Assessment Authors and Year

Liggins, G.W. 2023. NSW Stock Status Summary 2023/24 – Tiger flathead (*Platycephalus richardsoni*). NSW Department of Primary Industries, Fisheries. 19 pp.

Stock Status

Current stock status	On the basis of the evidence contained within this assessment, Tiger flathead are currently assessed as **sustainable**.

Stock structure & distribution

Tiger Flathead is a demersal finfish species, endemic to Australia, which inhabits depths of 10 – 400 m but most commonly occurs in depths 50 – 200 m on the continental shelf from northern NSW, westward through Victorian (Vic.) waters to south-east South Australia (SA), across Bass Strait and around Tasmania (Tas.).

Stock structure is poorly understood. There is some evidence of morphological variation across the distribution range, with observed regional differences in growth, appearance and timing of reproduction, especially off eastern Tasmania. No stock identification studies using genetic techniques have been undertaken. For assessment and management purposes, a single stock has been assumed for the assessment done for the Commonwealth (Bessell-Browne, 2022; Butler et al., 2023; Emery et al., 2021).

Thus, assessment of the stock status of Tiger Flathead is done at the biological stock level, spanning Commonwealth, NSW, Victorian and Tasmanian jurisdictions.

Scope of this assessment

Assessment of the status of the stock of Tiger Flathead (*Platycephalus richardsoni*, Syn. *Neoplatycephalus richardsoni*) that is fished by commercial and recreational fishers in New South Wales (NSW) is principally based on the modelling and assessment done for this species by the Commonwealth of Australia. The Commonwealth managed Southern and Eastern Scalefish and Shark Fishery (SESSF) takes approximately 96% of total Australian catch of Tiger Flathead. The primary mechanism for controlling the harvest of Tiger Flathead in the SESSF is through the allocation of an Annual Total Allowable Catch (TAC). Determination of annual TACs for the Commonwealth SESSF is based on the SESSF Harvest Strategy Framework (HSF) (AFMA, 2017) that derives from the Commonwealth Fisheries Harvest Strategy Policy (HSP) (DAFF, 2007). For SESSF management purposes, Tiger Flathead are managed under the multi-species "Flathead" category such that the Commonwealth TAC set for "Flathead" covers catches of Tiger Flathead, Sand Flathead (*Platycephalus bassensis*), Bluespotted Flathead (*P. caeruleopunctatus*) and Gold-spot or Toothy Flathead (*N. aurimaculatus*) (AFMA, 2021). Tiger flathead is, however, the only one of these flathead species currently assessed by the Commonwealth.

The Commonwealth assessment of the Tiger Flathead stock evaluates stock status relative to limit and target reference points prescribed in the HSF/HSP. The Tier-1 assessment uses a statistical catch-at-length, catch-at-age

model. The model provides retrospective and prospective estimates of biomass (the latter for alternative TACs) and thereby generates, through harvest control rules, a Recommended Biological Catch (RBC). The intention of this process is to move the stock biomass toward and maintain it around the target reference point.

This assessment of the status of Tiger flathead, in waters under NSW jurisdiction, comprises:

(1) a summary of the most recent Commonwealth stock assessment for Tiger Flathead (Bessell-Browne, 2022) and current determinations of status based on criteria specified by the Commonwealth and also those used for the Status of Australian Fish Stocks (SAFS);

(2) the rationale by which the Commonwealth assessment for Tiger Flathead is considered to be relevant and valid for determining the status of the Tiger Flathead stock fished within NSW jurisdiction (Appendix 1);

(3) information that may inform the determination of the 2023-24 NSW TAC for Tiger flathead in the Ocean Trawl Fishery (Appendix 2). This is done in the absence of: (i) a formal NSW harvest strategy for this species/fishery; and (ii) a formal resource sharing agreement between NSW and the Commonwealth.

Biology

Maximum age is approx. 20 years with males reaching a maximum size of approx. 50 cm total length (TL) and females 60 cm TL. Females mature (50% maturity) at approx. 300 mm TL at 3 to 5 years of age. In addition to reaching a greater maximum size, females grow substantially faster than males (AFMA, 2019a; Bessell-Browne, 2022; Butler et al., 2023; Emery et al., 2021). Sex-specific growth curves are estimated within the assessment model with a single parameter (maximum length, lmax) fixed and parameters lmin, K and CVgrowth estimated (Bessell-Browne, 2022).

Spawning occurs over an extended period between spring and autumn with some variation in timing depending on location. Females produce 1.5 – 2.5 million eggs per spawning season (AFMA, 2019a).

Estimates of the rate of natural mortality, M, reported in the literature vary considerably, from 0.21 to 0.46 yr-1. The assessment uses a value of 0.27 yr-1 and examines sensitivity of the model to scenarios based on alternative values of M (0.22, 0.32 yr-1) (Bessell-Browne, 2022).

Fishery statistics

Catch information

Commercial

Commercial landed catches of Tiger Flathead that were included in the 2022 assessment (Bessell-Browne, 2022) between 1915 and 2021 are shown in Figure 1. These data represent catches from the four fleets that were represented in the assessment model (Steam trawl, Danish seine, Eastern trawl and Tasmanian trawl). Commercial catches from NSW state waters are included within the Eastern trawl fleet category.

Reported landings in 2021 of 2,271.9 t, comprised 2,143.9 t from the SESSF, 49.6 t from NSW fisheries and 78.4 t from Victorian and Tasmanian state fisheries (Burch et al. 2023). Thus, total landings in 2021 of 2,271.9 was slightly lower than the 2,296 t assumed for 2021 in the 2022 assessment.

Reported landings in 2022 of 2,057.7 t, comprised 1,910.2 t from the SESSF, 56.7 t from NSW fisheries and an estimated 90.8 t from Victorian and Tasmanian state fisheries (Burch et al, 2023).

