stock trend and other indicators	<p>The last agreed Tier 1 assessment in 2006, estimated the eastern stock to be depleted below the limit reference point. In 2013, blue warehou was assessed as a Tier 4 species and was assessed as being below the limit reference point.</p> <p>In contrast, the western stock was thought to be above the limit reference point and close to the biomass maximum sustainable yield (B_{40}) level. However, the 2006 assessment predicted that the western stock will have dropped below the limit reference point by 2007 if the landed catches remained high and if recruitment was average.</p> <p><u>Biomass trend</u></p> <p>The standardised CPUE for both stocks continue to be low and declining in 2020, however, due to avoidance of blue warehou by operators, the use of CPUE as an index of abundance is no longer considered reliable.</p> <p><u>Catch against TAC</u></p> <p>Since the implementation of the Blue Warehou Rebuilding Strategy in 2008, the TAC has decreased from 365 t in 2008-09, to an incidental bycatch TAC of 183 t in 2009-10 and 2010-11, 133 t in 2011-12, 118 t in 2012-13 and then 50 t in 2021-22.</p> <p>Commonwealth catches have always been less than the incidental TAC, with the TAC being 20 per cent caught in 2020-21.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	

	N/A – Rebuilding species		N/A	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22	50	50	-
	2020-21	118	118	24
	2019-20	118	118	10
	2018-19	118	118	54
Economics (Secondary) Commonwealth Trawl and Scalefish Hook	Financial year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	<0.01	51.34	<0.02
	2018-19	0.17	49.47	0.34
	2017-18	0.11	41.86	0.26
ABARES Status (2021 Report)	Fishing Mortality: Uncertain		Biomass: Overfished	
Assessment summary				
Key model technical assumptions/ parameters	The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed significantly since the reference period to the end of the most recent year. Due to low catches and avoidance behaviour, CPUE is no longer considered a reliable index of abundance for this species.			
Significant changes to data inputs	N/A			
Data and RAG comments	Logbook catch and effort data is the only information available for this species – age and length data are not collected. SERAG (November 2018) noted a significant increase in estimated discards in 2017 for the eastern stock – 91 per cent and 216 t. This was influenced by a single observed Danish seine trip where a large amount of small fish were discarded. Recent estimates of discards are much lower – the 2018 estimate was 65 per cent and 28 t, and the 2020 estimate was 73 per cent and 6 t.			
Stock assessment information and RAG comments	An alternative primary index of abundance needs to be developed as a high priority for use in future stock assessments, and this species should be considered as a candidate for application of close-kin genetics assessments. SERAG (December 2020) considered the review of the Blue Warehouse Rebuilding Strategy and noted there is no reliable data with which to assess the status of the stock or inform rebuilding timeframes. The focus of the revised Blue Warehouse Rebuilding Strategy is to			

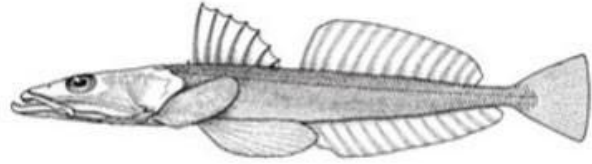
	<p>establish a reliable index of abundance and consider available information with which to update expected rebuilding timeframes.</p> <p>AFMA commenced a five-year review of the Blue Warehou Rebuilding Strategy in November 2019, and sought public comment on the revised Blue Warehou Rebuilding Strategy from 15 January to 12 February, 2021. AFMA are currently finalising the revised Blue Warehou Rebuilding Strategy with a view to having it published in 2022.</p> <p>SERAG (November 2021¹⁵) considered a companion species analysis which investigated the link between target species catch and the associated level of unavoidable bycatch of recovering species. The analysis incorporated a range of factors such as area, depth fished and gear type – also known as metiers.</p> <p>Using logbook data from 2019 and 2020, and expected 2022-23 TACs for the main companion species, the estimated unavoidable bycatch of blue warehou for 2022 is 11.4 t, with a range between 7.0 and 17.6 t – a decrease from 29.1 t in 2021.</p>		
Species specific research and priorities			
Blue warehou have been identified as a species for application of Close-Kin Mark-Recapture (CKMR) to establish an abundance of index and monitor the status of the stock.			
RAG Recommendations			
The metier and bycatch analysis does not identify any cause for concern in the predicted 2022 target species catches, which are estimated to be below the incidental catch limit of 50 t. On the basis that the current bycatch TAC remains appropriate within the context of the Blue Warehou Rebuilding Strategy, SERAG recommended maintaining the 50 t incidental bycatch TAC.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2022	0	No. Rebuilding species.
	2021	0	
	2020	0	
Discount factor (t)	N/A	Discount factor not applied to incidental bycatch TAC.	
State catch (t)	East = 2.3 West = 2.3	State catches are not deducted from the bycatch TAC.	
Discards (t)	East = 30.8 West = N/A	There are no estimates of discards in the west. Discards are not deducted from the bycatch TAC.	
Recreational catch (t)	N/A	Tasmanian recreational catch estimates are available for 1997 (101.9 t), 2001 (19.5 t), 2008 (11.9 t), 2010 (32.5 t), 2013 (15.4 t) and 2018 (0.8 t).	

¹⁵ Minutes from this meeting are currently being finalised

Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		0 t - Incidental bycatch TAC.		
MAC Recommendations				
Commercial fishers' interests	No specific commercial fisher interests have been identified.			
Species specific management (target, companion and bycatch)	This species is managed under the Blue Warehou Stock Rebuilding Strategy . AFMA are currently finalising the revised Blue Warehou Rebuilding Strategy with a view to having it published in 2022.			
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>50 t – single-year bycatch TAC</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted recent catches are well below the bycatch TAC, however further reductions to the bycatch TAC are unlikely to have a material impact on total mortality.</p> <p>SEMAC also noted that measures introduced to reduce catches of eastern jackass morwong will likely also reduce catches of blue warehou, and the focus of the rebuilding strategy for blue warehou should continue to be reducing total mortality and establishing an index of abundance.</p> <p>There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.</p>			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
0	0	2	50	
AFMA Advice				
AFMA Management recommends maintaining the bycatch TAC of 50 t for the 2022-23 fishing year. The revised Blue Warehou Rebuilding Strategy is expected to be published in 2022 and will continue to be the focus for management of this species.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
50	50	0	2	0

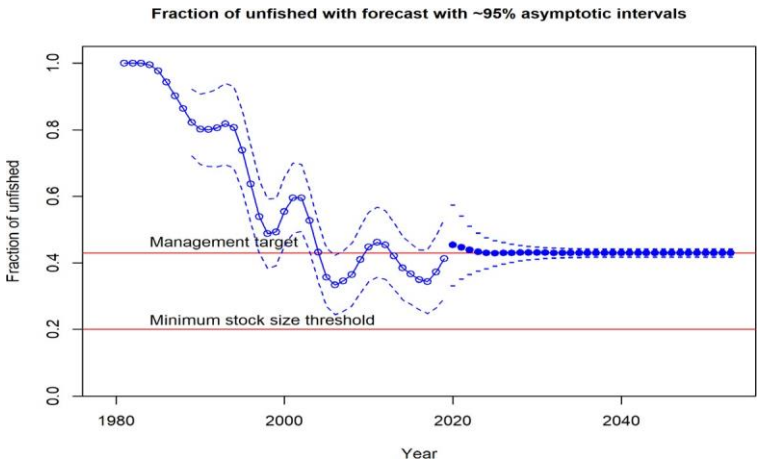
Deepwater flathead

Neoplatycephalus conatus



Species summary						
Common names	Deepwater flathead, deep sea flathead, trawl flathead					
Stock assessment	Tier 1 Species - last assessed by GABRAG in December 2019.					
Stock structure	Assessed as a single stock.					
Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2019	45	45	43	20
	1	2016	45	34		
	1	2013	45	38		
Stock trend and other indicators	<p>While remaining above target, estimated spawning biomass suggests a gradual decline toward the target since 2012-2013.</p> <p>The spread of recent age data indicates the stock is responding to a reduction in fishing effort.</p>					
Multi-Year TAC	Year of MYTAC (2021-22)				Has the MYTAC advice been revised?	
	2 nd of three-year				Yes Assessment year extended to 2024 in place of Bight redfish .	
Catch and TAC (t)	SESSF fishing year		Agreed TAC		TAC after unders/overs	Cth Retained Catch
	2021-22		1,238		1,362	-
	2020-21		1,238		1,349	629
	2019-20		1,128		1,229	694
	2018-19		1,128		1,241	529
Economics (Primary) Great Australian Bight Trawl	Financial year		Species GVP (\$m)		Fishery GVP (\$m)	% Fishery GVP
	2019-20		6.52		10.76	60.59
	2018-19		4.14		8.48	48.82

	2017-18	4.57	9.16	49.89
ABARES Status (2021 Report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	Single stock (Zone 80) Two sex model One fleet: Trawl (separated for different sources of length data – ISMP, Industry, GABFIS) Selectivity allowed to vary between GABFIS trawl fleet Discards: minimal (ignored) <i>M</i> : estimated at 0.263 Recruitment: estimated 1980 to 2013 (previously 2011)			
Significant changes to data inputs	Updated software: from SS-V3.24U to SS-V3.30.14.05 Apply new features in Stock Synthesis (SS) to allow better tuning of length and age data, automatically tune abundance indices Retune translated model using current model tuning protocols (revised since 2015) Final year 2018, add catch to 2018-19 Add GABFIS indices for 2017-18 Update CPUE to April 2019 Update length frequency data to 2018-19 Add updated age error matrix, age-at-length data to 2017-18 and GABFIS age-at-length data Final year of recruitment estimation changed to 2013 Retune using latest tuning protocols, including Francis weighting on lengths and ages.			
Data and RAG comments	Danish seine catches are included in the base case assessment as part of the trawl catch. A sensitivity was conducted to include a separate Danish seine fleet, with catches, age and length data from the Danish seine boat. This increased the estimates of biomass over time. However, there is not enough length data for this to be considered as a new base case; and the changes in biomass needed further exploration. GABRAG had previously noted that it would be useful to undertake a meta-analysis to better understand the value for natural mortality (<i>M</i>) in the assessment. The 2019 assessment shows a likelihood profile suggesting a plausible range between 0.233 and 0.3, with the model estimating <i>M</i> at 0.263. Industry noted that catch rates in October and November 2019, are the best they’ve seen in a long time and reflect catches in 2016. Industry have observed that deepwater flathead appear to be shifting to shallower depths. There also appears to have been a temporal shift in the spawning season for deepwater flathead.			
Stock assessment information and RAG comments	GABRAG (November 2019) suggested that more data is required before Danish seine can be included as a separate fleet; and should remain as a sensitivity.			

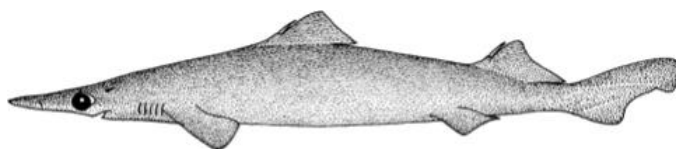
	<p>Bridging analysis: adding catch, CPUE and GABFIS indices made very little difference to the estimate of biomass. Adding age and length data to 2018 resulted in a lower estimate of biomass trend over time. There is a divergence in the estimate of biomass from about 2012, when age data was added, which is likely driven by the influence of age estimates on recruitment. The updated tuning protocol returns the Spawning Stock Biomass (SSB) trajectory to near target levels.</p> <p>Model fits to ages and lengths are good, and both improved once tuned. Fits to CPUE are good, whereas the fits to the GABFIS estimates are poor for the last two survey points.</p> <p>The GABFIS and commercial CPUE data shows a recent decrease in catch rates, however, the age and length data are more positive. The model does not fit the most recent GABFIS or CPUE points, which is likely due to a conflict in the data with ages and lengths.</p> <p>Catches of deepwater flathead have decreased since 2012; the last two years catches are the lowest since 1999. The decrease in 2014 was attributed to the seismic survey that was also conducted that year.</p> <p>Recruitment deviations show poor recruitment for the period 2008-2011, however, recruitments in 2012 and 2013 have recovered to just below, and just above average recruitment, respectively.</p> <p>While it is based on the estimate of 2018 biomass, likelihood profiles suggest biomass is not well determined; with a broad range of SSB_{2018} (2,250–5,000 t), with the most likely value 3,350 t.</p> <p>GABRAG (November 2019) expressed concern that the assessments are not impacted by the recent GABFIS abundance estimates and the latest catch data; both of which are indicating that the stock is declining.</p> <p>GABRAG (October 2021) noted biomass estimates of deepwater flathead (5,225 t, CV 0.08) and, particularly Bight redfish (3,447 t, CV 0.21) show continued decline (2021, 2018, 2015) relative to estimates provided from surveys from 2005–2011. However, 2021 estimates for deepwater flathead are more than 50 per cent greater than 2018 estimates (3,396 t, CV 0.06) (Knuckey et al, 2021).</p>
Projected biomass	<p>The 40-year projection depends on the RBC being caught each year, which GABRAG noted was unlikely due to the low number of boats operating in the fishery (Figure 10).</p>  <p>Figure 10: The projected relative spawning biomass trajectory for the deepwater flathead assessment (Tuck, Day and Burch 2019).</p>

Species specific research and priorities

There are no species-specific research priorities identified.			
RAG Recommendations			
<p>GABRAG (October 2021) recommended maintaining the current RBC of 1,238 t for deepwater flathead for the 2022-23 fishing year. Fisheries indicators are to be monitored annually to ensure key inputs to the Tier 1 assessment (CPUE, age/length frequencies) do not change.</p> <p>GABRAG also recommended extending the MYTAC period and scheduling the deepwater flathead stock assessment for 2024 to allow for the Bight redfish assessment to be brought forward to 2022 (see Bight redfish advice). GABRAG will consider time-based discount factor when recommending future TACs.</p>			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2022	1,224	Yes. 3-year MYTAC recommended using 3-year average of 1,238 t
	2021	1,238	
	2020	1,253	
	3-year average	1,238	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.	
State catch (t)	N/A	There are no estimates of State catches.	
Discards (t)	N/A	Discards are considered to be low, 1.9 t, and are not included in the RBC.	
Recreational catch (t)	N/A	There are no estimates of recreational catch.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		1,238 t	
MAC Recommendations			
Commercial fishers' interests	No specific commercial fisher interests have been identified.		
Species specific management (target, companion and bycatch)	GABRAG noted that deepwater flathead effort contributes to catches of other commercial species in the GAB (i.e. Bight redfish).		
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>1,238 t – third year of three-year MYTAC</p> <p>SEMAC advice and any dissenting views</p> <p>There were no dissenting views and GABMAC were comfortable with the advice provided in the paper.</p>		

Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	1,238	
AFMA Advice				
AFMA Management recommends a TAC of 1,238 t for the 2022-23 fishing year, the third year of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
1,238	1,238	10	2	0

Deepwater shark basket - east



Species summary					
Common names	<p>Dogfish (<i>Centroscyllium</i> sp.), sleeper shark (<i>Centroscyrnus</i> sp.), kitefin shark (<i>Dalatias</i> sp.), roughskin shark (<i>Deania</i> sp.), lantern shark (<i>Etmopterus</i> sp.)</p> <p>The deepwater shark basket quota includes multiple mid-slope species of deepwater sharks: brier shark (<i>Deania calcea</i>), platypus shark (<i>Deania quadrispinosa</i>), Plunket's shark (<i>Centroscyrnus plunketi</i>), roughskin shark (<i>Centroscyrnus</i> and <i>Deania</i> spp), pearl shark (<i>D. calcea</i> and <i>D. quadrispinosa</i>), black shark (<i>Centroscyrnus</i> spp), lantern shark (<i>Etmopterus</i> spp), dogfish family squalidae and other sharks.</p>				
Stock assessment	Last assessed by SERAG in 2021 using weight of evidence – a Tier 5 approach will be developed for 2022.				
Stock structure	<p>Little is known about the stock structure of deepwater sharks. They are benthic-pelagic species that have been sampled in oceanic environments over the abyssal plains and are distributed widely across ocean basins and along the middle and lower continental shelves.</p> <p>The eastern management area extends from NSW around the Tasmanian east coast and up the Tasmanian west coast to 42°S (approximately Strahan), including to the centre of Bass Strait to 146°22'E.</p>				
Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	Weight of evidence	2021	SERAG considered available indicator data and noted there were no immediate risks to stock sustainability. A Tier 5 approach will be developed for 2022.		
	4	2018	0.5332	1.1592	0.4830
	4	2017	0.5244	1.0699	0.4458
Stock trend and other indicators	There is little information with which to determine stock status or trends. SERAG (October 2021 ¹⁶) considered the available indicator data, including catch, effort and species composition data, and noted little concern. Additional data will be reviewed in 2022 with a view to undertaking a Tier 5 analysis in 2022.				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	3 rd of three year			N/A – TAC advice updated in 2021	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	24	26	-	

¹⁶ Meeting minutes are currently being finalised

	2020-21	24	25	18
	2019-20	24	26	21
	2018-19	23	27	19
Economics (Secondary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	Not Available	51.34	Not Available
	2018-19	Not Available	49.47	Not Available
	2017-18	Not Available	41.86	Not Available
ABARES Status (2021 report)	Fishing Mortality: Uncertain		Biomass: Uncertain	
Assessment summary				
Key model technical assumptions/ parameters	N/A			
Significant changes to data inputs	N/A			
Data and RAG comments	<p>Species catch composition varies over time and between logbooks, Catch Disposal Records (CDRs) and observer records. Recent observer records show most of the catch is made up of the two <i>Deania</i> species - brier shark (<i>Deania calcea</i>) and platypus shark (<i>Deania quadrispinosa</i>) – which comprise most of the landed catch and are also often recorded in logbooks and CDRs as pearl sharks.</p> <p>Length frequency information is only available for brier shark, and there is no obvious trend over time. Various research survey data (Kapala, Southern Surveyor, Soela) are available but there are no obvious trends.</p>			
Stock assessment information and RAG comments	<p>A deepwater shark working group agreed a five-step process to inform the RBC for deepwater shark basket for the 2022-23 fishing year:</p> <ol style="list-style-type: none">1. Estimate the level of unavoidable bycatches (via métier analysis including companion species), and how they compare with estimated total catches (including discards).2. Use the FishPath¹⁷ tool to identify the best performance indicators (either empirical or analytically-derived), possibly including some catch-only methods (ensuring that there is a full understanding of knowledge gaps etc. to aid informed decisions).3. Review these performance indicators and tabulate results, with caveats and assumptions explicitly listed, to see whether things are improving or getting worse (on a weight-of-evidence basis).4. Develop east and west deepwater shark TACs for the 2022-23 year on the following basis:			

¹⁷ FishPath is an online tool which guides users through a series of questions regarding economic, operational, biological, ecological and governance characteristics of the fishery which are then applied to a decision framework that matches responses to all available data collection, assessment, and management measure options.

	<ul style="list-style-type: none"> • Maintain the current TAC if the 2021-22 TAC: <ul style="list-style-type: none"> ○ is already at the level of minimum unavoidable bycatch; or ○ is above unavoidable catch and indicators are stable or showing an increase; • Reduce the TAC based on estimates of unavoidable bycatch if indicators show there is a risk to the species. <p>SERAG (October 2021¹⁸) agreed there was little risk to the stocks in the short term of adopting the previous TACs, particularly given the protection afforded by the deepwater closures and no clear negative indicators. SERAG suggested the extensive deepwater closures offered sufficient protection and the application of a discount factor was not required.</p> <p>In order to better inform future assessment and management options, SERAG supported the working group drafting a report that synthesises historical deepwater shark management arrangements, catch and discard species composition, market demands, protection afforded by closures etc. to better inform the development of Tier 5 approaches for these species.</p> <p>Based on the information collected under step 5 above, the Working Group will reconvene in 2022 to work through the FishPath tool and identify viable Tier 5 assessment options to inform a TAC for the 2023-24 fishing year.</p>
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Species specific research and priorities

A deepwater shark working group will convene in 2022 to collate all available information and use the FishPath tool identify viable Tier 5 options.

RAG Recommendations

SERAG (October 2021¹⁹) recommended maintaining the 2021-22 TACs for the 2022-23 fishing year.

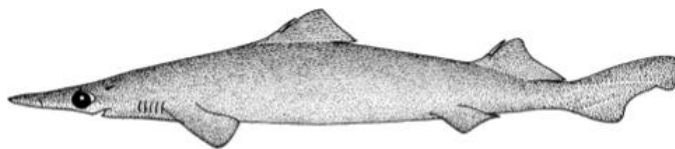
	Year	RBC (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2022	N/A	No. SERAG recommended a single year TAC.
	2021	10	
	2020	10	
Discount factor (t)	N/A	SERAG recommended not applying a discount factor given the protection afforded to the stock by closures.	
State catch (t)	0.5		
Discards (t)	N/A	There are reliable estimates of discards for the eastern species basket.	
Recreational catch (t)	N/A	There are no estimates of recreational catch.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	

¹⁸ Minutes from this meeting are currently being finalised

¹⁹ Minutes from this meeting are currently being finalised

Provisional TAC under the Harvest Strategy	24 t – carried over from the 2021-22 fishing year.			
MAC Recommendations				
Commercial fishers' interests	No specific commercial fisher interests have been identified.			
Species specific management (target, companion and bycatch)	A large proportion (>54%) of the catch (east and west combined) was previously taken in waters >700m and most of these areas are now closed (AFMA report 2008-836).			
MAC advice and any dissenting views	2022-23 TAC recommendation 24 t - single year TAC SEMAC advice and any dissenting views There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	24	
AFMA Advice				
AFMA Management recommends maintaining the 2021-22 TAC of 24 t for the 2022-23 fishing year, a single year TAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t. Further work is scheduled for 2022 to support the TAC setting process for the 2023-24 fishing year.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
24	24	10	2	0

Deepwater shark basket - west



Species summary					
Common names	<p>Dogfish (<i>Centroscyllium</i> sp.), sleeper shark (<i>Centroscomnus</i> sp.), kitefin shark (<i>Dalatias</i> sp.), roughskin shark (<i>Deania</i> sp.), lantern shark (<i>Etmopterus</i> sp.)</p> <p>The Deepwater Shark Basket quota includes multiple species of deepwater sharks: brier shark (<i>Deania calcea</i>), platypus shark (<i>Deania quadrispinosa</i>), Plunket's shark (<i>Centroscomnus plunketi</i>), roughskin shark (<i>Centroscomnus</i> and <i>Deania</i> spp), pearl shark (<i>D. calcea</i> and <i>D. quadrispinosa</i>), black shark (<i>Centroscomnus</i> spp), lantern shark (<i>Etmopterus</i> spp), dogfish family squalidae and other sharks.</p>				
Stock assessment	Last assessed by SERAG in 2021 using weight of evidence – a Tier 5 approach will be developed for 2022.				
Stock structure	Little is known about the stock structure of deepwater sharks. They are benthic-pelagic species that have been sampled in oceanic environments over the abyssal plains and are distributed widely across ocean basins and along the middle and lower continental shelves. The western management area extends from the Tasmanian west coast Latitude 42° S (approximately Strahan), around to WA.				
Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2018	0.7292	0.6073	0.253
	4	2017	0.6792	0.6027	0.2511
	4	2013	0.9554	0.5169	0.2068
Stock trend and other indicators	<p>While there has been a general increase in standardised CPUE since 2014, it is not considered a reliable index of abundance. There is little additional information with which to determine stock status or trends. SERAG (October 2021²⁰) considered the available indicator data, including catch, effort and species composition data and did not note any concerns regarding stock status.</p> <p>Additional data will be reviewed in 2022 with a view to undertaking a Tier 5 analysis in 2022.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	3 rd of three year			N/A – TAC advice updated in 2021	
Catch and TAC (t)	SESSF fishing year	Agreed TAC		TAC after unders/overs	Cth Retained Catch
	2021-22	235		250	-
	2020-21	235		252	96

²⁰ Minutes from this meeting are currently being finalised

	2019-20	235	255	85
	2018-19	264	281	79
Economics (Secondary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	Not Available	51.34	Not Available
	2018-19	Not Available	49.47	Not Available
	2017-18	Not Available	41.86	Not Available
ABARES Status (2021 report)	Fishing Mortality: Uncertain		Biomass: Uncertain	
Assessment summary				
Key model technical assumptions/ parameters	N/A			
Significant changes to data inputs	N/A			
Data and RAG comments	<p>Species catch composition varies over time and between logbooks, CDRs and observer records. Recent observer records show most of the catch is made up of the two <i>Deania</i> species - brier shark (<i>Deania calcea</i>) and platypus shark (<i>Deania quadrispinosa</i>) – which comprise most of the landed catch and are also often recorded in logbooks and CDRs as pearl sharks.</p> <p>Length frequency information is only available for brier shark, and there is no obvious trend over time. Various research survey data (Kapala, Southern Surveyor, Soela) are available but there are no obvious trends.</p>			
Stock assessment information and RAG comments	<p>A deepwater shark working group agreed a five-step process to inform the RBC for deepwater shark basket for the 2022-23 fishing year:</p> <ol style="list-style-type: none">1. Estimate the level of unavoidable bycatches (via métier analysis including companion species), and how they compare with estimated total catches (including discards).2. Use the FishPath²¹ tool to identify the best performance indicators (either empirical or analytically-derived), possibly including some catch-only methods (ensuring that there is a full understanding of knowledge gaps etc. to aid informed decisions).3. Review these performance indicators and tabulate results, with caveats and assumptions explicitly listed, to see whether things are improving or getting worse (on a weight-of-evidence basis).4. Develop east and west deepwater shark TACs for the 2022-23 year on the following basis:<ul style="list-style-type: none">• Maintain the current TAC if the 2021-22 TAC:<ul style="list-style-type: none">○ is already at the level of minimum unavoidable bycatch; or○ is above unavoidable catch and indicators are stable or showing an increase;			

²¹ FishPath is an online tool which guides users through a series of questions regarding economic, operational, biological, ecological and governance characteristics of the fishery which are then applied to a decision framework that matches responses to all available data collection, assessment, and management measure options.

	<ul style="list-style-type: none">Reduce the TAC based on estimates of unavoidable bycatch if indicators show there is a risk to the species. <p>SERAG (October 2021²²) agreed there was little risk to the stocks in the short term of adopting the previous TACs, particularly given the protection afforded by the deepwater closures and no clear negative indicators. SERAG suggested the extensive deepwater closures offered sufficient protection and the application of a discount factor was not required.</p> <p>In order to better inform future assessment and management options, SERAG supported the working group drafting a report that synthesises historical deepwater shark management arrangements, catch and discard species composition, market demands, protection afforded by closures etc. to better inform the development of Tier 5 approaches for these species.</p> <p>Based on the information collected under step 5 above, the Working Group will reconvene in 2022 to work through the FishPath tool and identify viable Tier 5 assessment options to inform a TAC for the 2023-24 fishing year.</p>		
Species specific research and priorities			
A deepwater shark working group will convene in 2022 to collate all available information and use the FishPath tool identify viable Tier 5 options.			
RAG Recommendations			
SERAG (October 2021 ²³) recommended maintaining the 2021-22 TACs for the 2022-23 fishing year.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2022	N/A	No. SERAG recommended a single year TAC.
	2021	235	
	2020	235	
Discount factor (t)	N/A	SERAG recommended not applying a discount factor given the protection afforded to the stock by closures.	
State catch (t)	1.5		
Discards (t)	42.2	Discards were not used in the previous Tier 4 assessment because they are poorly estimated and as such were not deducted from the RBC.	
Recreational catch (t)	N/A	There are no estimates of recreational catch.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	

²² Minutes from this meeting are currently being finalised

²³ Minutes from this meeting are currently being finalised

Provisional TAC under the Harvest Strategy	235 t – Carried over from the 2021-22 fishing year.			
MAC Recommendations				
Commercial fishers' interests	No specific commercial fisher interests have been identified.			
Species specific management (target, companion and bycatch)	A large proportion (>54%) of the catch (east and west combined) was previously taken in waters >700m and most of these areas are now closed (AFMA report 2008-836).			
MAC advice and any dissenting views	2022-23 TAC recommendation 235 t - single year TAC SEMAC advice and any dissenting views There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	235	
AFMA Advice				
AFMA Management recommends maintaining the 2021-22 TAC of 235 t for the 2022-23 fishing year, a single year TAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t. Further work is scheduled for 2022 to support the TAC setting process for the 2023-24 fishing year.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
235	235	10	2	0

Elephant fish

Callorhinchus milii



Ken Graham DPI Fisheries (1984)

Species summary					
Common names	Ghost shark, elephant shark, whitefish, plownose chimaera				
Stock assessment	Last considered by SharkRAG in 2020 using a weight of evidence approach.				
Stock structure	Little is known about stock structure from an assessment and management perspective. Their biology suggests some potential for regional management of stocks. However it is currently assessed as a single stock.				
Stock status against reference points (C _{Lim} /C _{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	Weight of evidence approach	2020	F<F _{MSY}	N/A	N/A
	4	2018	0.8656	0.844	0.422
	4	2015	1.0257	0.9750	0.3901
Stock trend and other indicators	<p>Following the advice from the SESSFRAG Technical Working Group (TWG), SESSFRAG (August 2019) recommended assessing elephant fish using a 'weight of evidence approach' recognising issues with the Tier 4 assessment due to high discard rates. This method sets a TAC based on the existing TAC, subject to sustainability concerns of SharkRAG and consideration of whether the TAC is restricting catches of that species or any other species.</p> <p>The SESSFRAG TWG recommended this method be used as an interim approach pending the outcomes of the multi-species harvest strategy project.</p> <p>SharkRAG (January 2020) suggested utilising recreational catch data as a potential source of information when considering future TACs.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)		Has the MYTAC advice been revised?		
	Second year of 3-year MYTAC		No		
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22		114	124	-
	2020-21		114	123	37
	2019-20		114	124	47
	2018-19		114	125	51
Economics	Financial Year		Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP

(Byproduct) Gillnet, Hook and Trap	2019-20	0.06	19.67	0.31
	2018-19	<0.10	23.66	<0.42
	2017-18	<0.10	19.51	<0.51
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	N/A - Tier 4 Model no longer used.			
Significant changes to data inputs	N/A - Tier 4 Model no longer used.			
Data and RAG comments	<p>At its February 2018 meeting, SharkRAG considered that neither Tier 4 assessment presented (including or excluding discards) were suitable for providing RBC advice. SharkRAG rejected the assessments because of concerns about the:</p> <ul style="list-style-type: none">• lack of a recent and reference period discard information, and how discard rates are estimated;• ability to factor discarding appropriately into CPUE; and• uncertain estimates of recreational catch, which are a significant proportion of either RBC. <p>SharkRAG felt that in the application of either Tier 4 method, a prohibitively low TAC would be driven by the assumptions about discards and recreational catch, whereas the CPUE itself suggests that stocks are stable at or above target levels.</p> <p>At its October 2018 meeting, SharkRAG was asked to provide 2019-20 RBC advice for elephant fish. SharkRAG deferred updating the 2017 Tier 4 assessment until the SESSF TWG had provided advice on species identified as ‘difficult to assess’.</p>			
Stock assessment information and RAG comments	<p>Recognising issues with the Tier 4 assessment, SESSFAG (August 2019) recommended setting the 2020-21 TAC for elephant fish using a weight of evidence approach, including recent catches and the outcomes of the most recent Ecological Risk Assessment (ERA). Considering the outcomes of the most recent ERA, SharkRAG (January 2020) recommended a three year MYTAC of 114 t.</p> <p>At its January 2020 meeting, SharkRAG noted the “low risk” status of elephant fish from the ERA for the shark gillnet sub-fishery 2012-2016. However, SharkRAG expressed concerns regarding their ability to make a justified recommendation based on limited data other than the ERA results for the species.</p>			
Species specific research and priorities				
There is no species-specific research currently underway or identified as future priorities.				
RAG Recommendations				
SharkRAG (January 2020) recommended maintaining the TAC at the current level of 114 t for three years, noting limited sustainability concerns and after consideration of whether the TAC is restricting catch of the species.				

