Stock Status Summary – 2021/22

NSW Stock Status Summary – Stout Whiting *(Sillago robusta)*

Assessment Authors and Year

Hall, K. C. 2021. NSW Stock Status Summary 2021/22 – Stout Whiting (*Sillago robusta*). NSW Department of Primary Industries, Fisheries. 18 pp.

Stock Status

Current stock status	On the basis of the evidence contained within this assessment, Stout Whiting is currently assessed as **sustainable** for the NSW part of the stock.

Stock structure & distribution

Stout Whiting is a tropical species that occurs in ocean waters to a depth of 70 m from south-western Western Australia, around the northern coastline to central NSW on the east coast. There is strong evidence that Stout Whiting on the east coast are a separate sub-species from populations along the northern and western Australian coasts (Dixon et al. 1987). More recent molecular analyses of Stout Whiting samples from Queensland locations suggest that biological sub-stocks of the east coast stock are unlikely to exist (Ovenden and Butcher 1999). Therefore, Stout Whiting in southern Queensland and northern NSW are considered a single eastern Australia biological stock for assessment purposes (Roelofs and Hall 2018).

On the basis of this evidence, assessment of the stock status of Stout Whiting is presented at the biological stock level – Eastern Australia.

Scope of this assessment

The data presented in this summary relate to the NSW part of the stock (reproduced from Hall 2021). This was considered a full stock assessment year for Stout Whiting, with new information available on the primary biomass indicator from the most recent 2021 Queensland quantitative stock assessment (based on data up to and including 2019). However, it was considered an interim stock assessment year according to the *Draft NSW Trawl Whiting Harvest Strategy* (NSW DPI 2021). This report also updates NSW fisheries statistics and secondary indicator information (for data up to and including 2020). The NSW part of the stock was assessed according to the *Status of Australian Fish Stocks* criteria (Piddocke et al. 2021) and with reference to the draft NSW harvest strategy.

A basket total allowable commercial catch (TACC) for 'Trawl Whiting' (combined Eastern School Whiting and Stout Whiting, *Sillago robusta*) was introduced in May 2019 for the Ocean Trawl Fishery in NSW waters north of Barrenjoey Point. It was initially set at 1,189 t for the 2019-20 fishing season (1 May 2019 to 30 April 2020) and was subsequently adjusted to 898 t for 2020-21 and 1,066 t for 2021-22 fishing seasons (Mapstone et al. 2020; NSW TAF Committee 2021).

Biology

Stout Whiting reach a maximum age of 8 years off southern Queensland, 10 years in northern NSW (near Yamba) and 6 years in central NSW (near Newcastle), with a maximum reported size of 23.7 cm FL (O'Neill et al. 2002; Butcher and Hagedoorn 2003; Gray et al. 2017). However, most of the commercial catch comprises 2- and 3-year-old fish (12 to 18 cm FL) in northern NSW and 1- and 2-year-old fish in central NSW (10 to 13 cm FL) and southern Queensland (of slightly larger size, 14 to 17 cm FL) (O'Neill et al. 2002; Gray et al. 2017). Sexual maturity is reached at about 2 years of age and 15 cm FL.

Distribution and size composition data from independent trawl surveys using the *FRV Kapala* in the early 1990s suggest that Stout Whiting, in contrast to Eastern School Whiting, are more common in shallower inshore waters (10–30 m depth) than in deeper offshore waters (60–80 m depth) (Graham et al. 1993a; Graham et al. 1993b; Graham and Wood 1997). These patterns were also described in the chartered prawn trawl survey in 2006–2007, with Stout Whiting most common in the shallow, inshore 10–30 m depth strata (Gray et al. 2014).

FISHERY STATISTICS

Catch information

Commercial

In southern Queensland, Stout Whiting is targeted by a small number (2 to 6) Danish seine and otter trawl vessels in the Finfish (Stout Whiting) Trawl fishery and is also caught and discarded as by-catch by the much larger East Coast Otter Trawl Fishery. The latter fishery primarily targets Eastern King Prawn (*Melicertus plebejus*) and is not permitted to retain Stout Whiting, but estimated discard mortalities are included in estimates of total removals for stock assessments (Fig. 1). In NSW, historic discard rates of Stout Whiting were much higher than recent estimates.

The reported commercial catches of Stout Whiting from Queensland have historically far exceeded those taken from NSW waters (Fig. 1). On average, 80% of the annual landed catch is taken in Queensland and 20% in NSW (Roy and Hall 2016). Queensland commercial catches (not including estimated discards) were over 1,000 t during the last four years (2017–2020), with Queensland TACCs set at 1,106 t in each season and the quota fully or almost fully caught (Wortmann 2020).

Annual commercial catches of Stout Whiting in NSW state waters (following adjustment for species misreporting in northern NSW) show a rapid increase from <100 t per annum to a peak of 526.7 t in 1998. Following a second peak of 479.1 t in 2002, catches have steadily decreased to an historical low of 182 t in 2017 (Fig. 2). Since then catches have increased again to 232 t in 2019 and 271 t in 2020, with the latter accounting for approximately 25% of the total trawl whiting harvest of 1,074 t from NSW waters.

Commercial catches of Stout Whiting are almost exclusively taken by the OPT sector in the north of the state, with minor quantities reported by the NFT in more recent years (Figs 2 and 3). Although the data adjustments are only applied to OPT catches in northern zones, some misreporting of Stout Whiting as Eastern School Whiting could be occurring further south to produce smaller catches in the fish trawl sector. The sudden increase in NFT Stout Whiting catches in 2020 may have resulted in response to greater industry awareness of the need to report correctly and may indicate that fish trawl catches of Stout Whiting were historically greater than reported. This has potentially serious implications regarding the accuracy of the catch history series included in the recent biomass modelling of both species.

Figure 1. Annual commercial catches and estimated discards (tonnes) of Stout Whiting from New South Wales and Queensland waters from (1945–2020). Reproduced from Wortman and Hall (2021).

