Tasmanian Seafoods Pty Ltd

Stout whiting (*Sillago robusta*) surveys 2024: Final Report

December 2024

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2024

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anthonyh@tasmanianseafoods.com.au

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Tasmanian Seafoods Pty Ltd

Name:	Anthony Hart
Address:	4/10 East Esplanade
	Smithton
Phone:	03 6452 1275
Email:	anthonyh@tasmanianseafoods.com.au
Web:	www.tasmanianseafoods.com.au

Table of Contents

Executive Summary

A fishery independent survey (FIS) of stout whiting (*Sillago robusta*) stocks in Qld was undertaken in 2024 on the Danish seine vessel, *FV Lilli M*. This was the first time an FIS had been attempted for this species. The vessel was suitable for this work because it has a consistent target area swept, being 1.7 km^2. The area fished was estimated to encompass 27% (3,336 km^2) of the total waters of the T4 fishery (12,328 km^2). A stratified survey design with systematic allocation of sites was adopted to survey this area fished. There were 8 strata encompassing all waters from north Fraser Island to the Qld/NSW border. Total area surveyed was 75 sites, at 1.7 km^2 per site, which is 128 km^2. Because of the sampling design, this 128 km^2 area is an unbiased representation of the optimal habitat for stout whiting, and results can be scaled up to the total area.

In addition to the broad survey, 11 fishing efficiency and productivity experiments were also undertaken at control sites, which were not subject to commercial fishing. Whiting stocks at these sites were subjected to repeated fishing (5 times per site) at least twice per year. The objective was to determine the fishing efficiency of the Danish seine, and the recovery rate of whiting subject to intensive fishing.

Experiments established that, based on an estimated fishing efficiency (*q*) of 35% or 0.35, the catch rate of stout whiting varied greatly between Frazer Island (~159 kg per km^2), Gold Coast (~2004 kg per km^2), and Sunshine Coast stocks (~28 kg per km^2). Area of the fishery also greatly differed between these stocks, being 1204 km^2 for the Fraser Island stocks, 222 km^2 for the Gold Coast stocks, and 1937 km^2 for the Sunshine Coast stocks. A big contrast in size-frequency was also observed, with Frazer Island stocks comprised of newly recruited Age 1 whiting, plus a residual stock of age 3 and 4 adults. Gold Coast stocks were primarily of age 2 and 3 whiting, in far greater numbers. Sunshine Coast size-frequency was all size and age classes from 50mm to 230 mm whiting,

Estimations of biomass and sustainable harvest levels were obtained for all stocks using a data set of 75 sites. The median total biomass (all stocks combined) was 2143 tonnes (95% cl: 1524 – 2990t). Median sustainable harvest level (SHL) for the all stocks combined was 723 tonnes. Median estimates of total biomass were 570 tonnes for Fraser Island, 174 tonnes for the Sunshine Coast, and 1320 tonnes for Gold Coast stocks. These translated into an overall sustainable harvest estimate of 723 tonnes. The % allocation between each area was 20% Frazer Island, 10% Sunshine Coast and 70% Gold Coast.

The current goal of Tasmanian Seafoods is to fast track the rebuilding of stocks to maximise catch rates and ensure sustainability. As a result of this, the conservative harvest strategy developed for stout whiting in 2025 specifies catches that are only 40% of the available estimated Sustainable Harvest Level (SHL) of 723 tonnes. Catch targets were 300 t overall, with 50 t from Frazer Island, 25 t from the Sunshine Coast, and 225 t from the Gold Coast.

1.0 Introduction

Stout whiting (*Sillago robusta*) is the principal target species for Tasmanian Seafoods (TSF) quota held in the Queensland Commercial Trawl Fishery (Fin Fish) (CTFFF). The CTFFF fishery is known as the T4 fishery and it targets stout whiting in water depths of 20–50 fathoms between Sandy Cape and the Queensland-New South Wales border using one Danish seine vessel, the *Lilli M*. Other species are also caught, however in this report we are primarily concerned with *S. robusta*. Area of the T4 fishery is defined in Figure 1.1.

The *Sillago robusta* fishery authorizations are a significant asset to TSF. The formal estimates of sustainable harvest and stock biomass for this species arise out of a historical reconstruction of catch levels, catch rates, and age structure data arising from the commercial fishery and fishery dependent sampling (Wortmann and Hall, 2021). Both surplus production and age-structured population models have been used but rely on many assumptions which cannot be verified. One of these is the estimation of discard mortality by prawn trawlers. This mortality is estimated to be as high as the commercial catch (Wortmann and Hall, 2020).

Formal stock assessments by the Qld and NSW government in 2020 estimated that spawning biomass was 42% of unfished (Wortmann and Hall, 2020). They also recommended a biological sustainable harvest in the 2021 fishing year of 2018 t for all sectors and waters. A current status update in 2022 by Sumpter (2022) confirmed that biomass was trending upwards towards a target biomass of 48% of unfished and recommended an increased quota in Qld of 1393 tonnes in 2022.

Darvin Hansen presented a Qld Whiting Fishing Plan in September 2023 that proposed a depletion in the w36 Zone (Caloundra waters) from 1990 to 2005, a recovery of the effort to 2010, and then a shifting of the effort from the north to the south zone, post 2010, as the zone W38 became accessible. The issue of whiting movement (or stock delineation) was also raised, with the catch data suggesting whiting migration between areas may not be as high as the “one-stock” definition implies.

To reduce the uncertainty in stock status and present another, fishery independent source of data, a survey of the Qld stocks using the “*Lilli M*” Danish seiner was recommended for 2024. The rationale for using this vessel is that, as well as being the only vessel currently fishing the T4 stock, its method of fishing is standardised. In effect, for each trawl or seine, the vessel covers the same area, namely 1.7 km^2.

This report is a final report and encompasses 75 survey sites in the fishery. It replaces the interim report, which was based on the 31 survey sites completed between February and June 2024.

