NSW Total Allowable Fishing Committee

Report and Determinations for the 2020–21 Fishing Period

NSW Ocean Trawl Fishery: Blue-spotted Flathead, Tiger Flathead, Silver Trevally, and Eastern School Whiting and Stout Whiting.

16 March 2020

EXECUTIVE SUMMARY

Preamble

The NSW Total Allowable Fishing Committee (the Committee) has responsibility under the NSW Fisheries Act (1994, No. 38) as amended in 2018 to determine the Total Allowable Commercial Catch (TACC) of four species or species groups taken in the NSW Ocean Trawl Fishery (OTF): blue-spotted flathead (*Platycephalus caeruleopunctatus*), tiger flathead (*Neoplatycephalus richardsoni*), silver trevally (*Pseudocaranx georgianus*), and eastern school whiting (*Sillago flindersi*) and stout whiting (*Sillago robusta*). The flathead and trevally species have species-specific TACCs whilst the two whiting species share a 'basket' TACC at this stage. The Determinations in this report are for the period 1 May 2020 to 30 April 2021, hereafter the 2020–21 Fishing Period. The determinations are based on information available about the relevant stocks and their harvest in NSW and other jurisdictions over a long history, the most up-to-date assessments of stock status and likely future trends, reports from fishery managers, comments from fishers, and input at a public forum in Sydney on January 22nd 2020.

The species considered here are landed from multiple NSW commercial fisheries by various methods and to various extents by recreational fishers operating either independently or on charter fishing trips. Each of the species also is subject to species-specific or basket TACCs in neighbouring jurisdictions: stout whiting in Queensland, and eastern school whiting, blue-spotted and tiger flathead, and silver trevally in the Commonwealth Southern and Eastern Scalefish and Shark Fishery (SESSF).

The TACCs set here, however, apply only to the OTF. The NSW OTF is a multi-method, share-managed fishery that includes four endorsement categories: Inshore Prawn trawl, Offshore Prawn trawl, Deepwater Prawn trawl, and Northern Fish Trawl and Purse Seine. All endorsement categories are regulated by specific input and output controls and all restrict fishing to occur only in areas north of Barrenjoey Headland, near Sydney. The Determinations set here apply across all endorsements in the OTF. Trawl-fishery catches from the Southern Fish Trawl Restricted Fishery operating south of Barrenjoey Headland are not part of these TACCs.

Determination

The Committee has determined that:

1. The Total Allowable Commercial Catch of blue-spotted flathead by commercial fishers in the Ocean Trawl Fishery during the 2020–21 Fishing Period should not exceed ***108.1 tonnes*** (t);
2. The Total Allowable Commercial Catch of tiger flathead by commercial fishers in the Ocean Trawl Fishery during the 2020–21 Fishing Period should not exceed ***166.9 t***;
3. The Total Allowable Commercial Catch of silver trevally by commercial fishers in the Ocean Trawl Fishery during the 2020–21 Fishing Period should not exceed ***26.8 t;*** and
4. The Total Allowable Commercial Catch of trawl whiting, comprising catches of eastern school whiting and stout whiting combined, by commercial fishers in the Ocean Trawl Fishery during the 2020–21 Fishing Period should not exceed ***898.1 t.***

Recommendations

The Committee provides the following recommendations to the Minister, the Department of Primary Industries (the Department), and the OTF industry (Industry), in addition to the above Determination components, towards improving performance of the fishery.

Recommendation 1: Resolution of formal catch-sharing and joint or reciprocal management arrangements between NSW and the Commonwealth for tiger flathead, silver trevally, and eastern school whiting be pursued as a matter of urgency.

Recommendation 2: Resolution of formal catch-sharing and joint or reciprocal management arrangements between NSW and Queensland for stout whiting be pursued as a matter of urgency.

Recommendation 3: The Department and Industry work together to resolve appropriate mechanisms to control catches of all quota species across all NSW fisheries, including recreational sectors.

Recommendation 4: The Department and Industry work together to improve immediately the accuracy of species-specific catch reporting for eastern school whiting and stout whiting in the interests of progressing to future setting of species-specific TACCs for these species.

Recommendation 5*: The Department, preferably in collaboration with neighbouring jurisdictions, do research to understand the implications of recent persistent declines in catches and reported declining sizes of silver trevally to inform more robust stock assessments.*

Recommendation 6: The Department work with industry and other jurisdictions to develop shared or complementary harvest strategies to guide management decisions, including TACC setting, for all harvests of quota species and including agreed fishery objectives and stock reference points.

Recommendation 7: *The Department work with industry to consider what, if any, mechanisms for managing incidental over-quota catches are possible or desirable in the OTF.*

Recommendation 8: The Department continue to refine regular recreational fishing surveys to estimate total recreational catches, including those by licence-exempt NSW residents and visitors to NSW.

Recommendation 9: The Department do research to estimate likely mortality rates of discarded catches of quota species, including those discarded from other commercial and recreational fisheries.

Stock Status

Four of the five stocks considered here have been assessed as being below what would be considered appropriate target status for sustainable harvest (40–48% of unfished biomass[1]), though none are considered likely to be below the widely accepted lower limit of 20% of unfished biomass. The best available information indicates that stocks of blue-spotted flathead, tiger flathead, and eastern school whiting are at about 34–35% of their unfished biomass, stout whiting is at about 42% of unfished biomass, and silver trevally has a very uncertain status but likely to be at less than 35%.

The allowable catch that is biologically appropriate should consider, and preferably limit, all fishing mortality to which a stock is subjected. It ideally also should be applied at the level of an entire stock subject to harvest, rather than across multiple stocks or for only part of a stock. Neither of these desirable conditions exist for TACC setting in the OTF. All the species considered in this report are caught in varying amounts outside of the OTF, in other fisheries within NSW and in other jurisdictions.

The Committee is concerned, for example, that a TACC for blue-spotted flathead might not manage stock status effectively whilst recreational fishing causes about as much, possibly more, fishing mortality as does the OTF. Sharing of stocks of tiger flathead, silver trevally, and eastern school whiting with Commonwealth fisheries and of stout whiting with Queensland fisheries means that sustainability benefits of TACC adjustments in the OTF will depend on TACC settings in those other jurisdictions.

The Committee also is concerned about the very disparate results from alternative assessments of silver trevally. Improved understanding of stock structure and connectivity would provide clarity in the degree to which CPUE is an indicator of abundance, and more assurance about whether the stock is being harvested sustainably or is in as poor a status as the most pessimistic assessments suggest. The basket TACC of trawl whiting raises different issues. The combined TACC does not manage directly the amount of either species landed and cannot control the prospect of shifting allowable catch between the two species, which likely have very different stock status.

Economic Considerations

The five species considered here form part of the catch of a multi-species, multi-sector fishery. The importance of these species varies among different sectors. These species contribute almost two thirds of the value of production in the OTF fish trawl sector but only around 10% of the value of production in the prawn trawl sectors. The species also are caught in a number of other fisheries not subject to quota control, as well as a number of other fisheries subject to different quota controls.

The species mostly are caught jointly, with catch history being an important indicator of their technical and economic interactions in the fishery and their prevailing stock conditions. The basis for the initial setting of TACCs, however, differed among the species, despite their joint catch in the same fishing events. The initial set of TACCs therefore were inconsistent with the technical interactions in the fishery and fisher behaviour, given the economic incentives in the fishery.

TACC-ITQ management is new to the OTF and the quota trading market has not yet developed to a level of efficiency that favours sensible autonomous fishery adjustments, either within years through quota leasing or longer-term though quota share transfer. Difficulty accessing unused quota has been reported as a major issue in this first year of quota management. This will improve over time, but improved information (e.g. “real-time” reporting of quota uptake) will assist in that process. Greater promotion of the “buy and sell” features of FishOnLine also may help fishers find quota. The newness of the system also means that information on the economic performance of the fleet cannot be determined from quota trading and leasing information. No other measures of economic performance are available.

[1] Stout whiting is estimated to be at around 42% of unfished biomass and below the 48% target adopted by the Committee but above the 40% target apparently used in the Queensland assessments of stout whiting.

Management Considerations

Management arrangements for the OTF are set out in the *Fisheries Management (Ocean Trawl Share Management Plan) Regulation 2006*, the *Fisheries Management (Supporting Plan) Regulation 2006*, and the *Fisheries Management (General) Regulation 2019*. There is no harvest strategy to guide management decision-making, nor reference points to inform TACC setting.

The OTF is a share managed fishery, with access to the fishery limited to shareholders (or their nominated fishers) who hold the minimum shares in a share class required for endorsement to fish. There are currently 246 businesses in NSW with one or more endorsements in the OTF, with most endorsements being for the prawn share classes while the fish trawl sector has only 29 current endorsements. Shareholders in each class have been allocated quota shares for species, and the catch amount represented by each quota share in a fishing year is dictated by the TACCs for the species or species group. Other management controls in the OTF, in addition to limited access, TACCs and Individual Transferable Quotas (ITQs), t include boat capacity restrictions, controls on fishing gear, temporal and spatial closures, and Minimum Legal Size (MLS) limits for some species.

Blue-spotted flathead and silver trevally are important recreational species, with recreational catch estimated to account for 56-74% of total landings of blue-spotted flathead and 15-42% of silver trevally landings in NSW[2]. Blue-spotted flathead is also important in landings from the charter boat fishery.

All five species under consideration have significant interactions with other fisheries in NSW and fisheries in other jurisdictions, in particular Queensland and the Commonwealth. There are no formal arrangements currently in place with Queensland or the Commonwealth to inform the allocation of shared stocks between jurisdictions ("resource sharing"), or to ensure complementary TACC setting or coordination on management of shared stocks more broadly.

Conclusion

Setting TACCs in this Determination has considerably more complexity than for many TACCs applied to other NSW commercial fisheries. All species considered here are caught in significant quantities in other fisheries, within NSW, in other jurisdictions, or both, where either catches are not controlled or controls are independent of this Determination. That diversity of controls over total fishing mortality brings considerable risks that can be mitigated only partly by these TACCs. A key challenge for NSW, therefore, is to resolve complementary measures for controlling harvest by other fisheries within its control and negotiating arrangements with neighbouring jurisdictions that will enable coherent cross-jurisdiction management arrangements for each species.

Each of the species considered here has been harvested for a long time, some for nearly 100 years. The best available information indicates that four of the five now are below what is considered the desirable status for fished stocks. That alone normally would trigger TACCs set to reduce fishing pressure and allow stocks to rebuild to optimum levels for sustainable harvest. Such action would be straightforward if each species was harvested alone in targeted ways mainly by the OTF, but that is not so for any of them.

A key consideration in setting multiple species-specific TACCs for a fishery where all species are landed together from the same fishing activity is to seek TACCs that allow sustainable harvest of each species whilst also capturing the balance of species in typical multi-species catches to ensure efficient multi-species operations. We endeavoured to capture both features in the TACCs set in this Determination.

The Committee recognises desires by industry members for stability and certainty in the fishery during this period of transition to TACC–ITQ management. We agree that there are benefits to stable TACCs, where those TACCs are responsible and consistent with sustainable harvest, but we also recognise that maintaining TACCs at inappropriate levels in the interests of short term stability, likely will result in more severe future change. Retaining all existing TACCs, for example, would have ensured short-term stability but almost certainly would precipitate more severe future TACC reductions, in particular for trawl whiting.

The TACCs here have been set in-concert to effect control where it seems most needed and is most likely to deliver material benefit whilst deferring actions that otherwise might have been desirable but are considered less urgent or less effective than the primary measures. This approach is unapologetically pragmatic and risk-based and taken in the interests of initiating necessary longer-term adjustments that can be effected in a measured way in the best interests of the fishery and the stocks it harvests.

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[2] Estimated recreational catches of blue-spotted flathead by NSW residents in 1993–94, 1994–95, 2000–01, and 2013–14 were 60%, 61%, 65%, and 65% of total landings respectively. Catch by non-resident fishers in 2000–01 increased the recreational take to 74% of total landings. Silver trevally landed recreationally by NSW residents in 2000–01 accounted for 24% of total landings but may have been upto 42% after including catch by non-residents.

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1. INTRODUCTION

The Total Allowable Fishing Committee (the Committee) is established under Part 2A S40 of the *Fisheries Management Act 1994* No 38. The committee in 2020 was:

- Dr Bruce Mapstone— Chair;
- Dr Rich Little — fisheries science;
- Ms Alice McDonald — fisheries management;
- Dr Sean Pascoe — natural resources economics; and
- Dr Keith Sainsbury[3] — fisheries science.

The Committee has been directed by the Minister to determine the Total Allowable Commercial Catch (TACC) of four fish species or species groups for the commercial Ocean Trawl Fishery (OTF) in NSW during the 2020–21 Fishing Period, from May 1st 2020 to April 30th 2021. The species included in this direction are blue-spotted flathead (*Platycephalus caeruleopunctatus*), tiger flathead (*Neoplatycephalus richardsoni*), silver trevally (*Pseudocaranx georgianus*), and eastern school whiting (*Sillago flindersi*) and stout whiting (*Sillago robusta*). The flathead and trevally species have species-specific TACCs whilst the two whiting species, collectively referred to as 'trawl whiting', share a 'basket' TACC.

TACCs for the above species were set first by administrative declaration for the 2019–20 Fishing Period at 108.1 tonnes (t), 166.9 t, 26.8 t, and 1,189.1 t (for both whiting species together), respectively. This Determination for the 2020–21 Fishing Period is the first by this Committee.

The Committee is to give effect to relevant objectives of the *Fisheries Management Act 1994,* and as since amended *(1997, 2004, 2006, 2010, 2015, 2018)*, and is not subject to control or direction from the Minister as to the outcomes of Committee considerations. The Act states (Section 40E):

(1) In making a fishing determination, the TAF Committee is to give effect to the objects of this Act and is to have regard to all relevant scientific, industry, community, social and economic factors.

(2) The TAF Committee is also to have regard to—

(a) the need to ensure that the exploitation of fisheries resources is conducted in a manner that will conserve fish stocks in the long term, and

(b) the impact of fishing activities on all species of fish and the aquatic environment, and

(c) the precautionary principle, namely, that if there are threats of serious or irreversible damage to fish stocks, lack of full scientific certainty should not be used as a reason for postponing measures to prevent that damage.

The Committee interprets 'threat' in this context to mean an 'indication of probable harm to come'. The Committee therefore must respond to evidence before it proves future harm to the fishery or the stocks and not postpone action to prevent that harm occurring even if there is uncertainty surrounding such evidence. Similarly, the Committee should not take pre-emptive decisions on issues such as increasing the TACC when there is insufficient verifiable information on which to base such decisions. The Committee may be consulted out of session on a range of management issues.

The Committee must consider, as far as possible, the full extent of exploitation that might affect resource sustainability to meet its statutory obligations. Total removals from the stocks considered here are made up of, to varying degrees:

- Quotas allocated to commercial fishers in the OTF;
- Quotas allocated to commercial fishers in other jurisdictions where a shared stock is exploited;
- Catches discarded by commercial fishers in all jurisdictions, for whatever reason;
- Catches landed or discarded by NSW commercial fisheries not subject to these Determinations;
- Total legal catch by recreational and Aboriginal fishers, including discarded catches;
- Total catches by recreational fishers during charter fishing operations in NSW waters ; and
- Catches by commercial, recreational, or Aboriginal fishers not sanctioned by the Regulations controlling the fishery and not recorded in catch statistics (illegal catches).

The Committee makes determinations on the TACCs and matters it is required to regard that affect directly those TACCs. This stand-alone report has been prepared in support of TACC Determinations for 2020–21. The report also includes recommendations for management of the fishery related to setting TACCs, based on the experience and background of the Committee members, reports received by the Committee, and submissions or comments from stakeholders. The degree to which the Committee's other suggestions or recommendations are accepted is a matter entirely for the Minister and the Department. Constructive dialogue between the Committee, the Department, and Industry on fishery-related issues is an important and valuable part of the Committee's deliberations.

[3] Dr Sainsbury did not participate in these Determinations. Dr Rich Little was his appointed alternate.

The NSW Ocean Trawl Fishery (OTF) is a share management, multi-method, multi-species fishery with a gross value of production for 2017–18 of around $27 million. The OTF is restricted to fishing north of Barrenjoey Headland (Sydney) where it extends to the 4,000m depth contour, approximately 60–80 nautical miles offshore. Prawn trawling (Ocean Prawn Trawl, OPT[4]) is allowed in the waters north of Smoky Cape, while prawn and fish trawling (Northern Fish Trawl, NFT) are allowed north of Barrenjoey and south of Smoky Cape. The Southern Fish Trawl (SFT) Restricted Fishery operates south of Barrenjoey Headland between the coast and three nautical miles offshore (NSW Coastal Waters) only and takes some of the same species as landed from the OTF but the SFT is not subject to this Determination, or any other TACC. Trawl fishing south of Barrenjoey beyond NSW Coastal Waters is part of the Southern and Eastern Scalefish and Shark Fishery (SESSF) managed by the Commonwealth. The stocks for which TACCs are set in this Determination all overlap with fisheries in other jurisdictions, including the SESSF (tiger flathead, silver trevally, and eastern school whiting) and Queensland fisheries (stout whiting). Blue-spotted flathead also are caught in Victoria and Queensland, in unknown quantities.