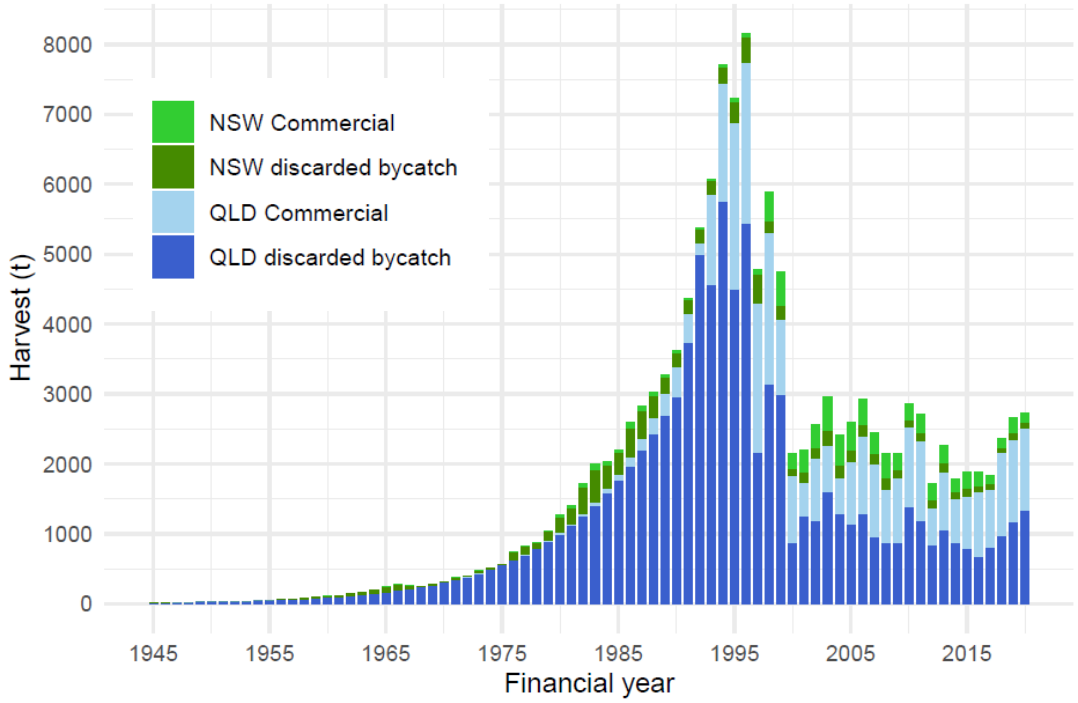


Figure 2. Annual adjusted commercial catches (tonnes) of Stout Whiting in NSW waters (1998–2020) for different sectors and endorsements in the NSW Ocean Trawl Fishery. OPT=ocean prawn trawl, NFT=northern fish trawl, SFT=southern fish trawl.

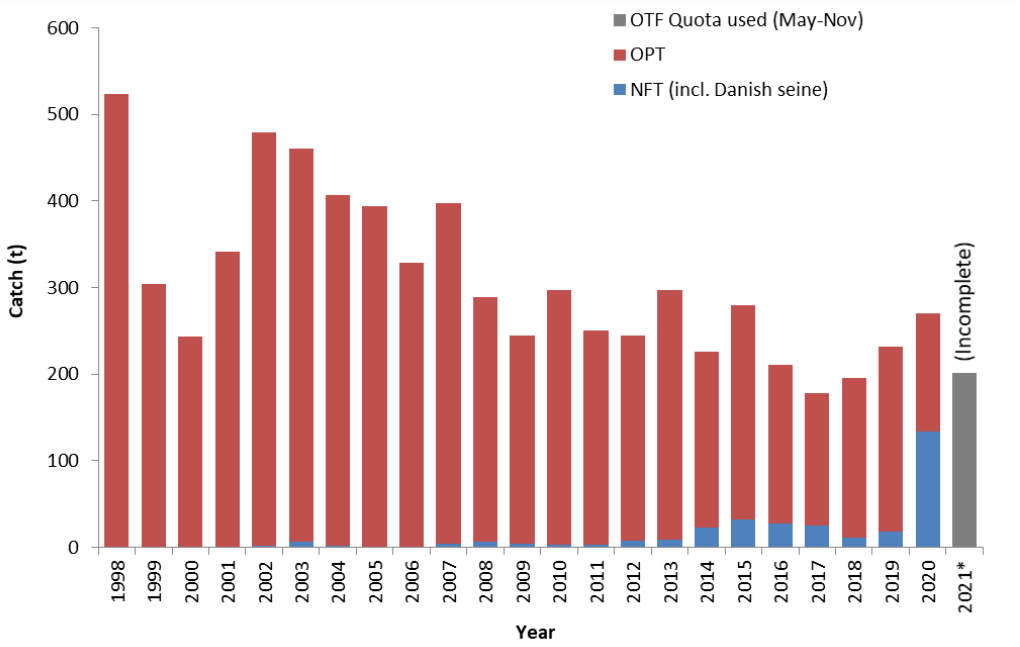
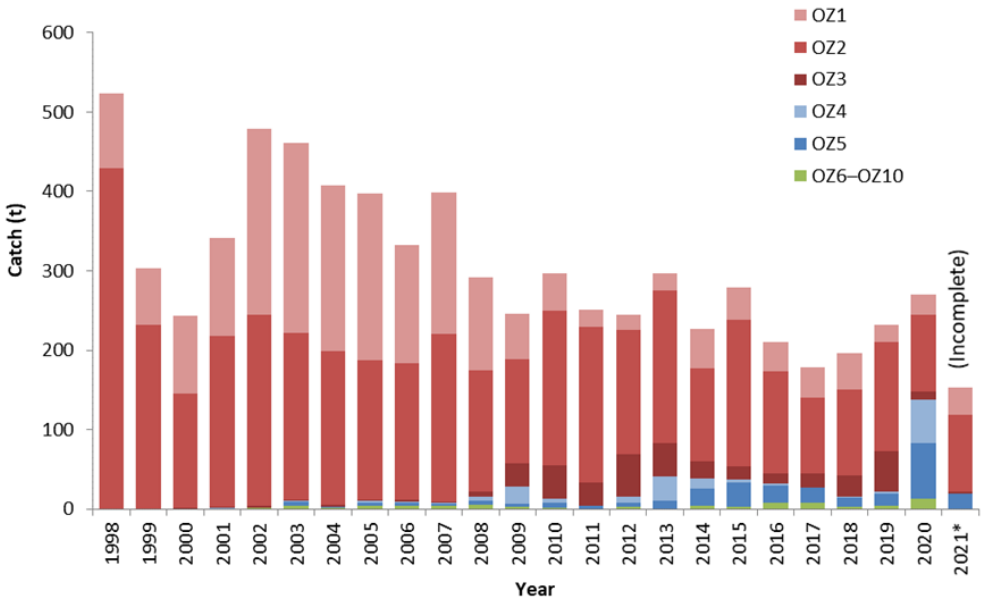