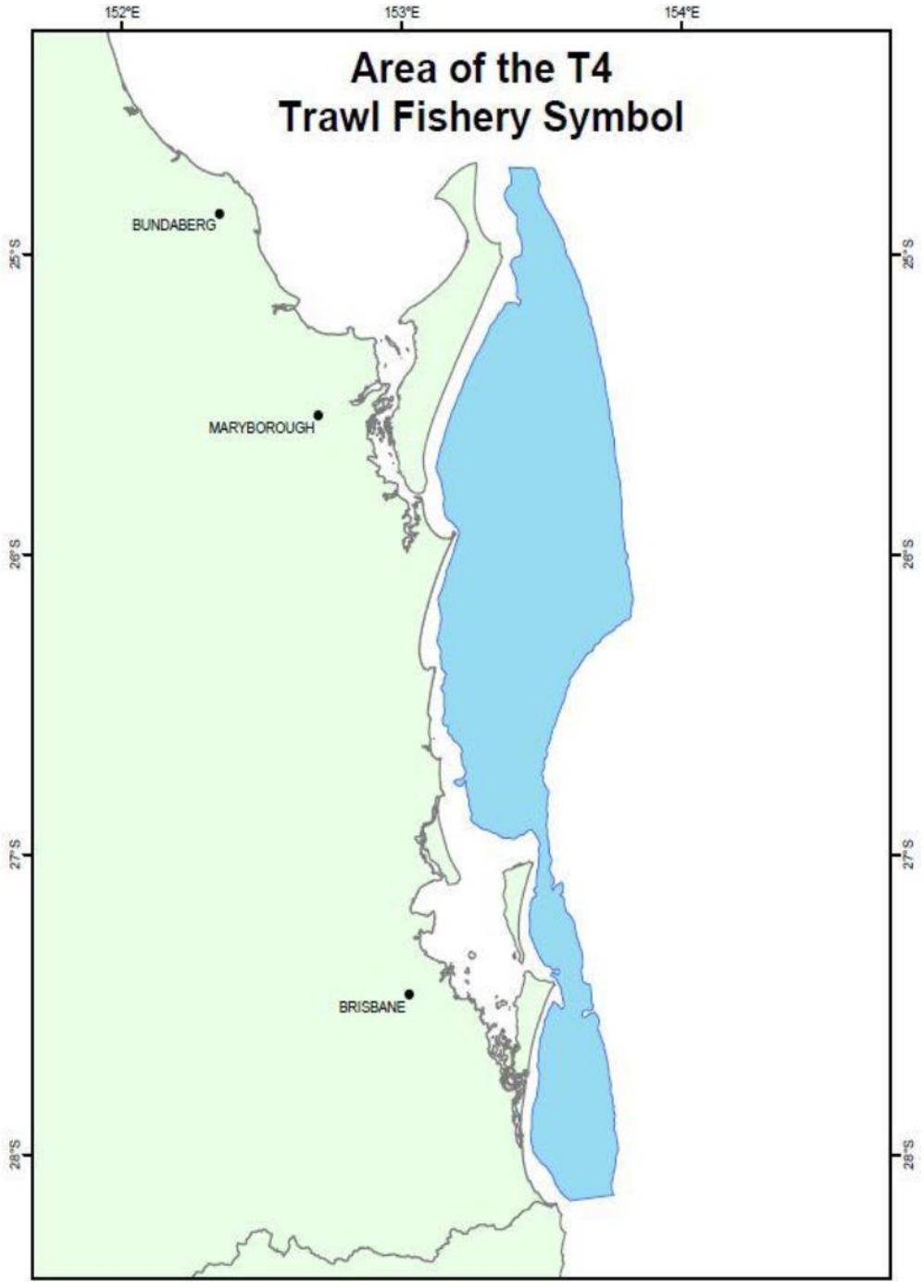


Figure 1.1: Fishing area of the Queensland Commercial Trawl Fishery (Fin Fish) CTFFF (T4) Fishery.

2.0 Survey methods

2.1 Defining the fished area

Stout whiting do not occur evenly across the area of the T4 fishery. To estimate the biomass of stout whiting in the fished areas, the key fishing grounds were defined.

The dark blue areas in Figure 2.1 cover the whole of the T4 trawl area.

This was estimated to be 3,954 nm^2 or 12,328 km^2.

In comparison, the yellow shaded areas in Figure 2.1 are the areas that are currently, or traditionally fished by the CTFFF fishery. These areas can be assumed to be the optimum stout whiting habitat.

Stout whiting habitat was estimated to be 3,336 km^2.

This is 27% of the total habitat in the T4 fishery.

Figure 2.1: Whole fishery vs fished habitat

2.2 Fishery Independent Survey (FIS) design and map.

A stratified survey design with systematic site placement was adopted for the FIS. There were 8 identified strata (Figure 2.2).

The red, orange, and brown polygons are the areas of fished habitat identified by the two experienced masters of the *Lilli M* vessel. These fishers had a combined experience more than 50 years fishing for stout whiting.

Overall, the number of survey sites for each strata was as follows

Grid w33 (Strata 1): 16 sites.

Grid w34 (Strata 2): 14 sites.

Grid w35 (Strata 3): 20 sites.

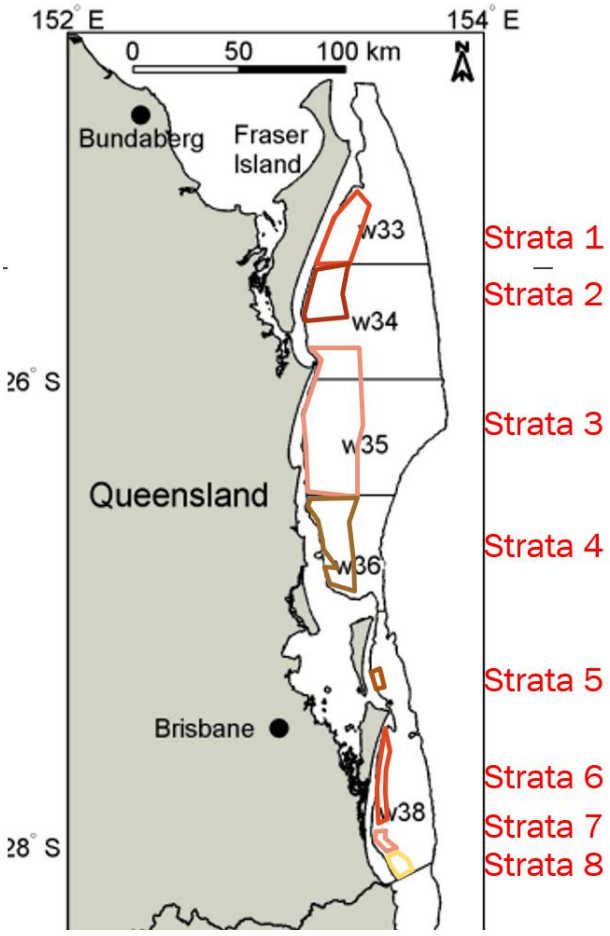
Grid w36 (Strata 4): 11 sites.

Grid w38 (Strata 5-8): 14 sites.

TOTAL: 75 Sites

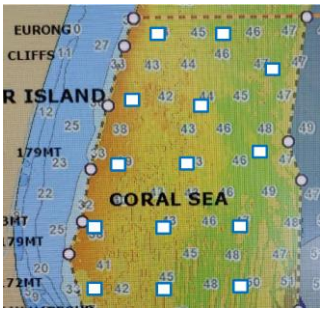
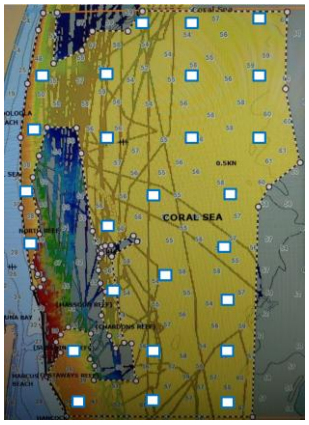
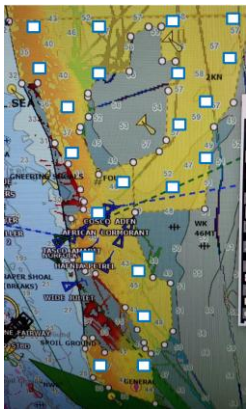
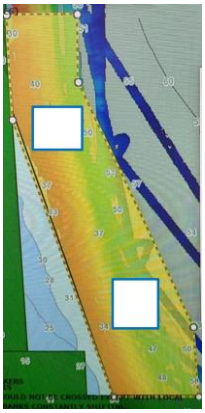
Locations of sites and spatial area within each strata is shown in Figure 2.3.