Setting multiple TACCs for different species or species groups taken concurrently as mixed catches by single activities (e.g., trawls) in the same fishery is more complex than setting just one TACC for predominantly single-species fisheries or for multi-species fisheries where different species are selected by fishers at the point of capture and not landed together in an uncontrolled way. The biological focus of each TACC should be on the status of a species under harvest and take into account all fishing mortalities from all sources across the entire stock. Setting multiple TACCs for application in parallel to control mixed-species catches in the same fishery, however, also requires consideration of the fishery interactions among the species, particularly the balance of species' presences in the mixed-species catches taken in usual fishing operations. Misalignment of a species' TACC with its expected representation in mixed catches can precipitate significant fishery inefficiencies or disproportionate threats to that or other species' stocks. A disproportionately high TACC for one (of several) species, for example, likely will mean either that that TACC is not landed because fishing ceases when other, proportionately lower, TACCs are filled or more than expected catches of other species will be discarded as fishing continues until the higher TACC is met. These considerations mean that considering the balance amongst initial TACCs is an important component of this Determination.

The Committee notes concerns from industry that the TACCs and Individual Transferable Quotas (ITQs) have been in place for the OTF for less than a year and many operators are unfamiliar with the operation of a TACC-ITQ management system. Concerns have been raised that the TAFC's TACC settings might be influenced inappropriately by issues arising in this 'settling-in' period for the OTF. The Committee therefore has taken great care to weight lightly the 'behaviours' of the quota management system in this first year. The Committee typically approaches TACC setting informed by a range of information reflecting the medium-long term dynamics of the harvested stocks and somewhat more recent trends in fishery metrics, and is unlikely to base TACC changes predominantly on just single-year events unless something exceptional and extreme has occurred. The Determinations reported here have been set after considering the long-term information available about stock status and harvest (in some cases covering many decades), the most up-to-date formal assessments of current and projected stock status, management arrangements and fishery dynamics during and since the reference period July 1 2009–June 30 2017 used by the Independent Allocations Panel (IAP) for allocating species quota shares, and, especially for economic considerations, data from the last three years up to 2019.

[4] The Ocean Prawn Trawl includes three share classes: *Inshore Prawn Trawl* for prawn trawling within within 3 nm of the coast; *Offshore Prawn Trawl,* allowing prawn trawling out to the 280m depth contour; and *Deepwater Prawn Trawl*, allowing prawn trawling seaward of 280 m depth.

2. PROCEDURES

2.1 Public Consultation by the Committee

The Committee, through the Department, called for public submission on the appropriate total allowable commercial catches under the requirements of Sections 40F and 284 of the *Fisheries Management Act* 1994. OTF fishers, relevant industry and stakeholder bodies, and the community were invited to make submissions on the Total Allowable Commercial Catches from NSW of blue-spotted flathead, tiger flathead, silver trevally, eastern school whiting, and stout whiting. The consultative process is set out in Appendix 1. Fifteen written non-government submissions and one management submission from another jurisdiction were received during this process.

The Committee obtained input from participants in the Total Allowable Fishing Committee Open Forum in Sydney on April 22nd 2020 and received written reports from:

- NSW Department Primary Industries (DPI) Fisheries Research;
- NSW Department Primary Industries Commercial Fisheries Management; and
- NSW Department Primary Industries Fisheries Compliance Unit.

Public verbal submissions and presentations to the Committee were invited during the Open Forum. The Committee also was able to call for *in-camera* discussions, where appropriate. In-camera discussions with Department officials were requested following the 2020 forum to clarify legislative and regulatory matters and request additional economic and fishery information for consideration by the Committee.

2.2 Matters considered

The Committee considered the following matters before reaching its Determinations:

- The original administrative TACC Determinations for 2019–20;
- TACC settings and fishery assessments for relevant stocks from Queensland (stout whiting) and the Commonwealth (tiger flathead, silver trevally, and eastern school whiting);
- The data and assessment reports for each species' stocks provided by the Department;
- Advice on the status of management of the fishery provided by the Department;
- Advice on the economic status of the fishery by the Department and Industry representatives;
- Advice on compliance with regulations from the Department and Industry representatives;
- The current state of the fishery;
- The spatial nature of the fishery; and
- Submissions, commentary, and presentations provided in writing and at the Open Forum.

2.3 Format of the Report

This report covers the three key areas affecting management of the fishery and setting the allowable commercial catch:

- Status of the stocks;
- Economic considerations; and
- Management considerations.

The key considerations for each of these areas are presented as relevant for each species or collectively in the following sections 3, 4, and 5, respectively. The Committee's conclusions in view of these considerations are presented in section 6, together with the details of this year's Determinations.

The Committee has made several recommendations with the Determinations to clarify the position of the Committee on a number of issues related to the TACCs. The primary recommendations are included in the Executive Summary.

The Determinations of the Committee are to be published by the Minister. The Minister is required to review the regulations and any other instruments under the Act In the light of the Determinations. The Determinations are to be implemented in accordance with the Act.

3. STATE OF THE STOCKS

3.1 Introduction

Determinations of four Total Allowable Commercial Catches (TACCs) in this report are based, in part, on Department assessments of stock status for blue-spotted flathead (*Platycephalus caeruleopunctatus*), tiger flathead (*Neoplatycephalus richardsoni*), silver trevally (*Pseudocaranx georgianus*), eastern school whiting (*Sillago flindersi*), and stout whiting (*Sillago robusta*). Relevant stock assessment information from Commonwealth and Queensland jurisdictions also was considered for tiger flathead, silver trevally, stout whiting, and eastern school whiting. The flathead and trevally species have species-specific TACCs whilst the two 'trawl whiting' species share a 'basket' TACC. The TACCs discussed here apply only to catches of these species from the NSW Ocean Trawl Fishery (OTF). The initial (2019–20) NSW TACCs, set administratively for these species, and the basis on which they were determined, are given in Table 1.

Table 3.1. Administratively determined initial Total Allowable Commercial Catches for selected species taken in the NSW Ocean Trawl Fishery between May 1 2019 and April 30 2020.

Species or Group	2019–20 TACC	Basis of Administrative TACC
Blue-spotted flathead	108.1 t	Average catch in 8 years 1 July 2009–30 June 2017
Tiger flathead	166.9 t	Maximum catch in 8 years 1 July 2009–30 June 2017
Trawl whiting	1,189.1 t	Maximum catch in 8 years 1 July 2009–30 June 2017
Silver trevally	26.8 t	Average catch in 8 years 1 July 2009–30 June 2017

3.2 Stock Status and Trends

3.2.1 Blue-spotted flathead

Blue-spotted flathead is a short-lived species, with a maximum age of 9 years, taken in relatively shallow waters (<30m) from southern Queensland to eastern Victoria.

NSW commercial catch records for blue-spotted flathead stretch back to 1947 and indicate peak commercial catches (all fisheries) of 494 t in 1947–48 and 407–411 t in 1964–66 but catches less than 300 t in most other years. Commercial catches since the early-1990s mostly have been in the range 125–175 t annually, with peaks of 198 t and 210 t in 1998–99 and 2010–11 respectively and lows of 96 t and 100 t in 2014–16. Total catch in 2017–18 was 146.2 t. The OTF has landed 80–95% of NSW annual commercial catches since 1999–2000, with the highest percentages in 2009–11 (94–95%) and 2017–18 (92%). Catches of blue-spotted flathead from neighbouring jurisdictions (Queensland, Victoria, the SESSF) "*... are unknown but assumed to be small*" (Hall 2019[5]).

Blue-spotted flathead is important for recreational fishers. Recreational catches of the species were estimated from surveys in 2000–2001, 2013–14, and 2017–18 but with considerable uncertainty. Total annual recreational catches, including those by visitors to and residents of NSW and charter sector catches, have been estimated to be 230–500 t since 1999–2000 and 350–450 t in most years. These recreational catches represent about 60–74% of all fishing mortality of blue-spotted flathead in NSW .

Discard mortality is likely to be important for blue-spotted flathead. Blue-spotted flathead harvest is regulated in NSW by a minimum legal size limit (MLS, 33 cm Total Length, TL) for harvest, applied to both commercial and recreational fisheries, bag (10 fish) and possession (20 fish) limits for recreational fishers, trip limits for the Southern Fish Trawl (SFT) fishery (200 kg), and a ban on retaining fish from prawn trawls south of Smoky Cape. It has been estimated that approximately as many fish are discarded as kept by recreational and charter fishing sectors, mostly because of the MLS. It was estimated in the 1990s that about 60% of caught blue-spotted flathead were discarded from the Ocean Prawn Trawl (OPT) sector but introductions of bycatch exclusion devices since then likely will have reduced discard amounts. Estimates of discards from fish trawling in the 1990s and 2014–15 put discards at approximately 20% and 22% of total catch, respectively. Mortality of released blue-spotted flathead has not been estimated but discard mortality of two other (estuarine) flathead species has been estimated at 3–9%. Mortality of blue-spotted flathead discarded from trawl fisheries is likely much greater, potentially near 100%, because of trauma from the fishing method.

The Committee relied heavily on the technical assessment of blue-spotted flathead stocks provided by the Department (Hall 2019), primarily based on analyses of standardised commercial Catch per Unit of

[5] Hall, K.C. (2019). *Stock assessment report 2019 – Ocean Trawl Fishery – Blue-spotted Flathead (Platycephalus caeruleopunctatus)*. NSW Department of Primary Industries, Coffs Harbour, pp 65

Effort (CPUE[6]). CPUE from both the Ocean Prawn Trawl (OPT) and Northern Fish Trawl (NFT) sectors trended up from the late 1990s to reach highs in 2010[7] and 2011 respectively and then declined to lows in 2011–12 and 2015 respectively. CPUE generally seems to have been stable (OPT) or trending up (NFT) since 2015, and are as high or higher recently than in the late 1990s. The assessment concluded that the blue-spotted flathead stock overall was likely to be at 32.6–34.2% of unfished biomass and sustainable.

Long-term sampling of commercial catches indicated stable size structures in catches over the last five decades. A catch curve analysis[8] done in 2018–19 indicated that fishing mortality (F) likely is about the same as mortality due to natural causes (M). A 1:1 ratio of fishing to natural mortality is not considered alarming and suggests that the stock is not subject to over-fishing (e.g., that cause stock levels below 20% of unfished biomass). Estimated values of F were based principally on samples collected from commercial fisheries but should capture the mortality due to both commercial and recreational fishing if the sampling was representative of the stock and catch characteristics were fairly similar among sectors.

A risk analysis also was done in view of the considerable uncertainty about the amount of removals and mortalities by recreational fishers. Simulation results indicated that the current OTF TACC for blue-spotted flathead likely will allow some recovery, but with considerable uncertainty because of the great uncertainty associated with size of recreational fishing catches.

No specific objectives or reference points[9] have been set for this species in NSW but the above status would be approximately half-way between target (48%) and limit (20%) references points adopted for similar stocks in the Commonwealth Harvest Strategy Policy. Hall (2019) concluded that the stock was sustainable and that current harvest levels, across all sectors, perhaps were allowing some rebuilding toward the notional target of 48% of unfished biomass.

The Committee noted that there is the possibility for this species to become locally depleted, and so considered where the fishery has been most active. Most of the OPT catches are taken in Ocean Zone (OZ) 2 in the north (between 29^0S and 30^0S, Figure A1). Standardised CPUE in that zone declined from a peak in 2010 until 2012 but since has increased and stabilised at about the long-term average. Standardised CPUE from the OPT in OZ1 and OZ2 show similar patterns and all zones appear to have recent abundance indices at or above those in the late 1990s. Most of the catches in the NFT come from OZ5 (32^0S-33^0S, Figure A1, Appendix 2) and OZ6 (33^0S - 34^0S, but only the area north of Barrenjoey, Figure A1). A smaller amount of catch comes from OZ4. Abundance indicated by daily CPUE in OZ5 and OZ6 declined after 2011 to recent minima in 2015–16 but since have stabilised close to the long-term average and monthly CPUEs remain above those in the late 1990s and early 2000s. These results do not indicate significant localised depletion.

Two key uncertainties in setting a blue-spotted flathead TACC for the OTF are (a) the real amount of recreational catch, including discards, in NSW, and (b) mortality rates of catch discarded from trawl fishing and recreational fishing. Testing the assumption that blue-spotted flathead catches in neighbouring jurisdictions are small also will clarify the sustainability benefits delivered by OTF TACCs.

- *The Committee recommends:*
  a. *The Department strengthens monitoring of catch by all recreational fishers, including visitors to NSW and licence-exempt fishers;*
  b. *Research be done to provide robust estimates of mortality of blue-spotted flathead following discard from trawl and recreational fisheries;*
  c. *The department liaise with neighbouring jurisdictions to verify the magnitude of catches of blue-spotted flathead in those jurisdictions.*

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[6] Catch-per-unit effort (CPUE) is an indirect measure of stock abundance. Effort is often standardised when different vessels with different fishing characteristics operate to different degrees over a number of years.

[7] A change in catch reporting requirements, from monthly to daily catch reporting, was introduced in 2009–10 and might have accentuated this peak in CPUE, though CPUE in both sectors was increasing in the years immediately preceding the change in reporting.

[8] Catch curve analysis tries to determine historical fishing pressure on a stock from the size and age distributions of fish in the catch. Stocks with relatively low numbers of large, old fish would have been subject to greater fishing pressure than populations with relatively more old, large individuals.

[9] Reference points are quantitative measures for specific fishery objectives, usually set within a harvest strategy and with reference to the status of a stock compared to its unfished state. The most common reference points are:
- *Target Reference Point*s define a desired state of a fished stock given consideration of stock sustainability and desired fishery outcomes. Often set in the range 40–50% of unfished biomass;
- *Limit Reference Point*s define the status of a stock at which sustainability is unlikely and precipitates immediate action to prevent further decline and enable stock rebuilding. Often set at 20–25% of unfished biomass.

3.2.2 Tiger flathead

Tiger flathead is a longer-lived species (up to 20 years) taken in depths to 200m from northern NSW south to Tasmania and west to eastern South Australia. Tiger flathead is key commercial species in the SESSF where its status is assessed by Tier 1[10] assessments. Landing records stretch back 100 years to steam trawlers operating in the early 20th century. Catches from all jurisdictions were as high as 3,500 t in the inter-war and post-war periods. Total annual landings since 2009 have been between 2,299 t–3,293 t.

NSW annual commercial catches since 2000 have been about 107–280 t, or 3.3–9.3% of the total commercial harvest across all jurisdictions. Total NSW landings[11] since 2009 have declined steadily from about 232 t in 2009 to 109 t in 2018, of which approximately 60–75% (67–168 t) since 2010 was taken in the OTF, 15–30% (31–54 t) was landed from other NSW commercial fisheries, and approximately 11% was recreational catch. Catches from prawn trawling consistently have been minor, mostly less than 0.5% of total harvest. Most of the NSW catches come from OZ6 (40–100 t 2009–18) and OZ5 (20–80 t).

Tiger flathead harvest also is regulated in NSW by a MLS of 33 cm TL for both commercial and recreational fishing and bag (10 fish) and possession (20 fish) limits for recreational fishers. Discard amounts or their mortality for NSW fisheries are unknown but discard rates have been estimated at 1–10% of retained catch for trawl fisheries in other jurisdictions, though with a different MLS (28 cm TL).

The assessment of tiger flathead stocks provided by the Department (Liggins 2019[12]) relied strongly on the SESSF Tier 1 stock assessment (Day 2019), considered the highest level of assessment in the SESSF. No harvest strategy[13] or specific harvest objectives exist for the OTF and so the Committee adopted the reference points from the SESSF as an appropriate interim framework for this species.

The SESSF assessment model integrates several sources of data including five historical series of fishery dependent CPUE indices, as well as long histories of age and length data. There is good agreement in recent years between standardized CPUE series for the eastern trawl fleet in the SESSF and NSW OTF, with an apparent increasing trend in CPUE between 1998 and 2009 followed by a decreasing trend between 2010 and 2018. Changes in the NSW CPUE were slightly more pronounced than for the SESSF CPUE in both intervals. The SESSF assessment put the tiger flathead stock spawning biomass at 34% of unfished bioamass, below the target reference point of 40% of unfished biomass and also slightly below the point in the harvest control rule where fishing mortality (and TACs) start declining with biomass. The SESSF assessment concluded that the stock is not subject to over-fishing (the point at which catches would lead to stocks below 20% of unfished biomass), based on the estimated fishing mortality[14]. The SESSF assessment recommended an average Recommended Biological Catch (RBC[15]) for 2020–22 of 2,563 t, 9.3% lower than the previous three-year average. Some slight reductions in harvests may be warranted over coming years to allow the stock to rebuild toward the target reference point.

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[10] The Australian Fisheries Management Authority (AFMA) uses five tiers of assessment for managed stocks. Tier 1 is a full statistical catch-at-age assessment that integrates data across a range of sources, including Catch-per-Unit-Effort (CPUE) abundance indices, age compositions, and length frequencies. Tier 2 is a quantitative assessment but with less reliable data. Tier 3 is based primarily on catch curve analyses. Tier 4 is based on standardised CPUE analysis. Tier 5 employs catch-only methods.

[11] Recreational catch was estimated in 2013–14 and 2017–18 and the mean proportional catch from those years applied to all other years to estimate total NSW harvest. Both recreational and total harvests likely will be underestimated by this method because of the limited sampling frames used to estimate recreational catches.

[12] Liggins G. 2019. *Stock Assesment Report — Tiger Flathead (Platycephalus richardsoni)*. NSW Department of Primary Industries, Sydney, 26 pp.