Figure 3. Annual adjusted commercial catches (tonnes) of Stout Whiting from the NSW Ocean Trawl Fishery (1998–2020) reported in different fishing zones (OZ1–OZ10), with catches in OZ6 and zones south of BJ aggregated for confidentiality reasons.



Recreational & Charter boat

The most recent estimate of the recreational harvest of combined trawl whiting (Eastern School Whiting and Stout Whiting) in NSW was approximately 9,882 fish or around 1.4 t during 2019/20 (Murphy et al. in prep.). This estimate was based on a survey of Recreational Fishing Licence (RFL) Households, comprised of at least one fisher possessing a long-term (1 or 3 years duration) fishing licence and any other fishers resident within their household, excluding other long-term licence holders. However, because these catches are so small the reliability of the estimates is questionable. Nevertheless, relative to the commercial catch, recreational catches are clearly negligible, and comprise approximately 0.1% of the total harvest from NSW waters.

Stout Whiting are also rarely reported in logbook catches and observer surveys of the NSW Charter Boat Fishery and catches are considered insignificant in comparison with commercial catches (Gray and Kennelly 2016; Hughes et al. 2021).

Indigenous

The annual Aboriginal harvest of Stout Whiting in NSW waters is currently unknown but is assumed to be small and to have a negligible impact on the stock biomass.

Illegal, Unregulated and Unreported

The level of illegal, unregulated and unreported fishing is unknown; however, there is significant misreporting of Stout Whiting as Eastern School Whiting on catch returns, particularly in northern

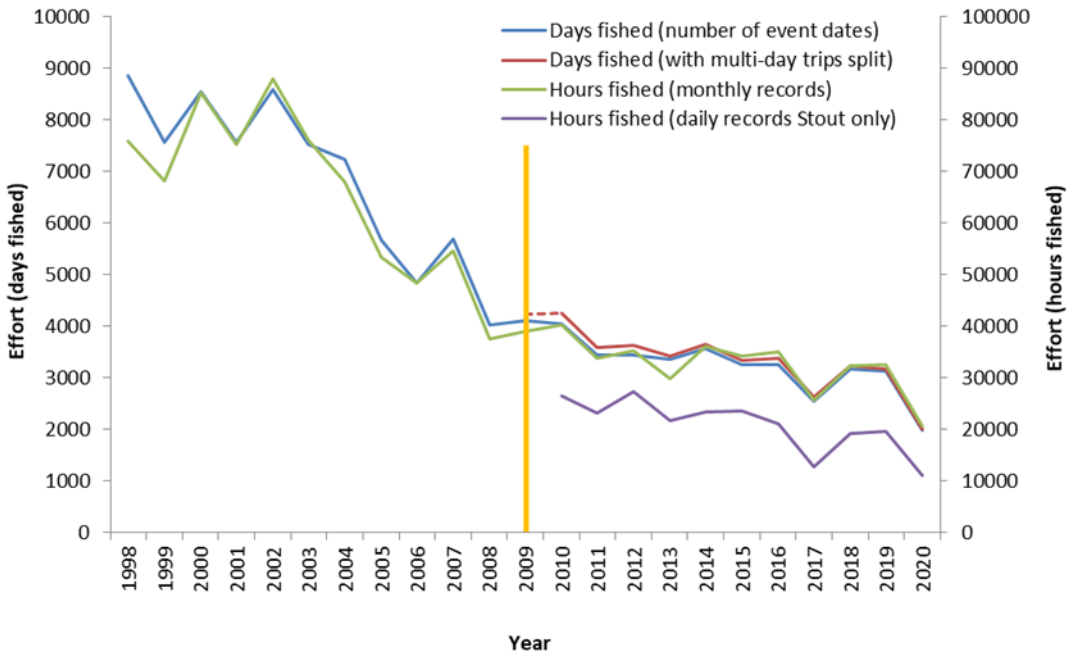
NSW waters since July 2009, when separate species reporting was first introduced for trawl whiting. A large quantity of trawl whiting catch in 2016–2018 was reported without accurate location information and other large catches in 2019 and 2020 on the south coast were deemed invalid, which contribute towards greater uncertainty in total catch data.

Fishing effort information

Commercial fishing effort for Stout Whiting was collected as number of days fished on monthly records prior to July 2009 and as numbers of hours fished per daily event after July 2009. To form a longer time series of effort, recent daily events were re-aggregated, with effort in days fished estimated from the number of fishing events entered for each fisher in each month where Stout Whiting was reported on at least one day; and were adjusted for multi-day trips reported as a single fishing event by dividing the total number of hours by 12.

The reported effort for Stout Whiting (in total days fished) by the prawn trawl sector declined rapidly from around 8,000 days fished and 80,000 trawl hours in the early 2000s to 4,015 days fished and 38,966 hours trawled in 2009 (Fig. 4). Since then effort has declined more gradually to an estimated 2,012 days fished and 20,605 hours trawled in 2020.

Figure 4. Annual adjusted effort (days and hours fished) for prawn trawl fishers that reported landing Stout Whiting on at least one day in a given month.