Figure 2.2: Statistical catch and effort grids (w33 to w38) and the 8 survey strata within these.



2.3 Strata areas and survey sites

Figure 2.3: Spatial area of strata (yellow shading) and location of survey sites (white squares) within them.

<table>
<tr>
<td>Strata 1 (483 km^2)
  </td>
<td>Strata 2 (721 km^2)
  </td>
<td>Strata 3 (1468 km^2)
  </td>
</tr>
<tr>
<td>Strata 4 (469 km^2)
  </td>
<td>Strata 5 (14.6 km^2)
  </td>
<td>Strata 6 (168 km^2)
  </td>
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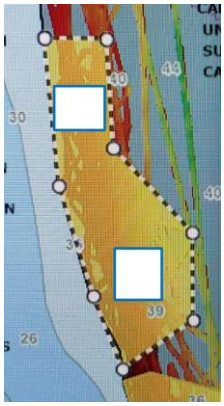
<tr>
<td>Strata 7 (16.4 km^2)
  </td>
<td>Strata 8 (23.3 km^2)
  </td>
<td></td>
</tr>
</table>

Total area surveyed was 75 sites, at 1.7 km^2 per site, which is 128 km^2. As a consequence of the sampling design, this 128 km^2 area is assumed to be an unbiased representation of the optimal habitat for stout whiting.

2.4 Timing of FIS in relation to prawn fishing

Prawn trawling vessels share the same space as the Danish seine whiting fishery in some areas, and consequently the prawn trawlers harvest stout whiting as a by-catch (Wortmann and Hall, 2021). The sharing of the same space is achieved by temporal separation of the fishing activities during each quota year. For example, prawn trawlers work on the Gold Coast stocks during December to March, while the Danish seiner targets stout whiting on the Gold Coast during April to August. It has been estimated that 50% of the total stout whiting catch is caught by prawn trawlers (Wortmann and Hall, 2021). Thus, any estimation of total abundance must take this into account.

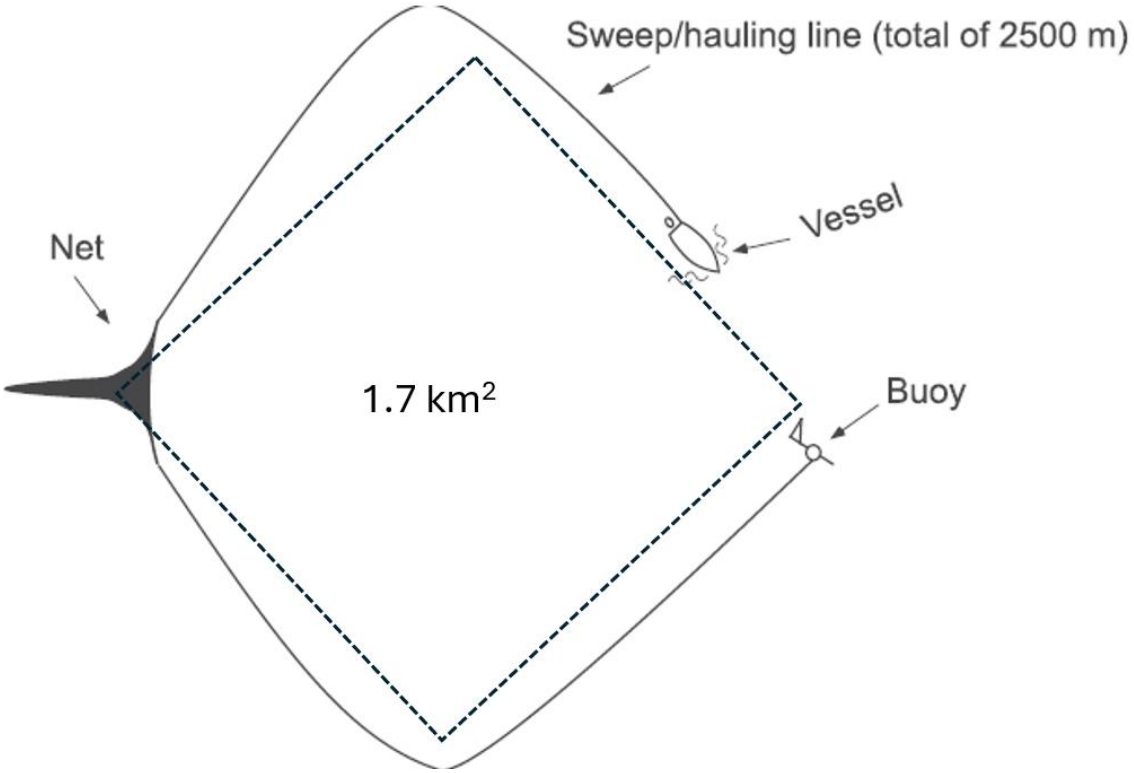
Within the Gold Coast region, the FIS voyages were undertaken in May and early June, after the prawn trawling fleet had left the grounds. Thus the estimates of biomass and SHL which arise from the FIS on the Gold Coast apply to what's left after the prawn trawling fleet has caught their portion of the total catch. It is not inclusive of the harvest by the prawn fleet.

2.5 Deploying the seine

At each survey site the seine was deployed and retrieved in the diamond shape shown in Figure 2.4. The seine encircles a target area, and the net is retrieved across the encircled area (1.7 km^2) at a slow speed (~0.9 ms^{-1}; Broadhurst and Millar, 2023). The continually hauled ropes vibrate over the habitat, setting up sand clouds and herding the fish into the catching path of the seine.

On occasion, wind and sea conditions altered the search area for the vessel. The actual area searched was recorded for each of these. Range in area searched varied from 1.5 to 1.7 km^2.

Figure 2.4: Schematic diagram of the deploying and retrieving operation of the Danish seine on the Lilli M. Area covered by each deployment is 1.7 km^2. Figure adapted from Broadhurst and Millar (2023).



2.6 Estimating the abundance and length of *Sillago robusta*

The number of stout whiting that were caught at each sampling site were counted, weighed, and a sample of 50 individuals measured for length. The challenge was to understand what % of the total available biomass was caught. This was accomplished by gear efficiency experiments.

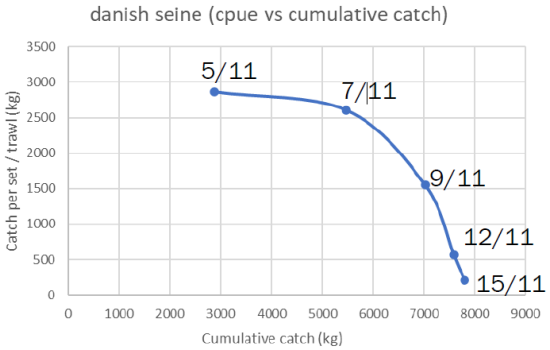
2.6.1 *Gear efficiency experiments (November 2023).*

Between November 2023 and September 2024, 11 replicate 1.7 km^2 areas of stock were repeatedly fished between 4 and 5 times over a ten-day period, to understand the depletion effect on the localised stock and calculate the gear efficiency. Areas fished were in Frazer Island, Sunshine Coast and Gold Coast stocks.

