

### Assessment Authors and Year

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### Introduction

The purpose of this document is to provide information relevant to the TAE determinations for the NSW Estuary General Meshing fishery. It uses data from the 5 most recent complete fishing seasons (2018/19 – 2022/23) and summarises key catch and quota usage patterns for the overall state and each region.

Separate species-specific stock assessments have been conducted for several key species and these are referenced where relevant with key outcomes summarised in this document to help provide context to the catch composition data.

Provision of an assessment that directly informs determinations of regional TAEs for the Meshing fishery is particularly complex because:

- (i) the fishery is a multi-species fishery;
- (ii) the fishery interacts with other commercial and recreational fisheries in NSW and adjoining jurisdictions;
- (iii) there are no formal resource-sharing arrangements among these interacting fisheries;
- (iv) meshing occurs in multiple NSW estuaries with connectivity among these estuaries and adjacent inshore waters poorly understood;
- (v) there is currently no fishery-level harvest strategy for the Estuary General Meshing fishery. Neither are there any species-specific harvest strategies for the principal species taken in this fishery. Note, however, that a harvest strategy for Mulloway is in the final stage of development;
- (vi) detailed models of stock and fishery dynamics for key species are in the early stages of development and are not yet of a standard for inclusion in a formal assessment.

These complexities justify the approach taken in this assessment, noting that this is the first time that an assessment of the Estuary General Meshing fishery has been provided to the Total Allowable Fishing Committee (TAFC) for determination of TAEs.

Despite the absence of specific harvest strategies relevant to the meshing fishery, it is relevant to note that the *NSW Harvest Strategy Policy* and *NSW Harvest Strategy Guidelines* indicate the broad objectives that will eventually apply across fisheries under NSW jurisdiction. Key design elements for harvest strategies that are relevant to the Meshing fishery include:

- (i) maintenance of stocks above a biological limit reference point (where risk to the stock is regarded as unacceptable). Where information to support selection of a suitable stock-specific biological limit reference point is not available, the default should be 20% of the unfished biomass;

- (ii) maintenance of stocks, on average, at a target biological reference level that maximises long-term yield (eg. MSY, MEY, ...) from a fishery;
- (iii) in multi-species fisheries, it may be necessary to manage individual stocks to different target reference levels to avoid limit reference points for all species and enable the benefits from the multi-species fishery to be maximised over the longer term.

## Catch

A large proportion of the harvest in the Estuary General Meshing endorsement is made up of only a few species. The following 6 species make up 90% of the harvested weight: Sea Mullet, Luderick, Yellowfin Bream, Dusky Flathead, Mulloway and Sand Whiting. Sea Mullet alone make up over 50% of the harvest. In total over the last 5 fishing seasons, 198 taxa have been reported in catch returns although many are only reported in very small quantities (130 taxa with <100kg annual average catch and 79 taxa with < 10kg annual average catch). Table 1 shows all taxa with average reporting landings of >1t over the last 5 fishing seasons (n = 30) as well as the current statuses as assessed under both NSW assessments and Status of Australian Fish Stocks (SAFS; 2023). SAFS 2023 statuses are preliminary and not published as may be subject to change. Taxa with landings <1t are not shown in this report as they are insignificant to the management of the fishery.

Table 1 Catch statistic summary for all species with >1t average landings in the Estuary General Meshing endorsement over the last 5 fishing seasons. SAFS represents the Status of Australian Fish Stocks report. All values show tonnes (t). \* SAFS 2023 classifications are not published yet so should be considered preliminary and may change.