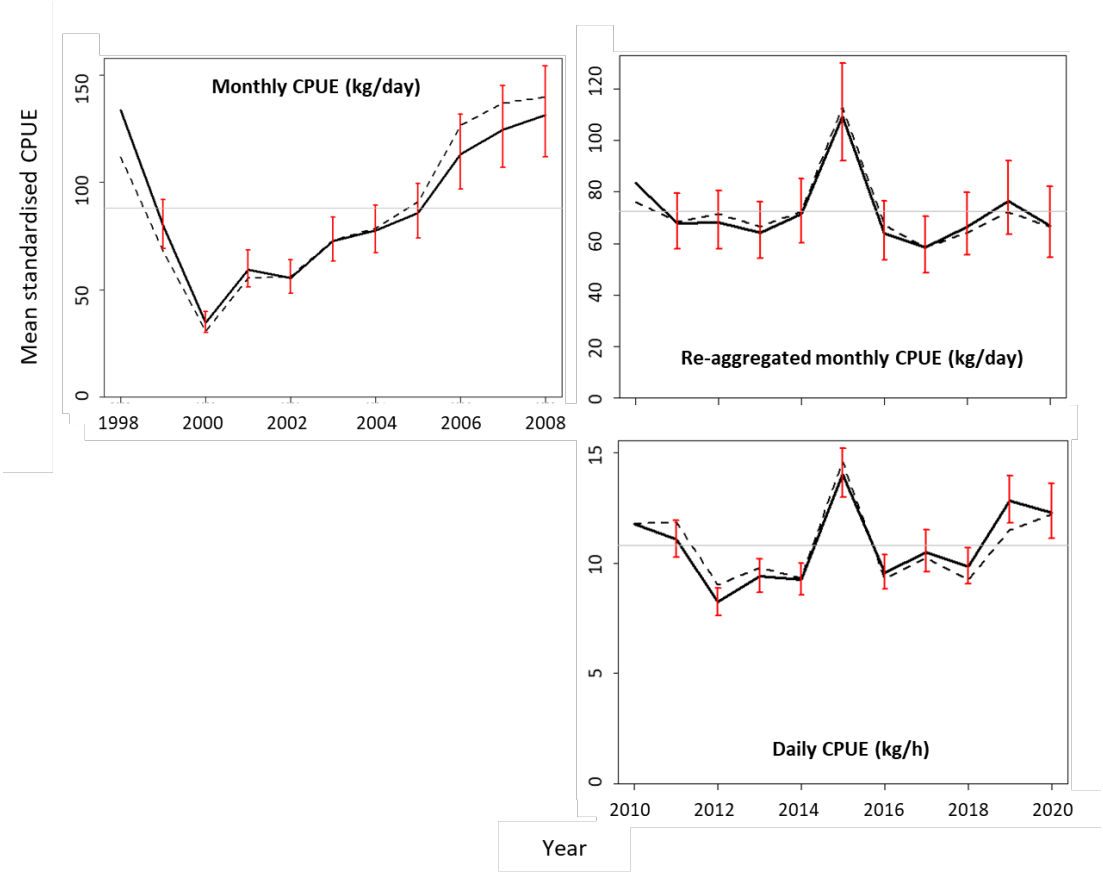


Catch Rate information

Monthly catch rates (catch-per-unit-effort, CPUE in kg per day fished) for Stout Whiting taken by the ocean prawn trawl sector were compiled from monthly records between 1998 and 2008 and re-aggregated daily records between 2010 and 2020. Catch rates were standardized for month, ocean zone and vessel using the r-package 'cede' (Haddon 2018). Continuity of the time series across the catch reporting change in July 2009 must be interpreted with caution. Daily catch rates (CPUE in kg per hour trawled) were also compiled from daily fishing event records from 2010 to 2020 and standardised for month, ocean zone, vessel and capture depth (taken from the mean depth of the reported c-square).

The mean monthly catch rates of Stout Whiting for the ocean prawn trawl sector rapidly declined between 1998 and 2000 to more than 50% below the long-term average, then steadily increased and have remained above or near long-term averages for since 2006 (Fig. 5). This suggests that the Stout Whiting stock in northern NSW may have declined following the peak trawl whiting catches in the late 1990s, but has since recovered. Trends in recent daily catch rates decreased slightly from 2010 to 2012, spiked in 2015 and then increased to above the 12-year average in 2019 and 2020. There was a marginal (4.2%) decrease in catch rates from 2019 to 2020.

Figure 5. Mean standardised catch rates (catch-per-unit-effort, CPUE) of Stout Whiting for the ocean prawn trawl sector of the NSW Ocean Trawl Fishery, estimated from monthly records (1998–2009) and re-aggregated daily records (2010–2020) in kg per days fished and from daily fishing event records (2010–2020) in kg per hours trawled. The dashed and solid lines indicate the nominal and standardised mean CPUE (± 95% confidence intervals), respectively; and the grey horizontal line indicates the long-term averages for each series.



STOCK ASSESSMENT

The *Draft NSW Trawl Whiting Harvest Strategy* (NSW DPI 2021) outlines separate decision rules for primary biomass indicators in years when a quantitative stock assessment is available for Eastern School Whiting (typically completed every 3 to 5 years) and a range of secondary indicators to be monitored in interim years. The most recent quantitative stock assessment for Eastern School Whiting was completed in 2020, so 2021 was considered an interim year for stock assessment purposes. The following stock assessment section summarises available information for the primary spawning stock biomass indicators (from the quantitative stock assessment) and updates information for the range of secondary indicators used in interim years.

Stock Assessment Methodology

Year of most recent assessment:

2021 using data up to 2019/20, Queensland quantitative stock assessment completed by DAF (Wortmann and Hall 2021); and 2021 using data up to 2020, NSW assessment of primary and secondary indicators outlined in the draft NSW harvest strategy for an interim year (Hall 2022).

Assessment method:

2021, a two-fleet integrated age-structured population dynamics model fitted using Stock Synthesis SS-V3.30.15 (Methot and Wetzel 2013; Methot et al. 2019); and 2021, weighted-average percent changes in catch rates of the prawn and fish trawl sectors of the NSW Ocean Trawl Fishery, standardised using the r-package ‘cede’ (Haddon 2018).

Main data inputs:

Commercial landings – reported annual catch, taken from fisher logbooks for the Queensland Finfish trawl sector (1990–2020) and NSW OTF (1998–2020).