Figure 1. Total landed catch of tiger flathead by fleet (stacked) from 1915-2021. This figure reprinted from Fig. 1 in Bessell-Browne (2022)
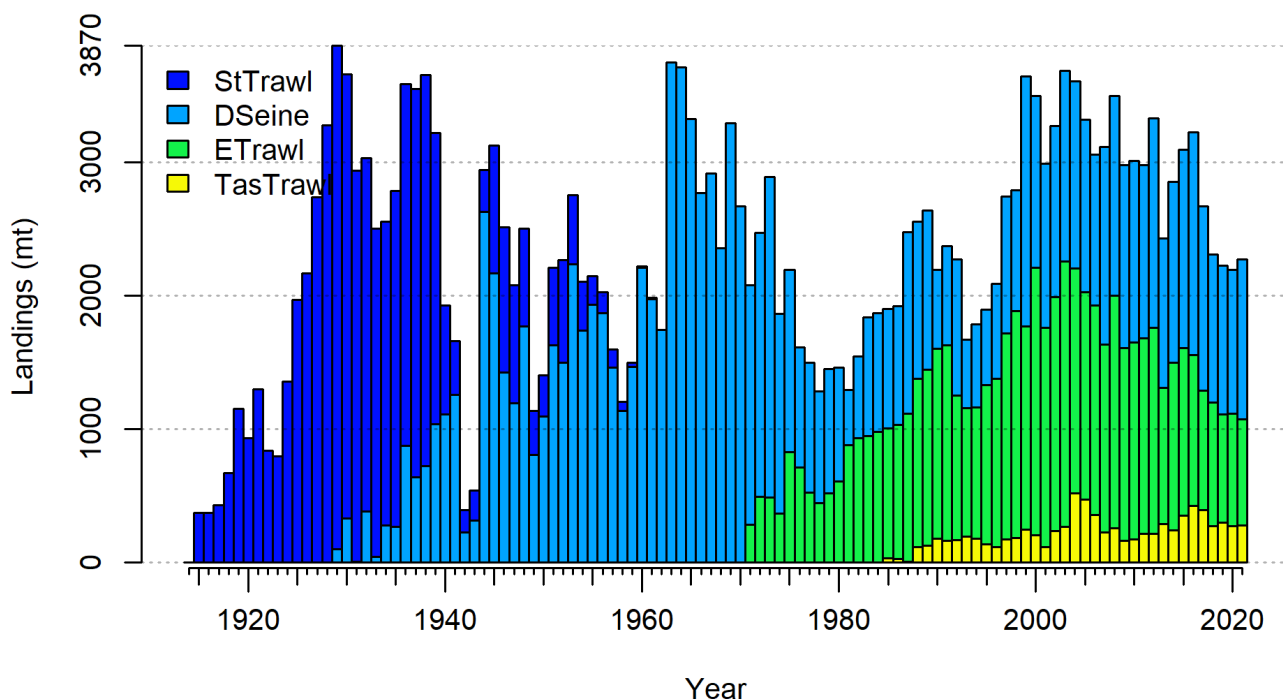
Information about rates of discarding was available from observer surveys done by NSW Fisheries (Liggins, 1996) and the Integrated Scientific Monitoring Program between 1992 and 2021 (Bessell-Browne, 2022). Typically, the discarding rate for Tiger Flathead was around 8% for Danish seine, 10% for eastern Trawl and 1% for Tasmanian Trawl components of the fishery. Annual estimates for each fleet during the period 1992-2021 were used during model calibration. Based on information that the total discards for all species taken by steam trawlers in the 1920s was of the order of 20% of the retained catch), a constant discard fraction of 17% was assumed for the Steam trawl fleet during the period 1915-1961 and for the Danish seine fleet during 1929-1960 (Bessell-Browne, 2022).

The Commonwealth assessment includes landed commercial catch data from State jurisdictions (NSW, Vic., Tas.). Discard fractions estimated for the Commonwealth fishery are applied to the relatively small component of the total landed catch that occurs in the State jurisdictions.

Recreational & Charter boat

The Commonwealth assessment does not, at present, include estimates of Tiger Flathead catches by the recreational sector.

A survey of the catches in NSW by NSW-resident recreational fishers during 2013/14 estimated a retained catch of 39,417 (se 14,738) Tiger Flathead and a discarded catch of 42,913 (se 19,117) fish (West et al., 2015). If the mean weight of landed Tiger Flathead was 0.521 kg (estimate in NSW DPI Resource Assessment System database), approximately 20 t of Tiger Flathead were landed by NSW-resident recreational anglers. A subsequent survey of catches in NSW during 2017-18, but restricted to 1-3 year recreational licence holders, estimated landings of approximately 13 t (Murphy et al., 2020). These magnitudes of catch represent less than 1% of the annual commercial landings of Tiger Flathead. Assuming that the total landings by recreational fishers from all State jurisdictions are of a similar order of magnitude, it can be concluded that the omission of recreational and Aboriginal catches from the model and Commonwealth assessment has little effect on model estimates and assessment outcomes.

Indigenous

The Commonwealth assessment does not, at present, include estimates of Tiger Flathead catches by Aboriginal fishers. As for recreational catch, any catches by Aboriginal fishers in recent history are negligible, relative to the magnitude of commercial catches.

Illegal, Unregulated and Unreported

The Commonwealth assessment does not, at present, include any allowance for an IUU component of fishing mortality.

Fishing effort information

Fishing effort used in calculation of CPUE within Commonwealth assessment.

Catch rate information

Indices of catch rates used in the Commonwealth assessment derive from multiple sources: (i) a standardised catch rate index for the historical steam trawl fleet for the years 1919-23, 1937-42 and 1952-57 (Klaer, 2006); (ii) an unstandardized catch rate index for the Danish seine in early years (Cui et al., 2004); (iii) standardised catch rate indices from the SEF1 logbook for the years 1986-2021 for each of 3 fleets (Danish seine, Eastern Trawl Fleet, Tasmanian Trawl Fleet) (Sporcic , 2019) and (iv) abundance indices form the Fishery Independent Survey during 2008-16 (Sporcic et al., 2019). The greatest decline in abundance is apparent during the first 40 years of the fishery between 1920 and 1960 (Fig. 2). Patterns of observed indices of abundance since 1985 exhibit fluctuations but no apparent long-term trend over the 3 and a half decades 1985 – 2021 (Figure 2).

Figure 2. Observed (circles) and model-estimated (lines) catch rates vs year, with approximate 95% asymptotic intervals. This figure reprinted from Figs. 11 -15 in Bessell-Browne (2022).