[13] A harvest strategy consists of several core components:

- One or more operational objectives including policy and management goals, and indicators that measure performance against the objectives. There are known as reference points which include:
  - a specified desired state of a fishery, called a **target reference point**;
  - the bounds of an undesired state, called a **limit reference point**;
- A monitoring and data collection strategy and program to capture the state of the fishery or stock;
- Analytical processes, including assessment, that translate monitoring data into management responses;
- A decision rule, called a **harvest control rule**, representing a control response which acts on catch (output control) or effort (input control) to achieve the operational objective.

[14] Fishing mortality is the removal of fish from the stock due to fishing activities and is related to the number of fish caught as a proportion of the entire stock.

[15] The Recommended Biological Catch (RBC) is the total amount of fishing-related removals from a stock recommended from an assessment and associated population modelling. The RBC includes landings in all jurisdictions and estimated discard mortalities and reflects the level of fishing-related mortality that would be expected to keep the stock near to its target reference point, or allow it to move in that direction. A depleted stock, for example, will precipitate a reduction in RBC to allow the stock to rebuild towards the target reference point.

3.2.3 Silver trevally

Silver trevally is a long-lived species with maximum age of 25 years and has a wide distribution within and beyond NSW waters. Silver trevally currently is considered a shared stock and harvested in the SESSF and in Victorian and Tasmanian waters. The stock structure is uncertain, however, and some have questioned whether the catches in other jurisdictions are from the same stock fished in NSW waters.

More catches of silver trevally have been taken historically from NSW waters than from the SESSF. Commercial catches of silver trevally greater than 1,000 t were reported from NSW during the 1980s, but catches have declined steadily since then to less than 100 t since 2015. Most of the NSW commercial catches have been taken by the SFT (up to 84%) but catches from the SFT and NFT have been similar since 2015, with each landing less than 35 t annually. Annual catches from the OTF since 2009–10 have been between 7.7 t (2018–19) and 36.0 t (2012–13), approximately 12–40% of total annual NSW commercial catches. SESSF catches of silver trevally also have declined from around 230–410 t annually prior to 2006 to less than 80 t annually since 2015 and just 33.1 t in 2018. Catches in the SESSF have not reached the SESSF TACCs since 2006 and have been less than 20% of TACCs since 2012. Catches of 26–99 t have been taken from Tasmanian and Victorian waters (combined) annually since 2000.

Commercial catches in NSW have been taken mainly from OZ6 by the NFT and mainly from OZ10 near Eden by the SFT. NSW regional OTF CPUE results for OZ5 and OZ6 arguably show slight declines since 2010 but are highly variable. CPUEs for the Ocean Trap and Line Fishery (OTLF), which also caught large amounts of silver trevally, showed similar patterns to the other fisheries.

NSW recreational catch of silver trevally was estimated to be 100 t in 2000–01, but may have been over 170 t including catches by non-NSW residents. Estimated recreational catches in 2013–14 and 2017–18 were 27 t and 7 t respectively but those estimates were for subsets of NSW-resident fishers and so will be underestimates by an unknown, probably substantial, amount. Recreational and commercial catches in NSW likely have been of similar magnitude in recent years. Harvest of silver trevally also is regulated in NSW by a MLS for harvest of 30 cm TL by commercial and recreational fishers and bag (10 fish) and possession (20 fish) limits for recreational fishers. Discard amounts or their mortality are unknown.

The Committee considered the Departmental assessment by Fowler (2020[16]) and previous (2017) SESSF assessments in the determination of TACC for silver trevally. Fowler (2020) concluded that the silver trevally stock overall was “depleting”. Standardized CPUEs from the OTF and the NSW OTLF indicated declining trends during 1998–2009 and 2010–2019. The 1998–2009 interval was characterised by high effort whilst effort was low after 2010. The integrated CPUE series 1998–2019 showed a declining trend to minimum abundance in 2008, after a period of high fishing effort, with a partial recovery until 2013 and 2014, but a decline again since then. All CPUE series indicated lowest catch rates were experienced in 2008 and 2009, around the time that logbook data collection methods changed, rendering it difficult to attribute changes around that time unequivocally to stock abundance or reporting changes.

Analyses applied to the stock were variable and uncertain, however, showing a potential range of depletion to 3–13% of unfished biomass, with highly uncertain levels of fishing mortality. Silver trevally in NSW has been assessed previously as growth overfished, implying that catches are being limited by harvesting small individuals (Stewart et al. 2015[17]). Comments received from fishers that most of recent catches is discarded because of MLS limits would be consistent with the 2015 assessment.

Silver trevally is a secondary by-product species in the SESSF and is assessed using a Tier 4 stock assessment based on a CPUE analysis stretching back to 1986. That CPUE series shows a rapid decline from 1990 to a minimum in 2000, then increasing to 2010. It has since declined again. Target and limit reference points for the stock are based on the average standardised CPUE from 1992 to 2001. SESSF standardised CPUEs averaged over the last 3 years (0.6722) place the stock slightly above half way between the limit (0.3761) and target (0.9026) reference point CPUEs. The SESSF assessment concluded that silver trevally stock appears stable and unlikely to be over-depleted.

It is difficult to draw a definitive conclusion from the above assessments. The results of catch-only, data poor methods used for both NSW and Tier 4 SESSF assessments were not consistent, and different methods used within the NSW assessment also produced different results. Both assessments, recent fishing history, and comments from industry, however, suggest that the silver trevally stock(s) currently is (are) below a reasonable target status and possibly closer to a level of concern for sustainable harvest.

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[16] Fowler, A.M. and Chick, R.C. (2019). *Stock assessment report 2019 – Ocean Trawl Fishery – Silver Trevally (Pseudocaranx georgianus)*. NSW Department of Primary Industries - Fisheries, Sydney, pp 46.

[17] Stewart, J, Hegarty, A, Young, C, Fowler, AM and Craig, J 2015, *Status of Fisheries Resources in NSW 2013-14, NSW Department of Primary Industries, Mosman.*

Key information needed to improve certainty around future TACC setting includes: (a) clarity about the stock structure of silver trevally around Australia's south-east coast to inform whether Commonwealth and State assessments are about the same or different stocks; (b) robust estimates of mortality rates for discarded fish, for both commercial and recreational fishing; (c) improved estimates of recreational catches, including discards, in NSW; (d) some population modelling to explore potential implications of persistent declines in amounts and size structures of catches of silver trevally over recent decades.

- *The Committee recommends that the Department, preferably in collaboration with neighbouring jurisdictions, do research to understand the implications of recent persistent declines in catches and reported declining sizes of silver trevally to inform more robust stock assessments.*

3.2.4 Eastern school whiting

Eastern school whiting is a relatively short-lived species with maximum age of 9 years. Its distribution overlaps with stout whiting in northern NSW, but few stout whiting occur south of Newcastle (33^0S), where trawl catches of whiting are almost all eastern school whiting. Eastern school whiting occur mainly in waters 31–60m deep, but occasionally can be taken from waters to 100m depth, and commonly co-occur with eastern king prawns. Eastern school whiting occurs in waters from southern Queensland to western Victoria and is a key commercial species in the SESSF, where its status is assessed by Tier 1 assessments. Estimates of eastern school whiting biomass have varied considerably, likely partly as a result of a relatively late age of recruitment to the fishery (2-3 years) for a short-lived species.

Commercial landings of eastern school whiting in NSW have been recorded since the early 1940s. There is considerable uncertainty about species identifications for some of those catches, however, especially those from north of Newcastle where eastern school whiting overlaps geographically with stout whiting, albeit mainly inhabiting different depth strata. Almost all NSW eastern school whiting catch is from trawl and seine fishing, mainly in the OT and SFT fisheries, where total annual catches reached 1,187 t in 2017 and exceeded 1,000 t in 1997, 1998, 2001–03, and 2018. Annual catches in other years since 1990 have been 395–999 t. Approximately 70–90% of catches since 2009 were taken by the OTF, with around 50–70% taken by prawn trawlers in most years and the remainder taken by fish trawl and seine sectors. Notable exceptions were 2017 and 2018 when the NFT sector took over 85% of the total annual catches of over 1,140 t, which were about 60% higher than the 2009-2016 average. Only small catches of eastern school whiting are taken in the Estuary General Fishery (<10 t annually), Ocean Haul Fishery (<2 t), other commercial fisheries (<3 t), or by recreational fishers (<1 t).

Discard rates of eastern school whiting historically were relatively high in the prawn trawl sector (24–89% of catch) but somewhat less from fish trawls (2–32%). Those estimates pre-dated introduction of bycatch reduction devices, however, with fewer whiting now likely to be caught in prawn trawls. Recent estimates have discards at 30–63% for prawn trawls and an average of 6.8% for fish trawls. Anecdotal accounts indicate that most whiting do not survive capture by trawling and are dead prior to discard but specific estimates of discard mortality are not available. Approximately equal numbers of caught fish are discarded as retained by recreational fishers, but recreational catches of eastern school whiting are small.

The eastern school whiting assessment provided by Hall (2019[18]) presented two analyses in approximate agreement. Standardised CPUEs fluctuated between 60-110 kg/h in the last 9 years in the NFT where eastern school whiting is targeted. CPUE in the OPT sectors, where eastern school whiting mainly is bycatch, declined slightly from 15 kg/h to 12 kg/h in those 9 years. Both NFT and OPT CPUEs have been higher since 2009 than in 2000. Hall (2019) also did a catch curve analysis using data from 2005–2007 that indicated moderately high fishing mortality. Catches then were around 800–850 t annually.

The 2017 SESSF Tier 1 stock assessment and CPUE analyses (Day 2017[19]), together with a recent update (Day 2019[20]), put the spawning stock biomass currently (2020) at 35% of unfished biomass, a decline from 44.7% in 2017. The 2019 assessment update was triggered by recent increases in catches of eastern school whiting in NSW that resulted in the total landings (excluding discards) from all fisheries in 2017 and 2018 exceeding the RBC by 22% and 10% respectively. The 35% stock level is below the

[18] Hall, K.C. (2019) *Stock assessment report 2019 – Ocean Trawl Fishery – Eastern School Whiting and Stout Whiting (Sillago flindersi and Sillago robusta)*. NSW Department of Primary Industries, Coffs Harbour, 96 pp.

[19] Day, J. 2017. *School Whiting (Sillago flindersi) stock assessment based on data up to 2016*. Technical report prepared for SERAG Meeting, December 2017. Commonwealth Scientific and Industrial Research Organisation, Hobart, Tasmania.

[20] Day, J. 2019. *School whiting (Sillago flindersi) projections based on CPUE updates to 2018, estimated catch to 2019 and projected catch scenarios to 2021*. Technical report prepared for SERAG Meeting, December 2019. Commonwealth Scientific and Industrial Research Organisation, Hobart, Tasmania.

SESSF target reference point of 48%[21] of unfished biomass, but above the 20% limit, and resulted in a reduced 2020 RBC of 1,165 t (from 1,622 t in 2017) and a three-year average RBC of 1615 t. The 2019 updated SESSF stock assessment indicated that the stock was not subject to over-fishing, defined by the point at which catches would lead to stock levels below 20% of unfished biomass, assuming recruitment to the stock remained about or above the historical average. Continued fishing above the RBC would be expected to result in further, potentially severe, stock decline, however, if recruitment is low.

3.2.5 Stout whiting

Stout whiting is a relatively short-lived species, with a maximum age of 10 years. It is a warm-water species abundant in shallower depths of 15–30m, where NSW prawn fishers target eastern school prawns. Few stout whiting occur south of Newcastle (33^0S) but their distribution overlaps with eastern school whiting in northern NSW. The stout whiting stock is shared with Queensland, where it is landed by the Queensland Finfish Trawl Fishery. It also is caught in the Queensland East Coast Otter Trawl Fishery but 100% discarded because Queensland prohibits landing whiting from prawn trawling. Stout whiting has been assessed by Queensland over several years using a range of stock assessment models.

Stout whiting is taken almost exclusively by trawl fishing in NSW, mostly as a by-product of prawn trawling. Total catches from non-trawl fisheries, including recreational catches, have been less than 2 t annually. Annual trawl catches have been about 170–530 t since 1997, with only catches in 2017 and 2018 below 200 t. Annual landings prior to 1997 mostly were well below 100 t but it is likely that most catches were discarded in most years up to the mid-1980s. Landings from Queensland waters have been about 500–1,170 t annually since 2000, with lower catches in only 2003 (246 t).

Discard rates from NSW prawn trawling in the early 1990s were 80–100% of catch but recent estimates indicate 30–50% of catch is discarded. Discard rates from the whiting fishery in Queensland are not reported but the 100% of catch discarded from the Queensland prawn trawlers was estimated to be 1,000–2,000 t in 2002–04. Industry members have commented that almost all discarded whiting are dead, largely as a result of trauma incurred in capture.

The stout whiting assessment provided by Hall (2019) was similar in form to that for eastern school whiting and concluded that the stout whiting stock was sustainable under current harvest rates. A catch curve analysis done in 2016 estimated fishing mortality to be relatively high, although the authors questioned the representativeness of the data used in that assessment. Standardised CPUEs in the NSW OPT have been fluctuating between 10 and 15 kg/h since 2010, after increasing from a low in 2000. This pattern also is reflected in the CPUE from OZ2, where most of the catches of stout whiting are taken.

The most detailed assessments of stout whiting have been done in Queensland. The Queensland Department of Agriculture and Fisheries (QDAF) most recently assessed stout whiting in 2014 and 2015 (O'Neill and Leigh 2014, 2015[22]) and placed the biomass above the level that would produce maximum sustainable yield[23] (MSY). A long-term MSY of 1,363t was calculated but a lower TACC of 842t was recommended, for economic efficiency reasons. Those analyses place the stock at an intermediate level, generally considered to be 40–50% of unfished biomass, and unlikely to be being over-fished.

There currently is no harvest strategy nor specific objectives for stout whiting harvest in NSW but the assessments received by the Committee place the stock between the target reference points of 40–48% of unfished biomass recommended for similar species in the Commonwealth Harvest Strategy Policy.

3.3 Conclusion

Four of the five stocks considered here have been assessed as being below what would be considered appropriate target status for sustainable harvest (40–48% of unfished biomass), though none are considered below the widely accepted limit reference point of 20% of unfished biomass (Table 3.2).

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[21] No harvest strategy or specific harvest objectives exist for eastern school whiting in NSW or the OTF and so the Committee used the reference points from the SESSF as a working framework for this species.

[22] O'Neill, M. F., and G. M. Leigh. 2014. *Queensland Stout Whiting Fishery: commercial quota setting for 2014*. Department of Agriculture, Fisheries and Forestry, Brisbane, Queensland.

O'Neill, M. F., and G. M. Leigh. 2015. *Stout whiting fishery: Queensland total allowable catch for 2016*. Department of Agriculture and Fisheries, Brisbane, Queensland.

[23] Maximum sustainable yield (MSY) is the theoretically highest possible (usually annual) catch from a stock that can be sustained over time. Sustainable yield uses the population growth response when a stock is depleted. It is low when populations are high because density dependent (crowding) factors occur increasingly near the theoretical maximum size of the population, known as the carrying capacity. Sustainable yield is low when populations are very low because there are relatively few individuals to reproduce. Reproduction rates increase as population size increases until a maximum level (MSY), after which crowding factors start to diminish harvestable productivity.

Table 3.2. Likely current stock status and biomass (as % of unfished biomass) for blue-spotted flathead (BSF), tiger flathead (TF), silver trevally (ST), eastern school whiting (ESW), and stout whiting (SW) estimated by most recent assessments from NSW, Queensland, or Commonwealth jurisdictions. TRP = Target Reference Point used by the Committee in the absence of specific objectives for the NSW Ocean Trawl fishery.

Species	Status	Biomass (% B_0)	TRP (% B_0)	Source(s) of Assessment(s)
BSF	Sustainable	32.6–34.2	48	NSW
TF	Sustainable	34.0	40	Commonwealth (Tier 1), NSW
ST	Stable, Depleting	3–35.0*	48	Commonwealth (Tier 4), NSW
ESW	Depleting	35.0	48	Commonwealth (Tier 1), NSW
SW	Sustainable	42.8#	40	Queensland, NSW

* Estimates inferred from other indicators (CPUE, biomass relative to B_{MSY}) and considered extremely uncertain.
# Indicative proxy status derived from assessment result that stock was at 1.07 * B_{MSY} and assuming BMSY ~ 40% B_0

The allowable catch that is biologically appropriate should consider, and preferably limit, all fishing mortality to which a stock is subjected. It ideally also should be applied at the level of an entire stock subject to harvest, rather than across multiple stocks or for only part of a stock. Neither of these conditions exist for TACCs in the OTF. All the species are caught in varying amounts outside of the OTF, in other NSW fisheries and in other jurisdictions. Eastern school whiting and stout whiting share a combined or 'basket' TACC for 'trawl whiting'. Tiger flathead, silver trevally, eastern school whiting, and stout whiting are each subject to TACCs set independently in other jurisdictions without fco-management arrangements with NSW. All TACCs in this Determination apply only to the NSW OTF.

The Committee is concerned that the TACC for blue-spotted flathead might not manage stock status effectively because recreational fishing probably causes as much or more fishing mortality as does the OTF. The very low proportion of total tiger flathead fishing mortality caused by the OTF similarly means that sustainability benefits of OTF TACC adjustments will depend materially on TACC settings in the SESSF. The Committee recognises also that the current mechanism for capturing state catches in Commonwealth TACC-setting means that reducing the OTF TACC for tiger flathead could result in a corresponding increase in the SESSF TACC, effectively neutralising any (even minor) effects of the OTF TACC adjustment. It is noted, however, that recent catches in both jurisdictions have been well below the respective TACCs.