2.6.2 *Gear efficiency results – Experiment 1*

Gear efficiency for the Danish seine was calculated using a traditional depletion experiment, by estimating the biomass from the declining behaviour of the catch per unit effort (CPUE). From that biomass estimation, the % caught as a function of the total biomass can be estimated. Total biomass is defined as the cumulative catch when the CPUE is 0. This is the intercept of the CPUE line on the x-axis. Detailed below is the first experiment, followed by a summary of all the experiments.

Figure 2.5: Catch rate as a function of cumulative catch of stout whiting over a 10-day period in November 2023

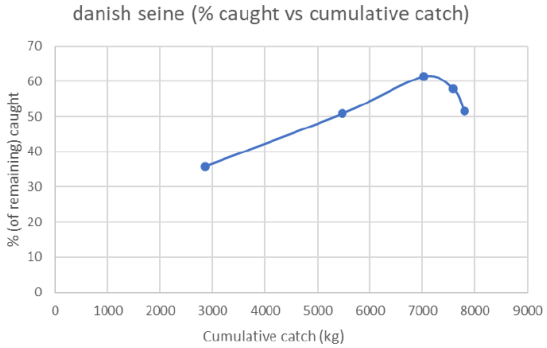


In experiment one, the quantity of fish caught over each consecutive seine declined from 3400 kg to 150 kg (Figure 2.5).

Catch rates did not decline at a linear rate. They exhibited hyperstability for the first 2 seines, before declining rapidly after that.

Using the linear decline observed between 9th November and 15th November, the estimated total biomass was 8000 kg in experiment 1 (Figure 2.5).

Figure 2.6: % caught as a function of cumulative catch of stout whiting over a 10-day period in November 2023



The % of fish caught in the first sweep of experiment 1 was 35% of the 8000 kg total (Figure 2.6). This increased to 50 and 60% of the remaining biomass in the 2nd and 3rd sweeps (Figure 2.6) and remained high before the final depletion at 50%.

Based on these results, a conversion factor of 35% (q = 0.35) was estimated for Experiment 1. The equation to convert the survey abundance (n) into biomass is Biomass = n/q.

2.6.3 *Gear efficiency results – all experiments*

Eleven efficiency experiments yielded results (Figure 2.7). The average CPUE on the first pass was 4300kg, declining to an average of 1000kg on the fourth pass (Figure 2.7). This equated to an overall gear efficiency average of 30% in the first seine, followed by 40% in the 2nd and 3rd seines (Figure 2.8). An interesting response observed was that in 4 of the 7 experiments, the 2nd seine yielded a higher catch than the first seine. It is hypothesised that this is evidence of a behavioural response by the fish, which move in quickly to seek their prey, such as polychaete worms, which have been exposed by the disturbed sediments.

Figure 2.7: CPUE (kg per seine) vs cumulative catch for all 11 fishing efficiency experiments.

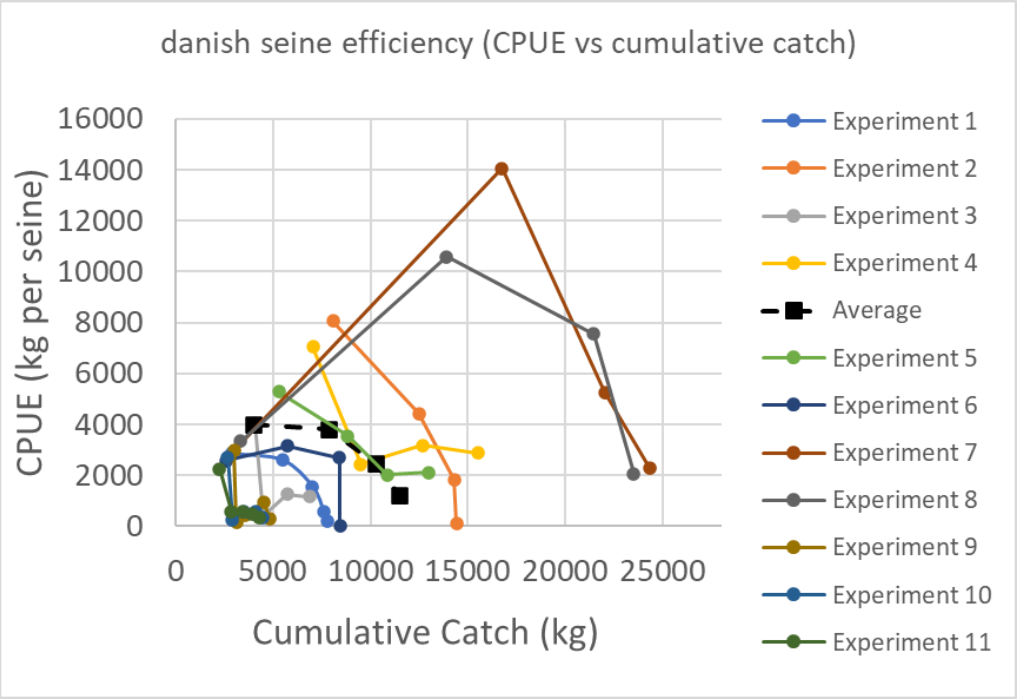
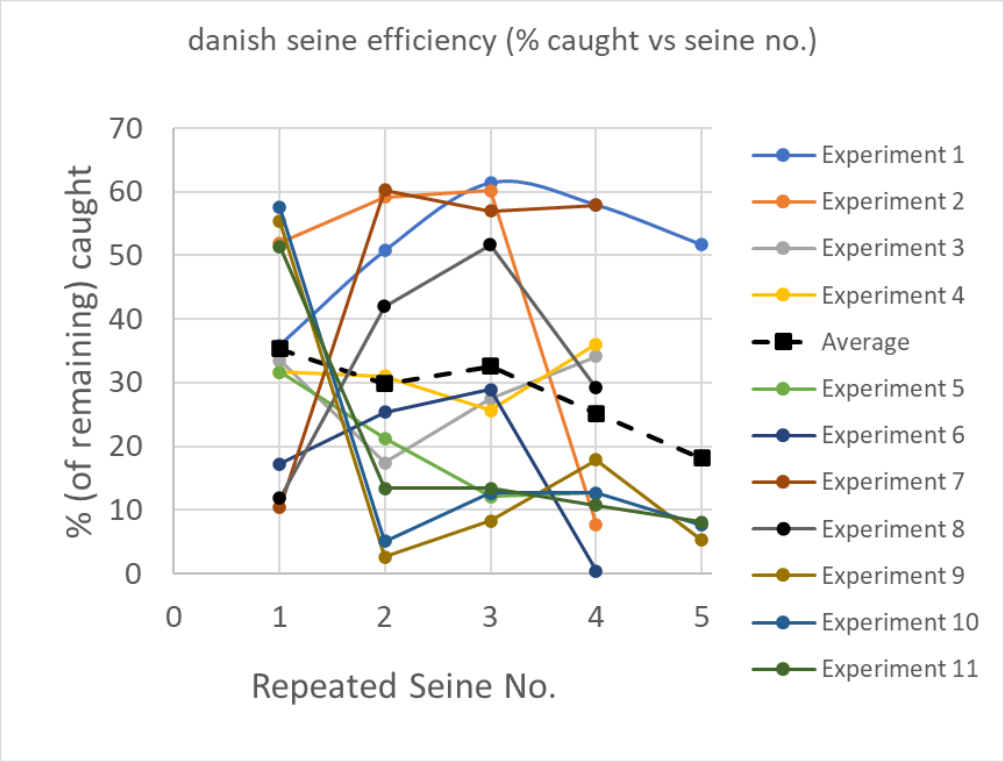


Figure 2.8: % of total biomass caught with each seine in the gear efficiency experiments



2.7 Procedure to estimate biomass

The formula for estimating biomass per km^2 for each sample site is as follows:

D_i (kg per km^2) = [(N_i x W) / q] / A_i

Where D_i is the biomass density for each site, N_i = number of boxes of whiting caught at site i, W = average weight of a box (23.9 kg), q is the fishing efficiency (30% or 0.3) and A_i = area covered by the seine at site i (usually 1.7 km^2).