"CPSTTrawl" refers to the Steam Trawl Fleet, "CPOldDseine" and "CPDseine" refer to the Danish seine fleet, "CPETrawl" refers to the Eastern trawl fleet, "CPTasTrawl" refers to the Tasmanian trawl fleet and "CPFIS" refers to the Fishery Independent Survey.
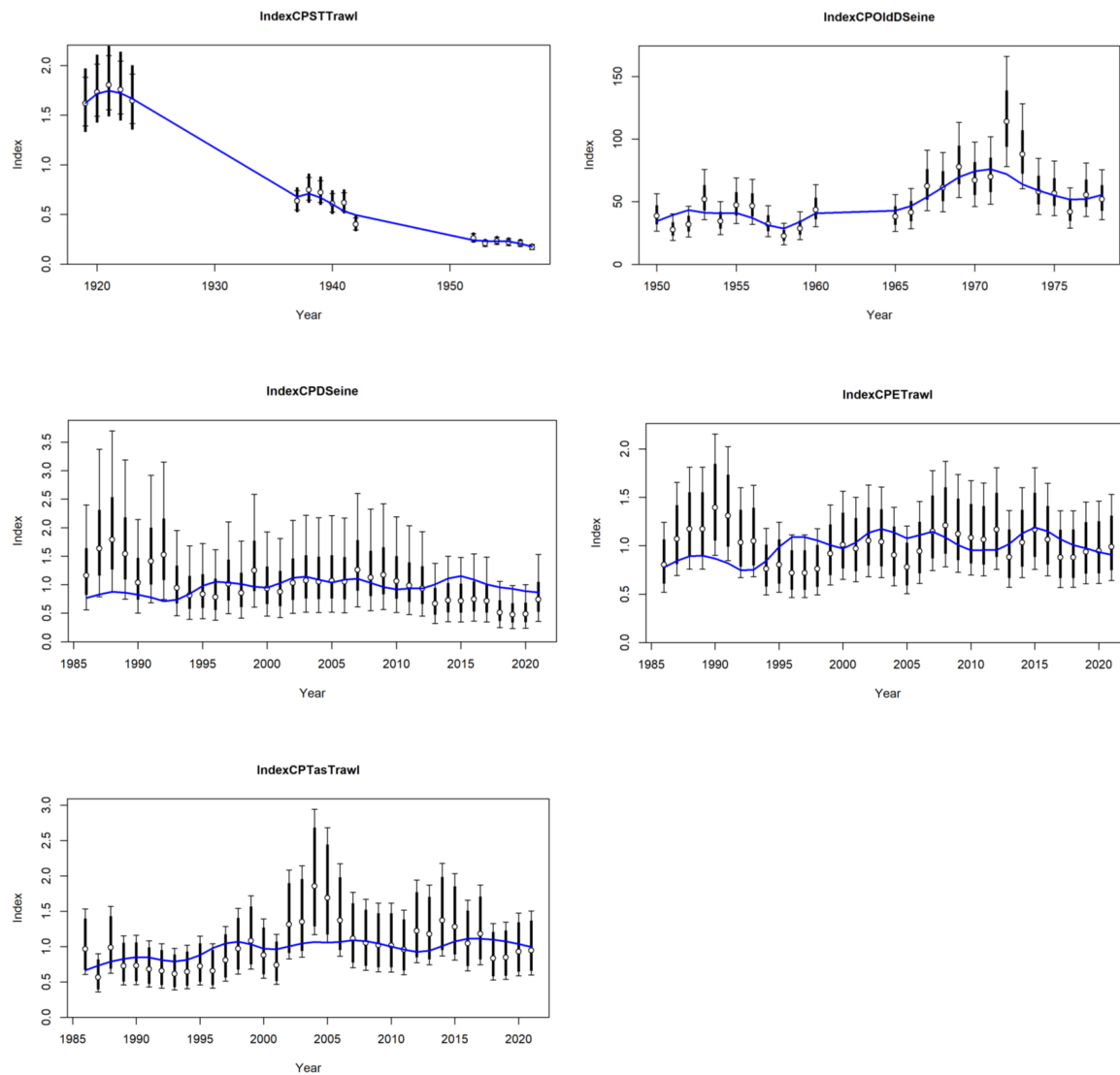
Stock Assessment

Stock Assessment Methodology

Year of most recent assessment:

2022 (using data to 2021) - most recent published Commonwealth tier-1 assessment.

Assessment method:

Commonwealth Tier 1 assessment using a 2-sex, multiple fleet, statistical age- and length-structured model implemented in the software package Stock Synthesis version SS-3.30.19 (see Bessell-Browne, 2022)

Estimation of a recommended Biological Catch (RBC) based on (i) the Commonwealth SESSF Harvest Strategy Framework (HSF) and (ii) SERAG adoption of RBC calculation according to a "20:35:40" (Blim : Inflection point : Ftarg) strategy

Main data inputs:

COMMERCIAL LANDINGS for each of 5 "fleets": Steam trawl: steam trawlers (1915 – 1961); Danish seine: Danish seiners from NSW, eastern Victoria and Bass Strait (1929 – 2021); Eastern trawl: diesel otter trawlers from NSW, eastern Victoria and Bass Strait (1971 – 2021, this includes NSW and Victorian state catches); Tasmanian trawl: diesel otter trawlers from eastern Tasmania (1985 – 2021); this includes Tasmanian state catches. Calendar year landings for 2022 assumed to be same as 2021 catches

DISCARDED COMMERCIAL CATCH estimates: from Integrated Scientific Monitoring Program for Danish seine, Eastern trawl and Tasmanian trawl fleets (1992-present); assumed discard fraction of 17% in base-case for Steam trawl (1915-1961) and early Danish seine (1929-1960) fleets; assumed discard fractions for Danish seine fleet (1961-present) based on observed ratios since 1994

COMMERCIAL CATCH RATES (CPUE): standardised CPUE indices for steam trawl fleet (1919-23, 1937-42, 1952-57); unstandardized catch rate indices for Danish seine (1950-78); standardised CPUE indices for Danish seine, Eastern trawl and Tasmanian trawl fleets (1986-2021)

ABUNDANCE INDICES FROM FISHERY INDEPENDENT SURVEY in zones that correspond to the Eastern trawl and Tasmanian trawl fleets (2008-16)

AGE-AT-LENGTH MEASUREMENTS (sex-specific) based on sectioned otoliths for: Danish seine fleet (1998, 2000-21); Eastern trawl fleet (1998-2002, 2004-21); Tasmanian trawl fleet (1999-00, 2002, 2005-08, 2010, 2012-21)