The Committee also is concerned about the very disparate results from alternative assessments of silver trevally. Improved understanding of stock structure and connectivity would clarify the degree to which CPUE is an indicator of abundance, and more assurance about whether the stock is being harvested sustainably or is in as poor a state as the most pessimistic assessments suggest.

The basket TACC of trawl whiting raises different issues. The combined TACC creates a disconnect between the population dynamics of each species and management of fishing mortality, and cannot control the prospect of shifting catch between the two species, which likely have very different stock status. It has been argued that operational constraints and misreporting of catches of both species occurs sufficiently to render species-specific TACCs unworkable. Fishers are required to report catches by species, however, meaning that misreporting is a compliance issue, notwithstanding operational inconvenience, which once resolved will facilitate sensible setting of species-specific TACCs.

The above issues have material implications for the effectiveness of OTF TACCs. The Committee considers catches outside the OTF when setting OTF TACCs but those external catches cannot be constrained by the OTF settings, and in some cases are not constrained at all. All species considered in this Determination therefore may be subject to more risk than anticipated or desired in setting the TACCs.

- *The Committee recommends that the Department, and government, urgently pursue:*
  1. *Mechanisms to harmonise regulation of catches of these species across all NSW fisheries , in the interests of securing expected sustainability benefits of OTF TACCs;*
  2. *Joint assessments of shared stocks with neighbouring jurisdictions to enable co-management and catch-sharing and facilitate harmonised TACCs across fisheries; and*
  3. *Work with Industry to resolve misreporting issues and secure species-specific reporting of catches of eastern school and stout whiting.*

4. ECONOMIC CONSIDERATIONS

4.1 Introduction

The five species considered here form part of multi-species catches in several fisheries: the Ocean Trawl Fishery (OTF), the Southern Fish Trawl Restricted Fishery (SFT), the Ocean Trap and Line Fishery (OTLF), the Estuary General Fishery (EGF), and the Ocean Hauling Fishery (OH). The degree to which these species are targeted also varies. Stout and eastern school whiting and blue-spotted flathead, for example, mostly are significant byproducts for ocean prawn fishers but targeted by some operators in the fish trawl sector. Tiger flathead are targeted specifically to a greater extent, with relatively small amounts landed as byproduct by prawn trawlers. Silver trevally appears to be targeted opportunistically as well as caught as byproduct by all sectors. Some catches of most of these species, and of several other species not subject to this Determination, however, are caught in most fishing events.

The multi-species, multi-fleet, mixed-catch nature of the harvest of these species has different implications for the economics of this fishery than for fisheries targeting single species or fisheries where each species can be selected explicitly at the point of capture, rather than being caught as a somewhat uncontrolled mixed catch. A reduced TACC for a high-value species that mainly is byproduct in a mixed catch, for example, can affect total trip revenues or even restrict total fishing activity of trips, resulting in greater economic impacts than a reduction in the TACC would imply. Conversely, a low TACC for a species that contributes relatively little to fishing revenue might result in continued fishing after quota has been used, discarded over-quota catch, and reduced economic returns without any commensurate sustainability benefits. Economic information in the OTF is not sufficient to affect substantially the level of the TACC for each species but some consideration of how different TACCs might affect the economic performance of the fishery can help inform the combination of TACCs set together in this Determination.

An additional complication in this Determination is that the TACC is to be set for only that portion of each species' catch taken by the OTF. The species considered here are caught in other fisheries that will not be subject to this Determination. Stout whiting is part of a larger stock also harvested in Queensland, blue-spotted flathead supports a substantial recreational fishing catch, and school whiting, tiger flathead, and silver trevally are caught in the NSW SFT and other NSW fisheries not covered by this Determination, as well as the Commonwealth SESSF. The ability of the TACCs set here to secure sustainability benefits, therefore, is limited by the absence of formal catch sharing and joint management arrangements across the various NSW fisheries and with other jurisdictions.

4.2 Volume and Value of Production

4.2.1 Catch distributions

The fishery is a multi-species fishery characterised by technical interactions. That is, the non-selectivity of the fishing gear and the mixed species composition on the fishing grounds results in each trawl shot returning multiple species. This composition can be changed to a limited extent through technology applications, such as bycatch reduction devices (BRDs), or changing fishing grounds, but the ability to target individual species is very limited. Observer data indicates that most shots contain less than 25% of a single species. Figure 4.1, for example, illustrates that trawl whiting represented less than 25% of the total catch in nearly 60% of trawl shots by NFT operators, tiger flathead was less than 25% of total catch in around 80% of shots, and blue-spotted flathead was less than 25% of total catch in around 90% of shots. Conversely, less than 3% of shots contained more than 75% of a single species (Figure 4.1).

Technical interactions in multi-species fisheries are common. Parallel species-specific TACCs that are inconsistent with the technical interactions (in relative terms) can result in elevated discarding of some species and under catch of other species, depending on the ability of fishers to change their catch composition through changing their behaviours (e.g. location). Initial individual quota allocations that are incompatible with the usual catch composition of a multi-species fishery also can result in elevated discarding of some species and under caught quota of others. A well-functioning quota market might reduce these effects over time provided the set of TACCs approximately matches the usual catch composition. The ability of fish or prawn trawl fishers in the OTF to alter their production mix is not known, but the relatively small proportion of shots with a high percentage of a single species suggests that their options are limited.

- *Better understanding of the fishery's production processes would benefit future TACC setting.*

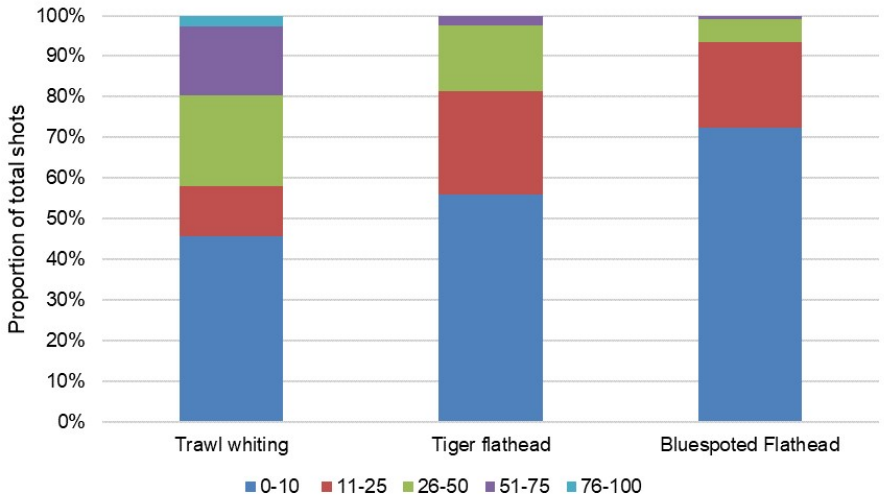

Figure 4.1. Contributions of the key species to overall catch from OTF fish trawlers seen by on-board observers in 2017–18. Different colours in bars represent the shots in which each species comprised a given percentage of the total catch, as indicated in the legend. The red section of each bar, for example, shows the percentage of all shots in which the species named below that bar comprised 11–25% of the total catch per shot.

4.2.2 Gross value of production and contribution of TACC species

The sectors affected by the Determination had a combined gross value of production of about $27.6m in 2017–18, with the quota species contributing about $6.7m or about 24% on average (Table 4.1). The offshore prawn sector had the greatest gross value of product (GVP) in the OT Fishery, although the quota species under consideration contributed relatively little to the overall value of that sector, for which prawns are the major target.

Table 4.1. Estimated Gross Value of Product (GVP, AU$ millions) overall (Sector GVP) and from the species subject to this Determination (Quota GVP) for each sector of the Ocean Trawl Fishery in 2017–18, with average contribution (%) of each quota species to total revenue[24].

	GVP ($m)		Average contribution to fishery GVP (%)					
Sector	Sector Total	Quota Species	All Quota Species	Blue-spotted flathead	Tiger flathead	Eastern school whiting	Stout whiting	Silver trevally
Fish trawl	6.93	4.38	63.13	10.35	18.56	30.66	1.07	2.49
Inshore prawn	3.03	0.31	10.07	0.74	0.00	7.28	2.03	0.01
Offshore prawn	17.62	1.99	11.27	1.13	0.03	9.42	0.68	0.00
Deepwater prawn	N/A	N/A	0.75	0.01	0.73	0.00	0.00	0.00

The dominant TACC quota species by value overall is eastern school whiting, accounting for over $4.6m in value of production in 2017–18. Around three quarters of this is caught by the fish trawl sector, where it also is the dominant quota species in terms of value of production. Eastern school whiting contributes a substantially smaller share of total sector revenue for the other sectors. Most of the non-fish-trawl catch of eastern school whiting is taken by the offshore prawn sector. The eastern school whiting stock is shared with Commonwealth, Victorian, and Tasmanian fisheries, but NSW takes the highest share of the catch, almost all of which is taken by the OTF and SFT. NSW caught 40–70% of the total catch annually between 2000 and 2018 and accounted for over 50% of the annual catch in all but two of those years.

Total landings of eastern school whiting in NSW have increased substantially in recent years, from an average of around 730 t annually 2009–2016 (value around $3.2m in 2016) to 1,188 t and 1,146 t in 2017 and 2018 (value around $5.0m in 2018). Much of this recent increase has been attributed to the introduction of two large trawlers with the specific aim of targeting eastern school whiting.

[24] Derived from McKinnon, F. (2020). *Ocean Trawl Fishery Management Report – Total Allowable Catch Determinations 2020–21*. Fisheries NSW, NSW Department of Primary Industries, Sydney.

Eastern school whiting is included with stout whiting in a basket TACC, despite both species being recorded separately in logbooks, assessed separately, and mainly interacting with different fisheries. The stout whiting stock is shared with Queensland, where it is landed from specifically endorsed fishing sectors and caught but 100% discarded from prawn trawl fisheries, from which landings of stout whiting are prohibited. NSW vessels catch about 13–18% of the total landings of stout whiting from Queensland and NSW waters. The NSW catch predominantly (around 94%) is byproduct of prawn trawling, with the remainder caught by the OTF fish trawl sector. The total value of stout whiting catches in 2018–19 was approximately $1 m. The combined value of trawl whiting (both stout and eastern school whiting) in 2018–19 was estimated to be around $6 m, based on Sydney Fish Market Prices.

Tiger flathead is the second most important quota species for the OTF fish trawl sector, with very small quantities taken as byproduct in the prawn sectors. The stock is shared with the Commonwealth managed SESSF and fisheries in Victoria and Tasmania. NSW fisheries have taken only 3.3–9.3% of the annual total catch from the stock since 2000. OTF catches of tiger flathead are estimated to have been around 59 t in 2018–19 financial year, with a market value of around $0.5m.

Blue-spotted Flathead is taken by the OTF fish, inshore prawn, and offshore prawn trawl sectors, which together landed 104 t in 2018–19 at a value of $0.7m. Blue-spotted flathead also is an important recreational species, with recreational harvest estimated to be up to 74% of the annual total harvest[25].

Total annual harvests of silver trevally by all NSW commercial fisheries has accounted for 30–61% (mean 45.3%) of the annual commercial catch of silver trevally taken from south-east Australian waters since 2010. The OTF (all sectors) has landed approximately 12–40% (mean 25.6%) of the total NSW annual commercial catch of silver trevally over the same period, with the remainder taken in the SFT (43.3%), OTL (16%), EG (8.2%) and OH (6.8%) fisheries. The TACC for silver trevally taken by the NSW OTF, therefore, is covering roughly only 25% of the annual NSW commercial catch of the species, and around 10% of the total commercial harvest from NSW and other jurisdictions around south-east Australia.

Silver trevally landings from non-OTF fisheries (SFT, OTLF, EGF, OHF) in 2018–19 constituted 70% of the total NSW commercial landings and the OHF landed more silver trevally than either the OTF or SFT. OTF catch of silver trevally in 2018–19 was 7.7 t with a value of $0.07m, down from 33 t in 2015–16[26].

Industry submissions and other sources suggest that substantial quantities of silver trevally – as high as 50% of catch[27] – are discarded due to the MLS limit for all NSW fisheries. The MLS for this (and other) species is lower than that applied to Commonwealth catch in the SESSF, likely creating inequity through reducing the incomes of NSW fishers relative to Commonwealth fishers targeting the same stock. Discard mortality is likely to be high, meaning the larger NSW MLS provides little additional sustainability benefit.

4.2.3 Market prices

The main market for all quota species is the Australian domestic market. An “export” market has been developed for whiting, although this is to an offshore processor who re-exports the processed product back to Australia, which has enabled larger quantities of catch to be marketed without affecting adversely the domestic price. Not all of the OFT product passes through the Sydney Fish Market (SFM) but SFM data provide an indication of price trends for the fishery. Prices of the two whiting species have remained relatively constant in real terms[28] since 2000–01 (Figure 4.2). Prices for the two species have diverged slightly in some years but neither species has a consistent price premium over the other, suggesting they are fairly substitutable on the market. Prices of eastern school whiting on the SFM appear to have increased since 2016–17, coincident with the introduction of the two larger trawlers and their reported focus on the “export” market, possibly reflecting a reduction in supply to the SFM. This has resulted in a price premium of around $1/kg over stout whiting in recent years.

Prices for the two flathead species have followed similar trends, with prices of both species increasing slightly and roughly in parallel over the period 2000–01 to 2018–19. Tiger flathead appeared to attract a price premium over blue-spotted flathead of 12% on average (range 3–18%) over the period.

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[25] Hall, K.C. (2019). *Stock assessment report 2019 – Ocean Trawl Fishery – Blue-spotted Flathead (Platycephalus caeruleopunctatus)*. NSW Department of Primary Industries, Coffs Harbour, pp 65

[26] Fowler, A.M. and Chick, R.C. (2019). *Stock assessment report 2019 – Ocean Trawl Fishery – Silver Trevally (Pseudocaranx georgianus)*. NSW Department of Primary Industries - Fisheries, Sydney, pp 46.

[27] https://www.fish.gov.au/report/219-Silver-Trevally-2018

[28] Nominal values are the actual or ‘raw’ transaction values recorded at each time. Real values are the transaction values at each time adjusted for inflation between that time and a standard reference period. Comparison of real values over time is more sensible because effects of inflation have been removed. The Consumer Price Index (CPI) often is applied for this adjustment since it reflects changes in the cost of living, and so inflation, over time.

Prices of silver trevally have increased by 80% in real terms since 2000–01. NSW landings have declined by 90% over the same period, mostly since 2006. Total catches across all jurisdictions appear to have been relatively stable up until 2014, after which they declined substantially[29].

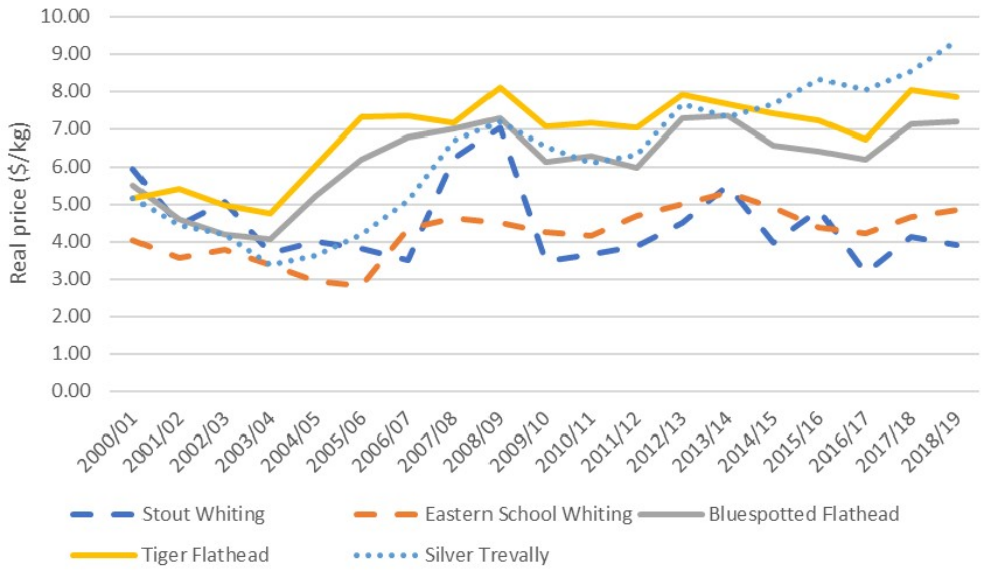

Figure 4.2. Real prices ($/kg) of OTF TACC species on the Sydney Fish Market 2000–01 to 2018–19.

4.3 Quota Markets and Autonomous Adjustment

Quotas were allocated in the OTF only at the end of 2018, with the 2019–20 fishing period (1 May 2019 – 30 April 2020) being the first full year of operation. The OTF quota market therefore has had little opportunity to develop. Industry, through their submissions to the TAFC, noted difficulties in identifying sources for additional quota, including uncertainty as to how much quota was available (i.e. uncaught) and who held under-used quota. Industry also noted that unfamiliarity with the quota system may have resulted in some fishers "holding on to quota just in case" (they needed it or trading prices increased) until late in the fishing period, rather than trading unused quota throughout the year.

Some autonomous adjustment appears to have taken place in the fishery despite these difficulties (Table 4.2). Between a quarter and a third of all OTF businesses transferred at least part of their quota holdings to other shareholders. Between 9% and 13% of business transferred their entire allocation, with some then leasing back quota to continue fishing.

Table 4.2. Quota allocations for the 2019–20 fishing period and transfers up to November 2019.