	Year	RBC (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2022	N/A	Yes. Three-year MYTAC using annual TAC of 114 t.
	2021	N/A	
	2020	N/A	
Discount factor (t)	N/A	A discount factor is not applied as the TAC is set based on a weight of evidence approach.	
State catch (t)	N/A	State catches are estimated to be 3.1 t. These are considered as part of the weight of evidence approach but are not deducted from the TAC.	
Discards (t)	N/A	Discards are considered to be high, 114 t. These are considered as part of the weight of evidence approach but are not deducted from the TAC.	
Recreational catch (t)	N/A	The only estimates of recreational catch are 45 t for Victoria in 2008. These are considered as part of the weight of evidence approach, but are not deducted from the TAC.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		114 t	
MAC Recommendations			
Commercial fishers' interests	SharkRAG industry members have previously expressed that a precautionary long-term TAC should be set for elephant fish, as the TAC level does not influence landings. Industry members have noted that the landed value of elephant fish is less than the cost of leasing quota.		
Species specific management (target, companion and bycatch)	There are no identified implications for target, companion and bycatch species.		
MAC advice and any dissenting views	2022-23 TAC recommendation 114 t – third year of a three-year MYTAC SEMAC advice and any dissenting views Discards are relatively high due to low market value – often less than the lease price. Elephant fish have been assessed as a species of least concern in the IUCN Red List (global assessment). SEMAC noted this is the final year of a 3-year MYTAC. The recreational member noted the lack of recreational data. Recreational catch in Victoria is uncertain but potentially influential on the stock. There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.		
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)

10	10	2	114	
AFMA Advice				
AFMA Management recommends maintaining the 2021-22 TAC of 114 t for the 2022-23 fishing year, the third year of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
114	114	10	2	0

Flathead

Neoplatycephalus richardsoni



Species summary						
Common names	King flathead, trawl flathead, deep-sea flathead					
Stock assessment	Tier 1 Species - last assessed by SERAG in December 2019. Partial update considered in 2021.					
Stock structure	For management purposes a single continuous stock has been assumed throughout all zones of the SESSF.					
Stock status against reference points (%B ₀ in year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2019	33	33	40	20
	1	2016	42	34		
	1	2013	50	39		
Stock trend and other indicators	<p>Otter board trawl CPUE in Zone 30 (east coast of Tasmania) - the annual standardized CPUE trend was noisy and flat between 1986 -2001, and after a transitional period between 2002 - 2006 during which catches surged, was noisy and flat from 2007 to 2020. Annual catches have increased again in more recent years (Sporcic, 2021b).</p> <p>Otter board trawl CPUE in Zones 10 and 20 - annual standardized CPUE appears cyclical above and below average, has remained below average in 2017-2018 and increased to the long-term average in 2019 and 2020 (Sporcic, 2021b).</p> <p>Danish seine in Zone 20 and 60 - annual standardized CPUE appears cyclical above and below average and has remained below average since 2012. There has also been an overall decrease over the 2007-2020 period. The 2020 catch (791.2 t) by Danish seine in zones 20 and 60 is the second lowest since 1997 (Sporcic, 2021b)</p>					
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?		
	2 nd of 3-year			No		
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs		Cth Retained Catch
	2021-22		2,333	2,361		-
	2020-21		2,010	2,236		2,183
	2019-20		2,468	2,695		1,967

	2018-19	2,507	2,761	2,039
Economics (Primary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	12.96	51.34	25.24
	2018-19	13.16	49.47	26.60
	2017-18	15.78	41.86	37.70
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	The current 2019 assessment assumes a single growth curve for the whole stock, an assumption also made in previous assessments.			
Significant changes to data inputs	The following were included in the updated 2019 assessment: <ul style="list-style-type: none">- Recruitment estimated from 1915 to 2015;- Length frequency data from the 2008, 2010, 2012, 2014 and 2016 CTSFIS;- Age-at-length data from the 2008 CTSFIS; and- CTS FIS abundance indices			
Data and RAG comments	2019 Catch rates have been lower over the past few years out of Lakes Entrance. There are 12-15 Danish seine boats working similar grounds, and access to those grounds have been impacted by entrants to the Victorian octopus fishery. The poor recruitment estimated in 2014 is not reflected in the 2018 length frequency data. There is a need to investigate spatial differences in growth parameters between eastern Tasmania and other regions. There was a question around the post-capture mortality assumed in the assessment, noting the susceptibility score in the 2007 ERA considered post-capture mortality was not 100 per cent.			
Stock assessment information and RAG comments	2019 Updates to the software (SS-V3.24Z to SS-V3.30.14.05) affected historical estimates of biomass but made very little difference to the estimate of current spawning biomass. Recent recruitments are well estimated, and the last three years of recruitment estimates, including a reduction to the 2012 estimate, have resulted in a lower estimate of current biomass. Fits to CPUE are generally poor, especially for the last six years, partly because the model is trying to fit the indices to three different fleets. An alternative discard estimate series was used (reverting to previously used methodology) which increased biomass estimates slightly, including the 2016 estimate being above the target, but the final estimate is similar. <u>Likelihood profiles</u> SSB ₀ estimated to be 22,000 t with plausible estimates ranging 15,000 – 29,000 t. SSB ₂₀₁₈ estimated to be 7,000 t with plausible estimates ranging 5,500 – 8,750 t. Current depletion estimated to be 33%B ₀ , with plausible estimates ranging 20%B ₀ to 45%B ₀ .			

	<p>Industry have noted poor catches and changes in environmental conditions, which may have implications for recruitment. SERAG recommended monitoring fishery indicators closely each year as part of the annual MYTAC analysis.</p> <p>SERAG (October 2021²⁴) considered an update to the 2019 assessment (catch and CPUE to 2020):</p> <ul style="list-style-type: none"> - Recruitment is revised downwards from 2011-16, however these were relatively small. - Danish seine CPUE declined in 2019 and 2020, and is the lowest of the whole series, whereas recent CPUE increased for trawl in zones 10, 20, and 30. - Catches were projected from 2022 using the RBCs from the 2019 model and 2021 update, and at 2400 t using the 2021 update. There is very little difference to the projected stock status and RBCs under all scenarios. - Fishwell consulting reviewed Danish seine CPUE for the purpose of a study on the impacts of a 2020 seismic survey, and found the first 6 months of 2020 were heavily impacted – this should be considered as part of the 2022 stock assessment. <p>Noting the recent decline in Danish seine CPUE series, the same decline was not evident in the eastern trawl and Tasmanian trawl CPUE. SERAG recommended maintaining the RBC advice for 2022 based on the outputs of the 2019 stock assessment.</p> <p>Steepness (h) for the 2022 assessment</p> <ul style="list-style-type: none"> - A number of sensitivities to the 2019 Tier 1 base case for flathead were explored. In the base case assessment, natural mortality (M) is typically fixed at 0.27 and h has been estimated. After minor changes to the base case (inclusion of FIS3 data length frequencies) the estimated h increased from 0.62 to 0.72, however it was poorly estimated. - For the 2019 assessment, SERAG recommended continuing to estimate h (estimated to be 0.72) and fixing M at 0.27. At its December 2019 meeting, SERAG agreed to consider how h could be fixed for the 2022 stock assessment, noting Dr Day's advice continue fixing M at 0.27, and fixing h at 0.75. - SERAG (October 2021²⁵) supported fixing M at 0.27 and fixing h at 0.75.
Projected biomass	<p>See Figure 11.</p> <p>Under average recruitment, the biomass is expected to increase to 36.7%B₀ by 2023 under the harvest control rule with RBCs of 2,334 t (2020), 2,648 t (2021) and 2,706 t (2022). If a three year average is applied (2,563 t) the biomass is expected to increase to 36.6%B₀.</p> <p>Under low recruitment, and assuming the RBC's from the average recruitment scenario are fully caught, the biomass is expected to decrease to 29.2%B₀ by 2023.</p> <p>Under high recruitment, and assuming the RBCs from the average recruitment scenario are caught, the biomass is expected to increase to 49.8%B₀ by 2023.</p> <p>While there were two years of poor recruitment in 2013 and 2014, the most recent recruitment estimate (2015) is considered to be average. While the 2015 recruitment estimate may also be revised as additional data is collected on this recruitment event, SERAG recommend setting RBCs based on average recruitment.</p>

²⁴ Minutes from this meeting are currently being finalised

²⁵ Minutes from this meeting are currently being finalised

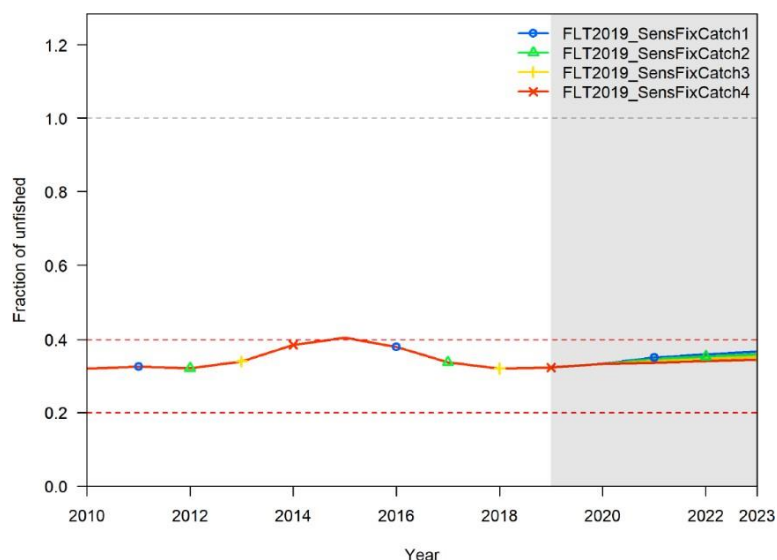


Figure 11: Relative spawning biomass (2010-2023) for four fixed catch projections under average recruitment – Catch1 used the RBC from the 2019 assessment, Catch4 uses higher RBCs from the 2016 assessment, with Catch2 and Catch3 values between them (Day, 2019).

Species specific research and priorities

There is no species-specific research currently underway or identified as future priorities.

RAG Recommendations

SERAG ([December 2019](#)) recommended a three-year RBC using either the single year RBCs or the three year average, noting the expected biomass in 2023 under each scenario is 36.7%B₀ and 36.6%B₀, respectively.

SERAG (October 2021²⁶) considered the updated 2019 stock assessment, and recommended maintaining the RBCs under the current MYTAC, noting the CPUE series were relatively stable across the relevant fleets.

Flathead are the main companion species for a number of rebuilding species, including redfish and jackass morwong. SERAG (November 2021²⁷) considered a companion species analysis using logbook data from 2019 and 2020, which estimated the unavoidable bycatch of eastern jackass morwong for 2022 ranged between 100 - 118 t, based on assumed catches of flathead of 2,000 t and 2,400 t, respectively. This is twice the total mortality of eastern jackass morwong recommended by SERAG, noting any discards would be in addition to this.

	Year	RBC (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2022	2,706	Yes. 3-year MYTAC using the single year RBCs each year.
	2021	2,648	
	2020	2,334	
	3-year average	2,563	

²⁶ Minutes from this meeting are currently being finalised

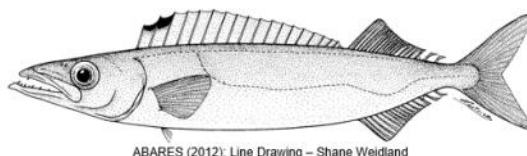
²⁷ Minutes from this meeting are currently being finalised

Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.
State catch (t)	117.8	Mostly NSW catches – NSW maintained the 2019-20 TAC of 166.9 t for the 2020-21 fishing year, which was set at the maximum annual catch during the eight year individual allocation period.
Discards (t)	181	Model estimated discards from the 2019 Tier 1 assessment are deducted from the RBC.
Recreational catch (t)	N/A	Assessment only considers tiger flathead, which are not considered a key recreational species.
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.
Provisional TAC under the Harvest Strategy		2,407 t
MAC Recommendations		
Commercial fishers' interests	Operators in the SESSF have reported declines in catch rates of flathead in the Bass Strait area.	
Species specific management (target, companion and bycatch)	Flathead are a companion species for jackass morwong. A companion species analysis considered by SERAG at their November 2021 meeting, provided estimates of unavoidable catch of eastern jackass morwong for 2022 ranged between 100 – 118 t, based on assumed catches of flathead of 2,000 t and 2,400 t, respectively.	
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>2,333 t – third year of a three-year MYTAC.</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted catches in recent years have ranged between 2,000 and 2,200 t and do not appear to have been constrained by the TAC (see 'Catch and TAC' above). The provisional flathead TAC for the 2022-23 fishing year is 2,407 t based on RBCs from the 2019 stock assessment, and accounting for other sources of mortality. This would represent an increase of 74 t from the 2021-22 agreed TAC of 2,333 t.</p> <p>SEMAC recognised the need to reduce catches of eastern jackass morwong, a companion species of flathead, which could be achieved via a reduction to the flathead TAC. However, based on the outcomes of the companion species analysis, and noting otter trawl accounts for approximately 50 per cent of the flathead catch, this would require a reduction to the flathead TAC of approximately 500 t.</p> <p>Flathead is a key economic species in the SESSF, and such a reduction to the TAC would have significant economic impacts on the fishery. SEMAC supported maintaining the 2021-22 agreed TAC of 2,333 t, noting the following:</p> <ul style="list-style-type: none"> - the outcomes of the 2022 flathead stock assessment will provide an opportunity to consider future TACs, including reductions to promote reduced catches of jackass morwong; - the effectiveness of other management measures to reduce jackass morwong catches can be reviewed as part of the TAC setting process for the 2023-24 fishing year, at which point a reduction to the flathead TAC might be necessary. 	

	There were no dissenting views and SEMAC recommended maintaining the 2021-22 TAC for the 2022-23 fishing year.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	2,333	
AFMA Advice				
<p>AFMA Management is currently considering a range of measures to be implemented early in the 2022-23 fishing year to further reduce mortality of depleted/rebuilding species on the east coast. These measures will likely include closures in areas that may overlap productive flathead grounds. The impact of these measures on flathead catches will be better understood and can be considered as part of updating the flathead stock assessment in 2022, in preparation for the 2023-24 fishing year.</p> <p>AFMA Management recommends maintaining the 2021-22 TAC of 2,333 t for the 2022-23 fishing year, the third year of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.</p> <p>Further reductions to the flathead TAC to ensure lower catches of rebuilding species, in particular jackass morwong, can be considered alongside the outputs of the updated 2022 Tier 1 flathead stock assessment, at which point the influence of the additional management measures will be better understood.</p>				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
2,333	2,333	10	2	0

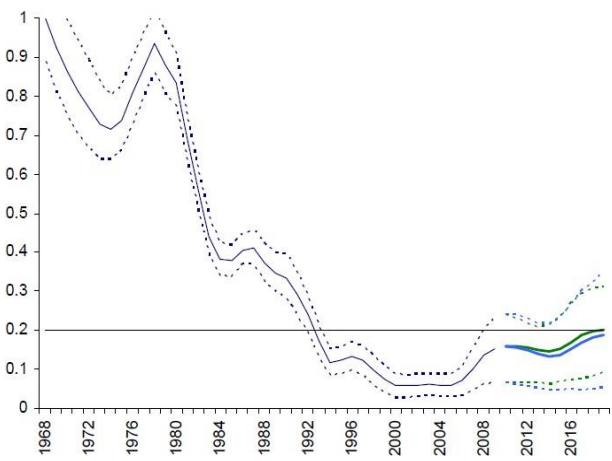
Gemfish east

Rexea solandri



Species summary					
Common names	Barraconda, common gemfish, deepsea kingfish, hake, king barracouta, king couth, silver gemfish, silver kingfish				
Stock assessment	Tier 1 Species - last assessed by ShelfRAG in 2010.				
Stock structure	<p>There are considered to be two stocks of <i>R. solandri</i> in Australia, an eastern and a western stock bordered by a boundary in the south west of Tasmania (west of 146°22'E, north of 42°43'S).</p> <p>The current assessment is based solely on eastern gemfish, caught south of Latitude 43° south off western Tasmania, and east of longitude 146° 22`.</p>				
Stock status against reference points (%B ₀ in year +1)	Tier	Year	Biomass	Target	Limit
	1	2010	15.6	48	20
	1	2008	16.5		
	1	2007	10		
Stock trend and other indicators	<p>The last updated assessment in 2010 (updated from 2008), estimated eastern gemfish to be at 16 per cent of its unfished biomass, below the limit reference point.</p> <p>The assessment model was updated in 2016 with more recent data. The updated assessment was not accepted by SERAG (November 2016), however, SERAG noted there was no evidence of stock recovery.</p>				
Multi-Year TAC	Year of MYTAC (2021-2022)			Has the MYTAC advice been revised?	
	N/A – Rebuilding species			N/A	
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22		100	100	-
	2020-21		100	99	56
	2019-20		100	100	71
	2018-19		100	100	40
Economics (Secondary)	Financial Year		Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20		0.04	51.34	0.08

Commonwealth Trawl and Scalefish Hook	2018-19	0.09	49.47	0.18
	2017-18	0.07	41.86	0.17
ABARES Status (2021 report)	Fishing Mortality: Uncertain		Biomass: Overfished	
Assessment summary				
Key model technical assumptions/ parameters	The data in the model is divided into four fleets: <ul style="list-style-type: none">- A non-trawl fleet (1993 – 2009);- A fleet targeting the winter spawning run (1975 – 2000 and inclusion of the results of the 2007 and 2008 surveys);- A non-spawning (summer) season fleet (1975 – 2009); and- A recent (spawning season) winter bycatch fleet (2000 – 2009).			
Significant changes to data inputs	N/A			
Data and RAG comments	SERAG (December 2020) noted the non-spawning CPUE index has increased over the last three years, which is consistent with industry reports of higher catch rates in 2019 and 2020. Total Commonwealth landings for 2019 were 72 t, more than double the 2018 catch of 34 t.			
Stock assessment information and RAG comments	<p>The stock assessment has not been formally updated since 2010 due to a paucity of data, and the main index of abundance is no longer considered reliable due to avoidance behaviour.</p> <p>Model fits to the non-spawning trawl fleet in the 2010 Tier 1 stock assessment were good. While not as valuable as the winter spawning index, it could be considered as an alternative index of abundance. CSIRO will clarify what is required to update the assessment, including whether the non-spawning CPUE index can be used as an index of abundance.</p> <p>Fixed catch projections from the 2010 Tier 1 assessment estimate catches of up to 100 t will allow for recovery under average recruitment. However, catch projections should be treated with caution given the failure of this species to recover since the 2010 stock assessment.</p> <p>SERAG has previously pointed out the eastern gemfish stock may now be at a new equilibrium and the stock may not rebuild under current conditions. Recent research by (Ovenden, et al., 2020) identified genetic drift and divergence as potential factors influencing the ability of gemfish stocks to rebuild.</p> <p>SERAG (December 2020) noted that total mortality for the three years immediately after the 2010 stock assessment were higher than those expected to allow for rebuilding of the stock. While the projections are based on landed catches of 100 t, the discard proportion for those years was high, between 55 and 67 per cent, resulting in total mortality of nearly double the projected catches.</p> <p>Total mortality from 2014 to 2018 was less than 100 t, and recent increases in CPUE are consistent with the modelled predicted increase in biomass when total mortality is less than 100 t.</p> <p>Eastern gemfish was scheduled for a Tier 1 stock assessment in 2022. The main index of abundance from the spawning stock is not thought to be reliable because of avoidance</p>			

	<p>behaviour, so completing a new assessment might not be possible. However, SERAG recommended at least updating the 2010 stock assessment to include catches up to 2020, and projecting forward using various fixed catches and recruitment scenarios.</p> <p>SERAG (November 2021²⁸) considered a targeting analysis for eastern gemfish as part of the 2021 annual review of the rebuilding strategy and noted:</p> <ul style="list-style-type: none"> - While catches in the northern part of the fishery have reduced, there is no apparent shift in the spatial distribution of catches. - There is no evidence of boats targeting eastern gemfish. - There are higher catches in the automatic longline hook sector in 2020, however these need to be understood before any advice around targeting or indicators of stock status can be resolved. - Standardised spawning and non-spawning CPUE has increased over the last three years, but without an assessment it isn't possible to determine whether this is indicative of an increase to biomass. - There is still some uncertainty around whether total mortality is sufficiently low to allow rebuilding – this will need to be resolved as part of updating the stock assessment in 2022. <p>SERAG (November 2021²⁹) considered a companion species analysis which investigated the link between target species catch and the associated level of unavoidable bycatch of recovering species. The analysis incorporated a range of factors such as area, depth fished and gear type – also known as metiers.</p> <p>Using logbook data from 2019 and 2020, and expected 2022-23 TACs for the main companion species (blue-eye trevalla, pink ling and blue grenadier) the estimated unavoidable bycatch of eastern gemfish for 2022 is 88.7 t, with a range between 68.9 and 111.9 t.</p>
<p>Projected biomass</p>	<p>Projections from the 2010 stock assessment indicate that with average recruitment the stock would recover to the limit reference point by 2023 which is within the rebuilding timeframe specified in the HSP. However, there is currently no reliable data with which to update the stock assessment and monitor the recovery of the stock.</p>  <p>Figure 1: Time-trajectories of spawning biomass depletion with projections under 0 t TAC (green) and 100 t TAC (blue), 0.05 and 0.95 percentile respectively (Little & Rowling 2010).</p>

²⁸ Minutes from this meeting are currently being finalised

²⁹ Minutes from this meeting are currently being finalised

Species specific research and priorities

Eastern gemfish have been identified as a candidate for application of CKMR analyses in order to establish an alternative index of abundance. A research priority has also been included in the [SESSF 2022-23 Research Statement](#) to develop a non-extractive method for establishing an index of abundance for eastern gemfish, however AFMA did not receive any research proposals for this priority.

RAG Recommendations

SERAG did not recommend an eastern gemfish incidental bycatch TAC for the 2022-23 fishing year. Instead, SERAG recommended SEMAC consider the following:

- RBCs continue to be set at zero, with bycatch TACs set at a level to cover incidental catches without promoting discarding and misreporting.
- Consider the results from the companion species analysis as well as projections from the 2010 Tier 1 stock assessment (see 'projected biomass' above).
- While total fishing mortality should be minimised to promote recovery, consideration should be given to the potential economic impact of changes to bycatch TACs or management arrangements for other key companion species (i.e. blue-eye trevalla, pink ling and blue grenadier).

Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2022	0	No. Rebuilding species
	2021	0	
	2020	0	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.	
State catch (t)	N/A	State catches, 2 t, are not deducted from the bycatch TAC but should be considered as a source of mortality.	
Discards (t)	N/A	Projections from the 2010 Tier 1 assessment are based on landed catch, and so estimates of discards (44.1 t) not deducted from the bycatch TAC but should be considered as a source of mortality.	
Recreational catch (t)	N/A	There are no estimates of recreational catch.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy	0 t - Incidental bycatch TAC		

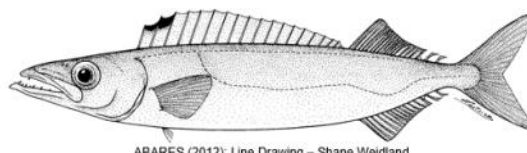
MAC Recommendations

Commercial fishers' interests	A code of conduct has been developed by SETFIA. The code includes move-on and reporting obligations to assist operators in avoiding incidental catches. SETFIA and AFMA are progressing a training course that will cover this code as well as others.
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	The hook sector has reported increased catches in the east associated with blue-eye trevalla and pink ling catches. This is consistent with a recent increase in the CPUE series			
Species specific management (target, companion and bycatch)	The species is managed under the Eastern Gemfish Stock Rebuilding Strategy 2015 . A review of the Eastern Gemfish Stock Rebuilding Strategy will commence in 2022.			
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>100 t bycatch TAC - single-year.</p> <p>SEMAC advice and any dissenting views</p> <p>While not constrained by the 100 t bycatch TAC, landed catches have increased in recent years, with this trend continuing in the 2021-22 fishing year (see TAC and landings above). 52 t has been caught as of 1 February 2022, compared to 44 t from the same time last year.</p> <p>SEMAC noted the main index for the assessment has been compromised because of avoidance behaviour, which will likely impact the ability to update the stock assessment scheduled for 2022.</p> <p>There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.</p>			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
0	0	2	100	
AFMA Advice				
AFMA Management recommends maintaining the 2021-22 bycatch TAC of 100 t for the 2022-23 fishing year, a single year bycatch TAC, with undercatch and overcatch provisions set at zero per cent, and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
100	100	0	2	0

Gemfish west

Rexea solandri



ABARES (2012): Line Drawing – Shane Weidland

Species summary					
Common names	Barraconda, common gemfish, deepsea kingfish, hake, king barracouta, king couta, silver gemfish, silver kingfish.				
Stock assessment	Tier 4 Species - last assessed by SERAG in 2019				
Stock structure	<p>There are considered to be two stocks of <i>R. solandri</i> in Australia, an eastern and a western stock bordered by a boundary in the south west of Tasmania (west of 146°22'E, north of 42°43'S). Recent genetic research has revealed evidence of genetically different populations between the east and west (with no gene flow), with a mixing (overlap) of the two stocks in western Bass Strait, through to Portland.</p> <p>Both eastern and western gemfish migrate towards opposite ends of their distributions and spawn six months apart; which is likely to be the major contributor to the genetic differentiation seen.</p>				
Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2019	1.0418	0.9942	0.4143
	4	2016	0.9378	1.1816	0.4923
	1	2013	74% B ₀	48% B ₀	20% B ₀
Stock trend and other indicators	<p>The Tier 4 assessment is based on catch rates from Zone 50 of the CTS only.</p> <p>The Tier 4 target reference point is the proxy level of CPUE assumed to produce a target biomass consistent with the HSP, and avoid the limit reference point.</p> <p>Stock status</p> <p>Standardised CPUE has been variable (but increasing) since 2008. While the last two years' estimates are decreasing, with the 2018 estimate being below the target reference point, the recent average remains above the long term average.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	2 nd of three year			No	
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22		343	372	-
	2020-21		300	317	84
	2019-20		200	218	96

	2018-19	200	218	79
Economics (Secondary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	Not Available	51.34	Not Available
	2018-19	0.21	49.47	0.42
	2017-18	0.17	41.86	0.41
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed in significant ways through the period from the start of the reference period to the end of the most recent year. It also assumes the reference period provides a good estimate of the stock when it was at a depletion level of 48%B ₀ and that historical catch records are accurate.			
Significant changes to data inputs	CPUE from Zone 50 only are used in the Tier 4 assessment.			
Data and RAG comments	The estimated discard rate seems to be tracking the CPUE trajectory, with a decrease in the estimated from 27% in 2017 to 11% in 2018.			
Stock assessment information and RAG comments	GABRAG previously considered a Tier 1 assessment, a Tier 4 assessment (no discards) and a Tier 4 assessment (discards). These analyses identified deficiencies in the data which prevented precise estimates of stock status being made, and a weight of evidence approach was adopted to set an RBC of 200 t for 2019. This species is now assessed as a Tier 4 species only, based on advice from SESSFRAG, using CPUE from Zone 50 in the CTS. The 2019 Tier 4 assessment produced an RBC of 423 t, compared to the RBC of 436 t from the 2016 assessment.			
Species specific research and priorities				
There is no species-specific research currently underway or identified as future priorities.				
RAG Recommendations				
SERAG (December 2019) recommended a three- year MYTAC using the RBC of 423 t from the 2019 Tier 4 assessment.				
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?	
	2022	423	Yes.	

	2021	423	3-year MYTAC using the RBC of 423 t from the 2019 Tier 4 assessment.	
	2020	423		
Discount factor (t)	63	The default Tier 4 discount factor of 15 per cent is applied.		
State catch (t)	N/A	State catches are not included in the assessment and are considered to be low.		
Discards (t)	19.8	Estimates of discards have decrease from 96 t in 2014 to 11 t in 2019.		
Recreational catch (t)	N/A	Recreational catch is not significant and not considered in the assessment.		
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		340 t		
MAC Recommendations				
Commercial fishers' interests	There is a small amount of western gemfish caught in the GABTS. These catches are managed under triggers described in the SESSF Harvest Strategy and are not deducted from the RBC.			
Species specific management (target, companion and bycatch)	While western gemfish are known to occur throughout the GABTS and into CTS Zones 40 and 50 , it is only under quota in the CTS and the Tier 4 assessment only includes Zone 50 . The GABTS component of the stock is managed under triggers described in the SESSF Harvest Strategy .			
MAC advice and any dissenting views	2022-23 TAC recommendation 340 t - single year TAC SEMAC advice and any dissenting views There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	340	
AFMA Advice				
AFMA Management recommends a TAC of 340 t for the 2022-23 fishing year, the third year of a three-year MTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
343	340	10	2	-3

Gummy shark

Mustelus antarcticus



Fisheries Research & Development Corporation (2012)

Species summary						
Common names	Gummy shark.					
Stock assessment	Tier 1 Species - last assessed by SharkRAG in December 2020.					
Stock structure	Gummy shark is endemic to southern Australia. It is considered a single genetic stock across the SESSF extending from Bunbury in WA to Jervis Bay in NSW. The single genetic stock is assessed as three separate sub-stocks within broad regions on the continental shelf of Bass Strait, Tasmania and SA.					
Bass Strait Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2020	48	48	48	20
	1	2016	59	49		
	1	2013	>48	48		
Tas Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2020	69	69	48	20
	1	2016	83	67		
	1	2013	>48	70		
SA Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2020	66	66	48	20
	1	2016	69	61		
	1	2013	>48	56		

Stock trend and other indicators	Pup production is used as a proxy for spawning biomass; this is the number of pups, on average, expected to be produced each year by the stock’s mature females. Pup depletion is the pup production in any year compared the unfished pup production and is the value used in the harvest control rule.			
	Estimated pup production shows an increasing trend in recent years in SA, and is steady in Bass Strait and Tasmania. The base case model (CAL2019c) indicates pup depletion is well above the 48% target reference point in SA and Tasmania (66% and 69% respectively). For the Bass Strait, the base case model estimates depletion at the target (48%). Pup depletion is above the 20% limit reference point for all stocks and all sensitivity models.			
Multi-Year TAC	Year of MYTAC (2021-22)		Has the MYTAC advice been revised?	
	1st of three year MYTAC		No	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22	1,672	1,647	-
	2020-21	1,775	1,854	1,874
	2019-20	1,785	1,897	1,779
	2018-19	1,763	1,871	1,682
Economics (Primary) Gillnet, Hook and Trap	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	17.60	19.67	89.48
	2018-19	20.94	23.66	88.50
	2017-18	17.13	19.51	87.80
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	Base case model (CAL2019c): <ul style="list-style-type: none">- Age-Structured Integrated Analysis model- Three sub-stocks – Bass Strait, SA and Tasmania. WA and NSW are not included. Sub-stock boundaries are somewhat arbitrary;- Seven fleets - trawl, shallow line, deep line and gillnets (6, 6.5, 7, 8 inch mesh sizes). Selectivity estimated for all but gillnets. Data <ul style="list-style-type: none">- Catch by fleet by stock (fixed)- CPUE (fitted) - trawl by sub-stock; shallow line, sub-stocks combined; gillnets (all mesh sizes combined) by sub-stock; old and new time series stitched together;- Length compositions (fitted):1970-2019;- Age compositions (fitted): 1986-7, 1990-93, 1995-7, 2002-03, 2007-8;- Conditional age-at-length (fitted): 1995-7, 2002-3, 2010-2019;			

	<ul style="list-style-type: none"> - Historical tag data (fitted): to 2005; - Proportion-mature-at-age (females); - Pups-per-female-at-age; - Growth (length-at-age), variability; - Weight-at-age. <p>Parameters</p> <ul style="list-style-type: none"> - Density dependence shared - M (0-30y) by 1+ biomass; - Gear saturation per sub-stock; - Unfished biomass (B_0) per sub-stock; - Natural mortality (M) shared; - Pup survival deviation / recruitment per sub-stock per year; - Gear selectivity per sub-stock.
Significant changes to data inputs	<p>In addition to the inclusion of new data for 2016-2020, SharkRAG (September 2020) recommended the following changes for the base case model:</p> <ul style="list-style-type: none"> - use a gillnet CPUE series based on net length; - use three trawl CPUE series, one for each sub-stock; the trawl series for Bass Strait should be split before 2005, and after 2008; - include age data, where length data are also available, as conditional-length-at-age rather than as age compositions; - not include Danish Seine data; - the best way to represent uncertainty with the model is via a series of sensitivities as per the last stock assessment; a sensitivity of effort saturation for gillnets should be investigated.
Data and RAG comments	<p>SharkRAG (November 2020) recommended for the next assessment in 2023:</p> <ul style="list-style-type: none"> - review the use of the effort (gear) saturation parameter; - CSIRO to investigate why estimated pup depletion is very different in the models where density dependence is affected by 0-2 and 0-4 year olds; - SharkRAG to discuss the method of data weighting in the model; - Danish seine fleet to be included in the next assessment. <p>SharkRAG (November 2021) agreed to a workplan to update the gummy shark assessment model in 2022, prior to the assessment being updated in 2023.</p>
Stock assessment information and RAG comments	<p>SharkRAG (December 2020) noted that when the stock was last assessed (2016), it was found to be well above the target reference point, and given this, the RBCs that were recommended would fish down towards the target over the subsequent three year period. As this additional component of the stock has now been fished down, future RBCs have been reduced to fish the stock at a level to maintain the stock around the target. SharkRAG discussed the RBC calculations shown in Figure 12.</p> <p>The Bass Strait sub-stock is estimated to be slightly under the 48% target so catches are lower at first, until the sub-stock rebuilds to the target.</p> <p>Similarly, Tasmania is above the target (69%) so catches are high initially and reduce as the target is neared.</p> <p>SA, which is initially above the target (66%), is complicated by a period of relatively low recruitment around the year 2000 so that catches are high initially, drop in response to lower adult biomass and therefore lower potential pup production, and then increase in response to assumed average recent and future recruitments.</p> <p>The algorithm that calculates annual RBCs is not sophisticated enough to anticipate the drop in pup production when it sets the initial high catch. All sub-stocks remain well above the 20% limit reference point throughout the time series.</p>

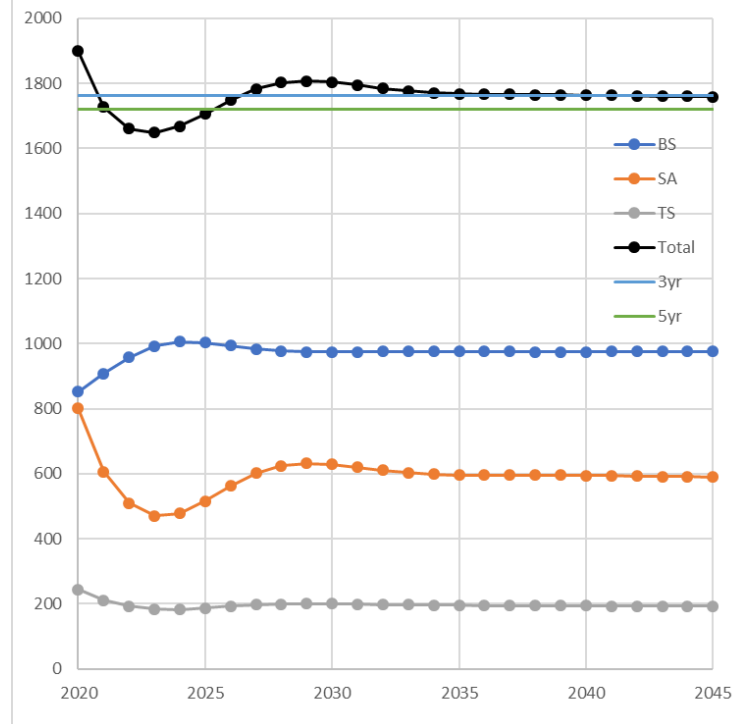


Figure 12: This figure shows the RBC calculations based on the base case model (CAL2019c). The annual RBC is calculated separately for each of the three sub-stocks and is then summed across the three (black line). The three year average and five year average RBCs are also shown. Source: Presentation by Dr Thomson to SharkRAG on 3-4 December 2020 titled, *Gummy shark assessment update for 2020: Choosing the base case*.