A total of 75 estimates of D_i were available for analysis.

The estimate of total biomass (B) was derived from a resampling with replacement procedure as follows:

(1) Sample n random estimates of D_i for each strata, where n = no. of sites

(2) Calculate the median D_i to obtain a random estimate of mean biomass per km^2 (Dt)

(3) Estimate total population biomass (B) using the following equation: B = Dt x T, where T is the total area (km^2) of the strata.

(4) Repeat steps (1) to (3) for 10,000 times.

(5) Calculate the median and confidence limits of the 10,000 estimates of B.

The resampling procedure was implemented in Microsoft Excel™.

2.8 Procedure to estimate sustainable harvest level

Sustainable Harvest Level (SHL) is estimated with the following formula, using the data obtained from the resampling procedure (section 2.7).

SHL = 2/3 x M x B

Where M is the natural mortality rate (0.7 instantaneous or 0.5 (50%) per year), and B is the biomass for the target strata

The instantaneous natural mortality rate of M = 0.7 was obtained from Wortmann and Hall (2021).

3.0 Results

3.1 Fraser Island (Grids w33 and w34)

Results from Frazer Island are based on a total of 31 sites surveyed in Grids w33 and w34.

Figure 3.1: Probability distribution of Frazer Island biomass (Grids w33 and w34).

The median estimate of Frazer Island biomass was 570 tonnes (Figure 3.1).

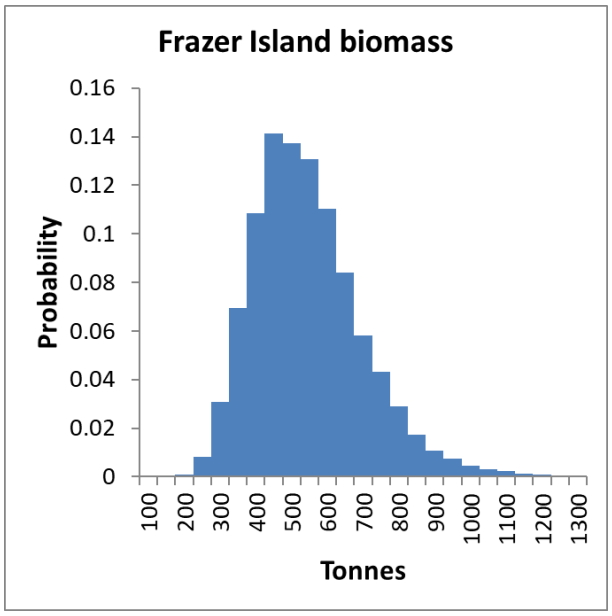


Figure 3.2: Probability distribution of Frazer Island sustainable harvest level (Grids w33 and w34).

The median estimate of Frazer Island sustainable harvest level was 193 tonnes (Figure 3.2).

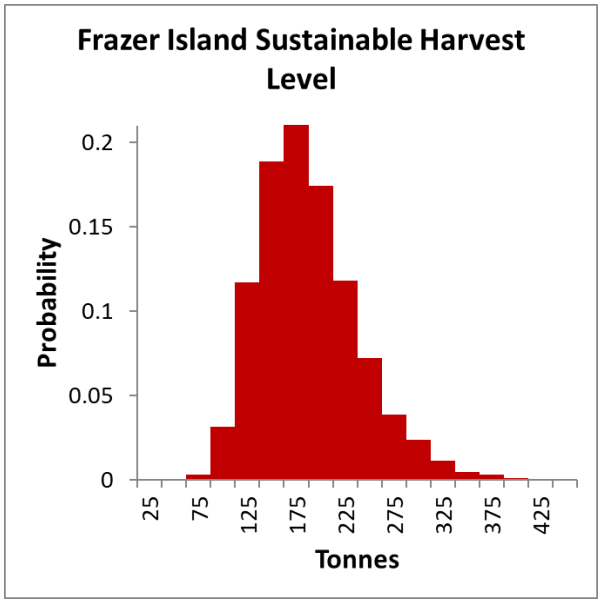
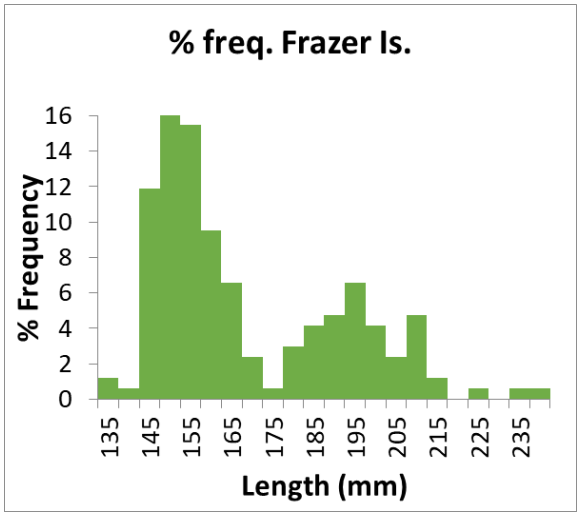


Figure 3.3: Length distribution of Frazer Island stout whiting (Grids w33 and w34).



The median estimate of Frazer Island size distribution of stout whiting was 158 mm (Figure 3.3).

The twin modes of the distribution suggest a missing age class between 170 to 180 mm. The growth data indicates this would be the age 2 year class.

3.2 Sunshine Coast (Grid w35 and w36)

Results from the Sunshine Coast are based on a total of 26 sites surveyed in Grids w35 and w36

Figure 3.4: Probability distribution of Middle Grounds biomass (Grids w35 and w36).

The median estimate of Sunshine Coast biomass was 172 tonnes (Figure 3.1).