Businesses:	Trawl Whiting	Blue-spotted Flathead	Tiger Flathead	Silver Trevally
• Allocated quota	130	130	130	27
• Transferred quota	48	47	31	8
• Leased additional quota	12	20	8	2
• Transferred full allocation*	12	18	15	0
• No usage reported	63	70	101	22
Quantities (tonnes):				
• Allocated quota	1,189.1	108.1	166.9	26.8
• Leased additional quota	346.1	21.9	26.9	0.9
• Transferred full allocation*	46.5	11.6	10.0	0.0

* Excludes three boats who transferred all of their trawl whiting quota but leased back the quota and two business who did the same with their tiger flathead quota.

High proportions of businesses have not reported any use of their quota allocations, ranging from almost 50% of businesses with trawl whiting quota to 80% of businesses with silver trevally quota holding mostly unused quota. This pattern corresponds to generally low levels of quota use for each species, with around 1% of silver trevally, 21% of tiger flathead, and 49% of trawl whiting quota used as of November

[29] https://www.fish.gov.au/report/219-Silver-Trevally-2018

2019, suggesting substantial underused capacity in the fishery and the potential for further autonomous adjustment. Constraints to autonomous adjustment may include the difficulties noted by industry in finding and connecting buyers and sellers of quota and unfamiliarity with operating in a quota-managed fishery.

Initial quota allocations were based on a combination of endorsement and catch history and were quite skewed, with a small proportion of businesses allocated relatively large amounts of quota for some or all species but most businesses receiving much smaller allocations. This distribution inevitably reflected fishing history but also may account for a high proportion of business reporting no quota use, presumably also reflecting historical participation. Eighty percent of the trawl whiting landings, for example, were reported by only 8 businesses.

The skewed distribution of quota allocation was highlighted as a concern in several of the industry submissions. Several individuals noted that many fishers with low allocations "ran out of quota" early and were unable to obtain more quota to cover continuing catches of some species. Others noted that those with low quota allocations were financially disadvantaged as the cost of leasing (or purchasing) quota was high relative to their fishing incomes, and others noted that low quota allocations increased discard rates because quota was exhausted early in the fishing year.

Information on quota trading and leasing prices is not yet available. Industry reports that whiting was leasing at $0.70/kg, which was believed to be driven by demand from the operators of two larger trawlers who had come late to the fishery and did not receive sufficient quota to cover their recent (pre-quota) catches. Industry members suggested that this price was too high to be financially viable for most operators, suggesting that $0.30-$0.40/kg was a more realistic lease price. The lower values are similar to lease prices of school whiting quota in the SESSF in 2019, which were estimated to be around $0.47/kg on average (from information supplied to AFMA). Blue-spotted flathead was reported to be leasing at $1.60/kg. Neither lease nor quota transfer prices for the other species were available.

4.4 Economic Performance Indicators

Information on costs and earnings is not available for the OTF. There appears to be similarity in some aspects between OTF vessels and those of the inshore components of the SESSF, potentially meaning that information collected in ABARES surveys of the Commonwealth fishery may be of some use in the future to indicate economic performance of the OTF. ABARES fisheries economic data usually are several years out of date before they are finally published, however, and would not provide useful information on contemporary economic performance for management purposes. We know of no economic information collected by third parties for the prawn sectors of the OTF.

- *Future TACC setting would benefit from collection and analysis of economic data covering the whole OTF. Similar suggestions have been made in TAFC considerations of other fisheries.*

Lease and transfer prices also can provide useful information on economic performance of the fishery. Those data will provide limited information about short-term profitability in the OTF now, but lease and transfer prices will provide increasingly useful information about changes in the economic performance of the fishery as the market matures. Several years of information is required to elicit any trends and identify key drivers of performance so initiating collection of trading data now will reap material benefits in future TACC considerations.

- *Encouraging fishers to provide quota leasing and transfer information, including trading prices, will help future TAFC considerations for the fishery.*

4.5 Economic Targets for the Fishery

The fishery is yet to have developed a harvest strategy and no formal targets have been identified for the fishery or any of the TACC species. The stock assessments provided to the Committee assessed the fishery against proxy indicators of biomass at maximum economic yield (MEY) or Maximum Sustainable Yield (MSY). These indicators mostly were based on single species proxies (B_{MEY} = $1.2B_{MSY}$) currently used for the SESSF, and did not consider the multi-species, multi-fleet aspect of the NSW fishery.

All species were assessed as being below the proxy economic target. The NSW harvest represents just one, in some cases small, component of the overall harvest on most of the quota species so achieving a stock-wide target will require co-ordination of management arrangements and harvest with the SESSF and other fisheries (e.g. in Queensland) that interact with the stocks shared with NSW .

4.6 Management Cost Recovery and Community Contribution

Annual management charges are payable by fishing business owners, as in all NSW commercial fisheries. Management charges contribute to the cost of managing NSW commercial fisheries but the cost of managing the OTF is not fully recovered. Management charges for a fishing business are based on the number of share classes held by the fishing business (i.e. OTFN, OTISP, OTOSP).

The management charge for 2019–20 for the first two share classes held is $1,184, with a cumulative discount of 40% applying to each additional share class held thereafter. The fishery also is subject to an annual community contribution of $100 per fishing business, as are all NSW fisheries. The community contribution represents only about 0.2% of the total value of the quota species landed. Nineteen businesses were allocated all three share classes, 97 only two classes, and 27 just a single class in 2018, meaning that the maximum potential management costs that could be recovered through levy of management fees and the community contribution was $334,453, equivalent to about 5% of the total value of quota species landed. Such a cost structure results in a disproportional burden on fishers with small quota holdings, as they pay the same management charge as fishers with high quota holdings but similar share class holdings. Linking cost recovery to quota holdings would result in a more equitable distribution of the burden of management cost recovery.

4.7 Conclusion

The fishery has only had one year of quota management, so essentially still is experiencing teething problems that affect its short-term economic performance and moderate prospects of autonomous adjustment through share trading. The quota trading market has not yet developed to the point where it can provide useful information on the economic performance of the fishery, and fishery inexperience and market operational inefficiencies currently may be restricting the ability of fishers to adjust their fishing businesses. The market will mature in time, but this is of little consolation to current fishers frustrated by the initial transition to quota management.

- *Issues in the quota market – particularly around quota availability and visibility – would benefit from greater reporting by managers on the level of quota uptake, along the lines of the AFMA Catchwatch reports.[30] Greater promotion of the buy and sell features of FishOnLine may also help with fishers finding available quota to lease or transfer.*

Catches of the three quota species (tiger flathead, silver trevally, and stout whiting) by the OTF sectors are small relative to the total catches either by other NSW sectors or Commonwealth and interstate fisheries. The prospect of OTF TACCs providing sustainability benefits for these species therefore is conditional on management arrangements in other NSW fisheries or other jurisdictions. The OTF takes higher proportions of total catches of eastern school whiting and blue-spotted flathead but in both cases significant catches also are taken in other fisheries. Sustainability benefits in such circumstances are best served by formalising resource sharing arrangements with the other jurisdictions, harmonising multi-fishery management of NSW harvest, and basing future TACCs on those arrangements and coordinated stock assessments. Development of fishery- and species-level harvest strategies that consider all sectors taking these species is perhaps the most robust action to secure potential sustainability benefits.

All the species considered here are below their target biomasses adopted by the Committee[31] in the absence of specific targets in the NSW jurisdiction, and there is little basis for increasing the TACCs. Lowering the TACCs, however, may have implications for the level of discarding in the fishery. Contributions to the overall value of catches are relatively small for some of the species and sectors, especially tiger flathead, blue-spotted flathead, and silver trevally contributions to catches in the prawn trawl share classes (Table 4.1). Reducing the TACCs for these species may have limited effect on fishing behaviour but likely will result in higher discard levels, and associated fishing mortality, from the approximately 107 businesses with only prawn shares, notwithstanding potentially different effects for the fish trawl sector. Balancing different implications of TACC adjustments for different sectors (share classes) of the fishery is a difficult challenge for the TAFC.

Eastern school whiting differs from the other species considered here because NSW, and the OTF in particular, is a major taker of overall catch of this species and TACC decisions are more likely to have material sustainability implications for the species. Eastern school whiting represents around 30% of the gross value of production on average of the OTF fish trawl sector but the distribution of quota holdings is

[30] https://www.afma.gov.au/fisheries-services/catchwatch-reports

[31] Stout whiting is estimated to be at around 42% of unfished biomass and so above the estimated level of MSY (40%) but below the level of MEY (48%). The Committee generally favours MEY-based targets but it appears that MSY was the target used in the Queensland assessments of stout whiting.

highly skewed, with a large proportion of the quota held by a small number of businesses. Changes to the (basket) TACC affecting this species may affect disproportionately the economic performance of these few operators, but are likely to have only small economic effects on the majority of fishers in the sector. Eastern trawl whiting represents less than 10% of the gross value of production for the OTF prawn trawl sectors, so changes to the TACC might have lower effects than for the fish trawl sector, but may affect materially the level of discards from the prawn trawl fleet.

A further consideration is the joint production nature of the fishery. The species by and large are caught together in mixed-species catches, although the species mix can change spatially. Catch history reflects these technical interactions, based on contemporary stock conditions and fisher behaviour. The initial TACCs were set based on catch histories but those histories were treated differently for different species. The TACCs for blue-spotted flathead and silver trevally were set at the average catch over the IAP period[32] whilst TACCs for tiger flathead and trawl whiting were set at the maximum annual catch from the same period. These TACCs consequently are not internally consistent with their relationship to the historical mix of species in the mixed catches. Setting TACCs based on average catches is most likely to reflect the usual multi-species catches and operating behaviours of a multi-species, mixed-catch fishery. Maximum-catch based TACCs are likely to be mismatched with those 'usual' conditions, especially where maximum historical catches occurred in different years for different species. Mixing TACCs based on a mixture of maximum-catch and average-catch in the same fishery is likely to mean either that (a) landing maximum-catch based TACCs is possible only with significantly increased discarding of species with the average-catch based TACCs, or (b) maximum-based TACCs go unmet because quota is exhausted for the species with average-based TACCs. Even a fully efficient quota trading market is unlikely to accommodate this mismatch and nor is simply setting all TACCs at each species' historical maximum, unless, perhaps, all species had their maximum landings in the same year (which is not the case for the OTF). TACCs in multi-species, mixed-catch fisheries need to be set taking into consideration technical interactions affecting catch composition as well as stock conditions.

Other management changes that might improve the economic performance of the fishery include the current application of Minimum Legal Sizes (MLSs) for harvest. The current NSW MLSs for quota species are higher than those for harvest of the same species by Commonwealth vessels. This difference reportedly has resulted in higher levels of discards by NSW fishers than by SESSF fishers. Reducing the NSW MLSs to the same as those in the Commonwealth fishery would, in this case, result in higher incomes to NSW fishers without increased total fishing mortality, assuming most discarded fish die. The effect of such a change on targeting behaviour by fishers is not clear, however — a lower MLS may attract more targeting of species such as silver trevally, resulting in increased catch. Such a change might have little effect on sustainability for those species for which the OTF takes only a small proportion of the total landings.

[32] An Independent Allocation Panel was charged with allocating individual quotas to business and did so, in part, on the basis of catch histories during an agreed period. That 'IAP Period' for the OTF was July 2009–June 2017.

5. MANAGEMENT CONSIDERATIONS

5.1 The Ocean Trawl Fishery

The OTF is a share managed, multi-species fishery that fishes using otter trawl and Danish seine trawl nets. The fishery is made up of four different endorsement types that differ by area fished and gear type used, and also by the composition of their catch.

- *Inshore prawn* — Otter trawl net fishery targeting prawns in inshore waters, upto 3 nm from the coast. Prawns are the primary target species, though significant catches of fish, in particular stout whiting are taken. The quota species considered here contribute about 10% of the sector's GVP.
- *Offshore prawn* — Otter trawl net fishery targeting prawns in offshore waters west of the 280m depth contour. This is the highest value sector in the fishery, with a GVP of approximately $16 million. The quota species considered here contribute around 11% to the GVP of this sector.
- *Deepwater prawn* — Otter trawl fishery targeting prawns in waters east of the 280m depth contour. This is the smallest sector in the fishery, with only 15 endorsements. Catch in this sector is almost entirely prawns, with the quota species contributing less than 1% of the sector's GVP.
- *Fish northern zone* — Otter trawl net or Danish seine trawl net targeting fish from waters north of Barrenjoey headland. This sector is the most reliant on the quota species under consideration here, which comprise 69% of the catch for this sector.

Spatial distributions of effort differ among sectors of the OTF, as does catch composition. Prawns represent an average 45% of total catch in the inshore and offshore prawn sector, catch-quota species 33%, and other primary and secondary species account for 23% of total catch. Average catches in the fish trawl sector comprise 69% quota species (47% trawl whiting, 12% tiger flathead, 8% blue-spotted flathead, 2% silver trevally) and 31% other primary and secondary species (not including prawns).

5.2 Catch History Since 2009

5.2.1 Blue-spotted flathead

The catch of blue-spotted flathead in the OTF has ranged between around 74.8 and 172.4 t since 2009–10, with an average annual catch of 110 t during that period. The OTF catch has represented on average 23% of the catch of blue-spotted flathead in NSW, with the recreational sector assumed to take around 67.5–74% of the total catch from NSW based on estimates from surveys in 2000–01 and 2013–14. Preliminary results presented to the Committee from a survey of recreational catch done in 2017–18 estimated that 109 t of blue-spotted flathead was taken by long term recreational licence holders. These recreational fishers represent around 60% of landings in the sector, which suggests that approximately 182 t of blue-spotted flathead was taken by NSW-based recreational fishers in 2017–18.

The OTF TACC for blue-spotted flathead was 108.1 t in 2019–20, which was the average annual catch of the species over the 8 year period 2009–10 to 2016–17. Half of the TACC had been caught approximately 70% of the way through the 2019–20 Fishing Period.

Table 5.1: Catch of Blue-spotted Flathead in the Ocean Trawl Fishery, other NSW fisheries, and other jurisdictions since 2009–10.

	Catches (t)				
Year	**Total OTF**	**All other NSW[33]**	**Other Jurisdictions**	**Total**	**OTF %**
2009–10	124.4	369.6	NA	494.0	25.2%
2010–11	176.4	519.4	NA	695.9	25.4%
2011–12	138.0	435.3	NA	573.3	24.1%
2012–13	107.2	341.4	NA	448.6	23.9%
2013–14	93.6	297.9	NA	391.5	23.9%
2014–15	75.5	251.7	NA	327.2	23.1%
2015–16	74.8	270.5	NA	345.3	21.7%
2016–17	90.2	345.9	NA	436.1	20.7%
2017–18	115.4	391.3	NA	506.7	22.8%
2018–19	104.1	359.9	NA	464.0	22.4%

[33] Includes Southern Fish Trawl (SFT) catch and recreational catches, which were estimated as constant 72% of total catch based on 2000–01 survey.

5.2.2 Tiger flathead

Tiger flathead does not feature in the OTF prawn sectors but makes up around 12% of the catch in the OTF fish trawl sector, with annual landings averaging 113 t since 2010[34]. The vast majority of catch from the tiger flathead stock is taken in the Commonwealth Southern and Eastern Scalefish and Shark Fishery (SESSF), which took over 90% of tiger flathead landings since 2010. OTF catches of tiger flathead have declined in recent years while the overall harvest from the stock has remained relatively stable.

The 2019–20 tiger flathead TACC for the OTF was 166.9 t, which represented the maximum catch of tiger flathead taken between 2009–10 and 2016–17. Thirty-five percent of the TACC had been caught approximately 70% of the way through the 2019–20 Fishing Period.

Table 5.2: Catch of Tiger Flathead in the Ocean Trawl Fishery, other NSW fisheries, and other jurisdictions 2010–19.

	Catch (t)					
Year	**Total OTF**	**All other NSW**	**Commonwealth**	**Other (Vic, Tas)**	**Total**	**OTF %**
2010	168.6	33.5	2,728.1	61.2	2,991.4	5.6%
2011	155.5	38.6	2,672.8	81.8	2,948.7	5.3%
2012	150.4	46.0	3,062.4	34.7	3,293.4	4.6%
2013	147.7	34.3	2,134.5	68.7	2,385.2	6.2%
2014	110.0	54.4	2,637.3	36.2	2,837.9	3.9%
2015	111.1	40.0	2,898.7	29.8	3,079.6	3.6%
2016	95.4	50.0	3,010.0	64.5	3,219.8	3.0%
2017	75.9	31.6	2,471.1	79.0	2,657.6	2.9%
2018	67.0	30.6	2,164.7	36.3	2,298.6	2.9%
2019[35]	51.7	32.3	N/A	N/A	N/A	

5.2.3 Silver trevally

Landings of silver trevally in the OTF have reduced dramatically over the last 25 years, from over 700 t per year in the mid-1990s to less than 40 t per year since 2010. Reductions also have been seen in total catches from the stock, from 362.6 t in 2010 to 131.3 t in 2018. The OTF catch represents only around 10% on average of all landings of silver trevally, with the SESSF taking the largest landings.

The TACC in 2019–20 was 26.8 t, based on the average catch over the 8 years 2009–10 to 2016–17. Only 3% of that TACC had been caught approximately 70% of the way through the 2019–20 Fishing Period. Industry advised that the low use of silver trevally quota likely was due to a combination of limited quota availability for lease and the MLS, which together made it unviable to target silver trevally.

Table 5.3: Catch of silver trevally in the OTF, other NSW fisheries, and other jurisdictions 2010–2019.