Projected biomass

SharkRAG ([December 2020](#)) discussed the pup production projections shown in Figure 13 (below).

Estimated pup production shows an increasing trend, in recent years, in SA and is steady in Bass Strait and Tasmania. The base case model indicates pup depletion is well above the 48% target reference point in SA and Tasmania (66% and 69% respectively). For the Bass Strait, the base case model estimates depletion at the target (48%). Pup depletion is above the 20% limit reference point for all stocks and all sensitivity models.

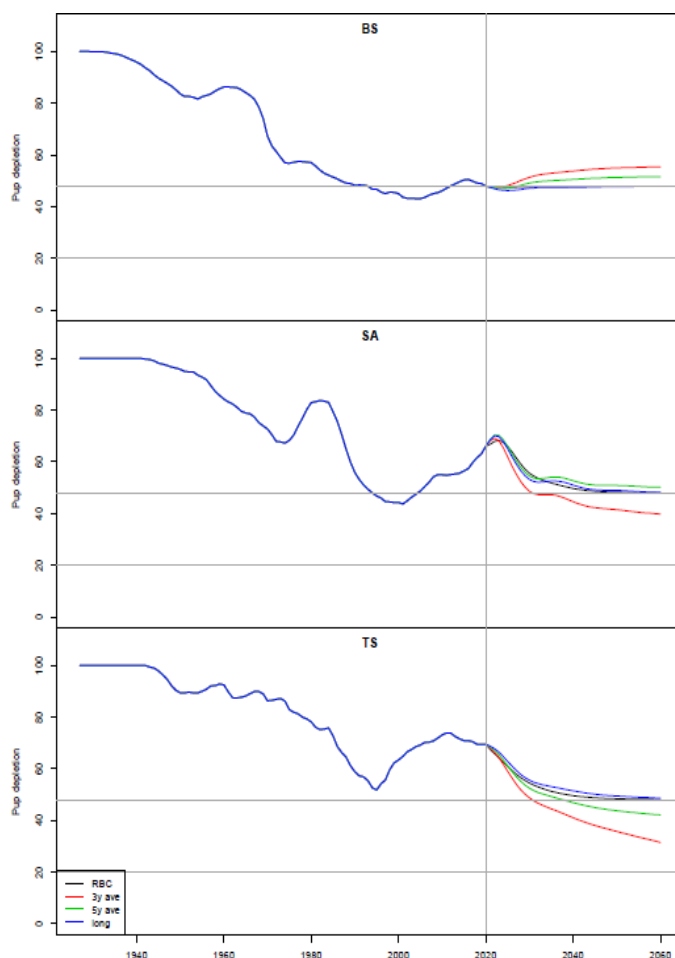


Figure 13: Pup depletion for the three sub-stocks showing future projections using annual RBC (RBC), the average over the most recent three RBCs (3y ave) and the most recent five (5y ave) as well as the long-term RBC (long). A vertical grey line marks the year 2020, and horizontal grey lines mark the 20% and 48% reference points (Thomson 2020).

Species specific research and priorities

GHAT CPUE calculation methodology (proposed, not funded)

CPUE for gillnet-caught species was previously calculated on a kilogram per shot basis. Given the change to net length restrictions, SharkRAG supported moving from catch by shot to catch by metres of net set to better account for zero shots. Ongoing work to clarify the relationship between CPUE and net length has been identified as a research priority.

School shark and gummy shark post release survival (proposed, not funded)

Investigation of the post-release survival rates of gummy shark (focus on tertiary stress response) and school shark (focus on immediate and post-release mortality), and the application of survivability to discard estimates for these species.

RAG Recommendations

SharkRAG ([December 2020](#)) provided four RBC options noting all are appropriate for a multi-year RBC, on the basis that they meet harvest strategy requirements. Furthermore, none of the four RBC options pose a risk of breaching the 20% limit reference point. In making this recommendation SharkRAG noted none of the four RBC options is likely to result in increased school shark catches. SharkRAG further noted that this RBC recommendation is based on the current structure of

the fishery. If there is substantial change in the dynamics of the fishery (e.g. gear or location), SharkRAG recommends that the RBC be revisited.

SESSFAG ([August 2021](#)) considered the indicators and supported maintaining the MYTAC.

RBC Option	Bass Strait	SA	Tasmania	Total
Annual	2021 – 853 t 2022 – 909 t 2023 – 958 t	2021 – 802 t 2022 – 606 t 2023 – 510 t	2021 – 244 t 2022 – 212 t 2023 – 194 t	2021 – 1,899 t 2022 – 1,727 t 2023 – 1,662 t
Three-year average	907 t	639 t	217 t	1,763
Five-year average	944 t	574 t	203 t	1,721 t
Long term	976 t	588 t	192 t	1,757 t
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?	
	2023	Annual – 1,662 t 3-year – 1,763 t 5-year – 1,721 t Long term – 1,757 t	Yes 3-Year MYTAC using one of the options provided above.	
	2022	Annual – 1,727 t 3-year – 1,763 t 5-year – 1,721 t Long term – 1,757 t	SharkRAG (December 2020) recommended if there is substantial change in the dynamics of the fishery (e.g. gear or location), the RBC be revisited. SEMAC (February 2021) supported the ‘Annual’ TAC option.	
	2021	Annual – 1,899 t 3-year – 1,763 t 5-year – 1,721 t Long term – 1,757 t	The Commission (March 2021) supported and determined the ‘Annual’ TAC based on the ‘Annual’ RBC option.	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.		
State catch (t)	113.5 t	The 2017-2020 weighted average of State catches is to be deducted from the RBC. Previously the State allocations agreed under the shark memorandum of understanding with SA, and Victoria have been deducted from the RBC. However, SharkRAG (2018) recommended deducting the weighted average State catch from the RBC, as is the case for other SESSF species. There is no allocation for Tasmania, rather, catches are limited in Tasmania through bycatch trip limits.		
Discards (t)	53.1 t	A weighted average of discards is deducted from the RBC, based on the last 4 years of annual discard estimates. SharkRAG (November		

		2021 ³⁰) agreed based on a comparative analysis of logbook and EM data, that logbook data for discarded gummy shark from gillnet and hook (manual and auto longline) methods is robust enough to use in the discard calculation. Discards from trawl methods will continue to be estimated following the Berg method. The discards are then summed across methods by year and weighted 1/8,1/4,1/2,1 with the most recent year receiving the highest weighting.
Recreational catch (t)	N/A	Estimates of recreational catches are available from South Australia, but are considered uncertain and as such are not deducted from the RBC.
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.
Provisional TAC under the Harvest Strategy		1,560 t – Using ‘annual’ RBC
MAC Recommendations		
Commercial fishers’ interests	Catch rates are high and have been constrained by the TAC. The TAC was fully caught in 2020-21 and will likely be fully caught in 2021-22 – quota availability has become an issue.	
Species specific management (target, companion and bycatch)	<p>The gillnet sector interacts with Australian sea lions in waters off SA. ASL interactions are managed through the ASL Management Strategy, which sets trigger limits that close spatial zones for 18 months if interaction numbers exceed the triggers.</p> <p>Dolphin interactions are managed through the GHAT Dolphin Strategy, which sets performance criteria for individual operators.</p> <p>To prevent targeting of school shark, GHAT operators (excluding scalefish hook which are subject to 100 kg trip limits) must limit their total school shark catch to 20% of their gummy shark catches, based on overall quota holdings. SharkRAG (December 2020) noted none of the four RBC options is likely to result in increased school shark catches.</p>	
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>1560 t – second of a three-year MYTAC</p> <p>SEMAC advice and any dissenting views</p> <p>The proposed TAC is based on a step-down approach recommended by SharkRAG, and then adopted by SEMAC and the AFMA Commission for the 2021-22 fishing year, the first of a three-year MYTAC. Industry noted a request to the AFMA Commission in 2021 to implement a three-year average TAC was not accepted, and industry continue to raise concerns about the step-down TAC.</p> <p>SEMAC noted industry’s concerns about continued high catch rates, however agreed there was little scope to change the approach in the second year of the three-year MYTAC</p>	

³⁰ Minutes from this meeting are currently being finalised

	without any change in the data available. SEMAC noted that to deviate from the three-year step-down approach for the 2023-24 fishing year, AFMA would need to consider advice from SharkRAG, including a possible assessment update (not full assessment) to include catches and catch rates from 2020 and 2021.			
	SEMAC supported the SharkRAG advice to set a TAC of 1560 t for the 2022-23 fishing year.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	1,560	
AFMA Advice				
AFMA Management has considered the merits of maintaining the 2021-22 TAC of 1,672 t for the 2022-23 fishing year on the basis that:				
<ul style="list-style-type: none">industry continues to report high catch rates, positive economic conditions, and has raised concerns about the impact of decreasing TACs;all three gummy shark stocks are assessed as being at or above the target reference point (the proxy target 48%B₀), and maintaining the TAC is not expected to adversely impact the sustainability of the stock;the gummy shark Tier 1 assessment is considered a ‘bespoke’ model and undertaking a partial update in 2022 to elicit further advice from SharkRAG on the risk of maintaining the TAC would require considerable resources, taking away from other work identified as a priority; namely planned upgrades to the gummy shark assessment model in preparation for the 2023 assessment.				
AFMA Management recommends maintaining the 2021-22 TAC of 1,672 t for the 2022-23 fishing year, the second year of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
1,672	1,672	10	2	0

Jackass morwong

Nemadactylus macropterus



Species summary						
Common names	Sea bream, jackass fish, perch, silver perch, squeaker perch, deepsea perch, mowie.					
Stock assessment	Tier 1 Species (East), weight of evidence (West) - last assessed by SERAG in 2021.					
Stock structure	For assessment purposes it is assumed there are separate stocks of jackass morwong in the Eastern and Western Zones.					
<u>West</u> Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2018	68	68	48	20
	1	2015	69	61		
	1	2011	67	38		
<u>East</u> Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2021	15	15	48	20
	1	2018	35	15		
	1	2015	37	17		
Stock trend and other indicators	<u>West</u> The 2018 assessment estimated that the stock status was below the target reference point between 2006 and 2014 and had increased to 68%B ₀ in 2019. This is slightly lower than the 2016 estimated biomass of 69%B ₀ from the 2015 assessment. There was insufficient catch and data to support a revised stock assessment in 2021 (see stock assessment summary below). CPUE has declined since the 2018 stock assessment was completed, and has been below the long-term average since 2007. <u>East</u> The estimated 2019 biomass from the 2018 stock assessment was 39% of the 1988 equilibrium spawning biomass. The 2021 assessment (the ‘low recruitment’ base case), estimates the status in 2020 was 14%, increasing to approximately 15% in 2022. See ‘Stock assessment information and RAG comments’ for further information.					
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?		

	3 rd of three year		N/A – Assessment updated in 2021	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22	463	507	-
	2020-21	468	514	98
	2019-20	469	515	109
	2018-19	505	556	186
Economics (Secondary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	0.20	51.34	0.39
	2018-19	0.64	49.47	1.29
	2017-18	0.45	41.86	1.08
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	<u>West (2018)</u> Single sex model and single stock in Zones 40 and 50 One fleet: trawl Natural mortality (M) fixed at 0.15 (agreed by SERAG) Recruitment is estimated from 1989 to 2012 <u>East (2021)</u> Single sex model and single stock in Zones 10, 20 and 30 Six fleets: eastern trawl (Zones 10 and 20), Danish seine, Tasmanian trawl (Zone 30), steam trawl (1915-1961), early Danish seine (1929-1967), Mixed (DS + trawl) (1968-1985). Natural mortality fixed at 0.15 (agreed by SERAG) Recruitment is estimated from 1945 to 2015.			
Significant changes to data inputs	There were no significant changes to data inputs from the 2018 assessment.			
Data and RAG comments	A western stock assessment was not conducted in 2021 due to limited data, poor data quality, concerns about the adequacy of the CPUE series to index the stock abundance and repeated concerns about the inability of previous western stock assessments to fit to the CPUE series. There has been an increase in discarding in the eastern trawl fleet in 2019 and 2020.			

<p>Stock assessment information and RAG comments</p>	<p><u>West</u></p> <p>The 2015 tier 1 assessment (Tuck et al, 2015) estimated a 2016 spawning stock biomass of 69%B₀. The 2018 assessment estimated the biomass had fallen below the target reference point between 2006 and 2014, increasing to a 2019 spawning stock biomass of 68%B₀.</p> <p>The initial western stock assessments were considered “preliminary” and then later classified as “increasingly uncertain” with concerns expressed about limited sampling effort, unrepresentative sampling, conflict between different data sources (highlighting potential unrepresentative sampling), very low catches and problematic retrospective patterns (Day <i>et al</i>, 2021).</p> <p>The results should be treated with considerable caution due to the limited data quality and quantity.</p> <p>SERAG (October 2021³¹) noted there were no concerns in the few available indicator data, and on the basis that there had been very little recent catch, there was no reason to deviate from the previous management advice.</p> <p><u>East</u></p> <p>Bridging from 2018 assessment: estimates of absolute and relative spawning biomass in the early part of the time series were revised downwards, especially during the step where recruitment deviations were extended from 2015 to 2018, and the projected increase in biomass from 2015-2019 in the 2018 assessment now shows a flat to declining trend in the same time period.</p> <p>Recruitment has been below the long-term average since 2004. There has been a downward revision to the recruitment estimates from the 2018 assessment for the period 1998-2012, and the recruitment deviations in 2013 and 2014 are the lowest on record.</p> <p>The 2018 assessment estimated biomass trajectory has an increase at the end of the series, which has been revised down in the 2021 assessment. The fit to the CPUE at the end of the series in the 2021 assessment is better than it was in the 218 assessment.</p> <p>SERAG agreed to project low recruitment (from 2016 onwards) in the base case (a ‘low recruitment base case’), on the basis that recruitment has been below average for the last 12 years in which it was estimated (2004-2015), and that projections should be based on a low recruitment scenario using the mean recruitment deviation of the most recent 10 years (2006-2015).</p> <p>Retrospective analyses show the estimated value of virgin biomass declines as each year of recent data is added to the model, as do recruitment deviations. There appears to have been a steady decline in productivity since around 1990, suggesting the ‘stepped’ shift in productivity accepted in 2011 was inappropriate. Under a dynamic B₀, stock status first drops below B₄₈ in the late 60’s and is just above the limit reference point in 2020. Under static B₀, the stock status dropped below the target in 2003 and has been below the limit reference point since 2013.</p> <p>Under the ‘low recruitment’ base case, the time series of relative spawning biomass has shifted lower in recent years with a minimum stock status of 14% in 2020, which was projected to be 36% from the 2018 assessment, however this was based on average recruitment, which has proven to be optimistic. The stock is estimated to be 15% in 2022. See projected rebuild timeframes under ‘projected biomass’ below.</p> <p>SERAG considered a companion species analysis which investigated the link between target species catch and the associated level of unavoidable bycatch of recovering species, incorporating a range of factors such as area, depth fished and gear type – also known as</p>
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³¹ Minutes from this meeting are currently being finalised

	metiers. Using logbook data from 2019 and 2020, and expected 2022-23 TACs for the main companion species (mostly flathead), the estimated unavoidable bycatch of eastern jackass morwong for 2022 ranged between 100 - 118 t, depending on assumed catches of flathead.				
Projected biomass	West The 2018 tier 1 assessment projected the stock to reach 48%B ₀ by 2045 assuming average recruitment.				
	East Under the low recruitment base case, the eastern stock is projected to rebuild to the limit reference point by 2026 under the harvest control rule catch of 0 t, however it is not expected to recover to the target reference point at any point if the low recruitment base case is projected forward – the model estimates stock status will plateau at 26.5% from around 2049.				
	Fixed annual catch scenarios were explored to provide estimates of rebuilding timeframes to the limit reference points (20%). <ul style="list-style-type: none">- Catches up to 50 t allow the stock to rebuild to rebuild by 2028- Catches up to 100 t allow the stock to rebuild by 2049- The stock status continues to decline with catches up to 150 t, and will be fully depleted by around 2057.				
Species specific research and priorities					
Jackass morwong have been identified as a candidate for application of CKMR assessment approaches.					
RAG Recommendations					
SERAG (November 2021 ³²) recommended that the western jackass morwong RBC of 223 t (3-year average from the 2018 stock assessment) be maintained for the 2022-23 fishing year.					
The eastern stock is assessed to be below the limit reference point, and SERAG recommended a 0 t RBC, consistent with the requirements of the SESSF Harvest Strategy. Noting the requirement in the <i>Commonwealth Harvest Strategy Policy</i> to rebuild a stock to the limit reference point within T _{MIN} ³³ , or up to 2xT _{MIN} after assessing the trade-off between costs and benefits of alternative recovery trajectories, SERAG recommended restricting total mortality to 50 t.					
Recovery projections are based on landed catches of 50 t with discards estimated to be 2.5 t in addition to landed catch. This is consistent with the requirement under the HSP to rebuild the stock to the limit reference point within ten years (2xT _{MIN}).					
Recommended Biological Catch (t)	Year	RBC (t): East	RBC (t): West	RBC (t): Total	Is a MYTAC Recommended?
	2024	0	-	-	No
	2023	0	-	-	The eastern stock is assessed as overfished, and as such jackass

³² Minutes from this meeting are currently being finalised

³³ The minimum time that would be taken to rebuild in the absence of any commercial fishing

	2022	0	-	-	morwong will be subject to a global bycatch TAC which must be reviewed annually.
	3-year average	0	223 ³⁴	-	
Discount factor (t)	N/A	SERAG did not recommend applying a discount factor on the basis that an incidental bycatch TAC in the east will require a global TAC well below the western RBC.			
State catch (t)	East = 8.3 West = 0.6	Four-year weighted average - mostly NSW catches. These are not deducted from the Commonwealth bycatch TAC but should be considered as a source of total mortality.			
Discards (t)	N/A	Modelled discards in the east depend on the level of catch permitted under an incidental bycatch TAC. Discards in 2022 are estimated to be 2.5 t under an incidental bycatch TAC of 50t (total mortality of 52.5 t), and 5.2 t under 100 t (total mortality of 105.2 t).			
Recreational catch (t)	N/A	A recreational survey in 2000 estimated that a total of 294 t of jackass morwong was caught across NSW, Victoria, Tasmania, SA and WA. A survey in 2013 estimated Tasmanian catches of 18 t. There have been no additional surveys and recreational catches are not considered in the assessment.			
Research Catch Allowance (t)	N/A				
Provisional TAC under the Harvest Strategy		0 t – Incidental bycatch TAC to be considered.			
MAC Recommendations					
Commercial fishers' interests	Industry have previously noted that catches were patchy and jackass morwong are a very temperature-dependant species. Industry observations in the east are consistent with the outputs of the 2021 stock assessment – there has been a decline in catches and catch rates.				
Species specific management (target, companion and bycatch)	<p>Jackass morwong is a companion species to flathead. In addition to measure such as closures, consideration should also be given to reductions in companion species TACs to promote reduced catches of jackass morwong in the east.</p> <p>A companion species analysis considered by SERAG at their November 2021 meeting, provided estimates of unavoidable catch of eastern jackass morwong for 2022 ranged between 100 – 118 t, based on assumed catches of flathead of 2,000 t and 2,400 t, respectively.</p> <p>In accordance with the requirements of the harvest strategy, a rebuilding strategy will be developed in 2022 to include measure such as bycatch TACs, closures and monitoring requirements to promote rebuilding of the eastern stock.</p>				
MAC advice and any dissenting views	2022-23 TAC recommendation				

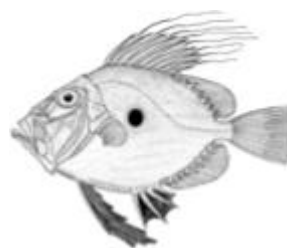
³⁴ RBC from 2018 Tier 1 assessment

<p>60 t bycatch TAC – single-year</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted although there are assumed separate stocks for assessment purposes, the combined TAC is applied across the fishery, and a bycatch TAC should allow for ongoing catches in the west, whilst promoting lower catches in the east.</p> <p>In recent years the majority of the catch has been taken in the east. The decline in biomass appears to be driven by a lack of recruitment, and there has been a subsequent decline in catches and catch rates. SERAG recommended that total mortality in the east should be limited to 51 t – less than half of the estimated recent total mortality.</p> <p>In addition to setting a bycatch TAC, AFMA are currently considering the spatial and temporal dynamics of catches, with a view to introducing management arrangements such as closures to reduce total catches in the east.</p> <p>SEMAC considered the estimated recreational catch of 294 t from a 2000 recreational survey and recognised the need to obtain updated estimates. SEMAC noted it is likely that some of the recreational catch reported may have been species other than jackass morwong, including grey morwong.</p> <p>SEMAC agreed that a bycatch TAC of 60 t applied across the fishery would allow for ongoing low catches in the west, whilst promoting lower catches in the east. However, as a standalone measure, a bycatch TAC will be insufficient in reducing catches, and SEMAC recommended AFMA consider other measures as a priority.</p> <p>SEMAC recommended a bycatch TAC of 60 t for the for 2022-23 fishing year, with no application of undercatch or overcatch provisions.</p> <p>There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.</p>			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)
0	0	2	60
AFMA Advice			
<p>Implementing a bycatch TAC for jackass morwong will not be sufficient as a stand-alone measure to reduce total mortality to 50 t in the east, as jackass morwong are incidentally caught using trawl methods on the east coast (zone 10, 20, 30 and 60) when targeting other species, mainly flathead.</p> <p>The estimate of unavoidable bycatch in 2022 is approximately double that which is expected to allow the stock to recover to the limit reference point within the timeframe required under the HSP. AFMA is currently considering a range of measures to be implemented early in the 2022-23 fishing year to reduce mortality of overfished species on the east coast, with a focus on jackass morwong, including closures, trip limits and move-on provisions.</p> <p>Based on current quota holdings, AFMA expect approximately 41 t of jackass morwong undercatch will be carried over to the 2022-23 fishing year because of undercatch provisions determined for the 2021-22 fishing year.</p> <p>On this basis, AFMA Management recommends a bycatch TAC of 20 t. This accounts for the likelihood that an additional 41 t will be available through undercatch, resulting in an available TAC of 61 t.</p>			

AFMA Management recommends a bycatch TAC of 20 t for the 2022-23 fishing year, a single year bycatch TAC, with undercatch and overcatch set at zero per cent, and a determined amount of 2 t.

2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
463	20	0	2	-443

John dory

Zeus faber

Species summary					
Common names	St Peter's fish				
Stock assessment	Last assessed as a Tier 4 by SERAG in 2021.				
Stock structure	For management purposes, a single stock is assumed for the SESSF.				
Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2021	0.4695	1.464	0.7320
	-	2020	N/A – Weight of evidence		
	3	2017	$F_{CUR} = 0.036$	$F_{MSY} = 0.126$	$F_{LIM} = 0.198$
Stock trend and other indicators	<p>Catches and catch rates have declined since the early part of the time series – 1970.</p> <p>The status of the stock during the default reference period is uncertain for the purpose of estimating a current depletion level, however standardised catch rates show a continued long-term decline. The CPUE fluctuated around the limit reference point between 2002 and 2009, and has been below the limit since 2010.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)		Has the MYTAC advice been revised?		
	Single year TAC		N/A		
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	60	104		
	2020-21	452	491	63	
	2019-20	395	421	68	
	2018-19	263	279	62	
Economics (Secondary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP	
	2019-20	0.49	51.34	0.95	
	2018-19	0.50	49.47	1.01	
	2017-18	0.82	41.86	1.96	

ABARES Status (2021 report)	Fishing Mortality: Uncertain	Biomass: Uncertain
Assessment Summary		
Key model technical assumptions/ parameters	<p>The Tier 4 assessment assumes there is a linear relationship between standardized CPUE and exploitable biomass, and that the character of the estimated CPUE has not changed significantly since the reference period to the end of the most recent year.</p> <p>The assessment assumes the biomass was around the target reference point proxy of 48%B during the reference period 1986-1995.</p>	
Significant changes to data inputs	This is the first Tier 4 completed for this species.	
Data and RAG comments	<p>The average of discard rate estimates from 1998-2006 have been used to backfill discard proportion estimates pre-1998. This is consistent with estimates that NSW DPI have on record. Forward fill missing discards in the time series repeating 2019 discard data in 2020.</p> <p>The catch time series used was derived in Sporcic and Day (2021), which incorporated the July 2021 revised NSW estimates and was endorsed by SERAG (28-29 September 2021) (Sporcic, 2021c).</p> <p>Based on the results of the 2020 catch-MSY and SPM assessment for 1970 – 2019, and assuming that productivity has remained unchanged over the history of the fishery, the John dory stock is estimated to have been at a 40%B₀ target in about 1985 (catch-MSY) or 1990 (SPM). This would indicate that the conventional reference period for SESSF Tier 4 assessments of 1986-1992 could be appropriate, assuming that productivity has not changed (Penney, 2020).</p>	
Stock assessment information and RAG comments	<p>Given uncertainties in historical catch and the status of the stock during the default reference period, SERAG (October 2020) recommended not applying a Tier 4 analyses to John dory in support of recommending an RBC for 2021-22.</p> <p>A weight of evidence approach, including the outputs of the Catch-MSY and Surplus production models (Tier 5 assessments), was used to recommend a TAC for the 2021-22 fishing year.</p> <p>The stock has declined over time, however it is not clear what the current estimate of biomass is. The CPUE series is potentially influenced by targeting behaviour (not a targeted species) and an apparent southerly shift in the distribution of catch.</p> <p>Both the Catch-MSY and Surplus Production models completed in 2020 estimate that the biomass exceeded the target reference point (48%B₀) between 1985 and 1990. However, the analyses produce markedly different estimates of MSY – 180 t from Catch-MSY and 60 t from the Surplus Production model.</p> <p>SERAG (November 2020) recommended exploring differences in standardised CPUE between ISMP Zones 10, 20 and 30 as a potential indicator of range shift to be considered by SESSFAG at its 2021 data meeting, with a view to undertaking a Tier 4 analysis in 2021.</p> <p><u>2021</u></p> <p>SERAG (October 2021³⁵) considered a Tier 4 assessment (Sporcic, 2021c) for the purpose of providing RBC advice for the 2022-23 fishing year and noted the following:</p>	

³⁵ Meeting minutes are currently being finalised

	<ul style="list-style-type: none"> - The recent CPUE (0.4695) is below the CPUE limit (0.732) and has been since 2010 on the basis of the Tier 4 assessment. - There was insufficient catch in zone 30 to inform a revised CPUE series to account for the suspected southerly shift in catch. - John dory discards were estimated to be 8 t in 2020. - The dynamics of the fishery have changed over time and John dory are not a targeted component of the fishery. <p>SERAG considered the 'alternative' CPUE series (requested by SESSFRAG) which excluded catch and effort from boats that are no longer a major part of the fishery – this made very little difference to the CPUE series.</p> <p>SERAG noted that the application of the default reference period and assumed stock status (48%B₀ during the period 1986-92) assumes there has been no change in productivity. There is the potential for a change in productivity, in which case the CPUE series would be compromised, however there is little current evidence to support this and the RBC advice should be based on the outputs of the Tier 4 assessment.</p> <p>On the basis of the outputs of the Tier 4 assessment, SERAG recommended an RBC of 0 t. SERAG noted it is unlikely that fishing is driving the decline in abundance, and as a non-targeted species, total mortality is unlikely to be constrained by TACs.</p> <p>SERAG (November 2021³⁶) considered a companion species analysis which investigated the link between target species catch and the associated level of unavoidable bycatch of recovering species. The analysis incorporated a range of factors such as area, depth fished and gear type – also known as metiers.</p> <p>Using logbook data from 2019 and 2020, and expected 2022-23 TACs for the main companion species (trawl caught flathead) the estimated unavoidable bycatch of John dory for 2022 is 61.3 t, with a range between 56.5 and 66.4 t.</p>
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Species specific research and priorities

There is no species-specific research currently underway or identified as future priorities.

RAG Recommendations

SERAG (October 2021³⁷) did not recommend a John dory incidental bycatch TAC for the 2022-23 fishing year. Instead, SERAG recommended SEMAC consider the following:

- RBCs to be set at zero, with bycatch TACs set at a level to cover incidental catches without promoting discarding and misreporting, based on the results from the companion species analysis.
- While total fishing mortality should be minimised to promote recovery, consideration should be given to the potential economic impact of changes to bycatch TACs or management arrangements for other key companion species (i.e. flathead).