Estimated discards and rates – reported discard weights for the Queensland Finfish trawl sector (1990–2016) and estimated by-catch for the Queensland East Coast otter trawl sector from reported boat-days of effort (1991–2013). Estimated discard rates from NSW onboard observer programs (1992–1995 and 2014–2019).

Commercial catch rates – reported annual catch-and-effort data for two fleets – Queensland Finfish mixed Danish seine and otter trawl fleet in catch-per-hour and catch-per-shot from daily records (1990–2016); NSW OTF prawn and fish trawl fleet (combined Danish seine and otter trawl methods in Queensland analyses, Danish seine excluded in NSW analyses) in catch-per-day from monthly records (1998–2008) and daily event records (2010–2020).

Length compositions – random samples of two 5 kg boxes from every fishing trip by vessels in the Queensland Finfish trawl fleet (1991–2016); length frequencies are statistically re-weighted by region.

Proportions-at-age data – from sectioned otoliths collected from fish sampled for length compositions from the Queensland Finfish trawl fleet (1991–2016).

Key model structure & assumptions:

Population dynamics modelling

Assumptions: a single-sex model (length data are not available by sex), with an equal sex ratio throughout the lifespan; growth according to the von Bertalanffy growth curve and average annual recruitment follows a Beverton–Holt stock–recruitment relationship; age and length data for the

NSW fleet were the same as the Queensland fleet; the population was at an unfished biomass and equilibrium age-structure at the start of 1945; population abundance is proportional to standardised catch rates; the selectivity of fleets, rate of natural mortality and growth (mean size-at-age) are constant over time; and selectivity is logistic for all fleets. More detail on model assumptions are provided in Wortmann (2021) and Methot and Wetzel (2013).

Standardised catch rates

Assumptions: annual catch rates are a relative index of abundance and not unduly influenced by other factors that are not accounted for through standardisation.

Sources of uncertainty evaluated:

The 2021 Queensland stock assessment included six additional model runs to assess model sensitivity to the fixed input parameters, including the effects of varying the natural mortality (from M=0.6 to 0.55, 07 or 0.85 per year) and reducing or increasing the trawl bycatch estimate (Wortmann and Hall 2021).

Status Indicators - Limit & Target Reference Levels

The stock status of Stout Whiting was assessed against the following performance indicators and reference points outlined in the *Draft NSW Trawl Whiting Harvest Strategy* (NSW DPI, in prep).

Biomass indicator or proxy	Spawning stock biomass depletion (as a percentage of the estimated unfished spawning stock biomass) estimated every 3–5 years from population biomass modelling; and standardised CPUE-based reference points in interim years.
Biomass Limit Reference Point	Blim of 20% of unfished spawning stock biomass. Current catch rates are assessed relative to long-term averages and levels in the last full assessment year.
Biomass Target Reference Point	Btarg of 48% of unfished spawning stock biomass.
Fishing mortality indicator or proxy	Current harvest levels relative to the estimated recommended biological catch (RBC) from population biomass modelling; and fishing mortality estimates from catch-curve analyses of age structures from commercial catches in interim years.
Fishing mortality Limit Reference Point	Level of fishing mortality (Flim) above which overfishing is occurring and biomass is depleting toward Blim.
Fishing Mortality Target Reference Point	Level of fishing mortality (Ftarg) that would result in a spawning stock biomass of Btarg.

Stock Assessment Results

Primary indicators

- Spawning stock biomass

Results from the most recent 2021 Queensland stock assessment suggest that the estimated spawning stock biomass of Stout Whiting has recovered to 42% of unfished biomass in 2020 following a minimum of 20–30% in early 2000s (Fig. 6) (Wortmann and Hall 2021). Results also suggest that the biomass is currently at the level for the maximum sustainable yield for the entire biological stock (all sectors and discarded bycatch components including that from the Queensland East Coast prawn trawl fishery) (Table 1). Under the harvest rules outlined in the draft Queensland harvest strategy for Stout Whiting, an RBC of 2,018 t in 2021 is predicted to permit the spawning stock biomass to rebuild to a relative biomass depletion of 48% of unfished biomass within 3 years and 60% by 2032 with a 0.87 buffer (Table 2). Although the draft Queensland harvest strategy originally outlined a target biomass reference point of 60% this has since been revised to 48% in the finalised harvest strategy in line with the draft NSW harvest strategy (DAF 2021).

Figure 6. Predicted spawning biomass trajectory relative to unfished (1945–2020 financial years), with projected estimates of future biomass levels (2021–2040). Figure reproduced from Wortmann and Hall (2021)