	Catch (t)					
Year	**Total OTF**	**All other NSW**	**Commonwealth[36]**	**Other (Vic, Tas)**	**Total**	**OTF %**
2010	26.1	87.5	205.6	43.4	362.6	7.2%
2011	30.2	86.0	188.7	44.9	349.8	8.6%
2012	20.3	113.2	134.3	30.9	298.7	6.8%
2013	38.1	121.3	121.8	25.9	307.1	12.4%
2014	19.3	138.3	103.9	29.6	291.1	6.6%
2015	25.8	53.0	77.9	38.0	194.6	13.2%
2016	34.4	50.6	50.6	46.2	181.9	18.9%
2017	20.9	38.6	50.5	58.8	168.8	12.4%
2018	12.5	45.2	33.1	40.5	131.3	9.6%
2019[35]	7.3	29.8	N/A	N/A	N/A	

[34] Data were provided only by calendar years for some species and jurisdictions whilst others were available by financial year. Financial year data are presented from 2009–10, consistent with the IAP Period. Calendar year data are from 2010, rather than 2009, to avoid confounding with changed reporting requirements beginning mid-2009.

[35] 2019 data are likely affected by incomplete reporting at the time of data extraction.

[36] Commonwealth catch is that reported from logbooks for trawl and non-trawl in SESSF.

5.2.4 Trawl whiting

The annual catch of eastern school whiting in the OTF has been 401.2–1,016.9 t since 2010, with an average annual catch of about 700 t. The OTF typically has represented around half of the total landings from the eastern school whiting stock, with the Commonwealth SESSF the next largest taker of catches. Eastern school whiting is the quota species with the highest contribution to the GVP of the OTF fishery.

The OTF has an average annual catch of 240 t of stout whiting since 2010, representing around 23% of total catch from the stock. The Queensland Fin Fish Trawl Fishery takes most landings from the stock with average annual catches of over 800 t, representing about 77% of total annual landings since 2010.

The TACC for trawl whiting in 2019–20 was 1,189.1 t, which was based on the maximum catch of stout whiting and eastern school whiting (as a basket) during the 8 year period 2009–10 to 2016–17. About 52.5% of the TACC had been caught approximately 70% of the way through the 2019–20 Fishing Period.

Table 5.4: Catch of eastern school whiting in the Ocean Trawl Fishery, other NSW fisheries, and other jurisdictions 2010–2019.

	Catch (t)					
Year	**Total OTF**	**All other NSW**	**Commonwealth**	**Other (Vic, Tas)**	**Total**	**OTF %**
2010	651.2	118.4	423.7	51.0	1244.3	52.3%
2011	853.9	130.1	376.8	32.8	1393.6	61.3%
2012	674.4	174.1	445.6	17.9	1311.9	51.4%
2013	577.7	68.9	509.8	49.6	1206.0	47.9%
2014	401.8	93.2	724.4	14.4	1233.8	32.6%
2015	527.5	100.2	765.3	25.6	1418.6	37.2%
2016	509.5	227.2	706.9	26.3	1469.9	34.7%
2017	1016.9	170.3	767.7	24.0	1978.9	51.4%
2018	1009.3	135.3	602.8	22.4	1769.8	57.0%
2019[37]	807.15	165.4	524.0	25.7	1522.3	53.0%

Table 5.5: Catch of stout whiting in the Ocean Trawl Fishery, other NSW fisheries, and other jurisdictions 2010–2019.

	Catch (t)				
Year	**Total OTF**	**All other NSW**	**Queensland**[38]	**Total**	**OTF %**
2010	297.1	0.9	1170	1468.0	20.2%
2011	250.7	1.6	665	917.3	27.3%
2012	244.8	1.2	784	1030.0	23.8%
2013	296.5	0.5	704	1001.0	29.6%
2014	226.1	1.4	581	808.5	28.0%
2015	278.8	1.6	787	1067.4	26.1%
2016	210.3	2.2	776	988.5	21.3%
2017	173.5	1.2	1028	1202.7	14.4%
2018	183.2	1.2	835	1019.4	18.0%
2019[39]	167.6	0.2	1079	1246.8	13.4%

5.2.5 Other species

There are five other primary species (bugs, cuttlefish, octopus, shovelnose rays, and southern calamari) and 19 key secondary species caught in the OTF in addition to prawns and the five species managed under quota. These other species on average account for 31% of catch in the fish trawl sector and 23% of catch in the prawn trawls. They contribute over 35% of the GVP of the fish trawl sector and around 15–25% of the GVP of the prawn sectors.

The OTF recently has been subject to three years of observer coverage but the results from that work were not available in full to the Committee. Strategies in place to reduce bycatch and discarding in the OTF include bycatch reduction device trials and the authorisation of specific modifications to trawl nets to reduce bycatch, including bycatch of quota species where limited quota is held.

[37] 2019 data are likely affected by incomplete reporting at the time of data extraction (February 2020)

[38] Queensland reported catch from South Whiting fishery, excluding estimated discards from East Coast Trawl fishery

[39] 2019 data are likely affected by incomplete reporting at the time of data extraction (February 2020)

5.3 Current Management Arrangements

5.3.1 Commercial Fishing

Management of the OTF is governed by the *Fisheries Management Act 1994* with arrangements set out in the *Fisheries Management (Ocean Trawl Share Management Plan) Regulation 2006*, *Fisheries Management (Supporting Plan) Regulation 2006*, and *Fisheries Management (General) Regulation 2019*.

Harvest of the species subject to this Determination by the OTF and other NSW commercial fisheries is managed by a suite of input and output controls. Input controls include limited entry, boat capacity restrictions, controls on fishing gear, temporal and spatial closures. Output controls include both Total Allowable Commercial Catches (TACCs) and Individual Transferable Quotas (ITQs) for the OTF, daily trip limits for fishers in the Southern Fish Trawl Restricted Fishery (SFT), and Minimum Legal Size (MLS) limits for harvest of some species.

The OTF is a share management fishery, with access to the fishery limited to shareholders (or their nominated fishers) that hold the minimum number of shares in each share class required for endorsement to fish. There are currently 106 endorsements in the inshore prawn share class, 96 in offshore prawn, 29 in the northern fish trawl, and 15 in the deepwater prawn share class. There are currently 246 businesses in NSW with one or more endorsements in the OTF. Management input controls over the past 20 years have reduced effort in the fishery by around 30% between 2002–03 and 2018–19.

The NSW Government in 2018 allocated quota shares for 17 species groups, including in the OTF for tiger flathead, blue-spotted flathead, 'trawl' whiting (eastern school whiting and stout whiting together), and silver trevally. Shareholders in each share class were allocated species' quota shares on the basis of the number of shares they held (20%) and their catch history (80%). Quota shares thus were allocated primarily on the basis of the catch composition of each shareholder over the period 2009–10 to 2016–17.

The catch amount represented by each quota share in a fishing year is dictated by the Total Allowable Commercial Catch (TACC) for each of the species or species groups in that year. TACCs relevant to the OTF are set for each fishing period (from May 1 to April 30 the following calendar year) for tiger flathead, blue-spotted flathead, trawl whiting, and silver trevally. The first ever Determination of TACCs for harvest of these four species groups by the OTF was for the 2019–20 Fishing Period and was done administratively by the Department. The TAFC has been asked to determine the TACC for these four species groups for the fishing period 1 May 2020 to 31 April 2021. Quota shares also have been allocated to the OTF for gemfish but that species is over-exploited and has a TACC of 0 t until further notice.

Endorsement holders in the prawn share classes of the OTF are also subject to prawn effort quota shares, under a Total Allowable Effort (TAE) setting. The Secretary of the Department is required to make the TAE Determinations for ocean prawn trawling during a transition period through to 20 June 2024. The TAE for prawn trawling therefore is not being considered by the TAFC for the 2020–21 Fishing Period.

There is no harvest strategy for this fishery and the management arrangements in place do not contain performance indicators or reference points to guide management decisions or TACC Determinations. The Department currently is developing a harvest strategy policy and intends to prepare draft harvest strategies for a number of trial fisheries over the next year, which will specify limit and target reference points. The OTF is not one of the fisheries slated for the harvest strategy trials, however, and it therefore is unlikely that a harvest strategy will be available for this fishery in the near future.

The Committee has used target and limit reference points used in the different stock assessments available for each species, or inferred from the Commonwealth Harvest Strategy Policy, in the absence of explicit target and limit reference points for these species' harvest in NSW. It is worth noting, however, that the reference points used in the stock assessments should be viewed with caution as they have not been developed in consultation with the NSW industry, in some cases they have been set by other jurisdictions (Commonwealth or Queensland), and in all cases are single species targets that may not reflect optimal outcomes in the context of a multi-species, mixed-catch fishery.

5.3.2 Recreational

Recreational bag or possession limits apply to all four species groups considered here, and MLSs consistent with those in the commercial fishery apply to tiger flathead, blue-spotted flathead, and silver trevally. The interaction between the recreational and commercial sector is thought to be relatively low given that ocean trawlers typically operate at night and further offshore than most recreational fishers.

Blue-spotted flathead and silver trevally are important recreational species. Estimated catches of blue-spotted flathead by NSW resident recreational fishers in 1993–94, 1994–95, 2000–01, and 2013–14 put those catches at 60%, 61%, 65%, and 65% of total landings respectively. Catch by non-resident recreational fishers also was estimated in 2000–01, which increased the estimated total recreational take

to 74% of total landings. Approximately as many fish were discarded as kept by recreational fishers. Silver trevally landed by NSW resident recreational fishers in 2000–01 were estimated to account for about 24% of total landings but the total recreational catch, including that by non-resident visitors, may have been as much as 42% of total catch. NSW recreational fishers were estimated to take about 14 % of all catch in 2013–14, but it was not possible to estimate total recreational take from that survey.

The most recent survey of recreational fishers was done in 2017–18, using a database of 1–3 year recreational licence holders, who are known to take around 60% of the recreational catch in NSW. Preliminary results from that survey presented to the Committee indicated that long term licence holders caught around 109 t of blue-spotted flathead in 2017–18, which when scaled up to all recreational fishers suggests catches of 182 t, equivalent to about 56% of total landings. It is also estimated that those fishers caught around 10-15 t of both tiger flathead (about 10%) and silver trevally (about 15%) in 2017–18.

Surveys of recreational catch have been irregular and there are significant uncertainties in the estimates they produce. The recent increase in frequency of surveys in NSW and more stable (albeit with ongoing refinements) methods should result in more robust and comparable estimates of recreational fishing catch and distribution. This is particularly important for those species where the recreational catch is a significant component of the total mortality of a species, such as blue-spotted flathead, or where there is uncertainty with regards to the status of the stock, as is the case with silver trevally. The Committee commends the Department for the improvements in methods and frequency of the recreational surveys, noting the importance of improved data to ensure robust management of all sectors fishing these stocks.

There are 208 active licensed charter boats in NSW and flathead and trevally are important components of their catch. Blue-spotted flathead represents around 82% of landings in the charter boat fishery. Catch records from the charter sector indicate that around 53 t of blue-spotted flathead were caught and retained over the period 2016–2019, while the catch of tiger flathead over the same period was estimated to be around 8 t and silver trevally around 4 t.

5.3.3 Aboriginal

The Aboriginal Cultural Fishing Interim Access policy allows an Aboriginal person to take double the prescribed recreational bag or possession limit, or up to specified limits for certain species to provide for cultural needs where elders, incapacitated, or other community members are unable to fish for themselves. There are no data on harvest of the species subject to this Determination by Aboriginal people. The Committee encourages the Department to increase their understanding of the contribution of Aboriginal people and communities to the landings of these and other species.

5.4 Multi-jurisdictional Considerations

All five species under consideration have significant interactions with other fisheries in NSW and fisheries in other jurisdictions. A summary of catch and management mechanisms in those other fisheries and jurisdictions is provided in table 5.6 below.

Table 5.6: Total annual catches (average tonnes/year since 2010), percentage distribution among fisheries, and Total Allowable Commercial Catches (t) for tiger flathead (TF), blue-spotted flathead (BSF), silver trevally (STF), eastern school whiting (ESW), and stout whiting (SW), in the OTF, ohter NSW fisheries, and other jurisdictions that also harvest the stocks commercially. Stout whiting is shared only with Queensland (QLD, bottom of table) and the other species are shared with the Commonwealth Southern and Eastern Scalefish and Shark Fishery (SESSF). Some catches also are landed in Victoria or Tasmania, which are not shown in the table.

	Catches				TACCs (t) 2019–20*	
Species	**t/yr**	**% OTF**	**% NSW Other**	**% SESSF**	**OTF**	**SESSF**
TF	2,856.9	4.2	N/A	92.4	166.9	2,468 (basket)
BSF	468.3	23.3	76.7		108.1	
ST	254.0	10.6	31.8	39.3	26.8	292
ESW	1,447.0	47.3	9.4	41.2	1,189.1 (basket)	788
		% NSW		**% QLD**		**QLD***
SW	1,056.0	23.3	N/A	76.7		1,106

* QLD TACCs are set for calendar years and that for stout whiting in Queensland was for 2019.

The OTF accounts for less than half of the landings of any of the five quota species. The biological sustainability of all of these species therefore cannot be controlled via management of the OTF alone. Management of the OTF is likely to have only a small impact on the sustainability of silver trevally and tiger flathead, and a moderate effect on blue-spotted flathead and stout whiting. Management of the OTF is only likely to have a substantive sustainability effect on eastern school whiting, where the fishery constitutes around 47.3% of the total landings on average.

5.4.1 Commonwealth

Commonwealth average annual catches since 2010 accounted for 92.4%, 41.2%, and 39.3% of landings of tiger flathead, eastern school whiting and silver trevally respectively. These species are target species in the Commonwealth Southern and Eastern Scalefish and Shark Fishery (SESSF), a multi-species, multi-gear fishery that operates in waters extending from southern Queensland around to Western Australia. The SESSF includes the South East Trawl Sector which operates in waters from 3nm out to 200nm off the NSW coast, south of Barrenjoey, and has similar operations and target stocks to the OTF.

The SESSF is managed under an ITQ system and TACCs for 34 different species or species groups including tiger flathead (within a 'flathead' basket TACC), eastern school whiting, and silver trevally. The TACC is decided by the Australian Fisheries Management Authority (AFMA) Commission, based on advice from the SESSF Resource Assessment Group (RAG) and Management Advisory Committee (MAC), and is informed by the SESSF Harvest Strategy. The harvest strategy informs the TACC setting process by deducting recent average State catches in NSW, Victoria, and Tasmania, and estimated discards of each species from the "recommended biological catch" (RBC) generated by the relevant stock assessment to provide a recommended TACC for the SESSF. The final TACC is determined by the AFMA Commission, however, which can take into account factors other than the advice from the harvest strategy, RAG, and MAC.

There are no current arrangements in place between NSW and the Commonwealth to inform the allocation of shared stocks between jurisdictions ("resource sharing"), or to ensure complementary TACC setting or coordination for shared stocks to ensure collective harvest management within RBCs.

The last full Tier 1 stock assessment of eastern school whiting done in 2017 by the CSIRO estimated an RBC of 1,606 t for 2018–19 and 1,615 t for 2019–20. NSW catches of eastern school whiting since that assessment have increased significantly, however, and the total catch by commercial fisheries across all jurisdictions, and particularly in the Commonwealth and NSW, exceeded the RBC in 2017–18 and 2018–19 and is expected to do so again in 2019–20. The stock assessment was updated in 2019 to take into account the recent increase in catches. The updated assessment found that biomass is likely to have decreased from 47% of unfished biomass that was estimated in the 2017 assessment, to 35% in 2019–20 as a result of the higher catches. A revised RBC of 1318 t[40] (average) was recommended for 2020-2022 accordingly. The SESSF harvest strategy indicates a significant cut in catches (from the recent high levels) therefore is needed to maintain a total catch from the stock consistent with the RBC. The AFMA Commission, however, had "*... agreed in principle to maintain the 2019–20 school whiting TAC of 788 t for 2020-21 and 2021-22 fishing years, subject to the Commission's final SESSF TAC decision in March 2020.*[41]" That position seems likely to reflect the significant economic impact a unilateral reduction would have on the SESSF industry and will be discussed in light of any new scientific information at a meeting of the Commission in March 2020.

The CSIRO also has completed recent assessments of tiger flathead (2019, Tier 1 assessment) and silver trevally (2017, Tier 4) for the SESSF. Recommended Biological Caches (RBCs) of tiger flathead for 2018–19 and 2019–20 were 2,837 t and 2,826 t respectively and those for silver trevally were 445 t in both years. Total commercial catches, including estimated discards, from all jurisdictions have been within the respective RBCs for each of these two species since 2013.

The tiger flathead (spawning) stock was assessed to be at 34% of unfished biomass at the beginning of 2019, down from 42% in 2016, still well above the limit reference point for that species in the SESSF harvest strategy (20% unfished biomass) but below the corresponding target reference point (40%). Reduced RBCs were recommended for 2020–22, with a three-year average RBC of 2,563 t, suggesting that total catches may need to be reduced to allow the stock to rebuild to its target reference point.

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[40] 1,318t is the 3 year average RBC. Single year RBCs estimated in the 2019 updated stock assessment were 1,165 t for 2020, 1,357 t for 2021, and 1,433t for 2022, based on an assumption of average or better stock recruitment.