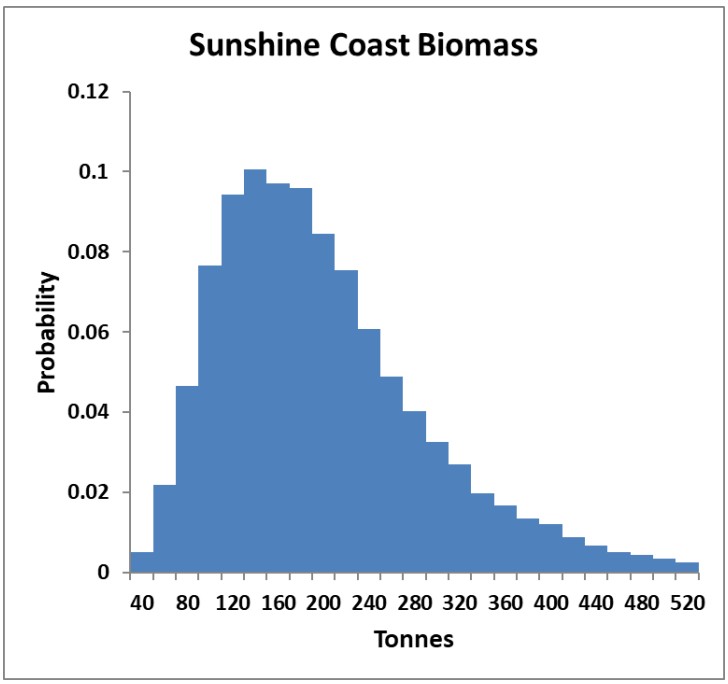


Figure 3.5: Probability distribution of Middle Grounds sustainable harvest level (Grids w35 and w36).

The median estimate of Sunshine Coast sustainable harvest level was 60 tonnes (Figure 3.2).

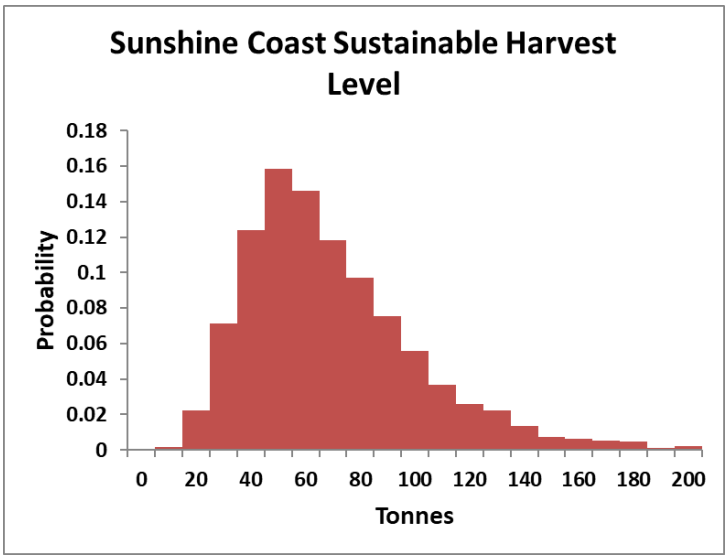
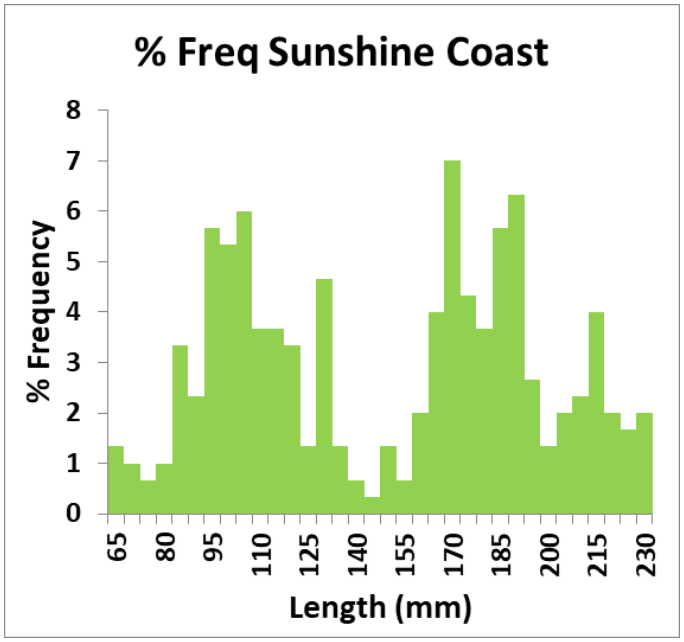


Figure 3.6: Length distribution of Sunshine stout whiting (Grids w33 and w34).

The mean estimate of Sunshine Coast size distribution of stout whiting was 154 mm (Figure 3.3).



3.3 Gold Coast (Grid w38)

Results from Gold Coast are based on a total of 14 sites surveyed in Grid w38.

Figure 3.7: Probability distribution of Gold Coast biomass (Grid w38).

The median estimate of Gold Coast biomass was 1322 tonnes (Figure 3.7).

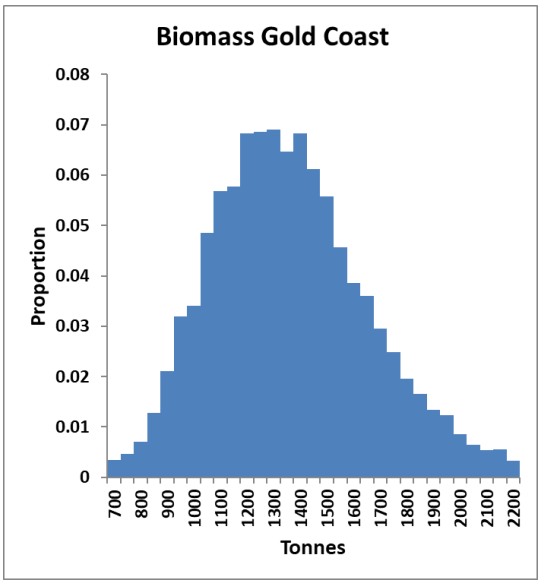
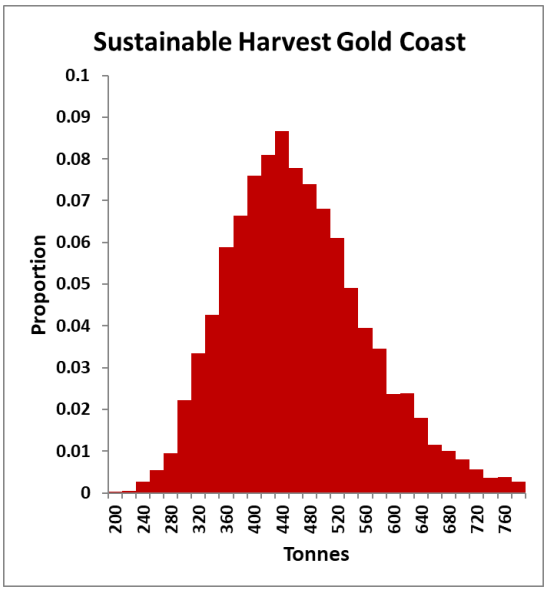


Figure 3.8: Probability distribution of Gold Coast sustainable harvest level (Grid w38).

The median estimate of Gold Coast sustainable harvest level was 446 tonnes (Figure 3.8).

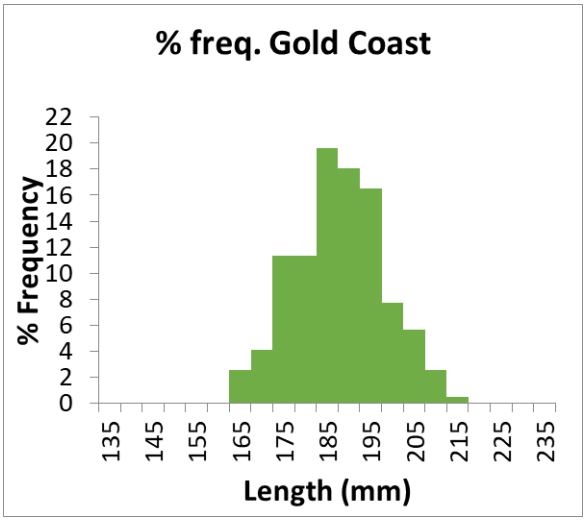


The median estimate of Gold Coast size distribution of stout whiting was 190 mm (Figure 3.9).