Estimated standard deviation of age reading error (by age)

LENGTH COMPOSITION DATA for: onboard retained catch for Danish seine fleet (1993-94, 1998-2007, 2009-21); onboard retained catch for Eastern trawl fleet (1977, 1993, 1996-18); onboard retained catch for Tasmanian trawl fleet (1998-2006, 2008, 2010-21); port data (landed catch) for Steam trawl fleet (1945-58); port data (landed catch) for Danish seine fleet (1945-67, 1992, 1994-21); port data (landed catch) for Eastern trawl fleet (1965-67, 1969-21); port data (landed catch) for Tasmanian trawl fleet (1999-00, 2002-06, 2011-13, 2015-2016); onboard discarded catch for Danish seine fleet (1998-2000, 2002-03, 2006-07, 2011-16, 2021); onboard discarded catch for Eastern trawl fleet (1992-93, 1997-2006, 2008-21)

Key model structure & assumptions:

2-sex, multiple fleet, statistical age- and length-structured model implemented in the package Stock Synthesis ver. SS-V3.30.19

7 fleets modelled (5 commercial fishing fleets + 2 FIS "fleets")

Single biological stock of Tiger Flathead assumed

Stock assumed to be unexploited at start of 1915 (i.e. catches prior to this minimal)

As model is conditioned on landed catch, it is assumed that:

(i)   Commercial catches reported for each fleet and from each jurisdiction are accurate

(ii)   Catches from other sectors (recreational and Aboriginal) are insignificant (relative to commercial catches)

Iterative reweighting used to adjust standard errors of catch rate indices so that their average equals those estimated by the model

Selectivity varies among fleets and is time-invariant except for a change in 1978 for the Danish seine fleet and in 1985 for the Eastern trawl fleet

Selectivity ogives modelled as logistic functions of length with 2 parameters estimated within the assessment model

Retention (versus discard) modelled as a logistic function of length with inflection and slope parameters estimated for Danish seine, Eastern trawl and Tasmanian trawl fleets

Natural mortality, M, assumed age- and time-invariant and equal to 0.27 yr-1 for base-case of model

Beverton-Holt stock-recruitment relationship parameterised by (i) pre-exploitation recruitment (R0) and steepness (h)

Recruitment deviations estimated for period 1915 – 2017

Magnitude of process error in annual recruitment was set to 0.7

An age plus-group modelled at age 20; growth assumed to be time-invariant; mean size-at-age time invariant

Distribution of size-at-age determined from fitting the growth curve within the assessment using age-at-length data (this done for 2 genders)

Max total length 55.9 cm TL

Length-weight parameters: a =5.88 x 10-6, b = 3.31

50% maturity at 30 cm TL

Relative weightings of input data series were based on the use of trip and shot numbers (when available) and the "Francis weighting method" rather than length/age frequency sample sizes, arbitrary caps on sample sizes or arbitrary down-weightings of likelihood components. For early length-frequency data down-weighting factors and caps were applied.

Tuning of the model involved a multi-step procedure (see Bessell-Browne, 2022)

Sources of uncertainty evaluated:

Evaluation of base-case model fits (estimated) to observed for:

  - indices of abundance time-series (by fleet and FIS)

  - discard fraction time-series (by fleet)

  - length compositions (retained catch) (i) aggregated across time (by fleet) and (ii) by year (by fleet and FIS)

  - length compositions (discarded catch) (i) aggregated across time (by fleet) and (ii) by year (by fleet and FIS)

- age compositions (retained catch) (i) aggregated across time (by fleet) and (ii) by year (by fleet)

  - age compositions (discarded catch) (i) aggregated across time (by fleet) and (ii) by year (by fleet)

Sensitivity scenarios based on alternative assumptions to those used in the base-case included:

  - low (M = 0.22 yr-1) and high (M = 0.32 yr-1) values of natural mortality

- low (27 cm) and high (33 cm) values of size at 50% maturity

- low (0.4), intermediate (0.4) and high (0.8) values of recruitment process error

- first year of recruitment 1915 v 1918

- stock-recruitment steepness 0.65, 0.75, 0.85 with M fixed at 0.27

- estimate natural mortality M with stock-recruitment steepness fixed at 0.75

- alternative weightings on length composition data (x 2, x 0.5)

- alternative weightings on age-at-length data (x 2, x 0.5)

- alternative weightings on survey (CPUE) data (x 2, x 0.5)

## Status Indicators - Limit & Target Reference Levels

Biomass indicator or proxy	Depletion of spawning biomass (model estimated)
Biomass Limit Reference Point	B20 (20% of pre-exploitation spawning biomass)
Biomass Target Reference Point	B40 (40% of pre-exploitation spawning biomass)
Fishing mortality indicator or proxy	Fishing mortality (model estimated)
Fishing mortality Limit Reference Point	N/A
Fishing Mortality Target Reference Point	F40 (Fishing mortality rate that achieves B40)

Stock Assessment Results

The most recent stock assessment for Tiger Flathead was done in 2022, based on data up to 2021 (Bessell-Browne, 2022). Spawning biomass at the commencement of 2022 was estimated to be 39% and in 2023, 40% of the pre-exploitation level (Figure 3). This is substantially greater than the limit reference point of 20% depletion, greater than the management inflexion point of 35% and equal to the target reference point of 40% depletion.

The estimated depletion of spawning stock biomass of 40% is elevated from the 34% depletion estimated from the 2019 assessment (Day, 2019; Bessell-Browne, 2022).

Figure 3. Time-trajectory of spawning biomass depletion for the base-case analysis for tiger flathead. This figure reprinted from Fig. 24 in Bessell-Browne (2022).