[41] https://www.afma.gov.au/news-media/news/68th-afma-commission-meeting-chairmans-summary?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+AustralianFisheriesManagementAuthority+%28Australian+Fisheries+Management+Authority%29

Silver trevally stock status was assessed to be about mid-way between the target and limit reference points based on CPUE analyses against an historical reference period. CPUE last was above the target reference point in 2010–11 and has declined since, though has been stable since 2016–17. The SESSF catch of silver trevally has been substantially below TACCs since 2009, dipping to 2% of the TACC in 2018–19. The SESSF Harvest Strategy would indicate a TACC for silver trevally of 286 t for 2020–21, though catch history for the last decade suggests that such a TACC is unlikely to be landed.

5.4.2 Queensland

The primary interaction of the OTF with Queensland is in harvest of the stout whiting stock, where the Queensland Finfish (Stout Whiting) Trawl Fishery has historically taken round 80% of the annual commercial catch. That fishery is comprised of a small number of vessels (2-6 vessels) and is managed under a TACC and individual quotas.

There also is a significant bycatch of Stout Whiting in the Queensland East Coast Otter Trawl Fishery. That fishery is not permitted to retain or land stout whiting so all catch is discarded at sea. These discarded stout whiting are not reported but the most recent estimate is that those discards now are about 400 t per year, with a large degree of uncertainty but significant reduction from historical levels.

There appears to be some informal cooperation between NSW and Queensland on data exchange and science for stout whiting, but there are no formal mechanisms to cooperate on management of the shared stocks or to ensure the two TACCs together are compatible with the long term sustainability of the stock.

5.4.3 Other NSW Fisheries

All five of the quota species being considered are taken in a number of other NSW commercial fisheries, but they are subject to quota management and TACCs only in the OTF. These other fisheries include the Estuary General Fishery (EGF), Ocean Haul Fishery (OHF), Ocean Trap and Line Fishery (OTLF), and the Southern Fish Trawl (SFT) Restricted Fishery.

The OTF has caught much of the silver trevally in NSW historically but since 2010 other fisheries have taken 75% of the NSW commercial catch of silver trevally. The SFT fishery typically catches more than twice as much silver trevally as now is taken in the OTF, and the OTLF and EGF also take substantial catches of silver trevally. The SFT fishery also takes substantial catches of tiger flathead (average annual catch of 37 t since 2010) and eastern school whiting (average of 131 t since 2010).

There are ongoing discussions with the Commonwealth to transfer the SFT fishery to Commonwealth management. The Department has advised that this transfer has been agreed in-principle but will not occur before the 2020–21 Fishing Period. It can only be assumed, therefore, that the SFT will continue to operate under existing arrangements for the entire 2020–21 Fishing Period and potentially beyond. This represents a significant risk in the sustainable management of the OTF quota species because the SFT is not subject to any TACCs and a number of operators in the OTF fish trawl sector, including at least one of the largest vessels, also hold SFT endorsements and can switch between the fisheries. There are trip limits on flathead in the SFT but no such mechanisms to restrict whiting or trevally catches. The absence of any TACC or quota restrictions in the SFT means that dual-endorsed operators could offset any reduction in TACC and quota in the OTF by increasing catches in the SFT. Such behaviour could undermine significantly any sustainability benefits of appropriate TACC management in the OTF.

5.5 Multi-species Considerations

This is the first fishery where the Committee is determining TACCs for multiple species within the same fishery. This adds complexity to the consideration, especially because the species generally are caught together in mixed catches and the Committee must consider biological and economic circumstances for harvest of each species and also the effect that each species' TACC may have on the catch and effort of other species and the economic circumstances of the fishery overall. Multi-species, mixed-species catches generally are unavoidable in trawl fisheries and so interactions among the species- or group-specific TACCs cannot be ignored.

OTF prawn trawl logbooks show that 49% of catch records include catches of trawl whiting, 43% of catch records include blue-spotted flathead, and 92% include catches of other species. This suggests that blue-spotted flathead and trawl whiting are byproduct while targeting prawns, although industry has suggested that some targeting of whiting by prawn trawl vessels also occurs.

Catch records from the fish trawl sector show that prawns can be avoided, with only 2% of catch records showing catches of prawns, and only a small number (18%) of records feature silver trevally. The fish trawl catch records, however, show a fishery where multiple species are caught during most trips, with

most catch records featuring blue-spotted flathead (73% of records), trawl whiting (70%), tiger flathead (61%), or various other species (99%).

Some of the species considered here can be targeted by some gear in some locations but there evidently is unavoidable catch of all five species whilst targeting other species, including prawns. Operators' management of their quota, the Department's management of the fishery, and the setting of TACCs must all consider this juggle between target, byproduct, and unavoidable catch of quota species.

Industry has advised that operators have been cautious in targeting and using quota for some species in the first quota year (2019–20) due to uncertainty about how much quota should be retained to cover unavoidable catches and other operational needs later in the quota year. This is exacerbated by the lack of fluidity in the market for leasing quota or buying quota shares. Earlier use of quota should increase as the industry becomes more experienced with the ITQ system and the market for leasing and buying quota matures, but uncertainties in quota management likely will persist for some time yet.

The allocation of initial species quota shares on the basis of operators' historical catch composition was likely done to ensure that operators would received a balance of quota that reflected their usual targeting practices and catch mix. The determination of TACCs on the basis of different baselines, however, materially subverts that intent and will distort the connection between distribution of quota and usual fishing behaviours and catches. Silver trevally and blue-spotted flathead TACCs were based on recent (July 2009–June 2017) average catches while trawl whiting and tiger flathead TACCs were based on a maximum catch from the same period, both of which occurred at the beginning of the period, though in different years. Many operators therefore will have received whiting and tiger flathead quota that was higher than that which would be consistent with their usual historical catch composition, whilst quota for silver trevally and blue-spotted flathead would align approximately with historical catch composition. Managing a balanced use of these misaligned quotas therefore likely will be difficult for fishers and result in either under-use of some quota or elevated discarding of other species.

Mechanisms are available to assist operators to manage the use of quota for multiple species in fisheries where mixed species catches are unavoidable. Such mechanisms include provisions for carry over of quota over-catch (e.g. allowing some level of catch taken in excess of one year's quota allowance to be deducted from that operators quota allowance in the following year) and grace periods that allow a short, fixed period after an operator has caught more than their quota to purchase additional quota to cover that catch.

- *The Committee recommends that the Department work with industry to consider what, if any, mechanisms for managing incidental over-quota catches are possible or desirable in the OTF.*

5.6 Compliance

The Department uses a risk based approach to fisheries enforcement activities that uses State wide and fishery specific risk analysis. Compliance strategies employed include intelligence gathering and analysis, education, targeted patrols, and covert and overt operations.

The Department's compliance analysis of the OTF indicates an increase in the number of offences detected over the past 5 years, with increased offences related to retention of lobsters by prawn trawlers and seizures of silver trevally. A trend also is evident over the last 5 years of decreasing compliance rates in the fishery, with the compliance rates at 63% and 73% in 2018 and 2019 respectively, compared to the target compliance level of 85%. Together these two indicators are of some concern. Compliance data must be interpreted with caution, however, as many factors can influence compliance rate reporting, including improvements in targeting offenders, the use of intelligence led and risk-based approaches, and changes to regulation and rules. The introduction of species quotas in the OTF in 2019, and associated quota reporting requirements, for example, may have affected very recent OTF compliance rates.

The highest number of compliance issues associated with the quota species occur in the recreational sector, particularly in association with under-size silver trevally taken by recreational fishers targeting bream and snapper in larger estuaries. Compliance intelligence suggests that there is a moderate to high level of illegal sales of flathead, including tiger flathead, by recreational fishers, though the quantities of such illegal sales are not estimated. Illegal activity associated with the other quota species does not appear to be significant. There is a moderate level of illegal activity related to gemfish, however, which is relevant to the broader OTF and should be monitored.

Current compliance issues in the commercial fishery include the retention of under sized silver trevally and cross jurisdictional issues associated with commercial fishers that are dual endorsed by NSW and the Commonwealth. This is exacerbated by the different size limits applying to silver trevally in the two jurisdictions, with NSW applying a 30cm MLS and the Commonwealth applying a 28cm MLS. Industry

has advised that few fish are caught over the NSW MLS and it therefore is contributing to the under-catch of quota and discarding of under-sized silver trevally. The current size limit was introduced in 2007, however, and substantive catches have been taken since that time, suggesting that the effect of the MLS on current catch levels is at least unclear and there is no evidence to distinguish between effects of the MLS or, alternatively, growth over-fishing with declining stock abundance and length structure as contributors to declining landings and reported increases in proportions of catches discarded. The inconsistency between the MLS being applied in the Commonwealth and NSW fisheries is a concern, however, as it increases regulatory complexity and complicates compliance and reporting against different jurisdictions' quotas and endorsements. The Committee encourages the Department to discuss harmonising MLSs with the Commonwealth, with particular consideration given to the potential effect of changing MLSs on stock status, discarding, quota use, and compliance.

Another compliance issue identified by the department is discrepancies between the daily reports of quota use and the more detailed daily catch records (submitted monthly) received from some fishing businesses. Such discrepancies might be expected during the initial periods of quota management and currently do not present a major risk to the sustainability of the fishery given that quota has been implemented for less than one year and quota use has been low so far. Accurate reporting of quota use is a critical foundation to any quota system, however, and it is important therefore that the Department work with those operators to address discrepancies and protect the integrity of the quota system.

5.8 Recommendations for Review of Management Arrangements

5.8.1 Cooperation with other jurisdictions

The OTF accounts for less than half of the total catches of all five quota species. The sustainability of these stocks and the viability of the OTF, therefore, is dependent on the responsible management of the harvest of these species by the OTF, other fisheries in NSW, and Commonwealth and Queensland fisheries. There currently are no formal mechanisms to ensure cross-jurisdictional cooperative management of these stocks, notwithstanding some arrangements for exchange of catch data between NSW and the Commonwealth or Queensland.

- *The Committee therefore strongly recommends that the Department improve collaboration with AFMA and Queensland and implement mechanisms to ensure cooperation and harmonisation of the management of harvest of these species.*

Cooperation should include agreed, formal mechanisms for resource sharing, joint development of either shared or, at least consistent, harvest strategies (including reference points), TACC setting, Minimum Legal Size limits for harvest, quota management, reporting, stock assessments, and exchange of data.

5.8.2 Reporting of whiting by species

Issues associated with misreporting of both species of whiting have been raised with the Committee by the Department and industry, despite the requirement that fishers accurately report catches of each species separately. These issues include eastern school whiting being reported as stout whiting in the prawn trawl sectors and stout whiting being reported as eastern school whiting in the fish trawl sector. Such misreporting undermines the accuracy of catch and CPUE data and so increases uncertainty in stock assessments. It also means that the estimated catch of either species against RBCs, MSY, MEY, or other sustainable catch level estimates are likely to be misleading. It has been suggested that some portion of the recent increases in catches of eastern school whiting may have included large catches of stout whiting, which would mean the erosion of the eastern school whiting stock biomass that has been identified by the Commonwealth's 2019 assessment update is not as large as estimated and that the stout whiting stock might be more depleted than expected. Inaccurate reporting of whiting species undermines the ability to understand the fishery and the status of the two whiting stocks, and therefore set a robust TACC for either or, currently, both species together. It is difficult to estimate reliably the quantities misreported for either species, however, leaving the Committee to rely on the best available science, which includes the existing catch and stock assessment projections.

- *The Committee recommends that the Department work with industry to improve the accuracy of reporting of whiting species.*

It would be preferable in future for the two whiting species to be managed under separate species-specific TACCs to provide more sensible and focussed collaboration with the Commonwealth for managing harvests of eastern school whiting and with Queensland for harvest of stout whiting. Species-specific TACCs also are essential to align TACCs with biological assessments of stock status and sustainable catch levels and to prevent catch-shifting between species that will undermine intended

sustainability and fishery benefits of TACC settings. Improving the accuracy of reporting of catches of these two species is an important step toward enabling species specific management in future.

5.8.3 Managing other NSW fisheries catching quota species

The quota species under consideration here are harvested in a number of other commercial and recreational NSW fisheries but the OTF is the only NSW fishery subject to quota for these species. This presents a significant risk to the OTF industry and the harvested stocks. Material increases in catches in other fisheries or declines in the biomass of these species likely will affect negatively OTF catch rates and the OTF TACCs. Absence of any harmonised strategy for managing harvest by all the NSW fisheries taking non-trivial catches of the species will mean the OTF industry likely will end up sacrificing catch to compensate for the lack of regulation in other fisheries. One mechanism to coordinate species management across fisheries would be through species-based harvest strategies that instigate management responses in all relevant fisheries in response to changes in stocks.

- *The Committee recommends that the Department establish mechanisms to ensure all catches, including recreational, of these species are managed coherently across all relevant fisheries.*

The lack of catch controls in the SFT fishery in particular represents a significant risk in the sustainable management of the OTF quota species, especially eastern school whiting and silver trevally, because a number of operators in the OTF fish trawl sector also hold endorsements for the SFT and effort therefore easily can shift between the two fisheries. The southern fish trawl has trip limits on flathead but there are no such mechanisms in place for whiting or trevally and a shift of effort could mean that the intended benefits of TACCs for these species could be undermined by increases in uncapped catches in the SFT.

- *The Committee recommends that the Department continue working with AFMA to expedite transfer management of the SFT to the SESSF or implement mechanisms to prevent increased catches of whiting and silver trevally in the SFT if such transfer is delayed beyond the 2020–21 Fishing Period.*

5.8.4 Development of harvest strategies

There are no specific objectives for the harvest, stocks, or economics of the Ocean Trawl Fishery in NSW. Establishment of clear stock and harvest objectives would be done most appropriately through establishment of one or more harvest strategies to guide management of the OTF and the harvest of quota species across multiple fisheries in NSW and neighbouring jurisdictions. Harvest strategies will enable more informed and strategic TACC setting and ensure that appropriate and timely management responses can be made to future changes in the stocks, including in response to harvest by multiple fisheries. It will be important that development of a harvest strategy (or harvest strategies) is a considered and consultative process that engages the NSW commercial fishing industry, recreational sector, and other jurisdictions, given the diversity of catches of these species. Specific consideration should be given to the implications for management of these species being taken mainly in multiple multi-species commercial and recreational fisheries.

- *The Committee recommends that the Department and industry develop an agreed harvest strategy for the OTF and consider developing species-specific harvest strategies for quota species across all relevant NSW fisheries that formalise objectives and reference points appropriate to the multi-species nature of the fisheries.*

6. CONCLUSION

6.1 Summary

The setting of the Total Allowable Commercial Catches (TACCs) in this Determination has considerably more complexity than for many of the TACCs that apply to commercial fisheries in NSW. The complexities arise because all species considered here are landed in significant quantities in other fisheries, either within NSW or other jurisdictions or both, where either catches effectively are not controlled at all or the controls are independent of this Determination. That diversity, and disparity, of controls over total mortality arising from fishing brings with it considerable risks that can be mitigated only partly by TACCs determined here. These Ocean Trawl Fishery (OTF) TACCs, nevertheless, are important parts of managing the total fishing mortality for five commercially important and three recreationally important species.

A key challenge for NSW, therefore, is to resolve complementary measures for controlling harvest by other fisheries within its control and negotiating arrangements with neighbouring jurisdictions that will enable coherent cross-jurisdiction management arrangements for each species. The first is entirely within the control of NSW and the Committee recommends that the Department and relevant industry sectors work together as a matter of urgency to establish fair and coherent mechanisms to regulate the catch of OTF quota species across all NSW fisheries. Implementation of appropriate multi-fishery or species-specific harvest strategies would be an effective way to achieve such coherence.

Perhaps most important among the cross-jurisdiction issues is resolution of co-management and catch-sharing arrangements between NSW and the Commonwealth for species harvested in both the OTF and the SESSF (tiger flathead, silver trevally, and eastern school whiting). The current mode of interaction between NSW (including the OTF) and SESSF harvest of these species effectively means that changes in NSW catches (or TACCs) potentially are offset by compensatory increases or decreases in the corresponding SESSF TACCs. That formulaic mechanism essentially neutralises any sustainability benefits of constraints in NSW harvest or, alternatively, results in unreasonable responsibility for catch constraint in the SESSF to offset increases in NSW harvest or TACCs. Neither outcome is desirable or in the interests of efficient management of both fisheries and the stocks on which they depend. Establishing coherent stock-wide harvest management should be a priority objective for both jurisdictions.

The above should not be taken to diminish the importance of also establishing formal co-management arrangements with Queensland for stout whiting, and other (non-OTF) species harvested in both states. There perhaps is less urgency to resolving joint management arrangements for stout whiting than for some of the other species but absence of such arrangements will perpetuate the risks to fisheries and the stock associated with parallel, largely independent decision-making about catch regulation.

6.2 Total Allowable Commercial Catches for 2020–21

Each of the species considered here has been harvested for a long time, in some cases nearly 100 years. The best available information indicates that they all[42] now are at a status below what the Committee considers desirable for fished stocks, consistent with international best-practice. That status alone normally would indicate that TACCs should be set at levels that reduce fishing pressure and allow the stocks to rebuild toward optimum levels for sustainable harvest. Such action would be straightforward if each of the species was harvested alone in targeted ways mainly by the OTF, but that is not the case for any of them.