	Year	RBC (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2022	0	No.
	2021	N/A – weight of evidence	

³⁶ Minutes from this meeting are currently being finalised

³⁷ Minutes from this meeting are currently being finalised

	2020	485	Bycatch TAC to be implemented for 2022-23.
Discount factor (t)	N/A	A discount factor is not applied as the TAC is set based on a weight of evidence approach.	
State catch (t)	6.8	Four-year weighted average – mostly NSW catch. State catches are not deducted from a bycatch TAC but should be considered as a source of mortality.	
Discards (t)	7.2	There were no valid estimates of discards for 2020, and the 2019 estimate rate has been carried forward to 2020. Discards are not deducted from a bycatch TAC but should be considered as a source of mortality.	
Recreational catch (t)	N/A	There are no estimates of recreational catch.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		0 t - Bycatch TAC to be considered.	
MAC Recommendations			
Commercial fishers' interests	Industry noted approximately 37 t of the 2021-22 agreed TAC of 60 t had been caught as of 1 February 2022, compared to 52 t at the same time last year. Also, that a TAC of 60 t does not allow 60 t to be landed due to the imperfect nature of the market for quota. Industry proposed that a TAC higher than 60 t be set in order to allow landings of 60 t. Industry have previously advised this species is no longer targeted but, because of the good market price, is generally landed when caught.		
Species specific management (target, companion and bycatch)	In accordance with the requirements of the SESSF Harvest Strategy, a rebuilding strategy will be developed in 2022 to include measure such as bycatch TACs, closures and monitoring requirements to promote rebuilding of the stock. Using logbook data from 2019 and 2020, and expected TACs for the 2022-23 fishing year for the main companion species (trawl caught flathead) the estimated unavoidable bycatch of John dory for 2022 is 61.3 t, with a range between 56.5 and 66.4 t.		
MAC advice and any dissenting views	2022-23 TAC recommendation 60 t – single-year bycatch TAC SEMAC advice and any dissenting views SEMAC noted the outputs of the new Tier 4 assessment and that this stock is now considered overfished. The 60 t TAC introduced for the 2021-22 fishing year was based on the outputs of separate Tier 5 approaches, and once undercatch from the previous season was included, the available TAC was approximately 100 t. John dory is now considered an overfished species, in which case undercatch and overcatch provisions are not applied. Noting the outcomes of the companion species analysis, a 60 t bycatch TAC for the 2022-23 fishing year may constrain catches and		

	result in increased discarding. However, any measures put in place to reduce catches of jackass morwong are also likely to reduce catches of John dory. SEMAC recommended the TAC for 2022-23 fishing year be treated as a bycatch TAC, and as such is not subject to deductions of state catch, discards or recreational catch, or application of undercatch and overcatch provisions. There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
0	0	2	60	
AFMA Advice				
<p>A bycatch TAC of 60 t was introduced for John dory for the 2021-22 fishing year due to concerns around the sustainability of the stock. However, because of undercatch provisions determined for the 2020-21 fishing year, the available TAC for 2021-22 was 104 t.</p> <p>A John dory tier 4 assessment was undertaken 2021 which formally assessed the stock to be below the limit reference point. Accordingly, this species will be managed as an overfished species and will be subject to management arrangements under a rebuilding strategy, including setting a bycatch TAC. Measures introduced to constrain catches of jackass morwong are also expected to reduce trawl catch of John dory.</p> <p>There were no undercatch provisions determined for John dory for the 2021-22 fishing year. As such, determining a bycatch TAC of 60 t for the 2022-23 fishing year ensures the available TAC is constrained to 60 t.</p>				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
60	60	0	2	0

Mirror dory

Zenopsis nebulosus



A Mirror Dory, *Zenopsis nebulosus*. Source: Australian National Fish Collection. CSIRO. License: CC BY Attribution-NonCommercial

Species summary					
Common names	Deepsea dory, mirror perch, trawl dory, silver dory				
Stock assessment	Tier 4 Species – last assessed by SERAG in 2020.				
Stock structure	An eastern and western stock is currently assumed for assessment purposes. However, mirror dory is managed under a global TAC.				
East Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2021	0.6543	1.178	0.4908
	4	2020	0.729	1.1808	0.492
	4	2019	0.6482	1.1542	0.4809
West Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2021	0.6655	1.018	0.4242
	4	2020	0.6798	1.0054	0.4189
	4	2019	0.7488	0.9941	0.4142
Stock trend and other indicators	<p>East – including discards</p> <p>CPUE has been cyclical over time, decreasing from above the target reference point in the late 1980's to just above the limit reference point in the late 1990's and early 2000's. CPUE increased to above the target reference point between 2007 and 2011, then decreased again to be between the target and limit reference points in 2020. The CPUE in 2020 (0.49) is at the CPUE limit based on the Tier 4 harvest control rule</p> <p>West</p> <p>CPUE has been cyclical in the west, though much more variable than in the east, ranging from above the target and limit reference points since the mid-1980's. The CPUE has been relatively flat since 2012, between the limit and target reference points.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	Single year TAC			N/A	
Catch and TAC (t)	SESSF fishing year	Agreed TAC		TAC after unders/overs	Cth Retained Catch
	2021-22	144		154	-

	2020-21	137	155	102
	2019-20	188	212	117
	2018-19	253	275	117
Economics (Secondary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	0.47	51.34	0.92
	2018-19	0.37	49.47	0.75
	2017-18	0.82	41.86	1.96
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed significantly since the reference period to the end of the most recent year.			
Significant changes to data inputs	<p><u>East</u></p> <p>For any year where discard estimates are not available after 1998, the average of the years for which there are estimates available are used to ‘fill’ estimates for those years. The same average is applied to all years pre-1988.</p> <p>The catch time series used in this assessment was derived from Sporcic and Day (2021), which incorporated the July 2021 revised NSW estimates and endorsed by SERAG (September 2021). Discard estimates were based on Althaus et al. (2021) and modifications requested by SERAG in 2020 (Sporcic, 2021c).</p> <p><u>West</u></p> <p>The catch time series used was derived from Sporcic and Day (2021).</p>			
Data and RAG comments	<p><u>East</u></p> <p>Most of the catch is from Zone 10.</p> <p>Recent estimates of discards have been highly variable.</p> <p><u>West</u></p> <p>The CPUE series is quite noisy for this stock, though relatively flat over the long-term.</p>			
Stock assessment information and RAG comments	<p><u>East</u></p> <p>The 2021 estimated RBC was 112.93t, a decrease of 32.76 t compared to the 2020 estimated RBC (145.69). The2021 RBC is greater than the reported catch of approximately 77t (including discards) in 2020 for this species.</p> <p>The decrease in RBC of approximately 33 t can be mostly attributed to a decrease in the most recent CPUE (including discards) and hence the most recent four-year average which</p>			

	is used to calculate the RBC. The CPUE estimate for 2020 (0.4869) is at the limit reference point (0.4908) (Sporcic, 2021c).			
	<u>West</u>			
	The 2021 estimated RBC was 56.18 t, a decrease of 5.39 t compared to the 2020 estimated RBC (61.57 t). The decrease in RBC can be attributed to a decrease in the most recent four-year average CPUE which is used to calculate the RBC. The 2021 RBC is greater than the reported catch of approximately 34 t in 2020 for this species (Sporcic, 2021a).			
Species specific research and priorities				
There is no species-specific research currently underway or identified as future priorities.				
RAG Recommendations				
SERAG (October 2021 ³⁸) recommended a single year TAC using a combined east and west RBC of 169.1 t for the 2022-23 SESSF fishing year.				
Recommended Biological Catch (t)	Year	RBC (t)		Is a MYTAC Recommended?
	2022	East: 112.9 West: 56.18	Total: 169.1	No. Single year TAC.
	2021	East: 145.7 West: 61.7	Total: 207.4	
	2020	East: 92.7 West: 76.7	Total: 169.4	
Discount factor (t)	25.4	The default Tier 4 discount factor of 15 per cent is applied.		
State catch (t)	East: N/A West: N/A	There are no estimates of State catch for mirror dory (west).		
Discards (t)	East: 14.9 West: 3.3	Discards are considered low for the west and are not included in the Tier 4 assessment.		
Recreational catch (t)	N/A	Recreational catches are not considered in assessment and are assumed to be low.		
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		129 t		
MAC Recommendations				

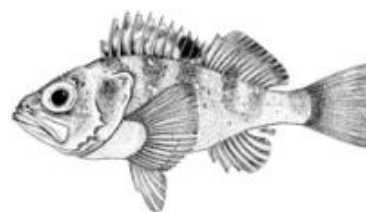
³⁸ Meeting minutes are currently being finalised

Commercial fishers' interests	Some operators have previously raised concerns about the TAC not responding quickly enough to changes in stock availability.			
Species specific management (target, companion and bycatch)	Restrictions on pink ling catches have likely contributed the decrease in mirror dory catch in the east.			
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>129 t - single year TAC</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted if the declining trend in CPUE continues, there will likely be a large decrease in the TAC for the 2023-24 fishing year. The Tier 4 assessment uses a four-year average CPUE, which is being 'held up' by the 2017 point estimate. If the 2021 point estimate is consistent with the 2018-2020 estimates, the average will decrease.</p> <p>There has been a long-term cyclical trend in CPUE, decreasing from 1985 to 2000, then increasing to 1985 levels in 2010 and declining again until recently. If the cyclical trend does not repeat itself, there is a risk that this species becomes depleted on the east coast.</p> <p>There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.</p>			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	129	
AFMA Advice				
AFMA Management recommends a TAC of 129 t for the 2022-23 fishing year, a single year TAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
144	129	10	2	-15

Ocean perch (basket)

Offshore ocean perch (*Helicolenus barathri*)

Inshore ocean perch (*Helicolenus percoides*)

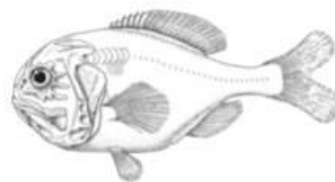


Species summary					
Common name	Offshore: Bigeye ocean perch Inshore: Reef ocean perch, Jock Stewart				
Stock assessment	Tier 4 Species – Offshore last assessed by SERAG in 2020. Inshore last assessed by SERAG in 2017.				
Stock structure	The ocean perch basket is made up of two species; offshore ocean perch (<i>Helicolenus barathri</i>) and inshore ocean perch (<i>Helicolenus percoides</i>). A single basket TAC is set based on the Tier 4 assessment for offshore ocean perch.				
Inshore Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2017	0.9669	0.3255	0.1628
	4	2013	1.769	1.0553	0.5065
	4	2012	0.8538	1.3056	0.5222
Offshore Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2020	1.0765	0.9273	0.4637
	4	2017	0.9668	0.9283	0.4642
	4	2013	0.9381	1.1456	0.4582
Stock trend and other indicators	While Commonwealth catches of offshore ocean perch have decreased from 440 t in 1997 to be between 160-200 t since 2014, standardised CPUE has steadily increased from between the target and limit reference points to above the target reference point during the same time period.				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	1 st of three year			No	
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22		304	323	-
	2020-21		239	262	189

	2019-20	241	259	169
	2018-19	241	255	195
Economics (Secondary) Commonwealth Trawl and Scalefish Hook sectors	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	0.65	51.34	1.27
	2018-19	0.43	49.47	0.87
	2017-18	0.04	41.86	0.10
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed significantly since the reference period to the end of the most recent year.			
Significant changes to data inputs	The average discard proportion for years after 1998 are used to ‘backfill’ the estimates pre-1998. Previously reported NSW annual catch was used for the period 1986-97 inclusive. However, revised NSW estimates were used for the period 1998- 2019 inclusive (Sporcic, 2020a).			
Data and RAG comments	The assessment uses catch rates from Zones 10 and 20 – most catch comes from Zone 10 .			
Stock assessment information and RAG comments	The average CPUE has increased since the last assessment, resulting in an increased RBC of 421.2 t from the 2020 assessment compared to 344.7 t from the 2017 assessment. This was also driven by an increase in C _{Targ} because of the addition of historical discard estimates (Sporcic, 2020a).			
Species specific research and priorities				
There is no species-specific research currently underway or identified as future priorities.				
RAG Recommendations				
SERAG (December 2020) recommended a three-year MYTAC using the RBC of 421.2 t from the 2020 Tier 4 assessment.				
Recommended Biological Catch (t)	Year	RBC (t)		Is a MYTAC Recommended?
	2023	421.2		Yes.
	2022	421.2		

	2021	421.2	3-year MYTAC using the RBC from the 2020 Tier 4 assessment.		
Discount factor (t)	63.2	Applying the default Tier 4 discount factor of 15 per cent.			
State catch (t)	10.6	Offshore ocean perch only – mostly NSW catches.			
Discards (t)	42.3	Estimates of discards have been variable and ranged between 25 t in 2018 and 75 t in 2013. Only offshore ocean perch discards.			
Recreational catch (t)	N/A	Estimates of recreational catch available for Tasmania in 2013, 1.1 t. Recreational catches are not included in the assessment and are not deducted from the TAC.			
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.			
Provisional TAC under the Harvest Strategy		305 t			
MAC Recommendations					
Commercial fishers' interests	No specific commercial fisher interests have been identified.				
Species specific management (target, companion and bycatch)	Inshore ocean perch are not considered an economically important species and are generally discarded.				
MAC advice and any dissenting views	2022-23 TAC recommendation 305 t -second year of a three-year MYTAC SEMAC advice and any dissenting views There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.				
Undercatch (%)	Overcatch (%)		Determined amount (t)	TAC (t)	
10	10		2	305	
AFMA Advice					
AFMA Management recommends a TAC of 305 t for the 2022-23 fishing year, the second year of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.					
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)		Determined amount (t)	Change in TAC (t)
304	305	10		2	+1

Orange roughy Albany and Esperance



Hoplostethus atlanticus

ABARES (2012): Line Drawing – Rosalind Poole

Species summary					
Common names	Slimehead, deep sea perch, red roughy, orange ruff.				
Stock assessment	No quantitative assessment undertaken to date.				
Stock structure	<p>The stock structure of orange roughy in the AFZ remains unresolved. Based on the existing data fishery dynamics multiple regional stocks of orange roughy are assumed.</p> <p>Orange roughy in the GAB are managed as a non-target, bycatch only species.</p>				
Stock status against reference points (%B ₀)	Tier	Year	Biomass	Target	Limit
	-	-	-	-	-
	<p>In 2006, the SESSF (including the GAB and excluding the Cascade Plateau) was closed to targeted orange roughy fishing, due to stocks being below the limit reference point</p> <p>Biomass was uncertain but predicted to be below 20%B₀ based on depletion of other orange roughy stocks.</p>				
Stock trend and other indicators	<p>There is no formal stock assessment for orange roughy in the GAB because catches and consequently data are sporadic and spatially scattered (Knuckey et al., 2010). No large aggregations have been reported since 1990, with the species believed to have declined in the GAB, as it had in other parts of the SESSF.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)		Has the MYTAC advice been revised?		
	N/A – Rebuilding species		N/A		
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	50	50	-	
	2020-21	50	50	0	
	2019-20	50	50	0	
	2018-19	50	50	0	
Economics (Primary)	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP	
	2019-20	-	10.76	-	

Great Australian Bight Trawl	2018-19	-	8.48	-
	2017-18	0.10	9.16	1.1 ³⁹
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Uncertain	
Assessment summary				
Key model technical assumptions/ parameters	N/A			
Significant changes to data inputs	N/A			
Data and RAG comments	N/A			
Stock assessment information and RAG comments	No quantitative stock assessment has been conducted for orange roughy in the GAB (including in the Albany & Esperance Quota Zones), as the available data are spatially and temporally dispersed, with no recent surveys or representative catch-trend data available to determine stock abundance. Albany & Esperance orange roughy are subject to an incidental bycatch TAC, implemented under the Orange Roughy Rebuilding Strategy .			
Species specific research and priorities				
GABT Orange Roughy Research Plan The GABT Orange Roughy Research Plan has been in place since 2007 and aims to collect robust scientific information, including biological data, to update the understanding of the status of the GAB orange roughy stock and determine sustainable harvest levels for commercial fishing under the SESSF Harvest Strategy .				
RAG Recommendations				
GABRAG (October 2021) recommended maintaining the Albany & Esperance orange roughy incidental bycatch TAC at 50 t for the 2021-22 fishing year.				
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?	
	2022	0	No. Rebuilding species.	
	2021	0		
	2020	0		

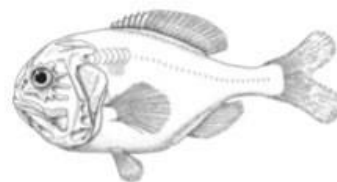
³⁹ Research catch

	-	-		
Discount factor (t)	N/A	Discount factors are not applied to the incidental bycatch TAC		
State catch (t)	N/A	There are no estimates of State catches.		
Discards (t)	N/A	There are no estimates of discards.		
Recreational catch (t)	N/A	There are no known recreational catches for orange roughy.		
Research Catch Allowance (t)	200	Research catch allocated under GABT Orange Roughy Research Plan		
Provisional TAC under the Harvest Strategy		50 t - Incidental bycatch TAC		
MAC Recommendations				
Commercial fishers' interests	Two scientific permits were allocated during the 2021-22 fishing year to fish under the GABT Orange Roughy Research Plan .			
Species specific management (target, companion and bycatch)	This species is managed under the Orange Roughy Rebuilding Strategy 2014 . AFMA commenced a five-year review of the rebuilding strategy in November 2019, and sought public comment on the revised Rebuilding Strategy from 15 January to 12 February, 2021. AFMA are currently finalising the revised rebuilding strategy with a view to having it published in 2022.			
MAC advice and any dissenting views	2022-23 TAC recommendation 50 t – bycatch TAC SEMAC advice and any dissenting views There were no dissenting views and GABMAC (November 2021) were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
0	0	2	50	
AFMA Advice				
AFMA Management recommends a single year bycatch TAC of 50 t for the 2022-23 fishing year, with no undercatch or overcatch provisions and a determined amount of 2 t.				
AFMA Management also recommends a Research Catch Allowance of 200 t to support data collection under the Great Australian Bight Orange Roughy Research Program for the 2022-23 fishing year.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)

50 – bycatch TAC 200 – Research Catch Allowance	50 – bycatch TAC 200 – Research Catch Allowance	0	2	0
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Orange roughy Cascade Plateau

Hoplostethus atlanticus



ABARES (2012): Line Drawing – Rosalind Poole

Species summary					
Common names	Slimehead, deep sea perch, red roughy, orange ruff				
Stock assessment	Tier 1 Species - last assessed by DeepRAG in 2009.				
Stock structure	<p>The stock structure of orange roughy in the AFZ remains unresolved. Based on the existing data fishery dynamics multiple regional stocks of orange roughy are assumed.</p> <p>The Cascade Plateau, however, holds orange roughy with distinct morphometrics, parasite populations, size and age composition, and which also have a distinct spawning time from other adjacent stocks.</p> <p>For assessment and management purposes they are regarded as a separate stock.</p>				
Stock status against reference points (%B ₀)	Tier	Year	Biomass	Target	Limit
	1	2009	64	48	20
	2	2006	73		
	2	2005	30-60		
Stock trend and other indicators	There are no recent data to assess the biomass trend. Catches have remained below the RBC since the assessment and the stock likely remains above the target reference point.				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	Single year TAC			N/A	
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22		500	550	-
	2020-21		500	550	211
	2019-20		500	550	24
	2018-19		500	550	0
Economics (Primary)	Financial Year		Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20		Not Available	51.34	Not Available
	2018-19		0	49.47	0
Commonwealth Trawl and Scalefish Hook					

	2017-18	0	41.86	0
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	N/A			
Significant changes to data inputs	N/A			
Data and RAG comments	Low levels of fishing has resulted in insufficient data being available to update the assessment.			
Stock assessment information and RAG comments	<p>The first quantitative stock assessment of the Cascade Plateau orange roughy population was produced in 2004 (Wayte, 2004). The 2004 assessment used catch records, biological data collected over the previous 6 years, and the 2003 acoustic biomass estimate.</p> <p>The 2004 stock assessment estimated the orange roughy biomass at Cascade Plateau to be between 7,000 and 18,700 t and the long term sustainable catch to be 300-400 t.</p> <p>In 2006, the assessment was again updated, using the acoustic biomass estimate from the 2005 winter spawning aggregation which was about three times larger than previous estimates. The 2006 assessment estimated the stock to be about 20,000 t and the current biomass as 72-73% of the unfished biomass (B_0) approximately 20% higher than the target reference point and 12% higher than the target under the Conservation Program.</p> <p>At the DeepRAG meeting in 2009, DeepRAG requested a re-run of the assessment using an alternative 2005 acoustic biomass estimate of 18,400 t, instead of the 31,600 t estimate used in the 2006 assessment. Using these data the assessment estimated a female spawning stock status of 64%B_0, and produced an RBC of 492 t under the 20:35:48 harvest control rule, or a long term RBC of 397 t.</p> <p>There were low levels of fishing on the Cascade Plateau (<1% of TAC caught) during 2011 and 2012. An update to the assessment was due for 2012 but this was deferred due to the lack of new data and a higher priority being assigned to other species.</p> <p>SERAG (September 2021)</p> <p>Recent studies into target strength estimates from acoustic biomass surveys of large orange roughy indicates that 2003-05 acoustic biomass estimates should be revised. When all other inputs are unchanged this would result in a decrease to the estimate of biomass. However, there have been multiple revisions to model assumptions and model techniques used in the 2009 assessment which would likely result in an upwards revision of the RBC if the assessment were updated.</p> <p>The annual TAC has been set at 500 t based on the 2009 stock assessment, however there has been very little fishing on the Cascade Plateau since then. There have been no catches in most years, and they have only increased recently with 211 t in 2020 and 266 t in 2021.</p> <p>A hull-mounted survey was completed in 2021, however there is a need to collect more data to update the assessment. Another hull-mounted survey is scheduled for 2022 to understand the timing and location of the spawning aggregations, and then an AOS in 2023 with a view to updating the stock assessment in 2024.</p>			
Projected biomass	N/A			
Species specific research and priorities				
Acoustic biomass estimates and monitoring of Cascade Plateau orange roughy				

Following a high level of research input in the early days of this fishery, the information flow has essentially all but ceased since 2006 due to a combination of low catches and fishing effort. The need for an updated stock assessment is apparent to inform appropriate TAC levels into the future. A hull mounted survey was completed in 2021, and another is scheduled for 2022. An SEQ (AOS) has been identified as a priority for 2023 to support a revised stock assessment in 2024.

RAG Recommendations

Noting the low levels of catch since 2009, SERAG did not have any concerns regarding the sustainability of the stock, however noted the need to update the assessment to inform future TACs.

SERAG recommended a TAC of 397 t for Cascade orange roughy for the 2022-23 fishing year. This TAC is based on the long-term RBC from the 2009 stock assessment and will allow for ongoing catch and data collection to support future stock assessments, including acoustic surveys in 2022 and 2023.

Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2022	397	No. SERAG (2021) recommended that the RBC be set at 397 for a single year, which was the long-term RBC from the 2009 stock assessment.
	2021	500	
	2020	500	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.	
State catch (t)	N/A	There are no estimates of State catches.	
Discards (t)	N/A	There are no estimates of discards.	
Recreational catch (t)	N/A	There are no known recreational catches for orange roughy.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		397 t	

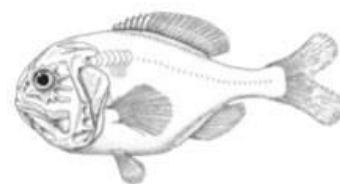
MAC Recommendations

Commercial fishers' interests	Industry noted that two boats fished the area during the 2021-22 fishing year, as of 1 February 2022, with approximately 42 per cent of the 2021-22 agreed TAC having been caught.
Species specific management (target, companion and bycatch)	This species is managed under the Orange Roughy Rebuilding Strategy 2014 . AFMA are currently finalising the revised Orange Roughy Rebuilding Strategy with a view to having it published in 2022.
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>397 t - single-year TAC</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted the recent developments around acoustic signal strength and how this has introduced uncertainty in the outputs of the 2009 stock assessment.</p>

	<p>Industry noted concerns that ten years of significant undercatch (only around 10% of TACs were caught in the last decade) on the Cascade Plateau had not been considered sufficiently by SERAG when recommending a reduction to the RBC to account for the uncertainties in the stock assessment.</p> <p>SEMAC noted that factors such as updates to stock assessment processes, undercaught TACs, and revised estimates of M would likely ‘offset’ the requirements for a decrease to the RBC, however in the absence of an update stock assessment these cannot be quantified.</p> <p>A hull-mounted acoustic survey is scheduled for 2022, with the potential for an Acoustic Optical Survey (AOS) to be completed in 2023. A stock assessment is unlikely to be completed until 2024 to allow time for this data to be analysed and incorporated in an updated assessment.</p> <p>SEMAC supported the SERAG advice to set a single -year TAC of 397 t for the 2022-23 fishing year.</p>			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	397	
AFMA Advice				
AFMA Management recommends a TAC of 397 t for the 2022-23 fishing year, a single year TAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t. Any changes to future TACs will be subject to the findings of acoustic surveys and updates to the stock assessment.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
500	397	10	2	-103

Orange roughy Eastern Zone

Hoplostethus atlanticus



ABARES (2012): Line Drawing – Rosalind Poole

Species summary						
Common names	Slimehead, deep sea perch, red roughy, orange ruff					
Stock assessment	Tier 1 Species - last assessed by SERAG in 2021.					
Stock structure	<p>Based on the existing data and fishery dynamics, multiple regional stocks of orange roughy are assumed and the fishery is managed and assessed as a number of discrete regional stocks.</p> <p>Recent genetic studies indicate little genetic diversity between all South East Australian stocks. However, they may be demographically separate.</p> <p>For assessment purposes the eastern stock (primarily St. Helens Hill and St. Patricks Head) is assumed to also include catches taken from the Pedra Branca area in the Southern Zone.</p>					
Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2021	30	30	48	20
	1	2017	33	26		
	1	2014	26	24		
Stock trend and other indicators	<p>Stock status: The most recent assessment (2021) indicates that the stock is above the limit reference point, and is estimated to be at 30% of unfished biomass (B₀) in 2021, and projected to be at 30%B₀ at the beginning of 2022 (Burch et al, 2021).</p> <p>Biomass trend: the 2021 stock assessment indicates that biomass is continuing to increase, however revisions to the model have resulted in an overall downward revision to the estimate of relative biomass – see ‘Biomass revised in most recent assessment’ above.</p> <p>Recent acoustic surveys (1999, 2006, 2010, 2012, 2013, 2016 and 2019) undertaken at St. Helen’s Hill and St. Patricks’ Head have estimated an increase in abundance, which supports the estimated increase in abundance from the Tier 1 stock assessments.</p>					
Multi-Year TAC	Year of MYTAC (2021-22)				Has the MYTAC advice been revised?	
	4 th of 3-year				N/A – assessment updated in 2021	
Catch and TAC (t)	SESSF fishing year		Agreed TAC		TAC after unders/overs	Cth Retained Catch
	2021-22		1,277		1,569	-

	2020-21	1,276	1,628	1319
	2019-20	900	976	619
	2018-19	689	966	856
Economics (Primary)	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
Commonwealth Trawl and Scalefish Hook	2019-20	5.01	51.34	8.74
	2018-19	7.15	49.47	14.45
	2017-18	2.30	41.86	5.49
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	The model assumptions include the single stock structure hypothesis; Eastern Zone spawning roughy and Pedra Branca non-spawning roughy. The biomass is assumed to have been unfished at the start of 1979. Plus group age was set at 120 years. Recruitment deviations (1905-1986) Natural mortality (M) estimated at 0.0393 Steepness fixed at 0.75 Recruitment variability fixed at 0.7			
Significant changes to data inputs	Acoustic biomass data from the 2019 eastern survey were included in the 2021 assessment.			
Data and RAG comments	The 2017 eastern orange roughy assessment used natural mortality of 0.04. For the 2021 assessment, M was estimated in the model to be 0.0393.			
Stock assessment information and RAG comments	<u>2021</u> <u>Estimating M</u> – The 2017 Eastern Zone Orange Roughy assessment highlighted the model was highly sensitive to the fixed value of natural mortality (M) used in the assessment. For the 2021 assessment CSIRO was asked to develop a process to account for uncertainty in M. A working group recommended estimate M using an informative prior developed from New Zealand Orange Roughy stocks. Age data was re-processed to provide models with 80, 100 and 120 age classes, and the ageing error for the model with 120 age-classes was used for assessments with 100 and 120 age classes. Natural mortality was estimated using the log-normal informative prior for 80, 100 and 120 age-classes. The number of age classes in the model was influential on the estimated value of M, with MPD estimates ranging from M=0.0344 for 80 classes, M=0.0373 (95%CI: 0.0326 – 0.0454) for 100 age classes and M=0.0386 (95%CI: 0.0331 – 0.0452) for 120 age classes. There was little information in the analyses to separate the models with 100 and 120 age classes - SERAG recommended the model with 120 age classes be adopted as the base case. Likelihood profiles for natural mortality show a conflict between age data, which prefers a higher estimate of M (~0.038), and the acoustic index data, which prefers a lower M (~.025). The likelihood profile on M was consistent with the estimated value of M.			

	<p><u>MCMC analysis</u></p> <p>SERAG (November 2021⁴⁰) requested using 12.5% and 87.5% quantiles of the estimated value of natural mortality from MCMC analysis as sensitivities to the base-case. The MPD estimates of current stock status (SSB₀/SSB₂₀₂₂) for the low (M=0.0358) and high (M=0.0432) natural mortality scenarios are 29.7% and 37.0% respectively, compared with the MPD estimate from the base-case of 32.4%.</p> <p>The status from the median of the MCMC was lower than the MPD estimate, and the selectivity width parameter was quite uncertain. The working group recommended that the MCMC analysis that estimates the width parameter of the logistic selectivity function should be retained and used to provide advice in setting RBCs, not the MPD.</p> <p>The MCMC model estimates stock status in 2021 to be 30%B₀ and produces a 2022 RBC of 681 t, or a three year average of 737 t. The working group also requested several constant catch projections to understand the uncertainty in future stock status (See ‘projected biomass’).</p> <p><u>Undercatch</u></p> <p>A sensitivity to the base case (not the MCMC) was undertaken to understand the impact of allowing 100% undercatch from the 2021-22 fishing year to be caught in the 2022-23 fishing year – the biomass in 2022 is expected to be 32.32%B₀ if undercatch is fully caught, compared to 32.46%B₀ if it were not caught. SERAG were supportive of the current undercatch provisions to remain in place, noting there is very little impact on the estimate of relative biomass.</p>						
<p>Projected biomass</p> <p>Estimated female spawning stock biomass (SSB), stock status and the probability of being below the limit reference point in 2024 and 2031</p>	Catch Scenario	SSB 2024	SSB 2031	Status 2024	Status 2031	Prob<LRP 2024	Prob <LRP 2031
	HCR	12,269	12,831	0.3162	0.3295	<0.001	<0.001
	550	12,378	13,609	0.3165	0.3481	<0.001	<0.001
	650	12,325	13,364	0.3152	0.3419	<0.001	<0.001
	737	12,279	13,149	0.3139	0.3363	<0.001	<0.001
	850	12,215	12,887	0.3129	0.3294	0.001	0.001
	950	12,123	12,583	0.3115	0.3230	0.003	0.002
	Industry Proposal	12,041	12,504	0.3093	0.3208	0.004	0.002
Species specific research and priorities							
<p><u>Orange roughy acoustic survey 2023</u></p> <p>This research has been identified as a priority and will provide an acoustic based biomass estimate for orange roughy (Eastern) for the 2023-24 fishing year. It also includes the collection of biological samples including length, weight, sex, spawning stage and otolith extraction.</p>							
RAG Recommendations							
<p>SERAG recommended a three-year MYTAC for orange roughy east using the outputs of the MCMC analysis. If a TAC greater than the RBC were to be set in the east, the constant catch scenarios and associated risk profiles should be used as basis for determining the TAC.</p> <p>The orange roughy Pedra Branca area three-year MYTAC will constitute 7 per cent of this RBC apportioned to the eastern zone.</p> <p>SERAG recommended maintaining the current undercatch provisions.</p>							

⁴⁰ Minutes from this meeting are currently being finalised

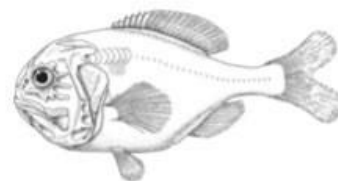
	Year	RBC (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2025	772 (93% of 830)	Yes. (93% of the Eastern Zone Tier 1 stock assessment, with 7% apportioned to the Pedra Branca area of the Southern Zone.)
	2024	734 (93% of 789)	
	2023	688 (93% of 740)	
	2022	633 (93% of 681)	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.	
State catch (t)	N/A	There are no estimates of State catches.	
Discards (t)	10.7	Estimated discards (four year weighted average 2017-2020).	
Recreational catch (t)	N/A	There are no known recreational catches for orange roughy.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		674 t – using three year average RBC	
MAC Recommendations			
Commercial fishers’ interests	See South East Trawl Industry Association (SETFIA) letter explained in SEMAC advice below.		
Species specific management (target, companion and bycatch)	Noting that the eastern stock estimated to be at 30%B ₀ , the model derived value of MSY, the species is managed under the Orange Roughy Rebuilding Strategy 2014 . Specific management, agreed by industry and AFMA, applies in the spawning period from 1 June to 31 August each year in the Eastern Orange Roughy Management Area (Eastern ORMA) including: <ul style="list-style-type: none">• Observer requirements• Minimum quota holdings (entry and stop fishing requirements)		
MAC advice and any dissenting views	2022-23 TAC recommendation 873 t - first year of a three-year MYTAC SEMAC advice and any dissenting views SEMAC noted the assessment process in 2021 involved revisions to the estimates of natural mortality (M) and the undertaking of a Markov-Chain Monte-Carlo (MCMC) analysis, which in		

	<p>combination resulted in a decrease to the recommended biological catch (RBC) from 1,279 in 2021 to 633 in 2022.</p> <p>SEMAC were presented with a constant catch table to understand the risk associated with total catches higher than the RBC produced by the harvest control rule (HCR). The projections estimate there is little risk to the stock in the short term of total catches up to 950 t.</p> <p>SEMAC considered a letter from SETFIA to SEMAC and the AFMA Commission proposing an even step-down TAC approach, whereby TACs are set based on a total mortality (RBC) of 1,166 t, 1,055 t and 950 t over the three-year MYTAC to accommodate the large decrease in the TAC. The proposed step down allows forward sales to be made in what has become a very difficult market for Australian orange roughy given:</p> <ul style="list-style-type: none"> • the orange roughy (eastern) “threatened” listing meant cancelation of MSC certification - sales difficult into Europe and the USA; • a trade dispute between China and Australia; and • large TAC reductions that spook the market. <p>While industry was supportive of the change in M because it removes uncertainty and likely better fits the ages of fish present, the SETFIA letter proposed that the TAC be set based on the risk of the stock falling below B20 in the medium term, points supporting this included:</p> <ul style="list-style-type: none"> • Despite significant investment in research, uncertainty in the Tier 1 assessment remain high. • Five iterations of the Acoustic Optical Survey (AOS) shows mature biomass of up to c40,000 t – (Tier 1 assessment c24,000 t). • Industry cannot afford AOS surveys under the SERAG recommended RBC of 633 t. • The introduction of an MCMC was a new process and has resulted in a further reduction to the RBC. • The HCR which is trying to accelerate the stock back to MEY is actually reducing TACs. For a highly aggregating stock like orange roughy (eastern) there is no catch efficiency to be had at higher biomasses. • For such a long-lived species, movements in TAC seem implausible and do not invite investment in catching, processing, or selling. <p>In providing its advice, SEMAC considered the following:</p> <ul style="list-style-type: none"> • the eastern stock continues to be managed under the Orange Roughy Rebuilding Strategy, which relies on the HCR to rebuild the stock towards the target reference point. Setting a higher TAC would slow down the recovery, although only marginally and in the short term; • a reduction in the TAC may result in a shift of effort elsewhere in the fishery, including the east coast where catches of jackass morwong are an issue; • there is little risk to the sustainability of the stock of setting catches up to 950 t (noting that this was the highest catch for which risk projections were provided) compared to the TAC produced by the HCR; the spawning stock biomass in 2024 is estimated to be 12,123 t compared to 12,279 t, and only a 0.03% chance of the stock falling below the limit reference point in the next ten years; • reducing the 2022-23 TAC to 674 t (almost half the 2021-22 TAC) would have significant economic impacts on the fleet; • with 2 months of fishing remaining, there is approximately 120 t of undercatch from the 2021-22 fishing year expected to carry over to the 2022-23 fishing year.
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	SEMAC considered and was sympathetic to the merits of a step-down approach, however, did not have the information at hand to understand the risk associated with catches higher than 950 t. SEMAC recommend a TAC of 873 t for the 2022-23 fishing year, the first of a three year MYTAC. This is based on an RBC of 950 t minus discards and a seven per cent allocation to the Pedra Branca area.			
SEMAC were also supportive of the AFMA Commission considering the step-down approach proposed by industry, subject to the projections table being updated to include these catch figures.				
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
100	10	2	873	
AFMA Advice				
<p>Constant catch projections using the total catch proposed by industry under a step-down approach shows there is very little difference to the expected spawning stock biomass and status (%B₀) in the years 2024 and 2031 (see ‘Projected biomass - Industry proposal’ above).</p> <p>While AFMA Management understands the benefit to industry and the low level of additional sustainability risk under a step-down TAC approach, there is some additional risk associated with setting a TAC in 2022 based on a total catch of 1,166 t - almost double the 2022 RBC from the updated assessment. Noting the species remains listed as a conservation dependent species, AFMA Management proposes that a TAC of 873 t (based on an RBC of 950 t) strikes a balance between meeting the objectives of the rebuilding strategy while maintaining the economic returns to the fishery.</p> <p>AFMA Management recommends a TAC of 873 t for the 2022-23 fishing year, the first of a three-year MYTAC, with undercatch provisions set at 100 per cent and overcatch provisions set at 10 per cent, and a determined amount of 2 t.</p>				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
1,277	873	Undercatch – 100 Overcatch - 10	2	-404

Orange roughy Southern Zone

Hoplostethus atlanticus



ABARES (2012): Line Drawing – Rosalind Poole

Species summary						
Common names	Slimehead, deep sea perch, red roughy, orange ruff					
Stock assessment	Tier 1 Species – Southern Zone last assessed by SlopeRAG in 2000 Pedra Branca has been assessed as part of the Eastern Zone Tier 1 stock assessment since 2002 and was last assessed by SERAG in 2021.					
Stock structure	Based on the existing data and fishery dynamics multiple regional stocks of orange roughy are assumed and the fishery is managed and assessed as a number of discrete regional stocks. Recent genetic studies indicate little genetic diversity between all south east Australian stocks, however they may be demographically separate. The part of the Southern Zone catch that is caught on the Pedra Branca grounds is assumed to be part of the eastern stock.					
<u>Southern</u> Stock status against reference points (%B ₀ in year +1)	Tier	Year	Biomass			
	-	2000	<30 (95% probability)		Maintain spawning biomass above 30% of the spawning biomass at the onset of significant commercial fishing (1988).	
	-	1996	<30 (56–68% probability)		Where there is a greater than 50% probability that a stock is below 30%, the TAC will be set such that the biomass reaches 30%B ₀ by 2004.	
	-	1995	<30 (9–55% probability)			
<u>Pedra Branca</u> Stock status against reference points (%B ₀ in year +1)	Tier	Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2021	30	30	48	20
	1	2017	33	26		
	1	2014	26	22		
Stock trend and other indicators	Southern Zone Stock status: unresolved in the Southern Zone. The most recent accepted assessment (2000) concluded that the stock was less than the limit reference point. The component of the Southern Zone stock that resides in the Pedra Branca seamounts is assessed as a part of the Eastern Zone stock assessment due to the stock structure					

	<p>assumptions. The Eastern Zone assessment in 2021 estimated the stock status in the Pedra Branca area to be 30% of unfished biomass in 2021, and projected to be at 30%B₀ at the beginning of 2022 (Burch et al, 2021).</p> <p>Biomass trend: the 2021 stock assessment indicates that biomass is continuing to increase, however revisions to the model have resulted in an overall downward revision to the estimate of relative biomass – see ‘Biomass revised in most recent assessment’ above.</p> <p>Recent acoustic surveys (1999, 2006, 2010, 2012, 2013, 2016 and 2019) undertaken at St. Helen’s Hill and St. Patricks’ Head have estimated an increase in abundance, which supports the estimated increase in abundance from the Tier 1 stock assessments.</p>			
Multi-Year TAC	Year of MYTAC (2021-22)		Has the MYTAC advice been revised?	
	Southern: N/A – Rebuilding species Pedra Branca: 4 th year of 3-year MYTAC.		Southern: N/A – Rebuilding species Pedra Branca: N/A assessment updated in 2021	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22	127	127	-
	2020-21	125	125	117
	2019-20	94	94	91
	2018-19	84	84	79
Economics (Primary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	Not Available	51.34	Not available
	2018-19	0.21	49.47	0.42
	2017-18	0.18	41.86	0.43
ABARES Status (2021 report)	Fishing Mortality: Uncertain		Biomass: Overfished	
Assessment summary				
Key model technical assumptions/ parameters	For Pedra Branca, see Orange Roughy East .			
Significant changes to data inputs	For Pedra Branca, see Orange Roughy East .			