Relative spawning biomass: B/B_0 with ~95% asymptotic intervals
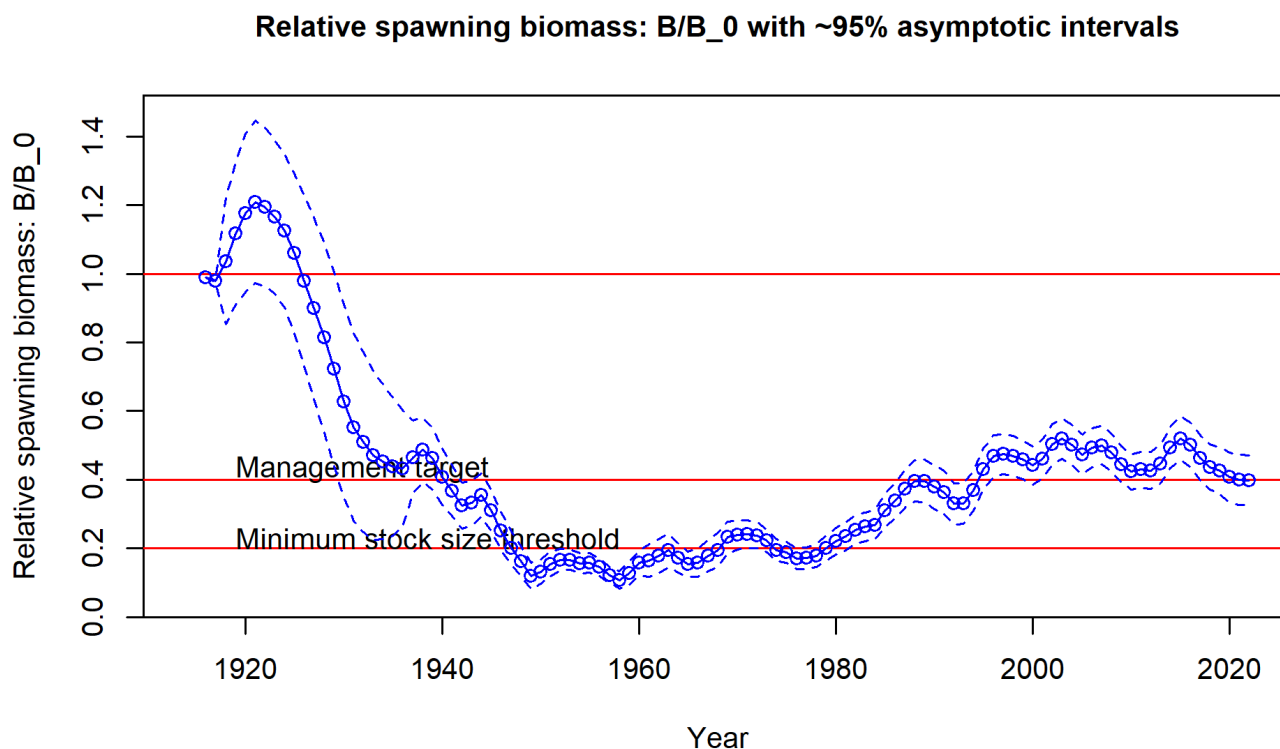
Based on the agreed harvest control rule, average recruitment (based on the stock-recruitment relationship) since 2018 and model projections, RBCs calculated for the next 3 years were (Bessell-Browne, 2022):

2,451 t for 2022

2,838 t for 2023

2,827 t for 2024.

Average RBC calculated for this 3-year period was:

 2,705 t for 2022-2024.

The most recent classification of stock status by the Commonwealth of not overfished and not subject to overfishing (Butler et al., 2023) was based on the tier-1 assessment of status (Bessell-Browne, 2022). The most recent classification of stock status under SAFS criteria was sustainable (Emery et al., 2021).

Stock Assessment Result Summary

Biomass status in relation to Limit	Projected for start of 2023: B = 40 % >> B20
Biomass status in relation to Target	Projected for start of 2023: B = 40 % < B40
Fishing mortality in relation to Limit	N/A
Fishing mortality in relation to Target	N/A
Current SAFS stock status	Sustainable

Current Commonwealth stock status	Not overfished
	Not subject to overfishing

Fishery interactions

There is interaction between fisheries managed under NSW, Commonwealth, Victorian and Tasmanian jurisdictions. Fish trawling at latitudes north of Barrenjoey Pt (NSW) and inside 3 nm south of Barrenjoey Pt are under NSW jurisdiction. Trawling outside 3 nm, on the south coast of NSW, falls under Commonwealth jurisdiction. Across all jurisdictions, the fisheries that capture Tiger flathead also capture other demersal species that inhabit continental shelf waters.

Qualifying Comments

Estimates and conclusions from the Commonwealth Tier-1 assessment model are subject to the assumptions outlined in section 'Key model structure and assumptions' but also note that general conclusions from the model regarding stock status were robust to the sensitivity scenarios examined. See also Appendix 1 regarding the reliability and relevance of the Commonwealth assessment to the assessment of stock status in NSW.

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Appendix 1 - Reliability and relevance of the Commonwealth assessment to assess stock status in NSW

As a "Tier 1" Commonwealth assessment, this assessment is classed as being of high quality. It is based on a statistical catch-at-age / catch-at-length model incorporating multiple fleets and is calibrated with multiple time-series of data including indices of abundance, estimates of discarding, and size- and age-distributions. The model is conditioned on landed catch data for commercial fisheries sourced from each of the relevant jurisdictions (Commonwealth, NSW, Victoria and Tasmania).

Accounting of NSW catches in the Commonwealth Tier-1 assessment model

Landings of Tiger Flathead from NSW commercial fisheries are accounted for in the Commonwealth Tier-1 model, representing an average of 5.6% of the total landings since 2001 and 2.7% of total landings during the last 3 years. Because (i) fishing mortality in waters under NSW jurisdiction are included in the model; (ii) the vast majority of fishing mortality occurs in the Commonwealth SESSF; and (ii) the stock of Tiger Flathead fished in Commonwealth and State jurisdictions is considered a single biological stock, it is reasonable that NSW use the Commonwealth assessment as the basis for determining stock status in NSW.

Location of NSW catches relative to the SESSF

Catches of Tiger flathead in waters under NSW jurisdiction are concentrated within latitudes (i) 32 – 33.58°S, immediately to the north of the SESSF boundary at Barrenjoey Headland; and (ii) 33.58 – 37.5°S, between the NSW coastline and the boundary with the SESSF at 3nm offshore (Fig. 4). Consequently, the assumption of a common stock across these jurisdictional boundaries is reasonable.