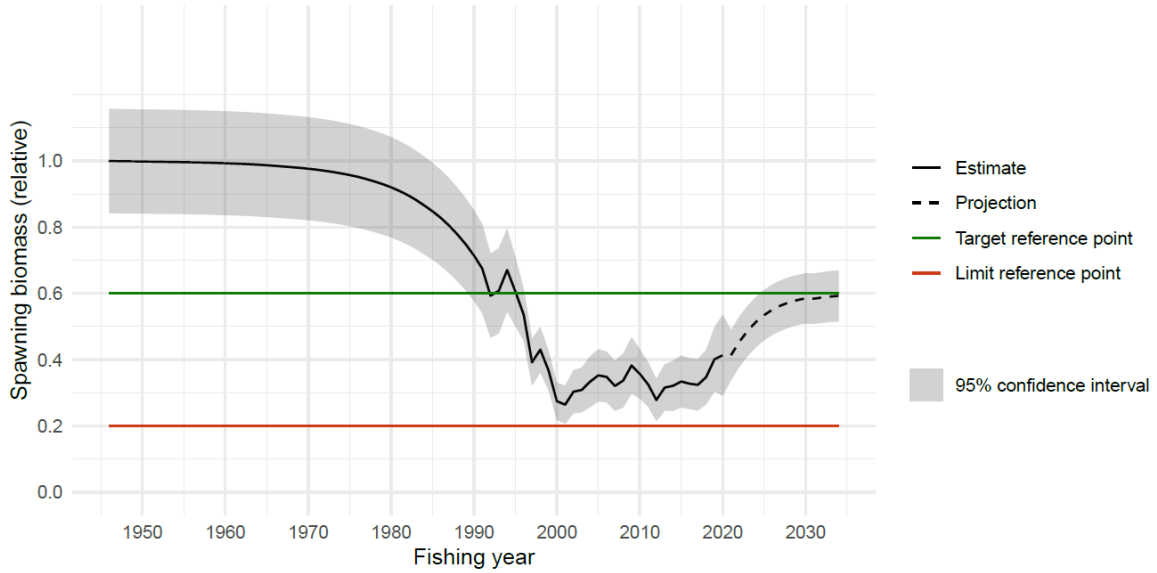


Table 1 Current and target biomass indicators for the eastern Australian Stout Whiting biological stock that includes all sectors and discarded bycatch components including that from the Queensland East Coast prawn trawl fishery. Reproduced from Wortmann and Hall (2021).

Parameter	Estimate
2020 spawning biomass (relative to unfished)	42%
Maximum sustainable yield	3259 t
Maximum sustainable yield biomass (relative to unfished)	42%
2020 harvest	2668 t
Equilibrium 60% biomass harvest	2897 t
2021 harvest to achieve 60% biomass	2018 t

Table 2 Estimated total harvests and biomass depletion ratios for the eastern Australian Stout Whiting biological stock to rebuild to the Queensland target reference point of 60% of unfished biomass within 20 years. Reproduced from Wortmann and Hall (2021).

Year	Harvest (t)	Biomass ratio
2021	2018	0.42
2022	2184	0.45
2023	2324	0.48
2024	2440	0.50
2025	2536	0.52
2026	2613	0.54
2027	2675	0.55
2028	2725	0.56
2029	2764	0.57
2030	2794	0.58
2031	2818	0.58
2032	2836	0.59

Secondary indicators

- Fishing mortality

The Queensland Stout Whiting Fishery harvest strategy does not outline any specific reference points with respect to fishing mortality. So, although surplus production fishing mortality estimates were estimated during the recent stock assessment update these were not interpreted within the final stock assessment report. Nevertheless, results from the stock assessment indicated that current levels of harvest are below that needed to maintain the biomass at the level for maximum sustainable yield.

Catch-curve analyses in 2016 suggested that estimated survival rates (ratio of abundance between older and younger age groups) had increased in recent years following particularly low survival rates between 1993 and 2003 (Wortmann and O'Neill 2016).The New South Wales basket TAC was reduced from 1,189 t in 2018-19 to 898 t for the 2019-20 fishing season, and then readjusted to 1,066 t for the 2020–21 fishing season, total Stout Whiting catches from NSW waters were 14.2% larger in 2020 at 270.7 t.

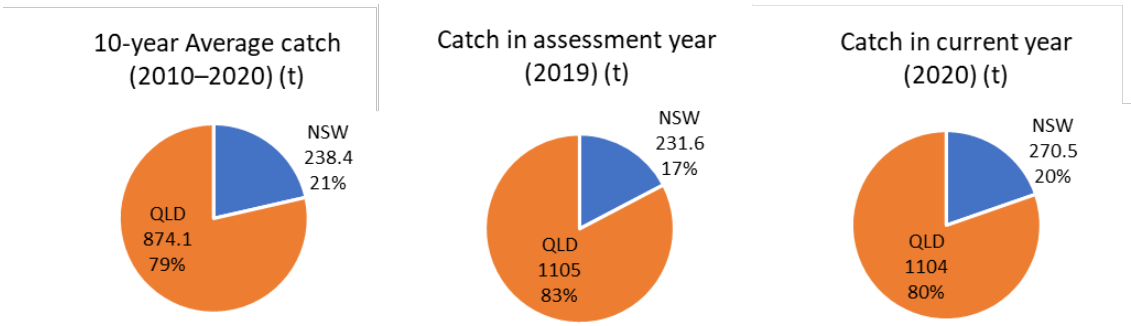
- Annual total catches and discards in NSW and other jurisdictions

Total catches of Stout Whiting across all jurisdictions increased slightly, by a weighted average percent of 3.6%, between 2019 and 2020. The NSW Ocean Trawl Fishery catch increased by 16.8% from 231.6 t in 2019 to 270.5 t in 2020. Most of this increase was due to unusually large catches in the NFT sector, with OPT catches decreasing. Updated discard information is not available for Stout Whiting in Queensland.

- Proportion of total catch caught by each jurisdiction for each species

The proportion of the total catch taken by NSW fisheries (20%) versus that taken by Queensland fisheries (80%) in 2020, differed little from that in the previous assessment year or according to the 10-year average catch breakdown, despite the increase in the NSW catches in 2020 (Fig. 7).

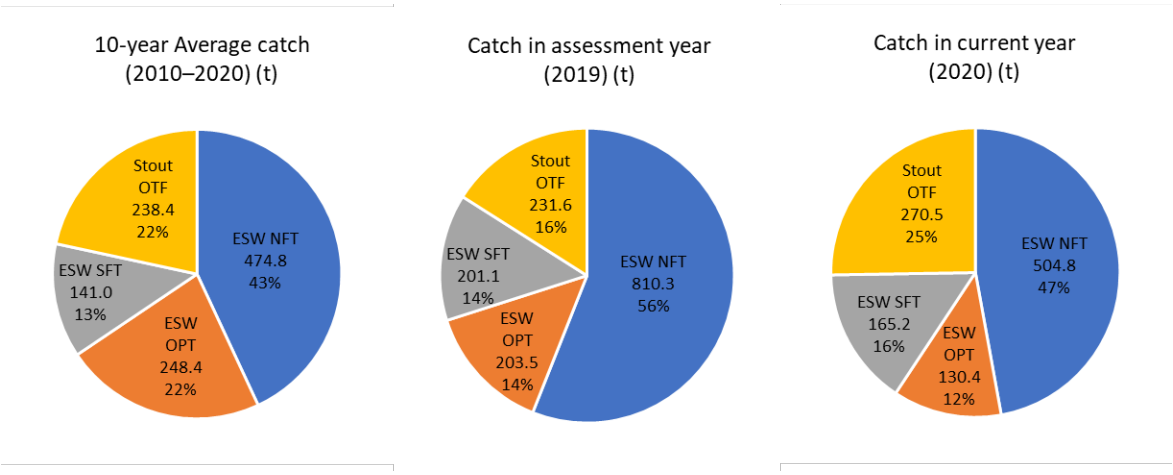
Figure 7. Breakdown of Stout Whiting total catches according to jurisdictions.