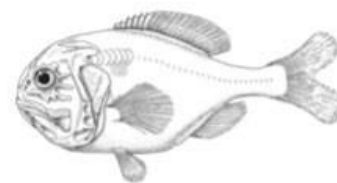
Data and RAG comments	For Pedra Branca, see Orange Roughy East .			
Stock assessment information and RAG comments	SERAG has previously agreed that, despite the absence of an agreed assessment model for the Southern Zone stock, the data show there is little targeting or bycatch of orange roughy. As such, the incidental bycatch TAC is applicable and does not impede recovery of the stock. For Pedra Branca, see Orange Roughy East .			
Species specific research and priorities				
Orange roughy acoustic survey 2023 This research has been identified as a priority and will provide an acoustic based biomass estimate for orange roughy (Eastern) for the 2023-24 fishing year. It also includes the collection of biological samples including length, weight, sex, spawning stage and otolith extraction.				
RAG Recommendations				
SERAG recommended a 3 year MYTAC for orange roughy (East) using the outputs of the MCMC analysis (see Orange Roughy East .). If a TAC greater than the RBC were to be set in the east, the constant catch scenarios and associated risk profiles should be used as basis for determining the TAC. The orange roughy Pedra Branca area 3 year MYTAC will constitute 7 per cent of this RBC apportioned to the eastern zone. SERAG recommended maintaining the 31 t incidental bycatch TAC for the remainder of the Southern zone. SERAG recommended maintaining the current undercatch provisions.				
Recommended Biological Catch (t)	Year	RBC (t): Southern	RBC (t): Pedra Branca	Is a MYTAC Recommended?
	2025	0	58 (7% of 830)	Southern: No. Rebuilding species. Pedra Branca: Yes – (93% of the Eastern Zone Tier 1 stock assessment, with 7% apportioned to the Pedra Branca area of the Southern Zone.)
	2024	0	55 (7% of 789)	
	2023	0	52 (7% of 740)	
	2022	0	48 (7% of 681)	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 stock assessments (Pedra Branca) and there is no assessment for the Southern Zone.		
State catch (t)	N/A	There are no estimates of State catches.		
Discards (t)	N/A	There are no estimates of discards.		
Recreational catch (t)	N/A	There are no known recreational catches for orange roughy.		

Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		Southern Zone: 31 t - Incidental bycatch TAC Pedra Branca: 52 t		
MAC Recommendations				
Commercial fishers' interests	SETFIA wrote to the Commission about Orange Roughy (east), noting that the TAC for Pedra Branca area is based on a seven per cent allocation of the eastern zone RBC.			
Species specific management (target, companion and bycatch)	This species is managed under the Orange Roughy Rebuilding Strategy 2014 . AFMA are currently finalising the revised Orange Roughy Rebuilding Strategy with a view to having it published in 2022.			
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>98 t comprising:</p> <ul style="list-style-type: none">- Southern zone 31 t - bycatch TAC- single-year; and- Pedra Branca 67 t - first year of a three-year MYTAC <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted the TAC for the Pedra Branca area is based on a seven per cent allocation of the eastern zone RBC. Noting the advice provided for eastern orange roughy, SEMAC supported a Pedra Branca TAC of 67 t, subject to the Commission further considering industry's proposal to implement a step-down TAC.</p> <p>There were no dissenting views on the application of a 31 t incidental bycatch TAC for the remainder of the Southern zone, and SEMAC were comfortable with the advice provided in the paper.</p>			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
0	0	2	98	
AFMA Advice				
<p>Noting AFMA's recommendation to set the eastern orange roughy TAC based on a total catch of 950 t, AFMA Management recommends the total catch permitted to be taken within the Pedra Branca area of the Southern zone be restricted to 67 t (that is, 7 per cent of the 950 t total catch).</p> <p>AFMA Management recommends maintaining the incidental bycatch TAC for the remainder of the Southern zone at 31t for the 2022-23 fishing year.</p> <p>AFMA Management recommends a TAC of 98 t for the 2022-23 fishing year, the first of a three-year MYTAC, with undercatch and overcatch provisions set at zero per cent, and a determined amount of 2 t.</p>				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)

127	98 67 t (Pedra Branca) 31 t (Southern Zone bycatch TAC)	0	2	-29
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Orange roughy Western Zone

Hoplostethus atlanticus



ABARES (2012): Line Drawing – Rosalind Poole

Species summary				
Common names	Slimehead, deep sea perch, red roughy, orange ruff			
Stock assessment	Tier 1 Species – Last assessed by SlopeRAG in 2002			
Stock structure	Based on the existing data and fishery dynamics multiple regional stocks of orange roughy are assumed and the fishery is managed and assessed as a number of discrete regional stocks. Recent genetic studies indicate little genetic diversity between all South Eastern Australian stocks, however they may be demographically separate.			
Stock status against reference points (%B₀)	Tier	Year	Biomass	
	-	2002	<30 (>50% probability)	Maintain spawning biomass above 30% of the spawning biomass at the onset of significant commercial fishing (1988).
	-	2000	<20 (97% probability)	Where there is a greater than 50% probability that a stock is below 30%, the TAC will be set such that the biomass reaches 30%B ₀ by 2004.
	No earlier assessment			
Stock trend and other indicators	Stock status is unresolved in the Western Zone however considering that there has been minimal fishing in the Western Zone and that the eastern stock has rebuilt to a harvestable level it is appropriate to consider that similar rebuilding may have occurred in the Western Zone.			
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?
	N/A – Rebuilding species			N/A
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22	60	60	-
	2020-21	60	60	9
	2019-20	60	60	24
	2018-19	60	60	19
Economics (Primary)	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	Not Available	51.34	Not Available

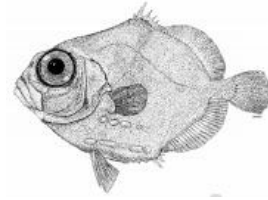
Commonwealth Trawl and Scalefish Hook	2018-19	0.21	49.47	0.42
	2017-18	0.84	41.86	2.00
ABARES Status (2021 report)	Fishing Mortality: Uncertain		Biomass: Overfished	
Assessment summary				
Key model technical assumptions/ parameters	N/A			
Significant changes to data inputs	N/A			
Data and RAG comments	N/A			
Stock assessment information and RAG comments	<p>SERAG has previously agreed that, despite the absence of an agreed assessment model, the data show there is little targeting or bycatch of western orange roughy. As such the incidental catch TAC is applicable and does not impede recovery of the stock.</p> <p>Bearing in mind the rebuild of the eastern stock from a low biomass it could be argued that the Southern and Western Zones should have recovered somewhat. This is tempered by not knowing if recruitment processes and stock movement in the Southern and Western Zones are similar or different to those in the Eastern Zone.</p> <p>SERAG (November 2021⁴¹) noted that the Western Zone continues to be managed under an incidental bycatch TAC and noted there was no additional information that would provide a basis for SERAG to change its' previous TAC advice. SERAG recommended that the Western Zone orange roughy incidental bycatch TAC remain unchanged – 60 t.</p> <p>SERAG noted that given the life history of orange roughy, multiple years of sufficient data will be required to provide informed advice on the recovery of western orange roughy. SERAG recommended maintaining the Western Orange Roughy Research Plan, including the research catch allowance of 200 t.</p>			
Species specific research and priorities				
Western Orange Roughy Research Plan				
<p>The Western Orange Roughy Research Plan (WORRP) was introduced in 2020 with the aim to assess the status of the western orange roughy stock and determine sustainable harvest levels for commercial fishing under the SESSF Harvest Strategy. This will be achieved by collecting robust scientific information including biological data, in each western orange rough research area.</p>				
RAG Recommendations				
<p>SERAG (November 2021⁴¹) recommended maintaining the 60 t incidental bycatch TAC for the 2022-23 fishing year.</p>				

⁴¹ Meeting minutes are currently being finalised

SERAG also recommended maintaining the 200 t RCA for the 2022-23 fishing year to support the WORRP.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2021	0	No. Rebuilding species.
	2020	0	
	2019	0	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.	
State catch (t)	N/A	There are no estimates of State catches.	
Discards (t)	N/A	Discards are not deducted from the incidental bycatch TAC.	
Recreational catch (t)	N/A	There are no known recreational catches for orange roughy.	
Research Catch Allowance (t)	200	Research catch allocated under the Western Orange Roughy Research Plan .	
Provisional TAC under the Harvest Strategy		60 t - Incidental bycatch TAC	
MAC Recommendations			
Commercial fishers' interests	Five scientific permits were allocated during the 2021-22 fishing year to fish under the WORRP. The program achieved the sampling requirements and approximately 115t in 2020-21 and 190 t in 2021-22 of RCA was utilised. During both years SETFIA's program to collect otoliths and lengths achieved >95% of the agreed data plan. The WORRP ran from August to January during the 2021-22 fishing year. Industry intend to apply for permits to fish from 1 May for the 2022-23 fishing year – this was supported by SERAG and SEMAC		
Species specific management (target, companion and bycatch)	This species is managed under the Orange Roughy Rebuilding Strategy 2014 . AFMA are currently finalising the revised Orange Roughy Rebuilding Strategy with a view to having it published in 2022.		
MAC advice and any dissenting views	2022-23 TAC recommendation 60 t bycatch TAC– single year 200 t – Research Catch Allowance SEMAC advice and any dissenting views SEMAC noted the success of the WORRP program and recommended a 200 t research catch allowance to support the program for the 2022-23 fishing year. There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.		
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)
0	0	2	60

AFMA Advice				
<p>AFMA Management recommends an incidental bycatch TAC of 60 t for the 2022-23 fishing year, with no undercatch and overcatch provisions and a determined amount of 2 t.</p> <p>AFMA Management also recommend a 200 t western orange roughy Research Catch Allowance for the 2022-23 fishing year and catch trigger of 100 t for each zone for 2022-23.</p>				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
60	60 – bycatch TAC 200 – Research Catch Allowance	0	2	0

Oreo basket



Species summary					
Species	Black oreodory (<i>Allocyttus niger</i>), spikey oreodory (<i>Neocyttus rhomboidalis</i>), warty oreodory (<i>Allocyttus verrucosus</i>) and other <i>Neocyttus</i> spp.				
Stock assessment	Tier 4 Species – last assessed by SERAG in 2020				
Stock structure	Little is known about the stock structure of the oreo species in this basket quota. They are benthic-pelagic species that are caught mainly below 600m. For assessment and management purposes they are treated as a single unit of stock through the SESSF.				
Stock status against reference points (C_{Targ}/C_{Lim})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2020	0.3986	0.4855	0.2023
	4	2017	0.4297	0.4743	0.1976
	4	2013	0.4076	0.464	0.1856
Stock trend and other indicators	<p>Catches have been variable through time, as high as 3,352 t in 1992, and between 780 - 2,091 t from 1993 to 2003. Since then, catches have declined and have remained below 200 t since 2011.</p> <p>Standardised CPUE has been essentially flat and stable since 2000.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	1 st of 3-year			No	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	139	157	-	
	2020-21	185	203	138	
	2019-20	185	203	94	
	2018-19	185	197	82	
Economics (Byproduct) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP	
	2019-20	0.66	51.34	1.29	
	2018-19	0.35	49.47	0.71	
	2017-18	0.10	41.86	0.24	

ABARES Status (2021 report)	Fishing Mortality: Uncertain	Biomass: Uncertain	
Assessment summary			
Key model technical assumptions/ parameters	The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed significantly since the reference period to the end of the most recent year.		
Significant changes to data inputs	The average of existing discard estimates were used to backfill earlier years’ estimates. Revised NSW annual catch were provided from 1992 onwards.		
Data and RAG comments	It has become apparent that spikey oreodory are being reported as ‘oxeye’ in logbooks. For the purpose of the Tier 4 assessment, logbook records of oxeye are assumed to be spikey oreodory. Most catches are from Zones 10 and 20 .		
Stock assessment information and RAG comments	Including discard estimates from 1986-2006 in the updated assessment has resulted in an increase in C _{Targ} . There was a decrease in the RBC to 170.2 t from the 2020 assessment compared to 256.5 t from the 2017 assessment. This was driven by an increase in C _{Targ} and a decrease in the four-year average CPUE (Sporcic, 2020a).		
Species specific research and priorities			
There has been no species specific research priorities identified.			
RAG Recommendations			
SERAG (December 2020) recommended a three-year MYTAC using the RBC of 170.2 t from the 2020 Tier 4 assessment.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2023	170.2	Yes. 3-year MYTAC using the RBC from the 2020 Tier 4 assessment.
	2022	170.2	
	2021	170.2	
Discount factor (t)	N/A	SERAG (December 2020) recommended not applying the discount factor due to 40 per cent of the oreo fishery being protected by deepwater closures.	
State catch (t)	N/A	There are no estimates of State catch.	
Discards (t)	33.2	The estimated discards decreased from 54 t in 2018 to 4 t in 2019, however the four-year weighted average remains higher.	

Recreational catch (t)	N/A	There are no known recreational catches as oreo are a deepwater species and are not targeted by recreational fishers.		
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		137 t		
MAC Recommendations				
Commercial fishers' interests	No specific commercial fisher interests have been identified.			
Species specific management (target, companion and bycatch)	There are no identified implications for target, companion or bycatch species.			
MAC advice and any dissenting views	2022-23 TAC recommendation 137 t - second year of a three-year MYTAC SEMAC advice and any dissenting views There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	137	
AFMA Advice				
AFMA Management recommends a TAC of 137 t for the 2022-23 fishing year, the second year of a three year MYTAC, with overcatch and undercatch provisions set at 10 per cent and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
139	137	10	2	-2

Pink ling

Genypterus blacodes



Species summary					
Common names	Pink cusk-eel, kingclip, golden ling, ling, Australian rock-ling				
Stock assessment	Tier 1 Species - last assessed by SERAG in 2021				
Stock structure	Pink ling are assessed as separate stocks east and west of Longitude 147° East. Genetic variation between eastern and western pink ling has not been found, however, there are differences in size and age structure, growth and catch rates between the Eastern and Western Zones. These differences suggest there is little mixing of pink ling between the zones, and that fishing in one area will have limited impact on fish in the other area.				
<u>East</u> Stock status against reference points (%B ₀ in year +1)	Tier	Year	Biomass	Target	Limit
	1	2021	34	48	20
	1	2018	30		
	1	2015	30		
<u>West</u> Stock status against reference points (%B ₀ in year +1)	Tier	Year	Biomass	Target	Limit
	1	2021	91	48	20
	1	2018	84		
	1	2015	73		
Stock trend and other indicators	<u>East</u> Biomass continues to increase and stock status is estimated to be between the limit and target reference points for the base model and sensitivities <u>West</u> Biomass has continued increasing above the management target.				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	3 rd of three year			N/A – Assessment updated in 2021	
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22		1,121	1,229	-

	2020-21	1,310	1,436	910
	2019-20	1,288	1,378	833
	2018-19	1,117	1,203	952
Economics (Primary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	6.37	51.34	12.41
	2018-19	6.38	49.47	12.90
	2017-18	5.05	41.86	12.06
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	Single area, two sex, age-structured (east and west) Von Bertalanffy growth, single natural mortality (M) Fixed maturity and steepness (h=0.75) SSB: female only, mid-year Two fisheries: trawl, non-trawl Time-blocked selectivities for trawl Boat effects in CPUE standardisation time-blocked for most boats (1986-1999, 2000-2006, 2007-2020) to account for effects of structural adjustment and halving in the number of boats from 2006 to 2007. Estimate parameters: B ₀ , growth, recruitments strengths, natural mortality, selectivities. Data weighting followed Francis (except age-length not fully down-weighted). A full Bayesian estimation was undertaken; Mode of the posterior distribution (MPD) runs for diagnostics followed by Markov Chain Monte Carlo (MCMC) runs for estimates.			
Significant changes to data inputs	The 2021 assessment was an update of the 2018 assessment with no significant changes to data inputs other than addition of new data (catch, CPUE, length and age frequencies).			
Data and RAG comments	Changes to the trip limits in the east since 2013 make it difficult to resolve the standardised CPUE and estimates of discards. ISMP data was used to estimate stock and fishing method specific landing multipliers (m) by year (west) and by trip limit periods and year for the east. Catch histories were revised for 2016 to 2018 (compared to the 2018 assessment) and catches for 2019 and 2020 were added, with catches in 2020 assumed to be the same in 2021. East (as in 2018), multiply estimated landing for each trawl record by the appropriate landings multiplier to get an estimate catch for each trawl. There is a strong depth effect on length frequency for trawl, so port sampled length frequencies were not used in the east.			
Stock assessment information and RAG comments	<u>West</u> A comparison of trawl CPUE series across the last four stock assessments shows a similar trend, with western CPUE trending upwards.			

	<p>Western MPD runs estimate relative biomass ranging from 78%B₀ to 93%B₀ based on the addition of data since the 2018 stock assessment. Estimates of relative spawning biomass are highly dependent on values of M, and range 71%B₀ to 95%B₀ under high (0.26) and low (0.2) values of M.</p> <p>Model fits to trawl CPUE are good in the later part of the time series. Model fits to FIS and trawl length frequencies are also good, but less so for the FIS indices.</p> <p>There is a ‘spike’ in fish around 90-95cm in 2018 which the model cannot fit.</p> <p>The likelihood profile for B₀ showed little conflict between the data sets with the MPD estimate at 5910 t and little support for values below 4000 t.</p> <p>The likelihood profile for M showed little conflict between the data sets with most information coming from age data. This provides a good basis for estimating M in the model (the MPD estimate was 0.22 and the MCMC estimate was 0.23).</p> <p>East</p> <p>A comparison of trawl CPUE series across the last four stock assessments shows a similar trend, with eastern CPUE trending upwards.</p> <p>Adding a latitude effect to the CPUE series depresses the series, driven by lower catch rates in the northern latitudes – there has been a southerly shift in the eastern trawl catches over time.</p> <p>MPD estimates are primarily presented for diagnostic purposes, whereas the results of the MCMC runs are used as a basis for management advice. Eastern MPD runs estimate relative biomass ranging from 29%B₀ to 33%B₀ based on the addition of data since the 2018 stock assessment with fixed value of M (0.23). Estimates of relative spawning biomass are highly dependent on values of M, and range 22%B₀ to 36%B₀ under high (0.26) and low (0.2) values of M.</p> <p>Model fits to the eastern trawl CPUE, length frequencies and Fishery Independent Survey Indices (5 years) are very good.</p> <p>The likelihood profile for B₀ shows good agreement between the data sets and provides a well-defined MPD estimate of 5890 t. However, the likelihood profile for M shows a confusing picture where age data favour high estimates of M and are opposed by length frequency data. This profile does not support the estimation of M in the base model.</p> <p>SERAG (September 2021) supported the proposed base case models and recommended that the eastern model use a value of M fixed at the estimate from the Western base case MCMC model.</p> <p>The MCMC estimates the 2021 eastern stock biomass at 34%B₀ with a 2022 RBC of 410 t and the western stock is estimated to be 91%B₀ with a 2022 RBC of 1300 t (Figure 14). The table below provides the likelihood of being below 20%B₀, or 30%B₀ or being at or above 48%B₀ in 2024 and 2031 under constant catch scenarios.</p> <table><tr><th>Catch (t)</th><th>E(B₂₄) (%B₀)</th><th>E(B₃₁) (%B₀)</th><th>P(SS₂₄ < 0.2)</th><th>P(SS₃₁ < 0.2)</th><th>P(SS₂₄ < 0.3)</th><th>P(SS₃₁ < 0.3)</th><th>P(SS₂₄ ≥ 0.48)</th><th>P(SS₃₁ ≥ 0.48)</th></tr><tr><td></td><td>47</td><td>75</td><td>0.00</td><td>0.00</td><td>0.01</td><td>0.00</td><td>0.41</td><td>1.00</td></tr><tr><td></td><td>40</td><td>51</td><td>0.00</td><td>0.00</td><td>0.12</td><td>0.03</td><td>0.17</td><td>0.56</td></tr><tr><td></td><td>39</td><td>46</td><td>0.00</td><td>0.01</td><td>0.15</td><td>0.07</td><td>0.14</td><td>0.43</td></tr><tr><td></td><td>38</td><td>45</td><td>0.01</td><td>0.01</td><td>0.18</td><td>0.10</td><td>0.12</td><td>0.36</td></tr><tr><td></td><td>37</td><td>42</td><td>0.01</td><td>0.02</td><td>0.20</td><td>0.15</td><td>0.11</td><td>0.28</td></tr><tr><td></td><td>36</td><td>38</td><td>0.01</td><td>0.05</td><td>0.25</td><td>0.24</td><td>0.09</td><td>0.20</td></tr><tr><td></td><td>36</td><td>36</td><td>0.02</td><td>0.08</td><td>0.28</td><td>0.34</td><td>0.09</td><td>0.14</td></tr><tr><td></td><td>34</td><td>32</td><td>0.03</td><td>0.16</td><td>0.33</td><td>0.46</td><td>0.07</td><td>0.10</td></tr><tr><td></td><td>34</td><td>29</td><td>0.04</td><td>0.23</td><td>0.37</td><td>0.55</td><td>0.07</td><td>0.06</td></tr></table>	Catch (t)	E(B ₂₄) (%B ₀)	E(B ₃₁) (%B ₀)	P(SS ₂₄ < 0.2)	P(SS ₃₁ < 0.2)	P(SS ₂₄ < 0.3)	P(SS ₃₁ < 0.3)	P(SS ₂₄ ≥ 0.48)	P(SS ₃₁ ≥ 0.48)		47	75	0.00	0.00	0.01	0.00	0.41	1.00		40	51	0.00	0.00	0.12	0.03	0.17	0.56		39	46	0.00	0.01	0.15	0.07	0.14	0.43		38	45	0.01	0.01	0.18	0.10	0.12	0.36		37	42	0.01	0.02	0.20	0.15	0.11	0.28		36	38	0.01	0.05	0.25	0.24	0.09	0.20		36	36	0.02	0.08	0.28	0.34	0.09	0.14		34	32	0.03	0.16	0.33	0.46	0.07	0.10		34	29	0.04	0.23	0.37	0.55	0.07	0.06
Catch (t)	E(B ₂₄) (%B ₀)	E(B ₃₁) (%B ₀)	P(SS ₂₄ < 0.2)	P(SS ₃₁ < 0.2)	P(SS ₂₄ < 0.3)	P(SS ₃₁ < 0.3)	P(SS ₂₄ ≥ 0.48)	P(SS ₃₁ ≥ 0.48)																																																																																			
	47	75	0.00	0.00	0.01	0.00	0.41	1.00																																																																																			
	40	51	0.00	0.00	0.12	0.03	0.17	0.56																																																																																			
	39	46	0.00	0.01	0.15	0.07	0.14	0.43																																																																																			
	38	45	0.01	0.01	0.18	0.10	0.12	0.36																																																																																			
	37	42	0.01	0.02	0.20	0.15	0.11	0.28																																																																																			
	36	38	0.01	0.05	0.25	0.24	0.09	0.20																																																																																			
	36	36	0.02	0.08	0.28	0.34	0.09	0.14																																																																																			
	34	32	0.03	0.16	0.33	0.46	0.07	0.10																																																																																			
	34	29	0.04	0.23	0.37	0.55	0.07	0.06																																																																																			
Projected biomass	East:																																																																																										

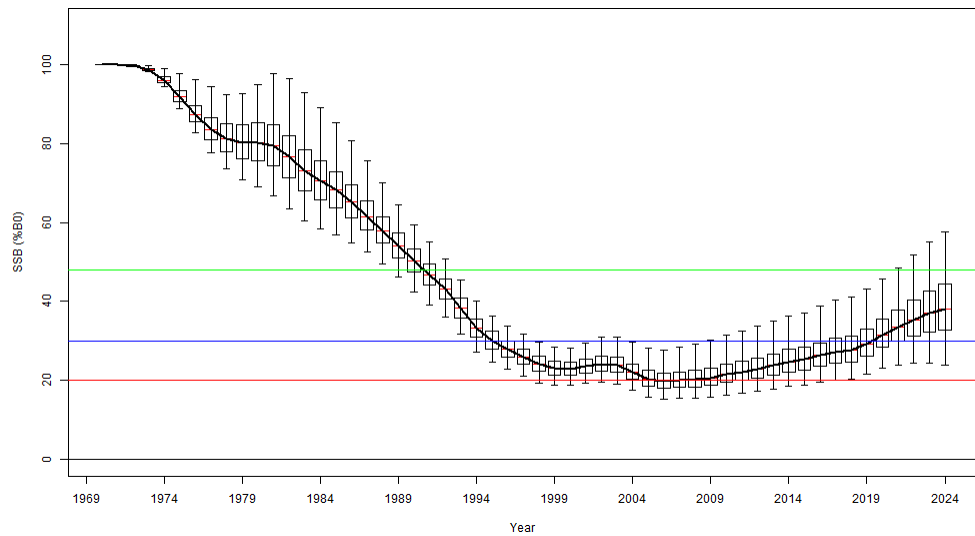


Figure 14: MCMC projected eastern biomass under the harvest control rule RBC

West:

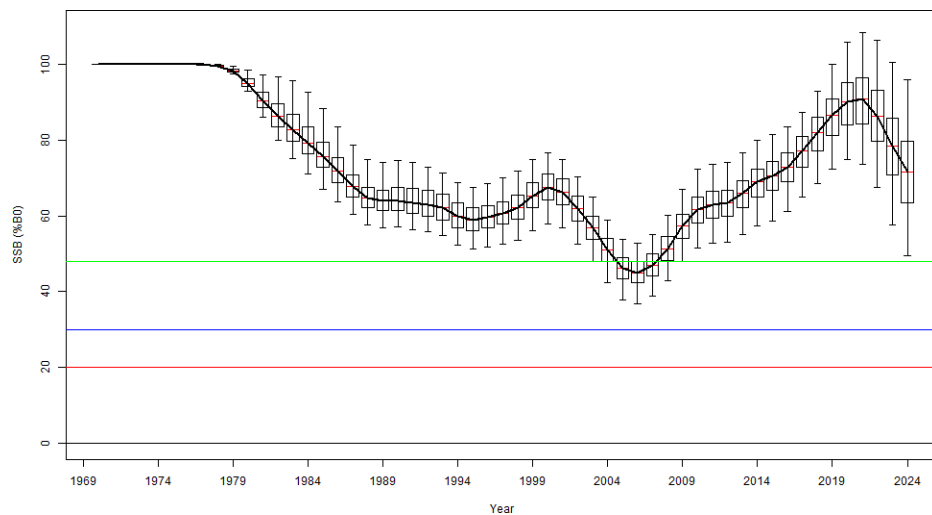


Figure 15: MCMC projected western biomass under the harvest control rule RBC

Species specific research and priorities

There is no species-specific research currently underway or identified as future priorities.

RAG Recommendations

SERAG (November 2021⁴²) recommended a 3-year MYTAC with RBCs for the east and west stocks based on the outputs of the MCMC analysis. If a TAC greater than the RBC were to be set in the east, the constant catch scenarios and associated risk profiles should be used as basis for determining the TAC.