NSW and SESSF Eastern Trawl Fleet catch rates

Trends in catch rates (CPUE) for Tiger Flathead taken by fish trawlers operating within NSW jurisdiction are generally consistent with indices of abundance based on catch rates from fish trawlers operating in the Eastern Trawl Fleet of the SESSF (Fig. 5). Both sources of data, show increasing trends in abundance during 1998-2009 and decreasing trends during 2010-2020. This suggests that the component of the stock in NSW waters (inside 3 nm on the south coast of NSW and to the north of the SESSF boundary at Sydney) is exhibiting similar dynamics (with respect to abundance) to the component of stock under Commonwealth jurisdiction and this is consistent with the assumption of a single biological stock.

Figure 4. Spatial distribution of Tiger flathead catch in waters under NSW jurisdiction, 2010-11 to 2021-22, by fishing method (FT – Fish trawl, OPT – Ocean prawn trawl, Other).
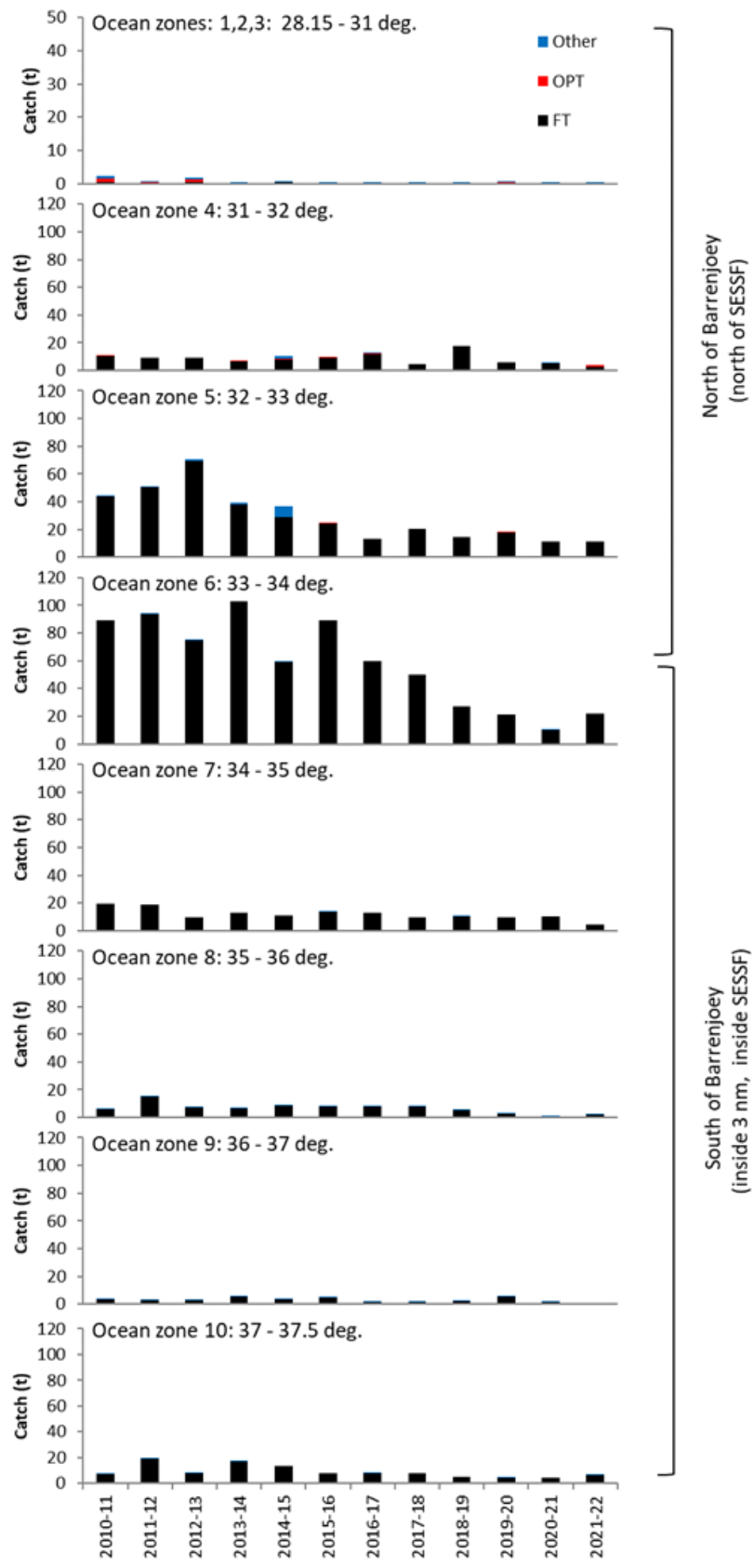
Figure 5. Annual CPUE (mean catch kg per day) based on reported catches of "Tiger Flathead" taken by fish trawlers operating within NSW jurisdiction (black) and standardised catch rates for the Eastern trawl fleet of the SESSF (red), 1998 – 2009 (left panel) and 2010-2022 (right panel). Dashed lines show linear trends. Data sources: NSW RAS database, Day (2019) and Sporcic (2021).

Linear trends in CPUE are shown by dashed lines on each graph. Data sources: NSW data from NSW RAS database; Commonwealth data from and Day (2019) and Sporcic (2021).
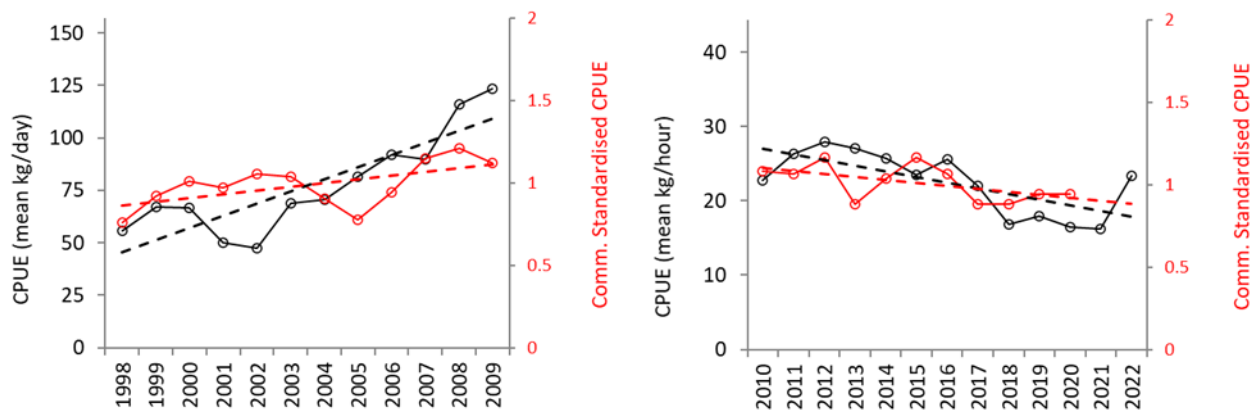
Minor inconsistencies re the representation of NSW data and regulations within the Commonwealth Tier-1 assessment model