The single mode at 190 mm supports the hypothesis that the fishery is primarily based on age 2 and age 3 fish.

This length frequency is different from the Frazer Island length frequency. Few fish less than age 2 were found in the Gold coast samples.

Figure 3.9: Length distribution of of Gold Coast whiting (Grid w38)



3.4 Comparison of Frazer Island, Sunshine Coast and Gold Coast stocks

3.4.1 *Catch rates (kg per km^2) and area of habitat (km^2).*

Figure 3.10: Comparison of cpue between the Frazer Island, Sunshine Coast, and Gold Coast stocks.

Catch rates in the Gold Coast area were an order of magnitude greater than in the Frazer Island and Sunshine Coast areas (Figure 3.10). This indicates a far higher abundance of stout whiting.

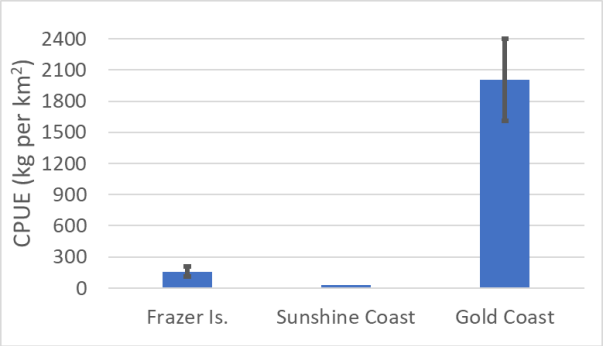
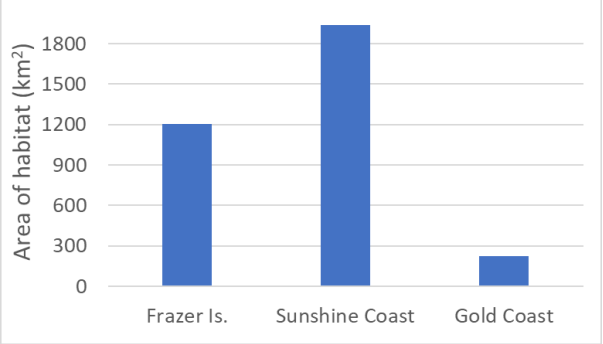


Figure 3.11: Comparison of area of habitat between the Frazer Island, Sunshine Coast and Gold Coast stocks

Area of habitat in the Frazer Island and Sunshine Coast fisheries was 6 to 9 times greater than in the Gold Coast fishery area (Figure 3.10). This indicates a far higher concentration of stout whiting on the Gold Coast.



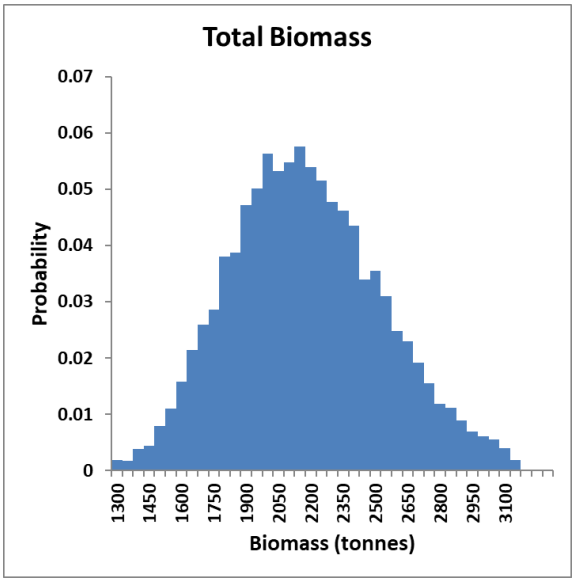
3.5 Total biomass and sustainable harvest level (SHL)

The median total biomass (all stocks combined) was 2143 tonnes. The lower 95% confidence limit estimate for biomass was 1524 tonnes, and the upper 95% confidence limit was 2990 tonnes (Figure 3.12a).

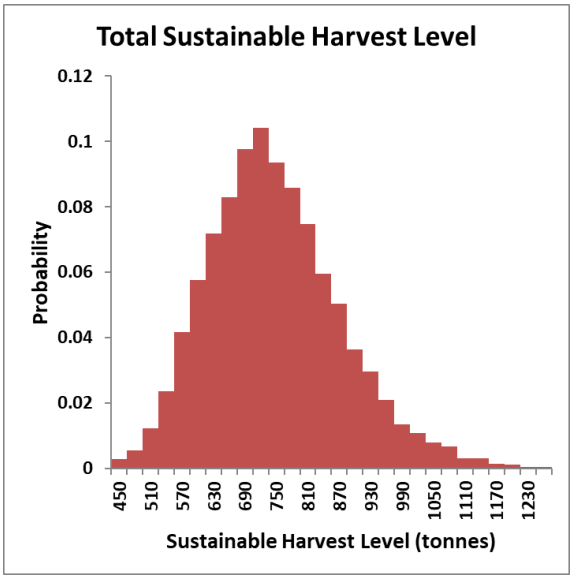
The median sustainable harvest level (SHL) for the all stocks combined was 723 tonnes. The lower 95% confidence limit estimate for the SHL was 514 tonnes, and the upper 95% confidence limit was 1008 tonnes (Figure 3.12b).

Figure 3.12: Total biomass (a) and sustainable harvest level (b) for the entire Qld stock of stout whiting

(a)



(b)



3.6 Division of harvest between catching sectors

Traditionally, the stout whiting resource has been “shared” between the prawn trawl sector, where it is discarded, and the CTFFF (Commercial Trawl Fishery (Fin Fish) where it is retained. Estimates of the discard of stout whiting from the prawn trawl fishery are a similar tonnage to the catch by the CTFFF (Wortmann and Hall, 2021), thus there has been a 50:50 allocation between the CTFFF and the prawn trawl fleet.

In the Gold Coast stocks, it has already been established that the FIS surveys occurred after the prawn fishing fleet had taken their share (section 2.4). Thus, the estimated sustainable harvest from the Gold Coast stocks will be the total amount estimated. In other areas that the CTFFF fishes, it gets allocated half of the SHL. There is also likely to be a big difference in the spatial area encompassed by the prawn fleet compared to the surveys made in this study.

3.7 Comparison with existing estimates of Sustainable Harvest Level.

Wortmann and Hall (2021) calculated that the maximum sustainable yield (MSY) occurs at 42% of unfished biomass and is 3259 tonnes. This estimate includes both Queensland and New South Wales commercial fishing sectors and the bycatch from the Queensland prawn trawl fishing sector.