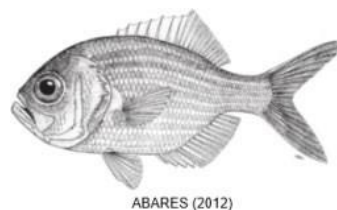
⁴² Meeting minutes are currently being finalised

	Year	RBC (t): East	RBC (t): West	Combined (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2024	490	1,090	1,580	Yes. 3-year MYTAC using average east (457 t) and west (1,193 t) RBCs from the 2021 assessment.
	2023	470	1,190	1,660	
	2022	410	1,300	1,710	
	Long term yield	570	730	1,300	
Discount factor (t)	N/A	A discount factor is not applied.			
State catch (t)	East = 54.4 West = 0.4 Combined =54.8	The majority of State catches were recorded in NSW (east) and TAS (west), and are deducted from the RBC.			
Discards (t)	East = 20.2 West = 6.4 Combined = 26.8	Discards are not modelled in the Tier 1 assessment – weighted average discards are deducted from the RBC.			
Recreational catch (t)	N/A	There are reports of increasing recreational catch of this species, but catches are not estimated and unlikely to be significant.			
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.			
Provisional TAC under the Harvest Strategy		East: 382 t West: 1,186 t Combined: 1,568 t * Eastern notional catch limit will be considered using constant catch scenarios			
MAC Recommendations					
Commercial fishers' interests	Line and trawl operators have previously noted the difficulty in constraining catches in the east. Pink ling are largely caught as a byproduct species using trawl methods, however line operators target pink ling, and can limit catches by focusing fishing effort in other areas of the fishery.				
Species specific management (target, companion and bycatch)	While the pink ling TAC is set across the whole fishery (east and west), pink ling is assessed separately as two stocks: eastern and western. The eastern stock, although above the limit reference point (LRP), requires rebuilding to the target reference point (TRP). Similar to the approach adopted for the previous three-year MYTAC, SEMAC considered setting a notional eastern catch limit based on constant catch projections (see stock assessment information and RAG comments), rather than the RBC. This				

	allows a level of incidental catch of pink ling to be landed instead of discarded, whilst allowing the stock to rebuild to the TRP (although at a slower rate than under the RBC). For the 2021-22 fishing year, operators opted to either limit their catches under the SETFIA commitment arrangement (commitment vessels) or default to a 200 kg trip limit. As of January 2022, all SETFIA vessels remain within their agreed catch limits, and total catches are on track to remain below the notional catch limit for the 2021-22 fishing year of 427 t, as they have for the previous several years			
MAC advice and any dissenting views	2022-23 TAC recommendation 1,568 t (including a 475 eastern notional catch limit) – first year of a three-year MYTAC. SEMAC advice and any dissenting views SEMAC recognised the positive work undertaken by SETFIA to manage industry catch commitments for the eastern stock and that the approach has been successful in limiting catches for a number of years. SEMAC recommended a total notional eastern catch limit of 550 t and considered this to be consistent with the level of risk applied when setting the notional catch limit for the previous MYTAC period. This provides for a notional eastern TAC of 475 t once state catches and discards are deducted. The eastern notional catch limit available to the Commonwealth will vary depending on the estimates of discards and state catches each year. There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	1,568	
AFMA Advice				
AFMA Management recommends a TAC of 1,568 t for the 2022-23 fishing year, the second year of a three year MYTAC, with overcatch and undercatch provisions set at 10 per cent and a determined amount of 2 t. Within this TAC, AFMA recommend a nominal catch limit of 475 t is introduced for the eastern stock. Within the 475 t eastern nominal catch limit, AFMA will work with SETFIA to agree an amount to be allocated to the SETFIA Commitment boats, based on expected catches by boats fishing under trip limits.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
1,121	1,568	10	2	+447

Redfish

Centroberyx affinis



Species summary						
Common name	Nannygai, golden snapper, red snapper, king snapper					
Stock assessment	Tier 1 Species - last assessed by SERAG in 2020					
Stock structure	No formal stock discrimination studies have been done in Australia. Tagging studies suggested a single unit stock of redfish off NSW. Previous studies of mean length at age suggest differences in growth rates between the ‘northern’ and ‘southern’ sectors of the fishery off eastern Australia. The boundary being Latitude 36°S (just north of Montague Island).					
Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2020	4	4	48	20
	1	2017	8	3		
	1	2014	12	2		
Stock trend and other indicators	The 2020 Tier 1 assessment estimates a slightly larger absolute spawning biomass compared to the 2017 assessment, however the relative spawning biomass has decreased from 7.8%B ₀ to 3.8%B ₀ .					
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?		
	N/A – Rebuilding species			N/A		
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs		Cth Retained Catch
	2021-22		50	50		-
	2020-21		50	50		26
	2019-20		50	50		29
	2018-19		100	100		31
Economics (Secondary)	Financial Year		Species GVP (\$m)	Fishery GVP (\$m)		% Fishery GVP
	2019-20		0.13	51.34		0.25

Commonwealth Trawl and Scalefish Hook	2018-19	0.11	49.47	0.22
	2017-18	0.11	41.86	0.26
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Overfished	
Assessment summary				
Key model technical assumptions/ parameters	Two sex, single stock in two regions; NSW and East Bass Strait. Steepness is fixed at 0.75. Natural Mortality (M) estimated at 0.075 (range 0.066 - 0.083) Recruitment deviations are estimated to 2015. The previous assessment (2017) estimated two selectivity patterns, one for onboard data and another for port, with one retention function. The current assessment structure only estimates one selectivity pattern for both NSW and eastern Bass Strait. The current assessment estimates two retention functions, one for each region to allow for differences in discard practices between each region.			
Significant changes to data inputs	There were no significant changes to data inputs other than the standard inclusion of revised catch, CPUE, discards and biologicals.			
Data and RAG comments	Length composition data is missing for the period 1993 - 1998 which has been filtered out in the data processing due to missing length type and location information.			
Stock assessment information and RAG comments	<u>Fits to CPUE</u> Fitting to two separate catch rate indices results in similar fits to NSW catch rates as in the 2017 assessment, while also fitting to the eastern Bass Strait index. <u>Recruitment</u> The model estimates above average recruitment in 2013, returning to below average recruitment in 2014 and 2015 and addresses the retrospective pattern revising recruitment deviations down with the inclusion of additional years of data. <u>Biomass Estimate</u> The new model structure reduces uncertainty in the biomass estimate in the early part of the time series, and results in a lower estimate of absolute and relative biomass. <u>Likelihood profiles</u> Natural Mortality (<i>M</i>) – the likelihood profile suggests a range of values from 0.066 - 0.083, with the most likely value 0.075. Steepness (<i>h</i>) – there is little information in the model that can inform estimation of <i>h</i> and it is fixed at 0.75 in the model. SSB ₂₀₁₉ - the likelihood profile suggests that the model estimates depletion in 2019 with high certainty, between 2% and 4.75% of unfished levels. Fixed catch projections from the 2020 Tier 1 assessment suggested there is three years difference in expected rebuilding timeframes for catches of 0 t, 50 t or 100 t under average recruitment, and five years between catch scenarios under a low recruitment scenarios (see Projected Biomass, Fig 18). However, catch projections should be treated with caution given the limited recovery of this species observed to date (Figure 16). SERAG (November 2020) considered a companion species analysis which investigated the link between target species catch and the associated level of unavoidable bycatch of recovering species. The analysis incorporated a range of factors such as area, depth fished and gear type – also known as metiers.			

	<p>Using logbook data from 2018 and 2019, and expected 2021-22 TACs for the main companion species, the estimated unavoidable bycatch of redfish for 2021 is 32.2 t, with a range between 26.7 and 38.7 t.</p> <p>SERAG (November 2021⁴³) reviewed the catch and effort information in 2021.</p> <p>The majority of catch continues to be taken off the east coast of NSW, and there has been no apparent shift distribution.</p> <p>There are two boats which have consistently caught redfish in high amounts, relative to other boats in the fleet, and a third boat has appeared in 2020 and has caught more than any other boat in recent years – this may be evidence of targeting.</p> <p>Catches have increased in 2020, and are close to the estimated level of fishing that would constitute overfishing estimated in the 2020 stock assessment.</p> <p>SERAG could not resolve the estimates of discards, and could not provide advice on whether total mortality is sufficiently low to allow rebuilding. Observed estimates of discards over time have been higher than those modelled.</p>		
Projected biomass	<p><u>Fixed catch projections</u></p> <p>Due to consistent estimation of recruitment below average levels, projections were conducted under a low recruitment scenario using the average recruitment over the past ten years. This updated ten year average was higher than the ten-year average used in the 2017 assessment and results in estimation of shorter recovery timeframes.</p>		
	<p>Estimated year of recovery to B_{Lim} under different catch and recruitment scenarios</p>		
	Catch (t)	Average recruitment	Low recruitment
	0	2032	2037
	50	2033	2039
	100	2035	2042
	<p>Predicted discards are considered in the projections, but are in addition to the projected catches.</p> <p>SERAG noted that factors other than fishing mortality seem to be preventing recovery of this species and management intervention has not prevented the decline in recent years.</p>		

⁴³ Meeting minutes are currently being finalised

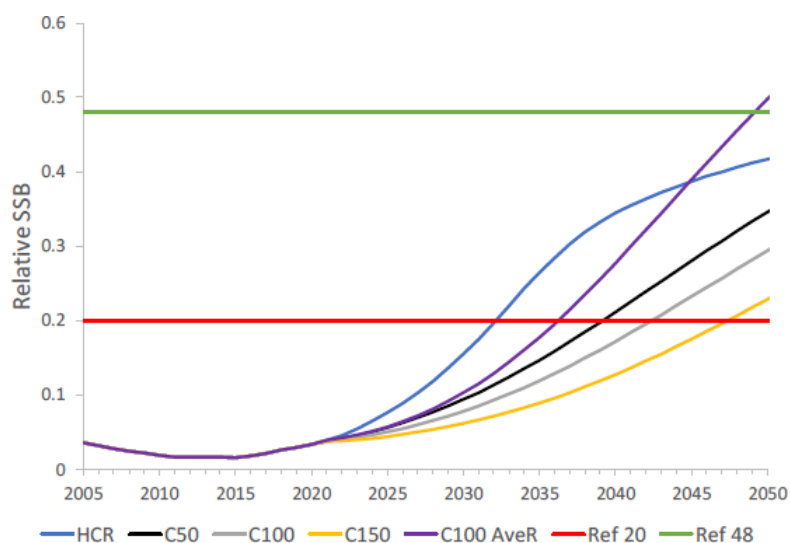


Figure 16: Relative spawning biomass time-series for alternative catch scenarios. Catches of 50 t (black), 100 t (grey) and 150 t (orange) are projected under a low recruitment scenario and the purple line (100 t) is projected under an average recruitment scenario (Bessell-Browne & Tuck 2020).

Species specific research and priorities

There is no species-specific research currently underway or identified as future priorities.

RAG Recommendations

SERAG did not recommend a redfish incidental bycatch TAC for the 2022-23 fishing year. Instead, SERAG recommended SEMAC consider the following:

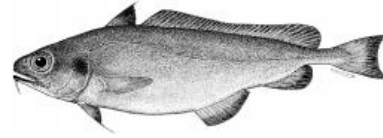
- RBCs continue to be set at zero, with bycatch TACs set at a level to cover incidental catches without promoting discarding and misreporting.
- Consider the results from the companion species analysis as well as projections from the 2020 Tier 1 stock assessment (see 'projected biomass' above).
- While total fishing mortality should be minimised to promote recovery, consideration should be given to the potential economic impact of changes to bycatch TACs or management arrangements for other key companion species (i.e. flathead, pink ling and blue grenadier).

Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2023	0	No. Rebuilding species
	2022	0	
	2021	0	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.	
State catch (t)	10.7	State catches are not deducted from the bycatch TAC but are considered as part of the annual review of the rebuilding strategy each year.	

Discards (t)	N/A	Discards are modelled in the Tier 1 assessment but are not deducted from the bycatch TAC.		
Recreational catch (t)	N/A	There are no estimates of recreational catch.		
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		0 t – incidental bycatch TAC		
MAC Recommendations				
Commercial fishers' interests	No specific commercial fisher interests have been identified.			
Species specific management (target, companion and bycatch)	The species is manage under the Redfish Rebuilding Strategy 2016-2021 . A review of the Redfish Rebuilding Strategy will commence in 2022.			
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>50 t bycatch TAC – single-year.</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted the current catch is below the model estimates that allow for rebuilding under a low recruitment scenario and that a 50 t bycatch TAC does not currently constrain catches.</p> <p>SEMAC also noted that measures introduced to reduce catches of eastern jackass morwong will likely also reduce catches of eastern redfish.</p> <p>There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.</p>			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
0	0	2	50	
AFMA Advice				
AFMA Management recommends maintaining the bycatch TAC of 50 t for the 2022-23 fishing year, a single-year bycatch TAC, with overcatch and undercatch provisions set at zero per cent and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
50	50	0	2	0

Ribaldo

Mora mora



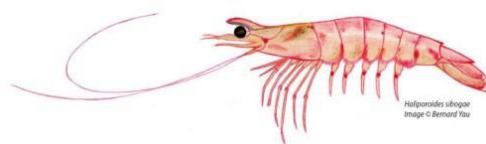
Species summary					
Common name	Ribaldo cod, googly-eyed cod, ghost cod, deepsea cod, common mora, morid cod, giant cod				
Stock assessment	Tier 4 Species - last assessed by SERAG in 2020.				
Stock structure	Assumed to be a single stock in the SESSF.				
Stock status against reference points (C _{Lim} /C _{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2020	0.7894	0.3728	0.1864
	4	2017	0.7978	0.3597	0.1799
	4	2013	0.6671	0.3416	0.164
Stock trend and other indicators	CPUE has been above the target reference point since the reference period and has increase from just above the target reference point in 2007 to a four-year average of more than double the target reference point in 2019.				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	1 st of three year			No	
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22		396	437	-
	2020-21		422	463	132
	2019-20		422	461	129
	2018-19		430	465	107
Economics (Byproduct) Commonwealth Trawl and Scalefish Hook	Financial Year		Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20		0.29	51.34	0.56
	2018-19		0.25	49.47	0.51
	2017-18		0.22	41.86	0.53
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing			Biomass: Not overfished	

Assessment summary			
Key model technical assumptions/ parameters	The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed significantly since the reference period to the end of the most recent year.		
Significant changes to data inputs	<p>The average of discard estimates from 1998-2004 (reference period) have been used to backfill discard rates from 1986-2003.</p> <p>There have been revisions to the NSW annual catch from 2009 onwards.</p> <p>CDR records begin in 2005 – the agreed catch history from the previous Tier 4 assessment was used again in 2020 (Sporcic, 2020a).</p>		
Data and RAG comments	<p>Most of the catch is taken in Zone 40.</p> <p>Catches have increased from 85 t to 126 t over the last four years.</p>		
Stock assessment information and RAG comments	While C _{Targ} increased because of revisions to NSW catches, a slight reduction in the four-year average CPUE has resulted in an RBC of 405.4 t, a reduction from 430.3 t from the 2017 assessment.		
Species specific research and priorities			
There is no species-specific research currently underway or identified as future priorities.			
RAG Recommendations			
SERAG (December 2020) recommended a three-year MYTAC using the RBC of 405.4 t from the 2020 Tier 4 assessment.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2023	405	Yes. Three-year MYTAC using RBC of 405 t from the 2020 Tier 4 assessment.
	2022	405	
	2021	405	
Discount factor (t)	N/A	SERAG recommended not applying a discount factor because deepwater closures provide protection to the stock.	
State catch (t)	1.3	Mostly NSW State catches; consistently low.	
Discards (t)	7.1	The 2018 estimated discard rate of five per cent was carried forward to 2019 and 2020.	
Recreational catch (t)	N/A	There are no estimates of recreational catch – likely insignificant.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		397 t	

MAC Recommendations				
Commercial fishers' interests	Industry members have previously noted the undercatch is due to the fact that a large portion of the stock is unavailable due to ground closures.			
Species specific management (target, companion and bycatch)	Deepwater closures are considered to provide significant protection.			
MAC advice and any dissenting views	2022-23 TAC recommendation 397 t - second year of a three-year MYTAC SEMAC advice and any dissenting views Industry noted ribaldo is a low value species and is not targeted. There were no dissenting views and SEMAC were comfortable with the information provided in the table.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	397	
AFMA Advice				
AFMA Management recommends a TAC of 397 t for the 2022-23 fishing year, the second year of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021–22 agreed TAC (t)	2022–23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
396	397	10	2	+1

Royal red prawn

Haliporoides sibogae



Species summary					
Common names	Pink prawn, jack-knife prawn, redspot king prawn				
Stock assessment	Tier 4 Species - last assessed by SERAG in 2020				
Stock structure	Little is known of the stock structure in Australia, but they are assumed to comprise a common stock off eastern Australia which straddles the Barrenjoey Point SESSF management line.				
Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE_{Recent}	CPUE_{Target}	CPUE_{Limit}
	4	2020	1.6045	0.9463	0.3943
	4	2017	1.1114	1.0692	0.4455
	4	2013	1.0443	1.0615	0.4246
Stock trend and other indicators	<p>Catches of royal red prawn have decreased from a peak in the 1990s (up to 640 t) to typically less than 200 t since 2006 – due largely to a decrease in the number of boats targeting.</p> <p>CPUE increased steadily from between the target and limit reference point in 2007 to above the target reference point 2017. There has been a large increase in CPUE in 2018 and again in 2019.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)		Has the MYTAC advice been revised?		
	1 st year of three year		No		
Catch and TAC (t)	SESSF Fishing Year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	605	645	-	
	2020-21	403	444	33	
	2019-20	409	447	164	
	2018-19	381	418	147	
Economics (Secondary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP	
	2019-20	0.56	51.34	1.09	
	2018-19	0.56	49.47	1.13	
	2017-18	0.88	41.86	2.10	

ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing	Biomass: Not overfished	
Assessment summary			
Key model technical assumptions/ parameters	The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed significantly since the reference period to the end of the most recent year.		
Significant changes to data inputs	<p>The average discard proportion for years after 1998, excluding years where estimates are not available, is used to ‘backfill’ the discard estimates pre-1998.</p> <p>A revised NSW catch series was provided by Dr Liggins for the period 1986 to 1997, however these were not used because the records were vastly different to previous catch series held by CSIRO. Dr Sporcic suggested this should be resolved before the catch series is updated for the next assessment in 2021.</p>		
Data and RAG comments	<p>The CPUE analysis was updated using bathymetry data to modify depth-reporting issues from the main boats in 2018 and 2019. SERAG (December 2020) noted the revised catch at depth is still too shallow, but noted there was very little change in CPUE trajectory.</p> <p>State catches are high in the early part of the time-series (150 - 330 t), however have been typically less than 10 t since 2007. State catches in 2016 we 51 t, most likely from NSW catches north of Barrenjoey point.</p> <p>Commonwealth catch has been between 115 and 220 t since 2010, with 143.4 t landed in 2019. Commonwealth discards are typically low, between 1.3 and 5.5 per cent since 2011.</p> <p>The TAC has never been a limiting factor for this species – catches are influenced by market demand.</p>		
Stock assessment information and RAG comments	<p>There was little difference in the CPUE series after modifications to depth records.</p> <p>CPUE over the past six years has increased significantly, resulting in an RBC of 869.6 t from the 2020 assessment compared to 430.8 t from the 2017 assessment. This was also influenced by an increase in C_{Targ} and the scaling factor (Sporcic, 2020a).</p> <p>The increase in CPUE is assumed to reflect an increase in biomass, however royal red prawns are only targeted by two boats, and it is difficult to account for targeting and improved efficiency when standardising CPUE.</p>		
Species specific research and priorities			
There is no species-specific research currently underway or identified as future priorities.			
RAG Recommendations			
SERAG (December 2020) recommended a three-year MYTAC using the RBC of 869.6 t from the 2020 Tier 4 assessment. SERAG noted the large change limiting rule would preclude the TAC from increasing by more than 50 per cent.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2023	869.6	Yes.

	2022	869.6	3-Year MYTAC using the RBC of 869.6 t from the 2020 Tier 4 assessment.
	2021	869.6	
Discount factor (t)	130.4	A discount factor was not applied in 2020-21 because of the protection afforded by deepwater closures. Due to the increased uncertainty in the 2020 Tier 4 assessment, SERAG agreed to apply the default 15 per cent discount factor.	
State catch (t)	82.9	All NSW catch. There was a significant increase in the reported catch in NSW from less than 1 t in 2019, to 153 t in 2020. AFMA will confirm this figure prior to recommending a TAC for the 2022-23 fishing year.	
Discards (t)	5.2	Estimated discard rates have been consistently low over time.	
Recreational catch (t)	N/A	Royal red prawn are a deep water species and are not targeted by recreational fishers.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		651 t	
MAC Recommendations			
Commercial fishers' interests	No specific commercial fisher interests have been identified.		
Species specific management (target, companion and bycatch)	Royal red prawn fishing grounds off Sydney historically occurred in areas of core habitat for Harrison's and southern dogfish and subsequently some of the fishing grounds have been closed under the Upper Slope Dogfish Management Strategy .		
MAC advice and any dissenting views	2022-23 TAC recommendation 651 t - second year of a three-year MYTAC SEMAC advice and any dissenting views SEMAC noted the large increase in NSW catches and that there are no catch arrangements between the Commonwealth and NSW for royal red prawn. State catches are deducted from the RBC. There were no dissenting views and SEMAC were comfortable with the information provided in the table.		
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)
10	10	2	651
AFMA Advice			
AFMA Management recommends a TAC of 651 t for the 2022-23 fishing year, the second year of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.			

2021-22 agreed TAC (t)	2022-23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
605	651	10	2	46

Sawshark

Pristiophorus spp.



CSIRO national Fish Collection (2009)

Species summary					
Common names	Common sawshark (<i>Pristiophorus cirratus</i>), southern sawshark (<i>P. nudipinnis</i>), eastern sawshark (<i>P. spp</i>)				
Stock assessment	Tier 4 Species - last assessed by SharkRAG in 2020.				
Stock structure	<p>Sawshark (comprising of <i>P. cirratus</i>, <i>P. nudipinnis</i>, <i>P. spp</i> and <i>Pristiophoridae</i>) are currently assessed as a single stock.</p> <p>Three endemic species of sawsharks occur off southern Australia, but their distributions have not been described precisely. Common sawshark (<i>P. cirratus</i>) is reported to range from Jurien Bay in WA to Eden in NSW, including Tasmania, to depths of 310 m. Southern sawshark (<i>P. nudipinnis</i>) is reported to range from the western region of the GAB to eastern Gippsland in Victoria, including Tasmania, to depths of 70 m. The eastern sawshark (<i>P. sp. A</i>) is reported to range from approximately Lakes Entrance in Victoria to Coffs Harbour in NSW at depths of 100–630 m (Last and Stevens 1994).</p> <p>Little is known of stock structure or movement rates. For assessment purposes, all sawshark south of the Victoria–NSW border are assumed to be common sawshark and southern sawshark, whereas those north of this border are assumed to be eastern sawshark.</p>				
Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE_{Recent}	CPUE_{Target}	CPUE_{Limit}
	4	2020	0.9476	0.7293	0.3646
	4	2017	0.9443	0.7236	0.3618
	4	2013	1.0050	0.8740	0.3497
Stock trend and other indicators	Total catches in 2019-20 are similar to the previous fishing year. Trawl CPUE is increasing towards the long-term average and has been used for the Tier 4 assessment. The assessment also includes discard estimates and State catches. The distribution of effort at depth has remained stable throughout the time series. The length frequency distribution has remained stable throughout the time series.				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	First year of a 3-year MYTAC			No	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	509	547	-	
	2020-21	432	471	172	
	2019-20	430	470	189	

	2018-19	430	472	179
Economics (Secondary) Gillnet, Hook and Trap	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	0.48	19.67	2.44
	2018-19	0.60	23.66	2.54
	2017-18	0.41	19.51	2.10
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	The Tier 4 assessment uses the standardised trawl CPUE series as a key input (Sporcic, 2020). Landings data between 1995 and 2001 was sourced solely from GABTS logbook data. Since 2002, data has been sourced from CDRs. It was noted the reference period (2002 – 2008) for the 2020 assessment used CDR data. The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed significantly since the reference period to the end of the most recent year.			
Significant changes to data inputs	In addition to the inclusion of new data for 2016-2020, SharkRAG (November 2020) recommended, consistent with the approach adopted by SERAG for other Tier 4 assessments, the following changes to data inputs to the assessment: <ul style="list-style-type: none">- an updated catch series incorporated part of a revised NSW annual catch. There are issues of (i) double reporting of Commonwealth catch and NSW catch and (ii) misreporting of Commonwealth catch as NSW catch before about 1998 which needs to be resolved. However, revised NSW annual catch post 1998 are not subject to the above (double and misreporting) issues and was therefore used in this assessment (i.e. in the reference period 2002-08);- P_{Discard} values were estimated for years where no data exists, inclusive of the reference period (2002-2008). These P_{Discard} values were estimated by calculating the average value for years where data exists. The average P_{Discard} value did not include values which were forward filled from previous years (i.e. 2010, 2015 and 2019).			
Data and RAG comments	SESSFRAG (August 2020) noted there is a lack of availability of port or length data, however there is some data from trawlers and Danish seine, and gillnet boats in 2017 and 2018.			
Stock assessment information and RAG comments	SharkRAG (December 2020) noted, that as shown in Figure 17, the standardised trawl CPUE which is used in a Tier 4 assessment has been increasing towards the long-term average and is above the target reference point (CPUE Report , Sporcic, 2020).			

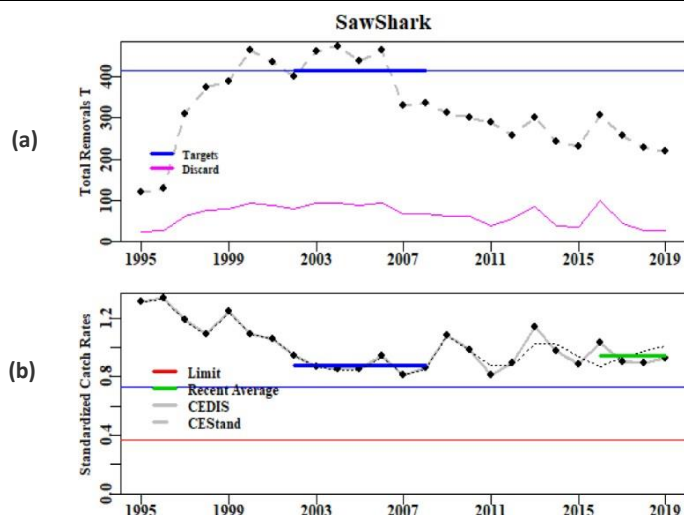


Figure 17: (a) total removals with the fine line illustrating the target catch, (b) standardised catch rates with the upper fine line representing the target catch rate and the lower line the limit catch rate. Thickened lines represents the reference period for catches, catch rates, and the recent average catch rate. The thin black dotted line is the unmodified standardised CPUE before the inclusion of discards. Source: Report presented by Dr Sporadic to SharkRAG on 3-4 December 2020 titled, *Draft Tier 4 Sawshark assessment in Australia's Gillnet Hook and Trap Sector of the SESSF (data to 2019)*.

The RBC for sawshark was calculated to be 653.4 t, an increase of 135 t from the previous RBC (2017). This increase was mostly attributable to the inclusion of annual discard estimates within the reference period (2002-08), which was not included in the previous Tier 4 assessment.

Noting that the assessment covers two species, SharkRAG requested that AFMA monitor species composition over the coming seasons to be able to respond to any potential changes which would have implications for the assessment. AFMA is considering how to approach this task, including using the use of logbooks and EM to differentiate between common sawshark and southern sawshark.

Species specific research and priorities

GHAT CPUE calculation methodology

Currently CPUE for gillnet-caught species is calculated on a kilogram per shot basis. Given the change to net length restrictions, SharkRAG has identified a strong need to change gillnet CPUE calculations: from catch by shot to catch by metres of net set to better account for zero shots.

RAG Recommendations

SharkRAG ([December 2020](#)) recommended a three-year MYTAC using the RBC of 653.4 t from the 2020 Tier 4 assessment.

	Year	RBC (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2023	653.4	Yes 3-Year MYTAC using the RBC of 653.4 t from the 2020 Tier 4 assessment.
	2022	653.4	
	2021	653.4	

Discount factor (t)	98 t	SharkRAG (December 2020) recommended applying the default Tier 4 discount factor of 15 per cent.		
State catch (t)	10.1 t	2017-2020 weighted average.		
Discards (t)	26.4 t	2017-2020 weighted average.		
Recreational catch (t)	N/A	Recreational catch estimates are uncertain. Recreational catch is not included in the assessment and not deducted from the RBC.		
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.		
Provisional TAC under the Harvest Strategy		519 t		
MAC Recommendations				
Commercial fishers' interests	No specific commercial fisher interests have been identified.			
Species specific management (target, companion and bycatch)	There are no identified implications for target, companion or bycatch species.			
MAC advice and any dissenting views	2022-23 TAC recommendation 519 t - second year of a three-year MYTAC SEMAC advice and any dissenting views The targeting of this species is influenced by market demand. Both main species in the quota basket have been assessed as species of least concern in the IUCN Red List (global assessments). There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	519	
AFMA Advice				
AFMA Management recommends a TAC of 519 t for the 2022-23 fishing year, the second year of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021-22 agreed TAC (t)	2022-23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
509	519	10	2	+10

School shark

Galeorhinus galeus



Fisheries Research & Development Corporation (2012)

Species summary					
Common names	School shark				
Stock assessment	Tier 1 Species - last assessed by SharkRAG in 2018 (CKMR assessment model). Review of Rebuilding Strategy underway by SharkRAG and SEMAC in 2020-21.				
Stock structure	Tagging and genetic data suggests a relatively well mixed stock with some evidence for localisation of stocks, or reproductively isolated sub-stocks.				
Stock status against reference points (%B₀)	Tier	Year	Biomass	Target	Limit
	1	2018	50 000 mature individuals in 2000 and increasing at ~ 3 % p.a. Status unknown relative to B ₀ .	48	20
	1	2016	<20		
	1	2012	<20		
Stock trend and other indicators See CPUE Report See Data Summary	<p>The CKMR assessment model provides an estimate of current absolute abundance with trend back to 2000. It does not provide an estimate of depletion relative to B₀. The CKMR model indicates that the stock had recovered slightly during the period from 2000 to 2017 although the CV on trend is so large that it also allows for a declining scenario.</p> <p>Gillnet CPUE is not considered a reliable index of abundance as school shark are actively avoided by gillnet fishers. Although representing only a small proportion of total catch, the trawl CPUE shows an increasing trend since 2003. In 2016, SharkRAG noted that this is a positive sign suggesting that the school shark is rebuilding. This is consistent with advice from industry that school shark, particularly juveniles, are in relatively high abundance. Interpretation of the trawl CPUE is complicated by (lack of) availability of quota for trawl operators.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	N/A – Rebuilding species			N/A	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	194	194	-	
	2020-21	195	195	184	
	2019-20	189	189	184	

	2018-19	215	215	196
Economics (Secondary) Gillnet, Hook and Trap	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	1.53	19.67	7.78
	2018-19	2.04	23.66	8.62
	2017-18	1.87	19.51	9.58
ABARES Status (2021 report)	Fishing Mortality: Uncertain		Biomass: Overfished	
Assessment summary				
Key model technical assumptions/ parameters	The CKMR assessment model assumes that there is one well mixed stock.			
Significant changes to data inputs	The Shark Industry Data Collection (SIDaC) program continues to collect close kin samples as a key input to the CKMR assessment.			
Data and RAG comments	The CKMR assessment model considers only one region, one population, starts in 2000 and does not allow (or need to take account of) movement between regions because there is only one region.			
Stock assessment information and RAG comments	<p>Assessments (since 1991) have consistently estimated the school shark population to be below the limit reference point of 20 per cent of unfished levels. The objective of the current rebuilding strategy is to rebuild the stock to B20 in 66 years since it was first implemented in 2009.</p> <p>In October 2018, SharkRAG accepted the new CKMR assessment. The CKMR assessment model provides an estimate of current absolute abundance with trend back to 2000. It does not provide an estimate of depletion from B₀. SharkRAG noted high confidence in the absolute estimate of abundance produced by the model, but lower confidence in the estimate of trend but that confidence in the trend will improve with additional data.</p> <p>The CKMR assessment underwent four reviews between 2019 and 2021. The final review was an expert panel commissioned by AFMA. The outcome of this review found the methodology appropriate to inform management and identified key uncertainties to be addressed to improve confidence in the results. SharkRAG (and AFMA) adopted the outcomes of the review. The next update to the CKMR assessment is not due until 2024.</p> <p>For 2019-20, 2020-21 and 2021-22, SharkRAG recommended setting an incidental catch TAC based on projections using the average fishery mortality rates over the last five years ("2013-17 mean F", red line in figures below). This rate, taking into account increasing stock size due to rebuilding, gave total fishing mortality estimates of 256 t, 263 t and 270 t in the relevant fishing years, respectively. This level of fishing mortality provides for consistent recovery.</p> <p>For the 2022-23 fishing year in the absence of an update to the CKMR assessment, SharkRAG (November 2021) recommended setting the incidental catch TAC to minimise the total mortality of school shark by accounting for the minimum unavoidable catch, including the discards associated with that minimum catch, as well as reflecting the estimated 3 per cent p.a. rate of increase in the population (Thomson et al 2020), and the 13 per cent reduction in the gummy shark TAC for 2022:</p> <p>Past landings (L), plus discards (D), multiplied by a 3% annual increase, and by a 13% reduction in the gummy quota: TAC = (L + D) * (1-0.13) * (1 + 0.03)</p>			

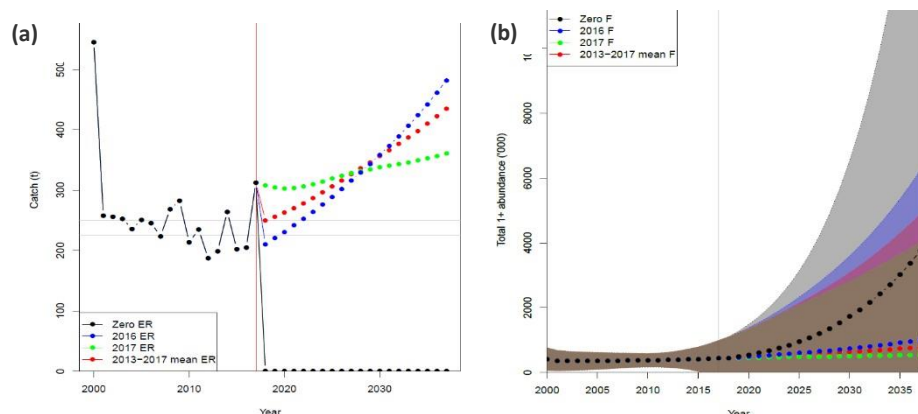
Projected biomass

Figure 18: (a) Projected catch (t) using different constant exploitation rate scenarios. (b) Projected abundance estimates based on different constant fishing mortality rate scenarios. Source: December 2018 SharkRAG

Species specific research and priorities

Continued Close Kin Mark Recapture sampling and analysis for school shark (funded)

Continue close kin sampling and analysis for school shark as the primary indicator of abundance for this species.

Improved Ageing Techniques (pilot funded)

Ageing of vertebrae was known to be biased for mature animals however the CKMR study for school shark showed that even for younger animals, the method performs poorly. The expert panel review of the CKMR assessment recommended improving the ageing of school shark as a key priority to improving confidence in the new assessment approach. A pilot study using epigenetic and bomb radio-carbon ageing is being undertaken as part of the CKMR project. The outcomes of this pilot study will inform an additional ageing project.

Developing a Harvest Strategy for school shark as a case study for species where depletion can no longer be estimated against B₀ (proposed, not funded)

Investigate development of a harvest strategy for species where depletion can no longer be estimated against B₀ (only an absolute estimate is available), using school shark as a case study. To be informed by the multi-species harvest strategy project (MSHSP), and dynamic reference points project.

Stock structure of School Shark (proposed, not funded)

Improve the understanding of the stock structure of school sharks caught by Australian fishers. The expert panel review of the CKMR assessment approach (2021) identified an improved understanding of stock structure as not critical to the assessment outcomes but important in the interpretation of the results and their use in making management decisions.