There are several minor issues with respect to the reliability of NSW landings data and the representation of NSW catch data and fishing regulations within the Commonwealth model:

There is uncertainty associated with the accuracy of reported landings of "Tiger Flathead" in NSW (and probably other jurisdictions also). In NSW, there may by a component of landings of Tiger Flathead that is unreported by fishers. Tiger flathead may be misreported as "Flathead (Other)" in NSW. Between 12 and 40 t of landings of "Flathead (Other)" were reported annually during 2009/10 -2020/21, by fish trawlers and prawn trawlers. It is likely that these catches principally comprise Tiger Flathead and Bluespotted flathead (*Platycephalus caeruleopunctatus*). The magnitude of these catches does, however, represent such a small proportion (1% order of magnitude) of the total Australian catch of Tiger Flathead that such misreporting would have little effect on model estimates and assessment outcomes.

There are minor discrepancies between the NSW landings used in the model and the historical catches recorded in the NSW database. The mean annual discrepancy between 2001 and 2018 is 1.0%. Note, however, that a 1% discrepancy for NSW landings results in a discrepancy of approximately 0.05% in total landings across all jurisdictions. Such small discrepancies have insignificant impact on modelling outcomes.

The Commonwealth assessment does not consider recreational or Aboriginal catch. The model is conditioned on commercial catches alone. Neither does the process by which the Commonwealth TAC is calculated from the RBC account for recreational/Aboriginal catch. A survey of the catches in NSW by NSW-resident recreational fishers during 2013/14 estimated a retained catch of 39,417 (se 14,738) Tiger Flathead and a discarded catch of 42,913 (se 19,117) fish (West et al., 2015). If the mean weight of landed Tiger Flathead was 0.521 kg (estimate in NSW DPI Resource Assessment System database), approximately 20 t of Tiger Flathead were landed by NSW-resident recreational anglers. A subsequent survey of catches in NSW by NSW during 2017-18, but restricted to 1-3 year recreational licence holders, estimated landings of approximately 13 t (Murphy et al., 2020). These magnitudes of catch represent less than 1% of the annual commercial landings of Tiger Flathead. Assuming that the total

landings by recreational and Aboriginal fishers from all State jurisdictions are of a similar order of magnitude, it can be concluded that the omission of recreational and Aboriginal catches from the model and Commonwealth assessment has little effect on model estimates and assessment outcomes.

The Commonwealth assessment model does not specifically recognise the minimum legal length (MLL) of 33 cm for Tiger Flathead taken under NSW jurisdiction, which is 5 cm greater than the MLL of 28 cm applicable in the SESSF (AFMA, 2021). The model combines NSW and SESSF catches within the "Eastern trawl fleet" and uses a single selectivity ogive. Given the relativity of the NSW and Commonwealth components of catch, this simplification would have minimal effect on model estimates and assessment outcomes.

Appendix 2 - NSW catch statistics and additional information relevant to TAC setting in NSW

Determination of a TAC for the NSW Ocean Trawl fishery for the 2022-23 fishing period may potentially be informed by the following facts and observations:

1.   There is currently no harvest strategy for Tiger flathead and trawl fisheries under NSW jurisdiction. Consequently, limit and target reference points specifically relating to the NSW fisheries for Tiger flathead are undefined. For the purpose of classifying exploitation status under SAFS criteria, NSW adopts a default 20% depletion of spawning biomass as a limit reference point. This is consistent with the Commonwealth's limit reference point of 20% depletion under the SESSF HSP. The Commonwealth's target reference point for Tiger flathead is 40% depletion of spawning biomass.

2.   There is currently no resource sharing policy between NSW and the Commonwealth relating to the shared stock of Tiger flathead.

3.   As a consequence of there being no harvest strategy ("1" above) and no resource sharing policy ("2" above), assessing the consequences of alternative TACs for Tiger flathead in NSW waters is problematic for 2022-23 and into the future.

4.   Technically, the magnitude of the TAC set for Tiger flathead for the relevant commercial fisheries under NSW jurisdiction is likely to have no impact on the sustainability of the Tiger Flathead population. This is because the Harvest Strategy Policy used by the Commonwealth for the SESSF requires that the Commonwealth TAC be determined using the calculation: TAC = RBC – State catch allowance – Discards allowance. Based on this policy, the Commonwealth TAC would be set so that the RBC is not breached, and stock continues to track to the target reference point.

5.   Setting a NSW TAC that is "out of step" with (i) the Commonwealth's harvest strategy and RBC; (ii) Commonwealth versus NSW catch histories; and (iii) the current Commonwealth stock assessment (Bessell-Browne, 2022); would seem to be counter-productive to the effective ongoing management of this shared resource.

6.   The determination of the 2024-25 Commonwealth TAC for Tiger Flathead will be based on the SESSF HSP and the RBC from the 2022 Commonwealth Tier-1 model (using data to 2021). Allowances for State catches (based on the 1:2:4:8 weighted average of State landings in years 2019, 2020, 2021 and 2022) and discards (estimated from model projections) will be subtracted from the RBC to determine the TAC. Given the relative stability of the tiger flathead stock over the past couple of decades, the allocated Commonwealth TAC is likely to be of similar or slightly greater magnitude than the 2023-24 TAC of 2,333 t.

7.   Although there have been fluctuations in the Commonwealth TAC during the past 3 years, TACs for the NSW Ocean Trawl Fishery have remained constant at 166.9 t. This TAC was based on the maximum annual landings from the period 2009-10 to 2016-17 for the sectors of the fishery that became quota-managed (Inshore Prawn Trawl, Offshore Prawn trawl and Northern Fish Trawl) (Tables 2 and 3, Fig. 6). A catch of this magnitude has not been taken during any of the 12 years 2010-11 to 2022-23. During the last 5 years (2018-19 to 2022-23) the mean annual catch was 40 t,

Table 2. Annual catches of "Tiger Flathead" by NSW commercial fisheries, by fishery/share-class, 2009-10 – 2022-23. Grey columns indicate share-classes for which a NSW TAC will apply.