We note that the rationales for initial TACC settings have varied considerably among NSW fisheries and species since the IAP determinations. We have not received explanations of what rationale(s) were used for setting some TACCs at previous average catches and others at historical highs or with respect to different reference periods. The use of different bases for multiple species' TACCs within a multi-species, mixed-catch fishery, however, is difficult to justify because doing so risks misrepresenting, potentially seriously, the usual balance of species in mixed-species catches and severely compromising the efficient operation of a TACC-ITQ system. We therefore have adopted as basic principles for setting such TACCs that:

- TACCs should as far as possible ensure *"... that exploitation is consistent with conserving fish stocks in the long term";*
- It is desirable when biologically appropriate to set multi-species TACCs within a fishery that align well with expected balance of species in usual mixed-catches;

[42] Stout whiting is estimated to be at around 42% of unfished biomass and below the 48% target adopted by the Committee but above the 40% target apparently used in the Queensland assessments of stout whiting.

- Extremes of catch (highs or lows) should not be the determinants of TACCs in mature, fully developed- because they likely differ in timing among species and do not match well usual catch-composition of mixed-species catches; and
- The most sensible reflection of usual catch-compositions in multi-species, mixed-catch fisheries will be derived from average catches over a reasonable, and consistent, reference period.

The Committee recognises desires expressed by industry members for stability and certainty in the fishery during this period of transition to TACC–ITQ management. The Committee agrees that there are benefits to stable TACCs, where those TACCs are responsible and consistent with sustainable harvest levels, but also recognises that inappropriate short term stability likely will result in more severe future change. Retaining all existing TACCs, for example, would have ensured short-term stability but almost certainly would precipitate more severe (near) future TACC reductions, in particular for trawl whiting.

The Committee therefore has considered, in addition to stock status *per se*, recent and likely near-future catches, fishery interactions among the species, their economic contributions to fishery income, the potential for changes in TACC in the OTF to deliver material sustainability benefits for the entire stocks, and the controls in place in other fisheries or jurisdictions where the species are taken. The TACCs accordingly have been set in-concert to effect control where it seems most needed and is most likely to deliver material benefit whilst deferring actions that otherwise might have been desirable but are considered less urgent or less effective than the primary measures. This approach is unapologetically pragmatic and risk-based and taken in the interests of initiating necessary longer-term adjustments in a measured way to reduce unnecessary economic consequences for fishing businesses.

6.2.1 Blue-spotted flathead

The Committee recommends the existing, initial TACC of 108.1 t is retained for blue-spotted flathead.

The initial TACC was set on the basis of the 8 year average catch for reference period (2009–10 to 2016–17) used by the Independent Allocation Panel (IAP) when allocating quota for multiple species in multiple NSW commercial fisheries and is likely to capture well the part played by blue-spotted flathead in the multi-species mixed-catches of the OTF. The current TACC does not appear to be compromising the viability of the stock at this stage, notwithstanding the fact that the stock is below its notional target status. The assessment with which we were provided indicated that estimated total catches across all fisheries are likely to be allowing stock rebuilding, albeit very slowly.

High uncertainty associated with recreational catches leave the Committee with some concern that more catch in total is being taken from the stock than has been assumed, but stable commercial catches and catch rates throughout the IAP period and since give the Committee some confidence that the stock is being used sustainably. It will be important that robust mechanism for controlling catches of blue-spotted flatehead in all NSW fisheries are established to effect future changes in harvest if there is no evidence of stock rebuilding in coming years.

6.2.2 Tiger Flathead

The current (initial) TAC for tiger flathead is 166.9 t. This TACC was set at the maximum annual catch during the 8 year IAP period and likely will distort materially the balance among TACCs with respect to the usual multi-species interactions in typical operations and mixed-catches of the OTF.

This TACC should be reset at the 8 year average from the IAP period, consistent with those for other OTF quota species, to reflect the long-run species balance of catches. That reset will result in a TACC of 133.9 t and should be implemented over the next 2–3 years, subject to assessments of the tiger flathead stock.

The Committee is maintaining the TACC at 166.9 t for the 2020–21 Fishing Period, however, for the following reasons:

- The most recent assessment of the status of the tiger flathead stock is optimistic and suggests rebuilding to the relevant target reference point is likely over coming years under moderate changes to total fishing mortality;
- The TACC of 166.9 t represents a small proportion of total annual landings from the stock (6% on average since 2009) and of the overall Recommended Biological Catch (5.5%) and so changes in this TACC alone have very limited potential to effect materially stock status;
- Catches of tiger flathead by the OTF since 2010 have been below the TACC, accounting on average for only 4.6% of total catches in all jurisdictions, and steadily declining to less than 1/3 of the TACC value, so a reduction of 33 t is unlikely to be necessary to constrain catch at this stage;
- Retaining some ability for fishers to increase targeting of tiger flathead (within responsible limits) may offset some of the economic effect of reduction in the TACC for trawl whiting;

- Retaining as much stability as possible for industry in the context of a significant change in the trawl whiting TACC is preferred to implementing multiple changes at once.

The Committee is of the view, however, that the TACC should be reviewed in future years, with consideration given to the benefits of aligning the TACC with the 8 year average from the IAP period.

6.2.3 Silver trevally

The Committee recommends the existing silver trevally TACC of 26.8 t is retained. That TACC ws set on the basis of the 8 year average for the IAP reference period (2009–10 to 2016–17) and remains likely to capture appropriately the average status of silver trevally in OTF catches.

The Committee has some concern about the real status of the silver trevally stock, especially given the great uncertainty in results of different assessments and emerging from different indicators. The OTF catch of silver trevally comprises a small component of the total catch from the stock and in recent years has been less than the TACC value, and the SESSF TACC has been significantly and increasingly under-caught since 2006. The low harvests by the OTF and SESSF leave the committee reassured that risk to the silver trevally stock is low from leaving the initial OTF TACC unchanged, notwithstanding concern that the stock arguably remains growth-overfished.

6.2.4 Trawl Whiting

The current (initial) OTF TACC for trawl whiting is 1,189.1 t, which was set at the maximum annual catch during the 8 year IAP reference period of July 2009–June 2017. That maximum occurred in 2010–11 and was not accompanied by similarly maximum catches of other species, so will provide a skewed perspective of the balance between trawl whiting and other species important in OTF catches.

Setting the TAC at a historical high, particularly where the species of concern is fully fished or depleting, has the potential to allow for unsustainable growth in catches. This likely has happened for eastern school whiting, where catches in NSW since the IAP have exceeded the TACC value and the RBC for the stock has been exceeded repeatedly. These significant increases in catch appear to have eroded the stock biomass to 36% of unfished biomass in 2019 and 35% in 2020. Assessment projections suggest that biomass is at risk of continued decline if total catches continue to exceed the RBC. Further decline would precipitate significant future cuts in TACCs to allow the stock to rebuild to levels that provide for sustainable harvest.

The RBC to promote rapid rebuilding for the school whiting stock to its target reference point from its current state would be 1,165 t, down from the current 3-year average RBC of 1,615 t. It has been estimated, however, that limiting total catches across all jurisdictions, and including discards, to around 1,800 t each year might allow the stock biomass to stabilise at around 36% of unfished levels provided recruitment to the stock remains at or above average. Lower recruitment would result in continued decline in stock status, with material consequences for future harvests. Constraining total catch to 1800 t, notwithstanding the lower RBC, will mean that NSW and Commonwealth TACCs should total around 1600 t, allowing for an estimated 200 t of discards. The AFMA Commission agreed in-principle in September 2019 to set a SESSF TACC for eastern school whiting of 788 t in 2020–21, in the interests of balancing the potential risks to the stock and the socio-economic consequences of a severe reduction in TACC.

The Committee has resolved that the appropriate OTF TACC for trawl whiting in 2020–21 is 898.1 t, which is based on the 8 year average annual catches of eastern school whiting (648.7 t) and stout whiting (249.4 t) from the IAP reference period. This conclusion is based on the following rationale.

- Setting the TACC at the 8 year average brings it in to line with the silver trevally and blue-spotted flathead TACCs, which together provide greater consistency with the historical catch composition in the fishery and of individual operators at the heart of species quota share allocations.
- Increased catches of eastern school whiting over the past 3 years, exceeding 1,000 t each year, have lead to a depletion in the stock. Maintaining the current TACC at 1,189.1 t would allow these high catches to continue, which would lead to further erosion of the stock. Assessment projections suggest that continuing catches at this level likely will require more extreme catch reductions in 2021–22 and after to enable stock to recover from more serious depletion.
- The revised TACC will prevent spikes in catches to historical highs of both eastern school whiting and stout whiting, which typically have been followed by years of low catches. Preventing catch spikes will reduce the risk of low-catch years and fishery instability.
- A TACC of 898.1 has the potential to maintain total mortality of eastern school whiting within the current RBC of 1,615 t if catches from all other sectors and jurisdictions in 2020–21 are close to

their long-term averages and below the 1,800 t upper limit, to prevent further declines, if other NSW sectors reached recent catches and the SESSF landed its TACC.

- A 898.1 t TACC reflects well the approximate historical distributions of catches of eastern school whiting and stout whiting between the NSW OTF and the SESSF or Queensland fisheries respectively.

The Committee recognises the tension between the above reduction in trawl whiting TACC and maintaining stability in the OTF during transition to a properly functioning TACC-ITQ system. Leaving industry to adapt to an inappropriately high trawl whiting TACC, however, inevitably will result in more severe future constraints, possibly far greater than those required now to prevent ongoing stock decline. The intention of this immediate reduction in the trawl whiting TACC is to arrest stock deterioration and increase the prospects of longer-term stability of whiting catches in the OTF.

The change in trawl whiting TACC is driven substantially by concern for the eastern school whiting stock and assumes that the recent, apparently sustainable, catches of stout whiting will continue without substantial increase. The risk exists, however, that there might be some displacement of focus within the OTF from eastern school whiting to stout whiting or, for dual-endorsed businesses, from the OTF to targeting school whiting in the Southern Fish Trawl (SFT) fishery. Such shifts are likely to compromise the intent of this TACC setting but is an unavoidable risk whilst ever the TACC is a basket setting and catches of whiting in the SFT fishery remain unconstrained.

6.3 The Determinations

The Total Allowable Fishing Committee, pursuant to Division 2 of Part 2A of the Fisheries Management Act 1994 (as amended), determines that the commercial catches of blue-spotted flathead, tiger flathead, silver trevally, and trawl whiting (comprising eastern school whiting and stout whiting together) from the NSW Ocean Trawl Fishery should not exceed 108.1, 166.9 , 26.8, and 898.1 tonnes respectively during the 2020–21 Fishing Period (Table 6.1). :

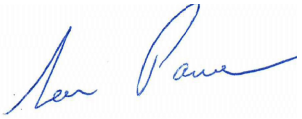
Table 6.1: Total Allowable Commercial Catches and recommended catch limits for five species taken in the NSW Ocean Trawl Fishery during the 2020–21 fishing period.

Species	2020–21 TACC (t)
Blue-spotted flathead	108.1
Tiger flathead	166.9
Silver trevally	26.8
Trawl whiting	898.1

Bruce Mapstone, Chair

Alice McDonald, Fisheries Management

Rich Little, Fishery Scientist



Sean Pascoe, Natural Resource Economist

APPENDIX 1. DETAILS OF PUBLIC CONSULTATION

Public consultation steps taken by the Committee, with support from the Department, are summarised in the table below. These steps effected the consultation requirements stipulated, *inter alia*, in the *Fisheries Management Act 1994, Part 2a, Division 2, S40.*

Date	Fisheries Management Act Reference	Consultation Stages
16.12.2019	Section 40F(1)	The Department called for public submissions on the appropriate level of the annual TACC for Blue-spotted flathead, Tiger flathead, Silver trevally and Trawl whiting for the 2020/21 fishing period.
16.12.2019	Section 284 (2)(c)	Individual calls for submissions sent to particular interest groups who the Committee considered might wish to provide collective submissions either due to their direct involvement in the OTF or their interest in related issues. These groups included: ■ NSW Ocean Trawl Fishery shareholders; ■ NSW Professional Fishermen's Association; ■ Recreational fishing sector (via NEWSCAST – Recreational Fisheries e-newsletter on 20 December 2019)
16.12.2019	Section 284 (2)(c)	Advertisement calling for public submissions placed in the "Open for Comment" section of the Department of Primary Industries web-site.
21.01.2020	Section 284 (2)(b)	Public consultation closing date, after at least 30 days.
21.01.2020	Section 40F (2)	The Committee received the following collated submissions: ■ NSW DPI — Commercial Fisheries Management Report; ■ NSW DPI — species Assessment Reports; ■ NSW DPI — Fishery compliance report; and 14 submissions were received from stakeholders.
22.01.2020	Section 40F (2)	The Committee considered submissions and heard formal presentations and opinions at the Total Allowable Fishing Committee Open Forum in Sydney on 22nd January 2020. The following made presentations or provided information to the Committee: ■ Ms Fiona McKinnon, NSW DPI — Management ■ Dr Ashley Fuller, NSW DPI Stock Status Report (silver trevally); ■ Dr Karina Hall, NSW DPI Stock Status Report (blue-spotted flathead, eastern school whiting, stout whiting); ■ Dr Geof Liggins, NSW DPI Stock Status Report (tiger flathead); ■ Ms Tricia Beatty, NSW Professional Fishermen's Association; ■ Dr Julian Hughes & Dr Faith Doyle, NSW DPI (Recreational Integrated Monitoring program) The following also attended the public forum: ■ Diego Hans Bagnato (Industry) ■ Paul Bagnato (Industry) ■ Richard Bagnato (Industry) ■ Michael Lowry (NSW DPI) ■ Dr. Rowan Chick, NSW DPI ■ Daniel Johnson (NSW DPI) ■ James McLeod (NSW DPI) ■ Philip Boulton (NSW DPI) ■ Robert Gauta (Commercial Fishermen's Co-operative) ■ Fiona Hill (Australian Fisheries Management Authority) ■ Erik Poole (Sydney Fish Markets) *Apologies:* Dr Keith Sainsbury, Murray Pinzone, Brett Bollinger, Murray Ham.

APPENDIX 2. Ocean Zones for NSW Trawl Fishing.

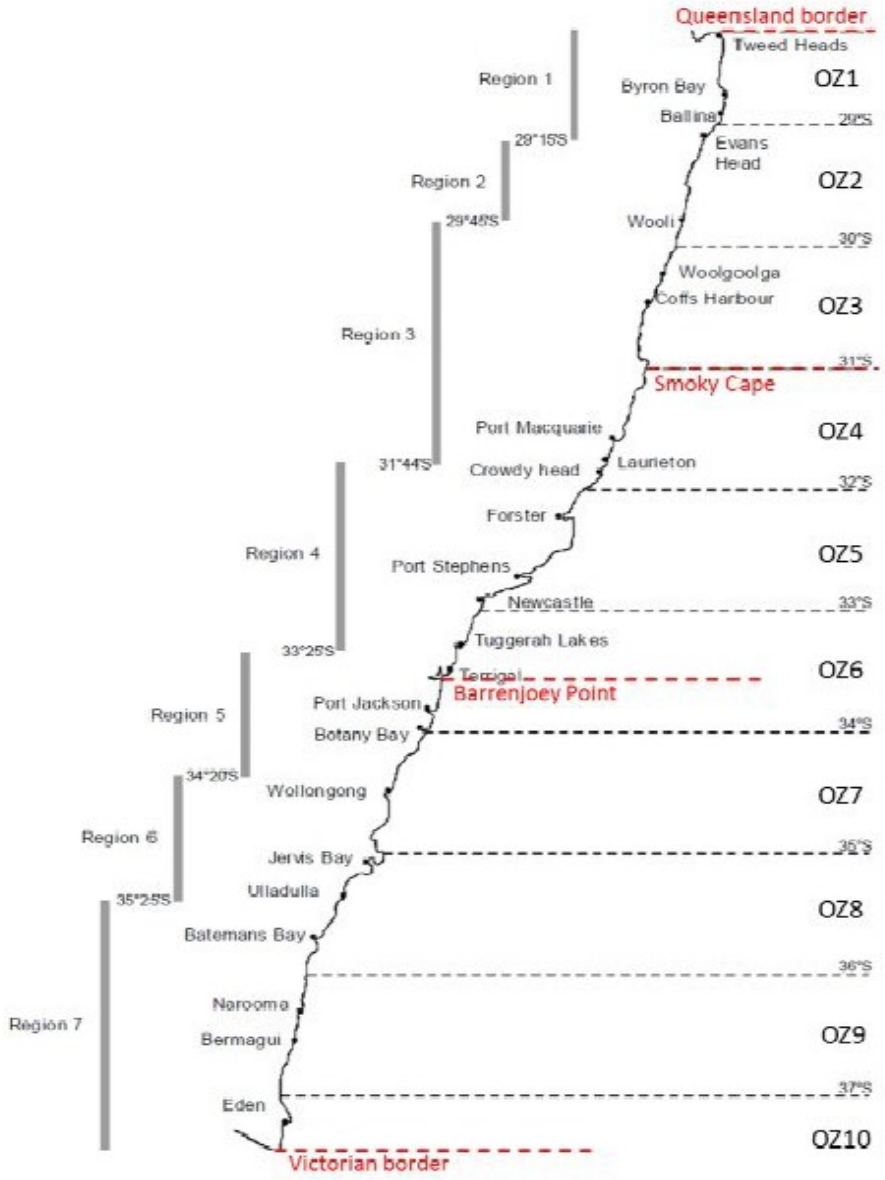


Figure A1 Map of NSW coastline indicating the main ports of landing, broad ocean fishing zones (OZ1 to OZ10) and estuary fishing regions (Region 1 to 7) for catch-and-effort reporting. Important management landmarks, including Smoky Cape, Barrenjoey Point and the Queensland and Victorian borders are also indicated by dashed red lines.