To build spawning biomass to the 60% target reference point, Wortmann and Hall (2021) proposed a recommended biological catch (RBC) of 2018 tonnes, with small increases each year up to 2800 t in the year 2030. The estimates from this study are well within the targets recommended by Wortmann and Hall (2021)

3.8 Limitations to the current FIS design

The main limitation is that the surveys were focused on areas that could be accessed by the vessel that is licensed in the T4 fishery. There are, however, a number of areas of substantial stock of stout whiting that are closed to fishing, as detailed in section 3.9. This includes Marine Parks in the Fraser Island and the Gold Coast sectors. It is likely that these areas make up more than 30% of the total habitat for stout whiting. Thus, the estimated total biomass of 1976 t from this study is an underestimate of the total breeding stock biomass.

3.9 Whiting stock in marine parks and other prohibited zones

The key quantity to be conserved in a fishery is the spawning stock. Within and adjacent to the boundaries of the T4 fishery which the CTFFF is permitted to access are considerable areas of marine park and other “no fishing” zones. Due to their proximity, these areas are likely to protect considerable portions of the spawning stock as well as provide areas of sanctuary for juveniles in shallow waters of the fishery.

Table 3.1 provides an estimate of the total area of “no fishing” zones immediately adjacent to each survey strata in the T4 fishery. It is estimated that that a total of 1,009 km^2 of prime stout whiting habitat has been protected. This amounts to 30% of the total fished area of 3,336 km^2. It is imperative that this “protected biomass” is accounted for in any estimation of the total biomass.

Table 3.1. Location and details for protected "no fishing" zones (AP = Area Protected) immediately adjacent to the T4 fishing grounds accessed by the CTFFF fishery

Grid	*Strata*	*Description*	*Area (km^2)*
W33	1	Protected area (Marine Park) Fraser Island North	423
W38	5	Moreton Island Marine Park	355
W38	6	Gold Coast Marine Park (inshore)	187
W38	7 & 8	Prohibition on fishing less than 20 fathoms	43.5
		TOTAL	1,009

3.10 Scaling between Harvestable and Total Biomass

In this report, the estimates of biomass are derived from areas that could be fished by a commercial fishing vessel. These biomass estimates are defined as "Harvestable biomass". Total biomass incudes these areas, plus areas that have been protected and cannot be fished. Estimates of total biomass are arrived at by scaling up from harvest to total biomass. This correction factor is derived by dividing the area fished (AF - 3,336 km^2) by the total area (TA). TA = AF + AP (Area Protected) = 3,336 km^2 + 1,009 km^2 = 4,345 km^2. From this, AF/TA = 0.77. It is suggested that this scale factor be used to arrive at a total biomass as an input value for models of the population dynamics of the fishery, such as those detailed by Wortmann and Hall (2021).

4.0 Final discussion and conclusions

4.1 Harvest strategy meeting

A meeting was held to examine the data from the FIS and use it to determine a fishing strategy for 2025. The meeting proposed conservative fishing strategies to promote rebuilding of stocks, and a catch allocation between 3 the main fishing areas. These areas are Fraser Island, Sunshine Coast, and Gold Coast. The % allocation between each area was 20% Frazer Island (grids w33, w34), 10% Sunshine Coast (grids w35, w36) and 70% Gold Coast (grid w38).

4.2 Harvest strategy 2025

Internal discussions between the Managing Director, Darvin Hansen, Brendan Kelleher and Craig Brotherston of B.P. KELLEHER FISHING SERVICES PTY LTD, and Anthony Hart, Fisheries Scientist, were had to decide on the harvest strategy for 2025. Below is an email that from the managing director which summarizes the position taken by the company for the 2025 calender yea, namely a catch target of 300 t, spread between the 3 spatial areas according to the % allocation split.

From: Darvin Hansen <darvinh@tasmanianseafoods.com.au>
Sent: Tuesday, 5 November 2024 2:16 PM
To: Anthony Hart <AnthonyH@tasmanianseafoods.com.au>
Cc: Brett Russell <brettr@tasmanianseafoods.com.au>
Subject: Stout Whiting discussion

Hi Anthony,

I'm suggesting we set the following internal catch limits for each strata, in the orange "Catch Target". Total of 300t for the QLD Stout Whiting fishery. This will give between 41-59% of the recruitment going back into rebuilding the stock, which seems about right given the level of depletion we've had in previous years. (Last year was 205t.)

For reference, the SHL = Sustainable Harvest Level, and this is basically equivalent to the concept of a current "Sustainable Yield", i.e. a harvest fraction at which the stock is exactly at equilibrium, neither increasing nor decreasing.

We will also aim to be able to calculate SHL estimates, as done in your report Anthony, on an annual basis, so that we can see how things are progressing.

It seems like, given the minimal stocks that can be caught in W35, and the proximity to the shore in that area, that there is absolutely minimal migration of fish between the Northern and the Southern areas. And that there are likely multiple schools within a strata.

My feeling is that there is potentially more to gain in terms of total biomass, in Frazer and Sunshine, than in GC, so we are rebuilding faster in those areas. Craig seemed to think we caught at the wrong time of year, given much higher catches at another part of the year. I guess we'll see on that. I look forward to any zonal catch data extending back in history, noting there may be a long historical catch of whiting in the gold coast not recorded in the T4 history, going back to the 1990s. This will give us a better handle on where the current SHL is wrt an MSY or PGY estimate, and correspondingly what % of SHL to set the catch at.

DMH Suggested					
	lower 95%	Median	Catch Target	% of SHL	
				Lower 95	Median
Fraser Island	103	145	50	48.5%	34.5%
Sunshine Coast	51	72	25	49.0%	34.7%
Gold Coast	360	506	225	62.5%	44.5%
Total	**514**	**723**	**300**	**58.4%**	**41.5%**

Please give serious thought to how we can ensure that any given school of whiting is only likely to being fished at somewhere below the SHL level. i.e. we never overfish a school, exerting something of a light tax on each school. On average, it seems likely that we are taking less than half the SHL for a given strata, but not sure what that is on the school level. This approach should also help reduce the impact of any Fishery-Induced Evolution (FIE) that could reduce the efficacy of Danish Seining or influence fish size.

Over time we need to consider how to ensure there are Whiting exclusion devices in the prawn fleet and that they are maximally effective. It seems cameras on prawn fleet being mandatory will help bring that about, but to the extent we can get success here, the SHL will increase for us.

Lastly, let's work towards compliance with MSC standards, aiming for MSC certification as soon as feasible.

In your reports on this topic, please make it clear that this is essentially a Tasmanian Seafoods "Sandbox" in terms of an experiment to fast track stock rebuilding. It is a significant investment given we are harvesting way below what we anticipated to make the venture profitable initially, but that we are "eating our own cooking" in terms of sustainable, long-term optimal fishery management.

Thanks, and I look forward to your insights.

Best regards,

Darvin Hansen, BScEE

Managing Director, Tasmanian Seafoods Group

P: 61 419 522 261

5.0 References

Broadhurst MK, Millar RB (2023). Improved size selection and estimated at-vessel mortalities for an Australian whiting (*Sillago* spp.) boat seine. *Fisheries Research* , 266: 1-9.

Sumpter LI (2022). Total allowable commercial catch review for Queensland stout whiting (*Sillago robusta*), with data to December 2021. Department of Agriculture and Fisheries, Queensland, Australia

Wortmann J, Hall K (2021). Stock assessment of stout whiting (*Sillago robusta*) in eastern Australia, 2021. Department of Agriculture and Fisheries, Queensland, Australia.