Year	Fish Trawl North (t)	Fish Trawl South (t)	Prawn Trawl Inshore (t)	Prawn Trawl Offshore (t)	Other (t)	Total (t)
2009/10	165.611	50.557	0.014	1.984	1.020	219.19
2010/11	150.363	30.577	0.079	1.062	0.711	182.79
2011/12	158.006	51.311	0.028	0.296	1.821	211.46
2012/13	151.172	30.582	0.006	0.054	1.816	183.63
2013/14	147.250	42.265	0.005	0.575	2.224	192.32
2014/15	93.473	38.364	0.004	0.529	11.169	143.54
2015/16	117.492	40.535	0.043	0.804	0.834	159.71
2016/17	80.061	47.855	0.057	0.575	0.763	129.31
2017/18	74.668	27.508	0.061	0.451	0.148	102.84
2018/19	59.472	32.855	0.002	0.135	0.327	92.79
2019/20	45.474	45.106	0.024	0.196	0.241	91.04
2020/21	26.462	26.574	0.058	0.718	0.085	53.90
2021/22	36.370	14.877	0.024	1.286	0.193	52.75
2022/23	28.037	22.847	0.061	2.139	0.231	53.31

Figure 6. Reported landings of Tiger flathead in NSW commercial fisheries / share-classes, 2009/10 – 2020/21.
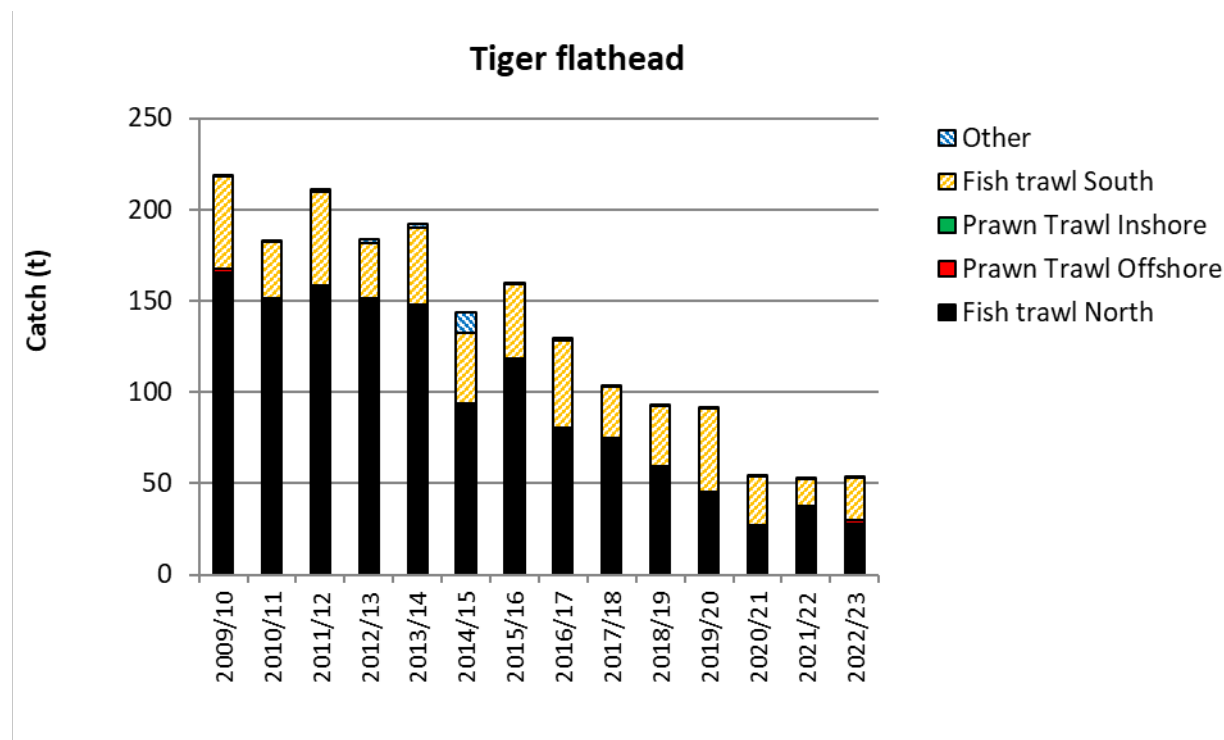
representing 24 % of the 166.9 t TAC. During the last 3 years (2020-21 to 2022-23) the mean annual catch was 32 t, representing only 19 % of the TAC.

8.   During the last 5 years (2018-19 to 2022-23), the mean annual catch of Tiger flathead from the components of NSW fisheries now consolidated in the Ocean Trawl Fishery represented 60 % of the mean annual catch of Tiger flathead from all NSW fisheries (Tables 2 and 3, Fig. 6). The vast majority of the remaining 40 % of NSW catch came from the Southern Fish Trawl fishery. This fishery remains outside TAC management in the current fishing year (2023-24).

Table 3. Summary statistics based on recent annual commercial catches (2009-10 – 2021-22) for Flathead reported as "Tiger Flathead" in NSW waters.

Catches of the fisheries / share-classes for which a NSW TAC currently applies (Fish Trawl North, Prawn Trawl Offshore, Prawn Trawl Inshore) are aggregated into a single column. Annual catches for Fish Trawl South and Other NSW fisheries and the total are also tabled.

Year	NSW TAC share-class fisheries (Catch, t)	Fish Trawl south (Catch, t)	Other fisheries (Catch, t)	Total (Catch, t)
2009/10	168	51	1	219
2010/11	152	31	1	183
2011/12	158	51	2	211
2012/13	151	31	2	184
2013/14	148	42	2	192
2014/15	94	38	11	144
2015/16	118	41	1	160
2016/17	81	48	1	129
2017/18	75	28	0	103
2018/19	60	33	0	93
2019/20	46	45	0	91
2020/21	27	27	0	54
2021/22	38	15	0	53
2022/23	30	23	0	53
Min:	27	15	0	53
Max:	168	51	11	219
Mean:	96	36	2	133
Mean, last 3 years:	32	21	0	53
Mean, last 5 years:	40	28	0	69