School shark and gummy shark post release survival (proposed, not funded)

Investigation of the post-release survival rates of gummy shark (focus on tertiary stress response) and school shark (focus on immediate and post-release mortality), and the application of survivability to discard estimates for these species.

RAG Recommendations

SharkRAG ([November 2021](#)) recommended an incidental bycatch TAC of 225 t on the basis that this TAC aims to reduce the total mortality of school shark by accounting for the minimum unavoidable catch, including the discards associated with that minimum catch, as well as reflecting the estimated 3 per cent p.a. rate of increase in the population (Thomson et al 2018), and the 13 per cent reduction in the gummy shark TAC for 2022. A four-year

weighted average of retained and discarded catch (based on the four most recent calendar years) is used as the best estimate of total mortality:

$$251 * (1 - 0.130) * (1 + 0.03) = 225 \text{ t.}$$

SharkRAG noted this TAC is well below the 278 t that the CKMR model estimated would still allow for rebuilding of the school shark stock in 2022, allowing room for state catches and discards in addition to the 225 t TAC. State landings have been below 30t in recent years (Althaus et al 2021). Recreational catches are poorly known.

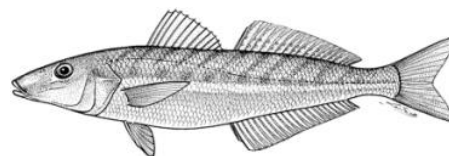
	Year	RBC (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2022	0 (225 incidental bycatch TAC)	No. Rebuilding Species
	2021	0 (270 incidental bycatch prior to deductions)	
	2020	0 (263 incidental bycatch prior to deductions)	
Discount factor (%)	N/A	Discount factors are not applied to Tier 1 assessments.	
State catch (t)	N/A	2017-2020 weighted average of 25.5 t Due to the way that the 2022-23 recommended TAC is calculated, state catch is not deducted. SharkRAG did however consider its TAC recommendation in the context of the 278 t that the CKMR model estimated would still allow for rebuilding of the school shark stock in 2022 and that a 225 t TAC allows room for state catches and discards in addition to the TAC.	
Discards (t)	N/A	2017-2020 weighted average of 77.6 t. Discards are explicitly accounted for via inclusion in the best estimate of total mortality used as the basis for the 2022-23 TAC calculation – they are not deducted in this instance. Trawl discards are collected via the ISMP program and a discard rate was calculated for calendar years 2017 to 2020, and applied to the retained trawl catch to estimate a discard tonnage. Discards from gillnet and hook methods were obtained from logbooks* for the calendar years 2017-2020. Trawl and GHATF discards were then added to the retained catch for each calendar year 2017-2020, to provide an estimate of total fishing mortality. A four-year weighted average, with the more recent years given the higher weights, was calculated to provide the best estimate of total fishing mortality. This number provided the basis for the TAC calculation. Note * GHAT boats now carry EM and it has recently been shown that logbook records of piece counts for discards for school shark are sufficiently accurate for use by management (Tim Emery, ABARES, pers comm).	
Recreational catch (t)	N/A	Recreational catch estimates are uncertain. Recreational catch is not included in the assessment and is not deducted from the RBC.	

Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		225 t – incidental bycatch TAC	
MAC Recommendations			
Commercial fishers' interests	Industry have previously expressed that it is difficult to avoid school shark in Tasmania and SA waters.		
Species specific management (target, companion and bycatch)	<p>The gillnet sector interacts with Australian sea lions in waters off SA. ASL interactions are managed through the ASL Management Strategy, which sets trigger limits that close spatial zones for 18 months if interaction numbers exceed the triggers.</p> <p>Dolphin interactions are managed through the GHAT Dolphin Strategy, which sets performance criteria for individual operators.</p> <p>To prevent targeting of school shark, GHAT operators (excluding scalefish hook which are subject to 100 kg trip limits) must:</p> <ul style="list-style-type: none">• limit their total school shark catch to 20% of their gummy shark catches, based on overall quota holdings.• release any school shark assessed as alive and vigorous		
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>225 t – single-year bycatch TAC</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted SharkRAGs approach to calculating the bycatch TAC in the absence of an updated assessment. The bycatch TAC calculation accounts for:</p> <ol style="list-style-type: none">1. discards as unavoidable catch,2. catches as an unavoidable consequence of gummy shark catches, noting that the gummy shark TAC is recommended to decline; and3. factors in the annual 3 per cent increase of school shark biomass as determined by the close kin assessment. <p>The revised approach results in a 30 t increase compared to the 2021-22 bycatch TAC. Industry expressed concerns that the TAC is overly conservative and raised ongoing concerns about the release of live school shark which continue to be considered as mortalities in the stock assessment.</p> <p>The conservation member questioned whether the estimate of unavoidable bycatch assumes there is a 1:5 ratio between school shark and gummy shark (given the 20 per cent rule). The AFMA member clarified that unavoidable bycatch is based on a metier analysis (a companion species analysis), and factors in the incidence of school shark catch with gummy shark catch across multiple gear types and zones.</p> <p>SEMAC noted the views of industry members and endorsed the proposed single year bycatch TAC of 225 t.</p>		
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)
10	10	2	225

AFMA Advice				
AFMA Management recommends a bycatch TAC of 225 t for the 2022-23 fishing year, a single-year bycatch TAC, with overcatch and undercatch provisions set at zero per cent and a determined amount of 2 t.				
2021-22 agreed TAC (t)	2022-23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
194	225	0	2	+31

School whiting

Sillago flindersi

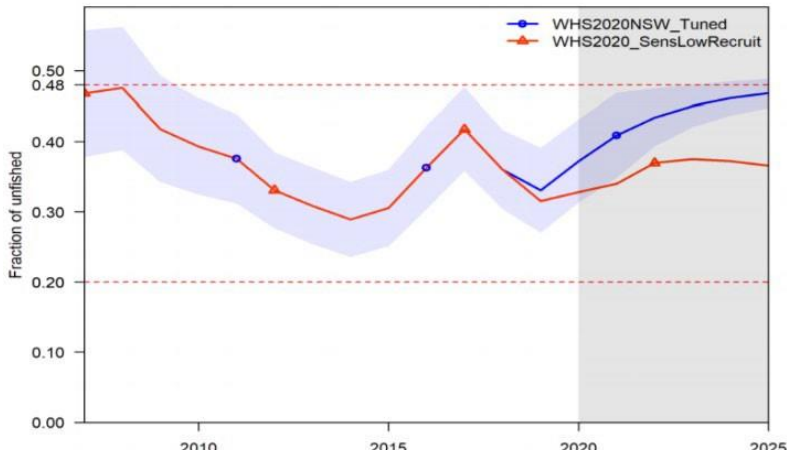
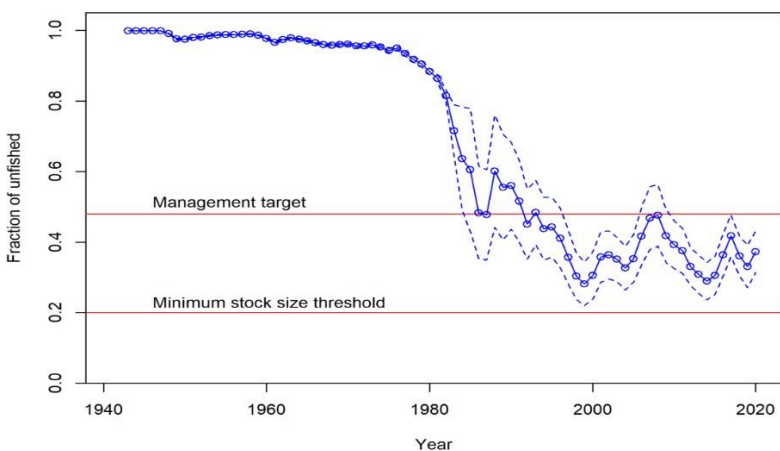


Species summary						
Common names	Red spot whiting, spotted whiting, silver whiting, trawl whiting.					
Stock assessment	Tier 1 Species - Last assessed by SERAG in 2020					
Stock structure	<p>Eastern school whiting is currently managed as a single stock from western Victoria, around Tasmania and along the east coast of Australia to southern Queensland.</p> <p>Dixon et al. (1986, 1987) report a discontinuity in the relatedness between samples observed between Forster and Coffs Harbour, which may indicate some degree of separation between the fish from northern and southern NSW. A FRDC project is currently underway to improve our understanding of stock structure using improved genetic techniques. The results of this project were not available for the 2020 assessment.</p>					
Stock status against reference points (%B ₀ in assessment year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2020	41	41	48	20
	1	2017 ⁴⁴	47	36		
	1	2009	50	39		
Stock trend and other indicators	<p>The stock declines slowly from the beginning of the fishery in 1942, before a sharp decline in the 1980s corresponding to an increase in catch. The stock status then varied between around 30% <i>SSB</i>₀ to 50%B₀ from 1992. In 1999 the stock declines to a low of 28% <i>SSB</i>₀, then increases to over 40% <i>SSB</i>₀ between 2006 and 2009, followed by another decline to 29% <i>SSB</i>₀ in 2014, and then varying between around 30% and 40% <i>SSB</i>₀ since then. The increase in stock status from 1999 to 2007 occurred during a period of general decline in total catches starting in the mid-1990s and lasting around 25 years. This rebound in spawning stock biomass from 1999 to 2008 also appears to have been boosted by good recruitment in 1999, 2003 and 2005 (Day et al., 2020).</p> <p>Commonwealth catch is mostly by Danish seine. The Danish seine (Zone 60) standardised CPUE moves around the long-term average between 2001 and 2017. However, there has been a decline in CPUE in 2018 and 2019 to the lowest CPUE values since 2000.</p>					
Multi-Year TAC	Year of MYTAC (2021-22)				Has the MYTAC advice been revised?	
	1 st of 3 year				No	

⁴⁴ A partial update to the 2017 assessment in 2019 estimated a biomass of 36%B₀.

Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22	917	986	-
	2020-21	788	862	520
	2019-20	788	867	526
	2018-19	820	915	537
Economics (Primary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	1.18	51.34	2.30
	2018-19	1.37	49.47	2.77
	2017-18	2.27	41.86	5.42
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	Natural mortality (M) – fixed at 0.6 Steepness (h) – fixed at 0.75 Recruitment deviations – estimated from 1981-2016 CV growth – estimated at 0.0937 Growth (K) – estimated at 0.329 Growth I _{Min} – estimated at 7.26 Growth I _{Max} – estimated at 23.1			
Significant changes to data inputs	<u>Additional Data</u> Catch adjusted with revision to 1942-2016 catch history – replace estimated 2017 catch with actual catch. Added three years of Commonwealth data – catch, CPUE, discards, length composition and conditional age-at-length data to 2019 (include revisions to NSW historical catch data, see below) Revised five-fleet model (Danish seine, trawl, NSW Danish seine, NSW trawl and NSW prawn trawl) <u>NSW Data</u> New NSW Danish seine, NSW trawl and prawn trawl catch, CPUE, discard, length and age data included in the assessment. Monthly CPUE (NSW trawl and prawn trawl) available from 1998-2008 and daily CPUE for 2010-2019. This data is collected at a much coarser spatial and temporal resolution compared to Commonwealth CPUE. Discard rates are available for NSW trawl (1993-95 and 2014-16) and NSW prawn trawl (1990-92 and 2017-19).			
Data and RAG comments	<u>Biologicals</u>			

	<p>Commonwealth length frequency data is showing larger fish are being recorded on board compared to port based sampling since 2015. It is not clear why this is occurring – AFMA are investigating.</p> <p><u>Recruitment</u></p> <p>Of the last ten years of recruitment estimated:</p> <ul style="list-style-type: none"> • two years are good: 2014, 2015 • five years are poor: 2007, 2009, 2011, 2012, 2016 • three years is average: 2008, 2010, 2013 • ten year average recruitment deviation: -0.142 • five year average recruitment deviation: -0.017 <p>The average recruitment deviation over the last ten years is lower than the average deviation over the previous ten years; however SERAG did not consider this compelling enough to consider a low recruitment scenario when recommending an RBC. The average recruitment deviation over the last five years has been close to zero, reflecting recruitment that can be considered close to.</p> <p><u>Discards</u></p> <p>There is a paucity of reliable discard estimates from Commonwealth Danish seine boats from about 2000 to 2010. The length and age sampling achieved over the same period suggests there was representative coverage. Resolving this would require further investigation of data collected by observers, which was not undertaken as part of this assessment.</p> <p>Both the observed and estimated NSW trawl and prawn trawl discard proportions are considerably larger than Commonwealth discards.</p>
<p>Stock assessment information and RAG comments</p>	<p>New base case (adding NSW age, length and CPUE data – recommended as new base case)</p> <p>M and h are fixed (M fixed at 0.6 and h fixed at 0.75)</p> <p>Five different selectivity curves (five-fleet model)</p> <p><u>Model fits to CPUE</u></p> <p>Fits to Commonwealth Danish seine and NSW trawl CPUE are reasonable; less so for NSW prawn trawl CPUE.</p> <p><u>Likelihood profiles</u></p> <p>Natural Mortality (M) - broad range of values from 0.64 - >1.0, with the optimal value at 0.9 which seems biologically implausible. Agreed to fix M at 0.6.</p> <p>2019 biomass estimate (SSB_{2019}) – broad range of plausible values from 27%B₀ to 39%B₀, with the optimal value at 33%B₀. Likelihood profiles cannot be constructed for 2021 stock status for technical reasons.</p> <p><u>Recruitment</u></p> <p>The most recent estimate of recruitment (2016) is still below the long-term average (see summary above).</p> <p><u>2021 Spawning stock biomass estimate</u></p> <p>There is much less uncertainty in the estimate of historical and current biomass compared to the 2017 assessment, due in part to fixing the value of M.</p> <p>The estimate of spawning stock biomass for 2021 is 41% SSB_0.</p> <p>SERAG (December 2020) considered options for future work:</p> <ul style="list-style-type: none"> - Explore stock structure (this is being progressed as part of the FRDC project led by Dr Karina Hall) - Spike of large fish in the 2018 trawl on board length data should be investigated. (Actioned) - Automatic processing of NSW length and age data (may need additional resourcing). - Encourage ongoing collection and provision of NSW data (supported).

	<ul style="list-style-type: none"> - Retrospective analysis on final base case, rather than initial base case (supported on case-by-case basis). - Consider seismic effects on catches and catch rates in Bass Strait (considered a priority and will be considered at 2021-2023 data meetings - must be considered in next assessment). - Consider the need for time-blocking selectivity and retention functions for NSW fleets to account for changes in gear and management regimes over time (supported).
Projected biomass	<p>The 2021 spawning stock biomass is estimated to be 41% SSB_0 (Figure 20) and under average recruitment is expected to exceed 47% SSB_0 by 2026.</p> <p>A low recruitment scenario was also considered, projecting low recruitment forward from 2017 to 2023, returning to average recruitment from 2024 onwards. Under this scenario, the stock is predicted to exceed 47% B_0 by 2040.</p> <p>SERAG noted that long-term projections are not particularly informative for a short-lived species with recent variable recruitment. Under the low recruitment scenario, the biomass is expected to remain between the limit and target reference points if catches from the Harvest Control Rule are maintained.</p> <p>Biomass projections up to 2025 under each of the recruitment scenarios are shown in Figure 19 below.</p>  <p>Figure 19: Projected relative spawning biomass (2007-2025) for the five-fleet base case (blue, average recruitment) and the low recruitment scenario (red, low recruitment) (Day et al., 2020).</p>  <p>Figure 20: Time-trajectory of spawning biomass depletion (with approximate 95% asymptotic intervals) corresponding to the MPD estimates for the base case analysis for school whiting (Day et al., 2020).</p>

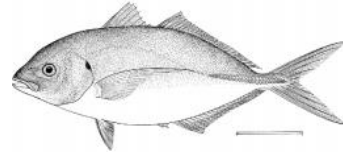
	Summary of projected total catch (landed catch plus model estimated discards) under the average recruitment and low recruitment scenarios.		
	Year	Average recruitment	Low recruitment
	2020	2,140	2,136
	2021	2,140	1,697
	2022	2,250	2,019
	2023	2,321	2,175
	2024	2,368	2,287
	2025	2,398	2,382
Species specific research and priorities			
<u>An updated understanding of eastern school whiting stock structure and improved stock assessment for cross jurisdictional management</u>			
The project aims to determine the stock structure of eastern school whiting stock and better understand the species composition mix between eastern school whiting and stout whiting. Future stock assessments will consider the outcomes from this project.			
RAG Recommendations			
SERAG (December 2020) recommended a three year RBC of 2,237 t, based on the three year average, minus the three year average of discards (378 t) for the SESSF. Fishery indicators will be monitored annually for any significant changes in fishery/stock trends.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2023	2,321	Yes 3-Year MYTAC using average RBC of 2,237 t. SERAG recommended reviewing the fishery indicator data each year as part of the annual MYTAC analysis.
	2022	2,250	
	2021	2,140	
	Long-term	2,448	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments	
State catch (t)	1,013.2 26.4 (excluding NSW)	Mostly NSW catches. There was a large decrease in reported NSW catches in 2020 (802 t) compared to 2019 (1218 t).	
Discards (t)	2021: 379	Model estimated discards from the most recent Tier 1 assessment are deducted from the TAC.	

	3-year average: 378	
Recreational catch (t)	N/A	Recreational catch estimates are uncertain and species (including King George whiting) are not clearly delineated. Recreational catch is not included in the assessment.
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.
Provisional TAC under the Harvest Strategy		846 t (using 3-year average)
MAC Recommendations		
Commercial fishers' interests	NSW introduced quota shares in 2019, including a combined school whiting and stout whiting TAC of 1189 t, close to the highest historical catch over the last nine years. The TAC was reduced to 898.1 t for the 2020-21 fishing year, however, catches in the NSW Southern Fish Trawl Fishery (SFTF) remain unrestricted. There was a large decrease in reported NSW catches in 2020 (802 t) compared to 2019 (1,218 t).	
Species specific management (target, companion and bycatch)	There is uncertainty around the stock structure as well as the species composition of NSW catches, particularly north of Barrenjoey Head. A FRDC project is currently underway, led by Dr Karina Hall (NSW DPI) and scheduled for completion by May 2022, to better understand stock structure.	
MAC advice and any dissenting views	<p>2022-23 TAC recommendation</p> <p>917 t - second year of a three-year MYTAC.</p> <p>SEMAC advice and any dissenting views</p> <p>The NSW representative advised that the NSW TAC Committee are meeting on the 9th of February 2022 to discuss the TAC for the 2022-23 fishing year.</p> <p>In providing its advice, SEMAC noted the following:</p> <ul style="list-style-type: none"> • Catches in the NSW Southern Fish Trawl Fishery (SFTF) are not currently constrained by a TAC or any other measures. • There are no formal catch sharing arrangements between the Commonwealth and NSW, however NSW have recently developed a draft Trawl Whiting Harvest Strategy, and consistency between that and the SESSF Harvest Strategy is important; • Historically, landed catches in each of the jurisdictions represent an approximate 50:50 split. • In the Commonwealth, all catches are controlled by the annual TAC, whereas in NSW the TAC does not apply to the SFTF, and catches are only restricted in the Ocean Trawl Fishery, north of Barrenjoey Head. • A 917 t TAC constitutes 50 per cent of the sustainable catch after discards and non-NSW catches are deducted from the RBC. <p>SEMAC supported AFMA's approach to setting the TAC based on a 50 per cent allocation of the sustainable catch between the jurisdictions.</p>	

	There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	0	
AFMA Advice				
<p>Historically, catches in each of the jurisdictions represent an approximate 50:50 split of the landed catch. In the Commonwealth, all catches are controlled by setting the annual TAC, whereas in NSW the TAC does not apply to the SFTF, and catches are only restricted in the Ocean Trawl Fishery, north of Barrenjoey Head.</p> <p>When modelled discards and non-NSW state catches are deducted from the 2022 RBC, the sustainable catch to be shared between NSW and the Commonwealth is 1,833 t.</p> <p>AFMA Management recommends maintaining a TAC of 917 t for the 2022-23 fishing year, the second year of a three-year MYTAC, with overcatch and undercatch provisions set at 10 per cent, and a determined amount of 2 t. This TAC constitutes 50 per cent of the sustainable catch after discards and non-NSW catches are deducted from the RBC and is consistent with the approach taken in 2021.</p>				
2021-22 agreed TAC (t)	2022-23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
917	917	10	2	0

Silver trevally

Pseudocaranx dentex



Species summary					
Common names	Silver bream, skippy, white trevally, skipjack trevally				
Stock assessment	Tier 4 Species - last assessed by SERAG in 2021.				
Stock structure	Preliminary research suggests that the silver trevally off south-eastern Australia represents a single stock.				
Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE_{Recent}	CPUE_{Target}	CPUE_{Limit}
	4	2021	0.5172	0.9418	0.3924
	4	2020	0.5642	0.9221	0.3842
	4	2017	0.6722	0.9026	0.3761
Stock trend and other indicators	Standardised CPUE has declined since 2010, and the CPUE point in 2019 was the lowest on record, and below the limit reference point. The CPUE point for 2020 has increased to be above the limit reference point. The four-year average remains above the limit reference point.				
Multi-Year TAC	MYTAC (2020-21)			Has the MYTAC advice been revised?	
	Single year TAC			N/A	
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	197	226	-	
	2020-21	289	318	25	
	2019-20	292	323	21	
	2018-19	307	368	8	
Economics (Secondary) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP	
	2019-20	0.21	51.34	0.41	
	2018-19	0.01	49.47	0.02	
	2017-18	0.23	41.86	0.55	

ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing	Biomass: Not overfished
Assessment summary		
Key model technical assumptions/ parameters	<p>The assessment excludes all data from inside the Batemans Bay Marine Protected Area (MPA).</p> <p>The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed significantly since the reference period to the end of the most recent year.</p>	
Significant changes to data inputs	<p>Discard rate estimates from 1998-2001 are used to backfill estimates from 1986-2000.</p> <p>The discard rate from 2015 (13%) is used to forward fill the discard estimates to 2020.</p> <p>Annual state catches were revised for the 2021 assessment – supported by SERAG 1, 2021.</p>	
Data and RAG comments	<p>Most of the Commonwealth catch is from Zone 10.</p> <p>81 t of the 84 t landed in 2019 was taken by State fisheries – mostly NSW and SA.</p> <p>Only seven Commonwealth boats caught silver trevally in 2019, a reduction from 14 boats in 2018 and 21 boats in 2015.</p> <p>Only Commonwealth catch and effort are used to inform the CPUE analysis, and State catches are included to inform C_{Tar} in the Tier 4 assessment.</p>	
Stock assessment information and RAG comments	<p><u>NSW Stock Assessment 2020-21</u> – Uses NSW Ocean Trawl data and a weight of evidence approach (catch rates, catch only methods, length based SPR)</p> <p>The CPUE series starts from 1997, where catch and effort can be linked to specific gear types. Data to 2009 is only available by month, and since then, daily catch and effort is available.</p> <p>NSW total catch peaked during the 1980s, and has reduced to historical lows in 2019 and 2020 - most catch is from trawlers. Effort has decreased since 2007.</p> <p>Standardised CPUE series (three series: 1998-2009, 2010-2020, 1998-2020) standardised for month, ocean zone, fisher and depth. All series show a recent declining trend, including when estimates of discards are included.</p> <p>Catch only modelling approaches produce estimates of B/BMSY from the trawl catch ranging from 0.18-0.20 (zBRT) and 0.25-0.30 (Optimise Catch-Only) and F/FMSY of 0.60 - 1.12 (Optimised Catch-Only). When total NSW catch was analysed, B/BMSY was estimated at 0.09 (zBRT) and 0.22 (OCOM).</p> <p>Length proportions from NSW observer records show fish >30cm FL from 1993-1995 range between 0.46 and 0.72, then declines from 0.4 in 1997 and to 0.06 in 2019. The Kapala survey during the 1993-95 period are consistent with the NSW observer data.</p> <p>Length-based Spawning Potential Ratio (LB-SPR) model estimates F/M is highly variable, ranging from 2.0 - 8.4 between 2004 and 2019. SPR shows consistent low value between 0.1 and 0.18 for the same period.</p> <p>Future work would ideally include Commonwealth catch data in catch-only modelling.</p> <p>While SERAG noted some potential issues with the various approaches, the review of various indicators show a consistent story, that the stock has declined over time.</p>	

	<p><u>Commonwealth Tier 4</u></p> <p>Recreational catches are not included in the assessment due to a lack of reliable data.</p> <p>Industry suggested the discard rate of 13% projected from 2015 is likely high because there are no size limits in the Commonwealth.</p> <p>SERAG considered the ‘alternative’ CPUE series which excludes boats that were considered to be targeting – the top boats that corresponded to the greatest number of shots >30kg. It results in an increase in CPUE for the period 1986-1992, and a lower CPUE series from the period 2004 to 2019. CPUE during the reference period (1992-2001) and 2017-2020 is very similar, and so would result in little difference to the outputs of a Tier 4 assessment.</p> <p>SERAG considered the application of a discount factor, noting it should only be applied where there is equivalent and demonstrable protection afforded. The CPUE series does not include historical catches from the Batemans Bay Marine Park, and SERAG recommended applying the default 15% discount factor.</p> <p>The 2021 Tier 4 assessment produces a 2022 RBC of 178.8 t, compared to the 2020 RBC of 369.9 t. SERAG adopted the outputs of the Tier 4 assessment, and did not recommend applying the discount factor.</p>
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Species specific research and priorities

There is no species-specific research currently underway or identified as future priorities.

RAG Recommendations

SERAG recommended a single year TAC using the 2022 RBC of 179 t for the 2022-23 fishing year, based on a tier 4 stock assessment with a discount factor applied. A joint stock assessment between NSW DPI and AFMA should be considered in 2022.

	Year	RBC (t)	Is a MYTAC Recommended?
Recommended Biological Catch (t)	2022	179	No.
	2021	370	
	2020	445	
Discount factor (t)	26.9	The 15 per cent discount factor is applied.	
State catch (t)	84.1	Mostly NSW and SA catches.	
Discards (t)	16.9	Four-year weighted average – a small decrease from the weighted average in 2020.	
Recreational catch (t)	N/A	Recreational catch is not included in the Tier 4 assessment because of a lack of reliable catch estimates over time. Recreational catch in NSW was estimated in 2012 at between 54-120 t.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	

Provisional TAC under the Harvest Strategy		51 t – The large change limiting rule would typically limit the reduction in TAC for the 2022-23 fishing year to 98 t. However, this can be disregarded where there are concerns around the sustainability of the stock.		
MAC Recommendations				
Commercial fishers’ interests		Industry noted approximately 9 per cent of the 2021-22 agreed TAC, as of 1 February 2022, had been caught. This is consistent with recent trends in catch.		
Species specific management (target, companion and bycatch)		The Batemans Bay MPA closure overlaps fishing ground that was preferred by NSW licenced operators (many of whom are dual endorsed)		
MAC advice and any dissenting views		<p>2022-23 TAC recommendation</p> <p>51 t - single year TAC</p> <p>SEMAC advice and any dissenting views</p> <p>SEMAC noted ongoing concerns around the sustainability of the stock. While the CPUE index increased in 2021 to be just above the limit reference point, there has been a long-term decline and the stock is estimated to be only just above the limit reference point.</p> <p>The proposed TAC represents more than a 50 per cent reduction from last year, however the large change limiting rule in the SESSF Harvest Strategy can be disregarded where there are concerns around the sustainability of the stock.</p> <p>SEMAC noted that CSIRO and NSW DPI will work together in 2022 with a view to establishing a joint Commonwealth and NSW stock assessment.</p> <p>SEMAC noted the importance of including recreational catch data in the assessment as silver trevally are an important recreational species. The utility of this data will depend on the type of assessment being completed, and how much data is available.</p> <p>The NSW representative noted the NSW TAC was reduced to 20 t in 2021 because of the stock assessment process which has classified the NSW stock as depleted.</p> <p>There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.</p>		
Undercatch (%)		Overcatch (%)	Determined amount (t)	TAC (t)
10		10	2	51
AFMA Advice				
AFMA Management supports not applying the large change limiting rule and recommends a TAC of 51 t for the 2022-23 fishing year, a single-year TAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021-22 agreed TAC (t)	2022-23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)

197	51	10	2	-146
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Silver warehou

Seriolella punctata

ABARES (2012): Line drawing – FAO

Species summary						
Common names	Spotted warehou, spotted trevally, spotted trevalla, snotty nose trevally, trevally, mackerel trevalla					
Stock assessment	Tier 1 Species - last assessed by SERAG in 2021					
Stock structure	Considered to be a single stock in the SESSF.					
Stock status against reference points (%B ₀ in year +1)	Tier	Assessment Year	Biomass (from assessment year)	Biomass (revised in most recent assessment)	Target	Limit
	1	2021	29	29	48	20
	1	2018	31	25		
	1	2015	40	22		
Stock trend and other indicators	<p>The 2021 assessment estimates that the projected 2022 spawning stock biomass will be 29%B₀ (projected assuming 2020 catches in 2021, compared to 31%B₀ at the start of 2019 from the 2018 assessment (Burch et al., 2018). Moving to the model with low recruitment projections as the base case (see below) for this assessment has been the main driver of this downward revision of stock status (Bessel-Browne & Day, 2021).</p> <p>The 2021 assessment suggests that spawning stock biomass was as low as 21% in 2016. The increase in estimated stock status since the 2018 assessment is likely due to slight increases in standardised catch rates and increasing recruitment combined with low catches (Bessel-Browne & Day, 2021).</p> <p>Standardised CPUE has declined in the east since 1994, and has been below average since 2000. Standardized CPUE in the west has declined since 2005, and since 2008 has been below the long-term average (Sporcic, 2021).</p>					
Multi-Year TAC	Year of MYTAC (2021-22)				Has the MYTAC advice been revised?	
	3 rd of 3-year				N/A – Assessment updated in 2021	
Catch and TAC (t)	SESSF fishing year		Agreed TAC		TAC after unders/overs	Cth Retained Catch
	2021-22		450		487	-
	2020-21		450		490	289
	2019-20		450		505	307

Economics (Primary)	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
Commonwealth Trawl and Scalefish Hook	2019-20	0.40	86.00	0.47
	2018-19	0.37	49.47	0.75
	2017-18	0.57	41.86	1.36
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	Single stock model with two fleets, one in the east and one in the west Von Bertalanffy growth curve estimated for one sex including both males and females Natural mortality fixed at 0.3 Stock recruitment steepness fixed at 0.75 The initial value of the parameter determining the magnitude of process error in annual recruitment is set to 0.7 Selectivity estimated for both fleets Retention estimated for both fleets, with a time block included in 2002, with all sizes discarded earlier and sized based discarding after this time. In the east trawl fleet an additional retention time block is included in 2018 to allow the model to fit increased discard estimates between 2018 and 2020 The age observation plus group is modelled to be 23 years The length-weight relationship is fixed based on previously determined estimates ($aa = 0.0000065 \text{ g}^{-1} \text{ cm}$, $bb = 3.27$) Female length at 50% maturity is assumed to be 37 cm			
Significant changes to data inputs	There have been no significant changes to data inputs			
Data and RAG comments	There has been a large increase in discard estimates in the east trawl fleet between 2018 and 2020. There were only five onboard retained length frequencies collected in the east in 2020, compared to 541 in 2019.			
Stock assessment information and RAG comments	Recruitment has been below the long-term average since 2004. Only one additional recruitment deviation was estimated from the previous assessment rather than the usual three (removing a known retrospective pattern in estimation). This had no impact in the estimation of stock status. An extra time-block on retention from 2018 onwards for the east trawl fleet was also included to allow the model to fit the dramatic increase in discard estimates. This improved the model fits to discard estimates and CPUE in the east trawl fleet. The jump up of stock status at the end of the series, which uses assumed catches in 2021 based on those in 2020 was discussed by SEAG. This projected estimate is not constrained by data inputs, most notably CPUE, and may be an overoptimistic representation of recovery. On the basis that recruitment has been below average since 2004, SERAG recommended adopting a ‘low recruitment’ base case to use the average of recruitment deviations from 2011-2015 from 2016 onwards. SERAG requested fixed catch projections under the low			

recruitment scenario and fixed catch projections using the RBC produced from the HCR, and a range of lower catches.

The 2021 base case stock assessment estimates that the 2022 spawning stock biomass will be 29% of virgin stock biomass (projected assuming 2020 catches in 2021 under low recruitment scenario) and a 2022 RBC of 587 t (Figure 21).

Retrospective analyses under the low recruitment scenario have alleviated concerning patterns observed in previous assessments and in the model with average recruitment projections.

Application of the harvest control rule catches estimate that there is no increase in stock status towards the target reference point ($48\%B_0$) and stock status remains at $29\%B_0$. Projected stock status under constant catch scenarios and the low recruitment scenario are provided below.

SERAG noted silver warehou are not a targeted species, and that a reduction to the TAC alone is not likely to constrain total mortality. The TAC is currently set at 450 t, of which 289 t and 307 t was caught in the 2020-21 and 2019-20 fishing year, respectively.

Constant catch scenarios developed using low recruitment projections (average recruitment over the last five years).