- Species composition of NSW catch relative to predicted species composition from the preliminary TACs

The preliminary TACs for each species used to derive the NSW basket Trawl Whiting TACC of 1,066 t for the 2021-22 fishing season, were reported by the TAF Committee as 217 t of Stout Whiting and 848 t of Eastern School Whiting (NSW TAF Committee 2021). These equate to 20.4% Stout Whiting and 79.6% of Eastern School Whiting. The species composition of reported landings that was realised during 2020 (after data adjustments in OZ1 and OZ2 for species misreporting) were 270.5 t (or 29.9%) of Stout Whiting and 635.2 t (or 70.1%) of Eastern School Whiting (Fig. 8). Therefore, Stout Whiting comprised a greater percentage of the harvest under the combined TAC in 2020 than predicted.

Figure 8. Breakdown of the NSW Ocean Trawl Fishery commercial catches of Eastern School Whiting (ESW) and Stout Whiting (Stout) according to species and sector. NB: Danish seine catches are included within the Northern Fish Trawl (NFT) and Southern Fish Trawl (SFT) sectors. OPT = Ocean Prawn Trawl.



- Standardised catch rates by fleet and weighted averages in NSW and in other jurisdictions

Over the last 12 months since the most recent full stock assessment was completed for each stock, catch rates for the NSW prawn trawl fleet were relatively stable, while those of the fish trawl fleet increased by over 50%. Overall, there was a weighted average percent increase of 31.6% in the CPUE indices of NSW Ocean Trawl Fishery sectors that target trawl whiting. This may have resulted from the reduced fishing pressure on the NSW part of the stock over the last two years when the TAC was reduced in the 2020–21 fishing season.

In comparison, recent catch rates in the two main Commonwealth sectors show opposing trends over recent years. The Danish seine series consistently declined over the last five years to over 50% below the long-term average, while the trawl sector catch rates have increased rapidly over the last two years.

- Catch rates for the most recent fishing period relative to projected catch rates from the quantitative stock assessment

Information on the projected catch rates from the quantitative stock assessment were not available to inform the current stock assessment. However, since the stock was estimated to be at around 42% of unfished biomass levels in 2020 and harvesting according to the predicted RBCs should rebuild the stocks towards the target of 48% of unfished biomass, catch rates would be expected to increase over subsequent years. As detailed above, NSW catch rates for Stout Whiting in the ocean prawn trawl sector were relatively stable, with a marginal decrease of 4.2%. Updated catch rate information for the Queensland fleet was not available for this assessment.

- Size and age-structure of the catch

No new data on the size and age-structure of Stout Whiting were available in 2020 due to delays in collection and processing of samples associated with covid-19 lockdowns in NSW and Victoria.

Stock Assessment Result Summary

Biomass status in relation to Limit	Standardised catch-rate analyses in the 2020 Queensland assessment suggested that following a substantial decline between 2010 and 2016, catch rates for the Queensland part of the stock had increased above the long-term average in 2019 and 2020 (Wortmann 2020). Standardised catch rates from the NSW part of the stock (including data up to 2020, this report), have also been above or near the long-term average over the last 3 years and increased to above the long-term average in 2019 and 2020 (for the daily CPUE series in kg per h). The most recent full assessment involving population biomass modelling in 2021, estimated that the current spawning stock biomass of Stout Whiting was at 42% of unfished biomass in 2020 and at the level for maximum sustainable yield (Wortmann and Hall 2021). On the basis of the above evidence, the biomass of the Stout Whiting biological stock is unlikely to be recruitment impaired.
Biomass status in relation to Target	The biomass modelling from 2021 predicted that the stock will recover to 48% of unfished biomass within 3 years if fished at an RBC of 2,018 t for the whole biological stock (Wortmann and Hall 2021).
Fishing mortality in relation to Limit	Results from 2021 Queensland population biomass modelling suggested that current levels of harvest are below that needed to the maintain the biomass at the level for maximum sustainable yield (Wortmann and Hall 2021). On the basis of the above evidence, the current level of fishing mortality is considered unlikely to cause the biomass to become recruitment impaired.
Fishing mortality in relation to Target	Recent and current harvest levels have been below that required to rebuild the stock to the target reference point of 48% of unfished biomass.
Current SAFS stock status	Stout Whiting was assessed as a **sustainable stock** under the SAFS framework in 2020 (Roelofs and Hall 2021).

Fishery interactions

The OTF trawl fishing gears interact with other commercial and non-commercial by-catch marine species, a range of endangered, threatened and/or protected (ETP) species and marine habitats. The OTF share management plan mandates that otter trawl nets must be fitted with at least one BRD of an approved design to reduce the by-catch of small prawns and juvenile fish. Mesh size and other gear restrictions are regulated to increase the target species selectivity of otter trawl and Danish seine nets and cod ends. Research results to date suggest that these measures significantly decrease the levels of by-catch associated with these fishing gears (Broadhurst and

Kennelly 1996; Broadhurst et al. 1996 ; Broadhurst et al. 1997; Broadhurst et al. 1999 ; Broadhurst et al. 2005; Broadhurst et al. 2006).

Interactions with animals protected under the *Environment Protection and Biodiversity Conservation Act* 1999 include marine mammals (dolphins, seals and sea lions), seabirds, some shark species, and seahorses and pipefish (sygnathids). The ETP species that interact with the OTF were subjected to a detailed risk assessment in the environmental impact statement (EIS) for the fishery (NSW DPI 2004). All 11 ETP species identified in the EIS were considered to be at moderate/low or low risk. An updated threat and risk assessment for all components of the NSW marine estate was completed in 2017 (Fletcher and Fisk 2017). The OTF was considered a moderate threat to ETP species along the north coast and a low threat to ETP species along the south coast. Interactions with grey nurse sharks and sygnathids were identified as the main concerns.