Retained catch scenario (t)	Mean discards (t)	2022 (% B_0)	2023 (% B_0)	2024 (% B_0)	2025 (% B_0)	2026 (% B_0)
0	0	29	31	34	36	37
250	59	29	30	31	32	33
350	85	29	30	30	31	31
450	110	29	29	29	29	29
2022 RBC	118	29	29	29	29	29

Projected biomass

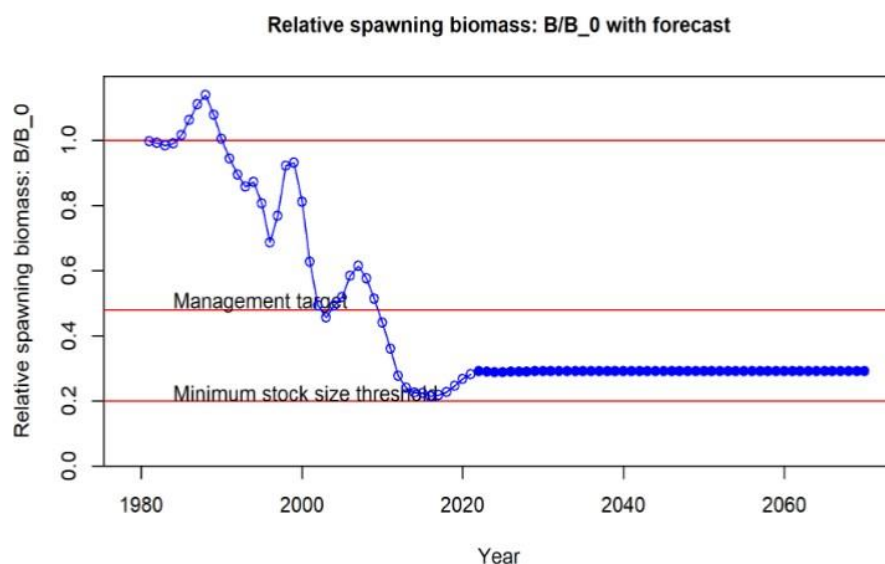


Figure 21: The estimated time-series of relative spawning biomass 2021 base case assessment with projections applying the HCR to 2070 (Bessel-Browne & Day, 2021)

Species specific research and priorities

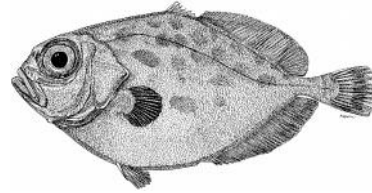
There is no species-specific research currently underway or identified as future priorities.

RAG Recommendations			
SERAG recommended setting the TAC for the 2022-23 fishing year on the basis of the fixed catch scenarios outlined above, while understanding the risk associated with stock status and time taken to rebuild towards the target.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2024	575	Yes. 3-year MYTAC using the ‘low recruitment’ constant catch scenario, noting the RBCs from the HCR (left) will not result in any rebuilding to the TRP and estimate stock status will remain at 29%B ₀ .
	2023	580	
	2022	587	
	3-Year Average	581	
Discount factor (t)	N/A	Discount factors are not applied to Tier 1 assessments.	
State catch (t)	0.01	State catches are very low and are not deducted from the RBC because a TAC based on constant catch is recommended.	
Discards (t)	75.5	Modelled discards from the 2021 stock assessment.	
Recreational catch (t)	N/A	There are no estimates of recreational catch.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		506 t - calculated using the three year average HCR RBC and modelled discards from the 2021 assessment. However, SERAG recommended setting the TAC based on fixed catch projection, and not the RBC produced by the HCR.	
MAC Recommendations			
Commercial fishers’ interests	Industry have reported that catch rates have recently improved off the east coast from St Helens to Ulladulla. There has been an increase in catches of smaller fish, indicating a level of recruitment.		
Species specific management (target, companion and bycatch)	There were no specific management arrangements identified.		
MAC advice and any dissenting views	2022-23 TAC recommendation 350 t - first year of a three-year MYTAC SEMAC advice and any dissenting views SEMAC noted that the recent estimates of recruitment, when projected forward as a low recruitment scenario, show that the stock is not expected to return the target reference point based on our current understanding of B ₀ . This is true of a number of SESSF species and is being considered as part of the FRDC project (2019-036) - <i>Implementation of</i>		

	<i>dynamic reference points and harvest strategies to account for environmentally-driven changes in productivity in Australian fisheries.</i>			
	SEMAC accepted SERAG advice that the TAC for 2022-23 fishing year should be based on the fixed catch projections, and not the RBC produced by the HCR.			
	SEMAC noted a TAC of 300 t would likely constrain catches and may result in an increase in discarding due to availability of quota. A TAC of 350 t is closer to estimates of current catch, and under the constant catch scenarios is expected to allow the stock to rebuild over the next three years and is consistent with the approach taken for the previous MYTAC period.			
	There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	350	
AFMA Advice				
AFMA Management recommends a TAC of 350 t for the 2022-23 fishing year, the first year of a three-year MYTAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
Fishery indicator data will be monitored closely as part of the annual MYTAC analysis (formally breakout analysis) to ensure there are no sustainability concerns identified.				
2021-22 agreed TAC (t)	2022-23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
450	350	10	2	-100

Smooth oreo (Cascade)

Pseudocyttus maculatus



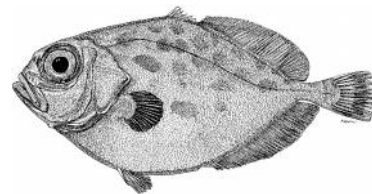
Species summary					
Common names	Smooth dory, smooth oreo, spotted dory, St. Pierre				
Stock assessment	Tier 4 Species – last assessed by SlopeRAG in 2010.				
Stock structure	Stock structure of smooth oreodory is unknown. For assessment and management purposes the Cascade Plateau is regarded as a separate stock.				
Stock status against reference points (C_{Lim}/C_{Targ})	Tier	Year	CPUE _{Recent}	CPUE _{Target}	CPUE _{Limit}
	4	2010	1.3575	0.4989	0.1996
	4	2008	1.962	0.4905	0.1962
	4	2008	96 t (C_{CUR})*	-	-
	*Tier 4 assessment used geometric mean catch rates rather than standardised CPUE				
Stock trend and other indicators	<p>Tier 4 species use CPUE targets as a proxy of biomass targets.</p> <p>The Tier 4 target reference point is the level of CPUE assumed to produce a spawning biomass of 48 per cent of unfished levels.</p> <p>The limit reference point is the level of CPUE assumed to produce a spawning biomass of 20 per cent of unfished levels.</p> <p>Stock status: the most recent assessment (a Tier 4 assessment in 2010 using data up to 2009) concluded that the CPUE-based biomass proxy was above the target reference point. SlopeRAG (November 2011) questioned the validity of the unrealistically high RBC from the updated assessment, concluding that CPUE may not be an accurate index of abundance.</p> <p>Low catch and effort levels since 2009 have precluded any updates to the Tier 4 assessment.</p> <p>Biomass trend: When last assessed, CPUE had been extremely variable and the fluctuations were considered to be not indicative of changes in stock status.</p>				
Multi-Year TAC	Year of MYTAC (2021-22)		Has the MYTAC advice been revised?		
	Single year TAC		N/A		
Catch and TAC (t)	SESSF fishing year	Agreed TAC	TAC after unders/overs	Cth Retained Catch	
	2021-22	150	168	-	
	2020-21	150	169	6	
	2019-20	150	169	0	

	2018-19	150	169	0
Economics (Byproduct) Commonwealth Trawl and Scalefish Hook	Financial Year	Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP
	2019-20	0	51.32	0
	2018-19	0	49.47	0
	2017-18	0	41.86	0
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	<p>The Tier 4 assessment assumes there is a linear relationship between catch rates and exploitable biomass, and that the character of the estimated catch rates has not changed significantly since the reference period to the end of the most recent year.</p> <p>Catch rates are estimated as catch per shot rather than catch per hour.</p> <p>Depth categories of 20m (acknowledged that 50 m may be more appropriate).</p> <p>Standardised catch rates: 1994-2010</p> <p>Zone 40 (depth 650 – 1,250 m)</p>			
Significant changes to data inputs	<p>SlopeRAG (October 2010) considered whether data from Zone 70 should be included in the analysis, given that the area was now closed to fishing. Noting the uncertainty of movement of the species between closures and permitted areas, SlopeRAG recommended excluding Zone 70 catches and CPUE from future stock assessments.</p>			
Data and RAG comments	<p>Using the standardised catch rates and the updated catches for 2009, the Tier 4 analysis shows the recent catch rates are well above the target, resulting in the calculation of a large RBC (711t).</p> <p>It is uncertain whether the catch rate value for 2009 is valid, as only 60kg of data meet reporting requirements.</p>			
Stock assessment information and RAG comments	<p>The rapid changes in apparent catch rates indicates that the observed catch rates are unlikely to be representative of the stock size, therefore the validity of applying a Tier 4 should be considered.</p> <p>SlopeRAG (October 2010) noted that there was a low number of boats, with a low level of catch, and that standardised catch rate contained a large amount of errors.</p>			
Species specific research and priorities				
There is no species-specific research currently underway or identified as future priorities.				
RAG Recommendations				

SlopeRAG (October 2010), due to the lack of confidence in CPUE as an indicator of stock status, recommended using the RBC from the previous assessment (247 t) and maintaining the TAC from the 2010-2011 fishing year (150 t). SlopeRAG recommended maintaining the TAC at this level until catches reach at least 10 t.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2010	711	No. Single year TAC 150 t recommended until catch levels reach at least 10 t.
	2009	770	
	2008	247	
Discount factor (t)	N/A	SlopeRAG (November 2011) determined that a discount factor was not required, due to the TAC being set at a level well below the RBC.	
State catch (t)	N/A	There are no estimates of State catch.	
Discards (t)	N/A	There are no estimates of discards.	
Recreational catch (t)	N/A	There are no estimates of recreational catch.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		150 t	
MAC Recommendations			
Commercial fishers' interests	No specific commercial fisher interests have been identified		
Species specific management (target, companion and bycatch)	Catches are reliant on trawl fishing (primarily for orange roughy) occurring on the Cascade Plateau.		
MAC advice and any dissenting views	2022-23 TAC recommendation 150 t (subject to 10 t trigger) - single-year TAC SEMAC advice and any dissenting views There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.		
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)
10	10	2	150
AFMA Advice			
AFMA Management recommends a TAC of 150 t for the 2022-23 fishing year, a single year TAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.			

2021-22 agreed TAC (t)	2022-23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
150	150	10	2	0

Smooth oreo (other)

Pseudocyttus maculatus

Species summary					
Common names	Smooth dory, Smooth oreo, spotted dory, St. Pierre				
Stock assessment	Last considered by SERAG in 2020 using a weight of evidence approach.				
Stock structure	Little is known about the stock structure of smooth oreodory. For assessment and management purposes they are treated as a single unit of stock through the SESSF excluding the Cascade Plateau and South Tasman Rise.				
Stock status against reference points (F _{Cur} /F _{MSY})	Tier	Year	F _{Current}	F _{MSY}	F _{Limit}
	Weight of evidence approach	2020	F<F _{MSY}	F _{MSY} = 0.16	F _{LIM} = 0.23
	Weight of evidence approach	2019	F<F _{MSY}		
	Tier 5	2015	N/A 90 t TAC maintains stock >35%B ₀		
Stock trend and other indicators	Catches have increased in recent years, as the TAC and targeting of eastern and Pedra Branca orange roughy stocks have increased. 85-90 per cent of the TAC has been caught over the last two fishing years.				
Multi-Year TAC	Year of MYTAC (2021-22)			Has the MYTAC advice been revised?	
	Single year TAC			N/A	
Catch and TAC (t)	SESSF fishing year		Agreed TAC	TAC after unders/overs	Cth Retained Catch
	2021-22		90	103	-
	2020-21		135	144	47
	2019-20		90	97	76
	2018-19		90	99	81
Economics	Financial Year		Species GVP (\$m)	Fishery GVP (\$m)	% Fishery GVP

(Byproduct) Commonwealth Trawl and Scalefish Hook	2019-20	0.13	51.34	0.25
	2018-19	0.33	49.47	0.67
	2017-18	0.14	41.86	0.33
ABARES Status (2021 report)	Fishing Mortality: Not subject to overfishing		Biomass: Not overfished	
Assessment summary				
Key model technical assumptions/ parameters	<p>The Sustainability Assessment of Fishing Effects (SAFE) provides an absolute measure of risk of overfishing by estimating fishing mortality rates, relative to fishing mortality rate reference points (based on life history parameters). To measure fishing mortality, SAFE estimates:</p> <ul style="list-style-type: none">- Spatial overlap between species distribution and fishing effort distribution- Catchability resulting from the probability of encountering the gear and size-dependent selectivity- Post capture mortality <p>Fishing mortality is the fraction of overlap between fished area and the species distribution, adjusted by catchability and post-capture mortality.</p> <p>Uncertainty around the estimated fishing mortality is estimated by including variances in encounterability, selectivity, survival rate and fishing effort between years.</p> <p>Assumes that:</p> <ul style="list-style-type: none">- Fisheries are impacting local stocks (within the jurisdictional area of the fishery)- There are no local effects from repeat trawls at the same location (i.e. populations rapidly mix between fished and unfished areas)- Mean fish density does not vary between fished and non-fished area within their distributional range.			
Significant changes to data inputs	N/A – advice based on weight of evidence approach.			
Data and RAG comments	SERAG (October 2019) noted the need to develop a data collection plan, with the intent to undertaking a future quantitative stock assessment.			
Stock assessment information and RAG comments	<p>SESSFRAG (August 2019) recommended assessing smooth oreo (other) as a weight of evidence approach recognising issues with the previous Tier 5 assessment, specifically that a key underlying assumption of the methodology – that catch is an indicator of abundance – is undermined because catch has been affected by the closure and then reopening of orange roughy fishing grounds.</p> <p>The 2019 Commonwealth Trawl Ecological Risk Assessment assessed smooth oreo (other) as ‘low risk’ which means the instantaneous fishing mortality rate (F) for the period of the assessment (2012-2016) was less than the F that corresponds to the maximum sustainable fishing mortality (MSM) at B_{MSM}, similar to the target species MSY.</p> <p>Considering the outcomes of the ERA and recent catches, SERAG (October 2019) recommended rolling over the 90 t TAC for a single year, and reviewing catches 2020.</p> <p>Noting the potential for smooth oreo (other) to become a choke species given the increase to the Pedra Branca orange roughy TAC, SEMAC (February 2020) recommended setting the smooth oreo (other) TAC at 135 t for the 2020-21 fishing year, subject to a trigger at 70 t,</p>			

	<p>at which point SERAG advice would be sought regarding catches up to the 135 t TAC. If SERAG did not support exceeding the existing 90 t TAC, AFMA would explore options for closing the Pedra Branca area once 90 t was caught.</p> <p>SERAG (2020) noted there was no increase in catch of smooth oreo (other) during the 2020-21 fishing year. In the absence of any new data to support an increase to the TAC, SERAG recommended setting the 2021-22 TAC at the previous level of 90 t. SERAG agreed to consider future increases to the TAC if additional information became available to support it.</p> <p>SERAG (2021) considered the application of a more considered weight of evidence approach to include indicators such as length, area fished and ERA results to support a future TAC setting process if the 90 t TAC were to be caught. This information should be included in the 2022 SERAG papers.</p> <p>SERAG recommended maintaining the 90 t TAC for the 2022-23 fishing year.</p>		
Species specific research and priorities			
There is no species-specific research currently underway or identified as future priorities.			
RAG Recommendations			
SERAG (November 2021 ⁴⁵) noted that no new information was available to change its advice provided at SERAG (October 2020), and recommended a TAC of 90 t for the 2022-23 fishing year, a single year TAC.			
Recommended Biological Catch (t)	Year	RBC (t)	Is a MYTAC Recommended?
	2022	90	No
	2021	90	
	2020	90	
Discount factor (%)	N/A	A discount factor is not applied as the TAC is set based on a weight of evidence approach.	
State catch (t)	N/A	There are no estimates of State catch.	
Discards (t)	N/A	There are no estimates of discards.	
Recreational catch (t)	N/A	There are no estimates of recreational catch.	
Research Catch Allowance (t)	N/A	There has been no specific research catch allocated.	
Provisional TAC under the Harvest Strategy		90	
MAC Recommendations			

⁴⁵ Minutes from this meeting are currently being finalised

Commercial fishers' interests	No specific commercial fisher interests have been identified.			
Species specific management (target, companion and bycatch)	Smooth oreo are caught with orange roughy and may be considered a choke species in some zones.			
MAC advice and any dissenting views	2022-23 TAC recommendation 90 t - single year TAC. SEMAC advice and any dissenting views There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.			
Undercatch (%)	Overcatch (%)	Determined amount (t)	TAC (t)	
10	10	2	90	
AFMA Advice				
AFMA Management recommends a TAC of 90 t for the 2022-23 fishing year, a single year TAC, with undercatch and overcatch provisions set at 10 per cent, and a determined amount of 2 t.				
2021-22 agreed TAC (t)	2022-23 recommended TAC (t)	Overcatch & undercatch (%)	Determined amount (t)	Change in TAC (t)
90	90	10	2	0

Non-Quota species recommendations

Boarfish and orange roughy are non-quota species in the East Coast Deepwater Trawl (ECDWT) Sector and are managed under catch triggers. These triggers were reviewed at the October 2021 SERAG meeting.

As at 18 February 2022, no catch has been recorded in the ECDWT Sector for the 2021-22 fishing year. SERAG recommended a continuation of previous TACs and catch triggers for boarfish and orange roughy in the ECDWT Sector for the 2022-23 fishing year (Table 1); noting that boarfish catches in the ECDWT Sector have been below 100 kg for the past two fishing years, and no orange roughy catch has been reported since 2003-04.

AFMA Management recommends maintaining the 200 t boarfish and 50 t orange roughy catch triggers in the ECDWT Sector for the 2022-23 fishing year (Table 1).

There are no undercatch or overcatch provisions for these species in the ECDWT Sector.

SEMAC advice

There were no dissenting views and SEMAC were comfortable with the advice provided in the paper.

AFMA Advice

AFMA recommend maintaining the catch triggers for non-quota species in the ECDWT Sector for the 2022-23 fishing year.

Table 1 Summary of catch triggers for Non-Quota species determination

Non-Quota species	2021-22 Catch Trigger (t)	2022-23 Recommended Catch Trigger (t)	Change from 2021-22 (t)
Boarfish	200	200	0
Orange roughy	50	50	0

Glossary

Biological reference points – quantitative values, often stated in terms of fishing mortality or stock size, that summarise either a desired state for the stock (a target) or a state of the stock that should be avoided (a threshold).

Biomass – the total weight of all the fish in a stock or a component of a stock.

B_{LIM} (biomass limit reference point) – The point beyond which the risk to the stock is regarded as unacceptably high.

B_{MEY} (biomass at maximum economic yield) – Average biomass corresponding to maximum economic yield.

B_{MSY} (biomass at maximum sustainable yield) – Average biomass corresponding to maximum sustainable yield.

B_{TARG} (target biomass) – The desired biomass of the stock.

B₀ (mean equilibrium unfished biomass) – Average biomass level if fishing had not occurred.

CASAL (C ++ Algorithmic Stock Assessment Laboratory) - an advanced software package developed by the National Institute of Water and Atmospheric Research (NIWA, New Zealand) for fish stock assessment. The software implements a generalised age or length structured fish stock assessment model that allows a great deal of choice in specifying the population dynamics, parameter estimation and model outputs.

Catch Per Unit Effort (CPUE) – the number or biomass of fish caught as by a unit of fishing effort. Often used as a measure of fish abundance.

C_{TARG} (Catch target) – The target catch level.

CE_{LIM} (CPUE limit reference point) – the point below which CPUE is too low and can indicate stock depletion.

CE_{TARG} (CPUE target) – The target CPUE rate.

Close Kin Mark Recapture (CKMR) – uses advances in genetics to affordably and reliably identify parent-offspring pairs (and conceivably other types of kin), and then analyses the number and pattern of pairs in a mark-recapture framework.

Commonwealth Trawl Sector Fishery Independent Survey (CTS FIS) - a survey undertaken in the CTS to provide a time-series of abundance indices that are independent from commercial fishing.

Confidence interval – also called the confidence bound, a range of values within which the true value most likely lies.

Determined amount - for a quota species and a fishing year, means the amount (in kilograms) of that species specified in a determination made by AFMA for section 22A of the *Southern and Eastern Scalefish and Shark Fishery Management Plan 2003* for that species and year.

F (fishing mortality) – The instantaneous rate of fish deaths due to fishing a designated component of the fish stock. F reference points may be applied to entire stocks or segments of the stocks and should match the scale of management unit. Instantaneous fishing mortality rates of 0.1, 0.2 and 0.5 are equivalent to 10 per cent, 18 per cent and 39 per cent of deaths of a stock due to fishing.

F_{LIM} (fishing mortality limit reference point) – The point above which the removal rate from the stock is too high.

F_{MEY} (fishing mortality at maximum economic yield) – The fishing mortality rate that corresponds to maximum economic yield.

F_{MSY} (fishing mortality maximum sustainable yield) – The fishing mortality rate that achieves maximum sustainable yield.

F_{TARG} (fishing mortality target) – The target fishing mortality rate.

Great Australian Bight Fishery Independent Survey (GABFIS) - a survey undertaken in the GAB to provide a time-series of abundance indices that are independent from commercial fishing.

Index of abundance – numerical value used to demonstrate the trend in relative abundance over time.

Markov Chain Monte Carlo (MCMC) – an approach to estimate uncertainty in a statistical model by beginning with a final model and shifting its associated parameter values slightly to recalculate the model's goodness of fit thousands or millions of times.

Maximum economic yield (MEY) – The sustainable catch level for a commercial fishery that allows net economic returns to be maximised. For most practical discount rates and fishing costs, MEY implies that the equilibrium stock of fish is larger than that associated with maximum sustainable yield (MSY). In this sense, MEY is more environmentally conservative than MSY and should, in principle, help protect the fishery from unfavourable environmental impacts that could diminish the fish population.

Maximum sustainable yield (MSY) – The maximum average annual catch that can be removed from a stock over an indefinite period under prevailing environmental conditions. MSY defined in this way makes no allowance for environmental variability, and studies have demonstrated that fishing at the level of MSY is often not sustainable.

Mortality – Deaths from all causes (usually expressed as a rate or as the proportion of the stock dying each year).

Multi-Year Total Allowable Catch (MYTAC) – MYTACs are applied for Tier 1, Tier 3 and Tier 4 species where suitable. The [Harvest Strategy](#) outlines criteria that should be considered when determining whether a stock is suitable for a MYTAC.

Overfished – A fish stock with a biomass below the biomass limit reference point. 'Not overfished' implies that the stock is not below the threshold.

Overfishing, subject to – A stock that is experiencing too much fishing, and the removal rate from the stock is unsustainable. Also:

- Fishing mortality (F) exceeds the limit reference point (F_{LIM}). When stock levels are at or above B_{MSY} , F_{MSY} will be the default level for F_{LIM} .
- Fishing mortality in excess of F_{LIM} will not be defined as overfishing if a formal 'fish down' or similar strategy is in place for a stock and the stock remains above the target level (B_{TARG}).
- When the stock is less than B_{MSY} but greater than B_{LIM} , F_{LIM} will decrease in proportion to the level of biomass relative to B_{MSY} .
- At these stock levels, fishing mortality in excess of the target reference point (F_{TARG}) but less than F_{LIM} may also be defined as overfishing, depending on the harvest strategy in place and/or recent trends in biomass levels.
- Any fishing mortality will be defined as overfishing if the stock level is below B_{LIM} , unless fishing mortality is below the level that will allow the stock to recover within a period of 10 years plus one mean generation times the mean generation time, whichever is less.

Spawning stock biomass (SB) – the total weight of all adult (reproductively mature) individuals in a population. Also called spawning biomass.

SB_{MSY} – Spawning or 'adult' equilibrium biomass at maximum sustainable yield.

Stock assessment – an evaluation of the past, present and future status of the stock that includes a range of life history characteristics for a species, such as the geographical boundaries of the population and the

stock; information on age, growth, natural mortality, sexual maturity and reproduction, feeding habits and habitat preferences; and the fisheries pressures affecting the species.

Stock Synthesis (SS) – is a statistical age-structured population modeling framework that has been applied in a wide variety of stock assessments globally (Methot & Wetzel, 2013).

Von Bertalanffy (VB) growth model – used in stock assessments to model the mean length or weight of fishes.

References

Althaus, F, Thomson, R and Sutton, C, (2021). Southern and Eastern Scalefish and Shark Fishery catches and discards for TAC purposes using data until 2020 . Prepared for the SESSFrag Data Meeting, 24-26 August 2021; Updated December 2021. CSIRO, Australia.

Bessell-Browne, P. and Tuck, G.N. (2020) Redfish (*Centroberyx affinis*) stock assessment based on data up to 2019 – development of a preliminary base case. Technical paper presented to the SERAG, 19-21 October 2020, Hobart, Australia.

Bessell-Browne, P. and Day, J. (2021) Silver Warehou (*Seriotelella punctata*) stock assessment based on data up to 2020. Technical paper presented to the SERAG, 29 November-1 December 2021, Hobart, Tasmania

Burch, P., Day, J., Castillo-Jordán, C., Osorio, S.C., 2018. Silver Warehou (*Seriotelella punctata*) stock assessment based on data up to 2017. Report for the Australian Fisheries Management Authority. CSIRO Oceans and Atmosphere.

Burch P, Curin Osorio S and Bessell-Browne P (2021). Eastern zone Orange Roughy (*Hoplostethus atlanticus*) stock assessment based on data up to 2020. Revised after the South East Resource Assessment Group meeting 29 November – 1 December 2021. CSIRO Oceans and Atmosphere and Institute for Marine and Antarctic Studies, University of Tasmania.

Day, J. (2019) Tiger flathead (*Neoplatycephalus richardsoni*) stock assessment based on data up to 2018. Technical report presented at SERAG, Hobart, 3 December 2019.

Day J., Hall K., Bessell-Browne, P. and Sporcic M. (2020) School Whiting (*Sillago flindersi*) stock assessment based on data up to 2019. For discussion at SERAG, December 2020.

Day, J., Bessell-Browne, P., and Curin-Osorio, S. (2021) Eastern Jackass Morwong (*Nemadactylus macropterus*) stock assessment based on data up to. For discussion at SERAG, November 2021.

Dixon P I, Crozier R H and Black M (1986) School whiting – how many species. Australian Fisheries 45: 33-38.

Dixon P I, Crozier R H, Black M and Church A (1987) Stock identification and discrimination of commercially important whittings in Australian waters using genetic criteria (FIRTA 83/16). Centre for Marine Science, University of New South Wales. 69 p. Appendices 1-10.

Kompas, T, Che, N, Chu, L & Klaer, N 2012, Transition to MEY goals for the Great Australian Bight Trawl Fishery, report to FRDC, Australian Centre for Biosecurity and Environmental Economics, Crawford School of Public Policy, Australian National University, Canberra

Little, R., and Rowling, K. (2010) Update of the Eastern Gemfish (*Rexea solandri*) stock assessment. Technical report presented at ShelfFRAG 2010.

Knuckey I, Hudson R, and Nemec J (2010) Monitoring Orange Roughy in the Great Australian Bight 2010, report to the AFMA, Canberra.

Knuckey, I., Koopman, M., and Hudson, R. (2021). Resource Survey of the Great Australian Bight Trawl Sector –2021. AFMA Project 2019/0837. Fishwell Consulting 40pp.

Methot, R.D., Wetzel, C.R., (2013) Stock Synthesis: a biological and statistical framework for fish stock assessment and fishery management. Fish. Res. 142, 86–99.

Mobsby, D forthcoming, Australian fisheries economic indicators report (2018) financial and economic performance of the Southern and Eastern Scalefish and Shark Fishery, Australian Bureau of Agricultural and Resource Economics, Canberra.

Penney, A (2020). Exploratory data-poor catch-MSY and production model assessments for John Dory in the Southern and Eastern Scalefish and Shark Fishery. Technical report presented to SERAG Nov 2020.

Sporcic, M (2020) Draft Tier 4 Sawshark assessment in Australia's Gillnet Hook and Trap Sector of the SESSF (data to 2019). Technical report presented to SharkRAG in December 2020.

Sporcic, M (2020a): Tier 4 Assessments for selected SESSF Species (data to 2019). Technical paper presented to the SERAG, Dec 9-10, 2020. CSIRO Oceans and Atmosphere, Hobart

Sporcic, M. (2021). *Tier 4 Assessment for Blue-eye Trevalla (Hyperoglyphe antarctica) slope (data to 2020)*. Technical report presented at the SERAG, MS Teams meeting 29 November – 1 December 2021. CSIRO Oceans and Atmosphere, Hobart. 16 p.

Sporcic, M. (2021a). *Update Part 2: Statistical CPUE (catch-per-hook) Standardizations for Blue-eye Trevalla (Auto-line and Drop-line) in the SESSF (data to 2020)*. CSIRO, Hobart. Technical report presented at SERAG meeting 29 November to 1 December 2021. 26 p.

Sporcic, M (2021b) Statistical CPUE Standardisations for selected SESSF species (data to 2020). Technical report prepared for the SERAG (MS Teams Video) Meeting 1, 28-29 September 2021.

Sporcic, M. (2021c). Draft Tier 4 Assessments for selected SESSF Species (data to 2020). Technical paper presented to the SERAG, 19 -20 October 2021. CSIRO Oceans and Atmosphere, Hobart. 28p.

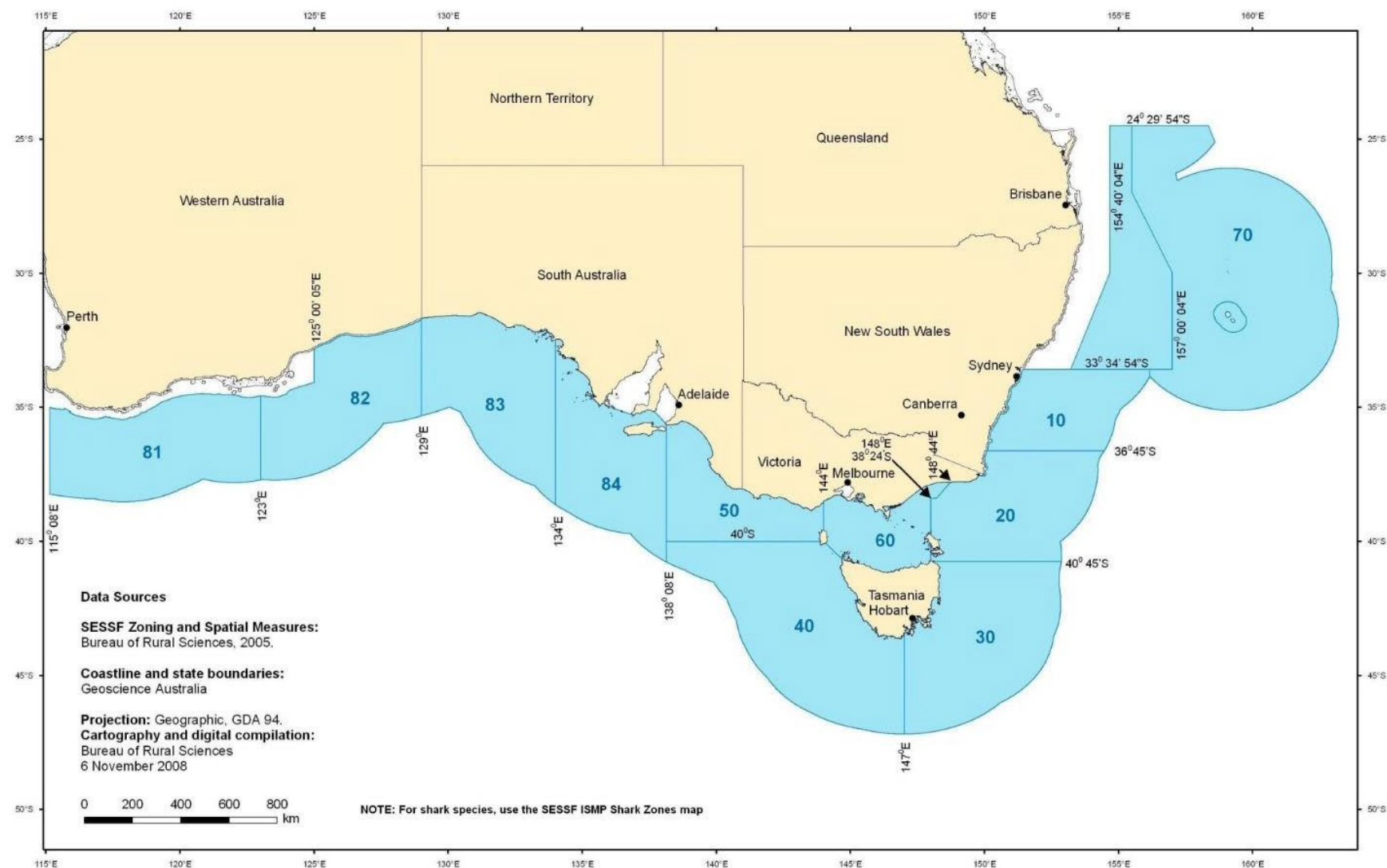
Sporcic, M., Day J. (2021). Draft catch history time series for selected Tier 4 SESSF species (data to 2020). Prepared for SERAG meeting 28-29 September 2021. 19p

Thomson, R.B., Bravington M.V., Feutry, P., Gunasekera, R. and Grewe, P. (2020) Close kin mark recapture for School Shark in the SESSF, Hobart, August 2020.

Tuck, G.N, Day, J. and Burch, P. (2019) Deepwater flathead (*Neoplatycephalus conatus*) stock assessment based on data up to 2018/19. For discussion at GABRAG, December 2019.

Wayte, S (2004) Stock assessment of the Cascade Plateau orange roughy. Technical report presented to DeepRAG 2004.

Appendix A - SESSF ISMP Scalefish Zones



Appendix B - Orange Roughy Zones