Compulsory reporting in commercial logbooks of all interactions with ETP species was mandated for the OTF in 2005 and these are reported annually to the Department of Environment and Energy (NSW DPI 2017). Data on incidental interactions with by-catch, ETP species and associated mortalities were also collected during a recent fish trawl (2014–2016) and prawn trawl (2017–2019) observer surveys.

The majority of available trawl ground in NSW waters is likely to be dominated by sandy habitat with little reef structure, and fishers typically try to avoid high topography, hard, structured habitats to prevent net damage. Large areas within NSW marine parks are closed to trawling and provide areas for habitat protection. The use of bobbins on ground ropes of fish trawl nets is prohibited north of Seal Rocks and the maximum size of bobbins is limited south of Seal Rocks to minimise damage to reef habitats. More information on the potential effects of trawl gears on the soft seabed biota is warranted, as impacts to these less protected habitats are likely to be more significant.

Qualifying Comments

While current stock assessment results indicate no concerns for the current status of the stock, it is pertinent to raise the following issues that should be considered when interpreting these results.

(1) There remains ongoing uncertainty with respect to the species composition of trawl whiting catches in northern and now central NSW, which increases the uncertainty in the data inputs that underpin the current biomass models. Especially given the sudden increase in Stout Whiting catches reported for the fish trawl sector in central NSW in 2020, likely to be in response to greater industry awareness of species reporting issues. Only catches in northern NSW are currently adjusted for species misreporting issues. These discrepancies suggest that a greater proportion of Stout Whiting may have been previously caught in the central region than reported, and there may be implications for the accuracy of the catch series for each species used in the current biomass models.

(2) Current discard rates have not been monitored and may be in excess of the recent observer survey estimates that were used in the biomass modelling. These were collected prior to quota introduction and anecdotal evidence from fishers suggests that discard rates have changed since then.

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Appendix 1

Reliability and Relevance of the Queensland Assessment to assessment of stock status in NSW

The principal source of information available to assess the current spawning stock biomass of Stout Whiting is the most recent Queensland quantitative stock assessment (Wortmann and Hall 2021). This assessment is considered appropriate to inform the determination of stock status for the whole biological stock.

The most recent update of the Queensland quantitative stock assessment occurred in 2021, and used a Stock Synthesis integrated age-structured population dynamics model, similar to that used in the Commonwealth Tier 1 assessments for Eastern School Whiting. The model included total catches, a standardised CPUE index (ocean prawn trawl catch rates) and estimated discard rates from NSW along with more comprehensive data inputs from Queensland spanning the period 1945 to 2020. Unfortunately, size and age data were not available from NSW at the time of the stock assessment, so information from the Queensland commercial fleet was applied to the NSW fleet. This was considered acceptable and size and age structures of Stout Whiting in Queensland are comparable to those in NSW; however, there are plans to ensure that NSW data are included in the next full assessment.

The standardised average commercial catch rates for Stout Whiting in Queensland and NSW waters declined in both jurisdictions from 2010 to 2012, and then show divergent trends (Figs 9 and 10) (Wortmann 2020). Catch rates in Queensland increased in 2013, then decreased until 2016 to below the long-term average and have steadily increased since 2016 to above the long-term average in 2018–2020 (Fig. 9). In contrast, catch rates in NSW increased between 2012 and 2015, then declined for 3 years before increasing rapidly to finish above the long-term average in 2019 (Fig. 10). The catch rate series produced by the Queensland standardisation of the NSW data show similar trends overall to those presented in the current NSW assessment, despite different data and factors being included in each analysis (compare Fig. 10 with Fig. 5). The Queensland standardisation of NSW data includes all prawn trawl, fish trawl and Danish seine records integrated into a single catch rates series and additional standardisation factors.

Figure 9. Annual relative standardised catch rates of Stout Whiting from the Queensland stout whiting fishery (in harvest per boat day scaled to the overall mean catch rate=1). Error bars indicate 95% confidence intervals. Reproduced from Wortmann and Hall (2021).

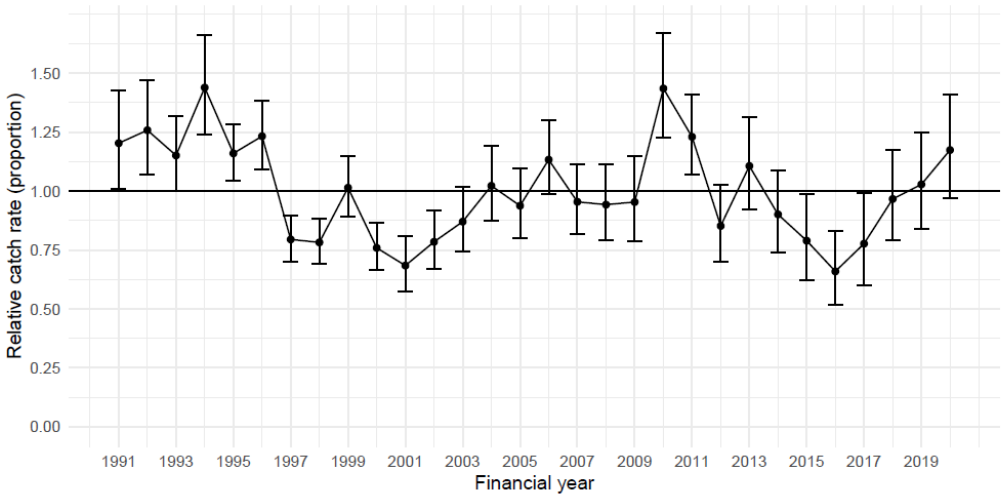

Figure 10. Annual relative standardised catch rates of Stout Whiting from the NSW Ocean Trawl Fishery (in kg per hour trawled scaled to the overall mean catch rate=1). Error bars indicate 95% confidence intervals. Reproduced from Wortmann and Hall (2021).