Taxa	5 year Average Landings (t)	5 year SD (t)	2022/23 Landings (t)	NSW Status	SAFS 2023 Status*	Comments
Sea Mullet	959.30	51.40	905.82	Sustainable	Sustainable	Assessment available – Stewart (2024)
Luderick	218.20	24.82	197.25	Sustainable	Sustainable	Assessment available – Schilling & Helidoniotis (2024a)
Yellowfin Bream	145.36	44.34	98.93	Sustainable	Sustainable	Assessment available – Helidoniotis & Schilling (2024a)
Dusky Flathead	120.08	4.27	113.41	Sustainable	Sustainable	Assessment available – Schilling & Helidoniotis (2024b)
Mulloway	46.40	13.96	67.15	Recovering	Recovering	Assessment available – Hughes (2024); Harvest strategy under development
Sand Whiting	30.09	5.00	23.58	Sustainable	Sustainable	Assessment available – Helidoniotis & Schilling (2024b)
Sand Mullet	23.55	8.90	16.62			
Forktail Catfishes	23.54	4.66	26.37			
Black Bream	18.04	7.33	8.97		Undefined	
Fantail Mullet	14.03	2.45	13.82			
Tailor	13.43	0.93	13.71		Sustainable	
Eeltail Catfish (cobblers)	8.88	0.78	9.27			
Common Pike Eel	6.75	1.41	4.33			
Silver Trevally	6.69	0.79	6.61	Recovering	Depleted	Assessment available - Burch <i>et al.</i> (2023)
Australian Salmon	5.31	2.04	6.87		Sustainable	
Common Blacktip Shark	5.05	1.05	4.81		Sustainable	
Blue Swimmer Crab	4.71	1.66	2.72	Depleting	Depleting	Assessment available – Johnson (2024)
Bull Shark	4.44	0.67	3.72			
Tarwhine	3.28	3.03	0.84			
Striped Scat (Butterfish)	2.97	0.70	3.91			
Flathead (other)	2.95	1.02	2.97			
Pinkeye Mullet	2.82	1.72	0.76			
School Shark	2.64	1.12	3.08		Depleted	
European Carp	1.78	0.61	2.54			

Taxa	5 year Average Landings (t)	5 year SD (t)	2022/23 Landings (t)	NSW Status	SAFS 2023 Status*	Comments
Bigeye Trevally	1.75	0.39	2.48			
Stingrays / Stingarees	1.74	0.45	2.12			
Gummy Shark	1.33	0.38	1.02			
Snapper	1.31	0.93	0.38			
Giant Trevally	1.23	0.51	1.71			
Old Wife	1.18	0.64	1.73			

## Catch by region

There are minor differences in catch composition between regions. Sea mullet is the most common catch in all regions and Luderick is the second most caught taxa in all regions except Region 2 where Forktail Catfish are the second most caught species. The top 10 taxa landed in each region under the Meshing endorsement are shown in Table 2 - Table 8.

Table 2 Catch statistic summary for the 10 species most abundant taxa in the Estuary General Meshing endorsement Region 1 over the last 5 fishing seasons. \* SAFS 2023 classifications are preliminary and may change prior to publication.

Taxa	5 year Average Landings (t)	5 year SD (t)	2022/23 Landings (t)	NSW Status	SAFS 2023 Status*
Sea Mullet	72.69	6.32	64.41	Sustainable	Sustainable
Luderick	6.14	0.75	7.07	Sustainable	Sustainable
Fantail Mullet	2.07	0.90	2.45		
Sand Whiting	1.84	0.56	1.72	Sustainable	Sustainable
Mulloway	1.79	0.71	0.80	Recovering	Recovering
Dusky Flathead	1.18	0.32	1.32	Sustainable	Sustainable
Bigeye Trevally	0.87	0.18	1.08		
Yellowfin Bream	0.79	0.19	0.51	Sustainable	Sustainable
Common Blacktip Shark	0.77	0.23	0.99		Sustainable
Giant Trevally	0.72	0.27	0.94		

Table 3 Catch statistic summary for the 10 species most abundant taxa in the Estuary General Meshing endorsement Region 2 over the last 5 fishing seasons. \* SAFS 2023 classifications are preliminary and may change prior to publication.

Taxa	5 year Average Landings (t)	5 year SD (t)	2022/23 Landings (t)	NSW Status	SAFS 2023 Status*
Sea Mullet	311.77	24.20	324.96	Sustainable	Sustainable

Forktail Catfishes	22.62	5.21	25.40		
Yellowfin Bream	18.72	5.15	10.69	Sustainable	Sustainable
Luderick	8.22	1.77	7.53	Sustainable	Sustainable
Dusky Flathead	8.08	2.04	7.62	Sustainable	Sustainable
Mulloway	8.06	2.00	10.30	Recovering	Recovering
Eeltail Catfish (cobblers)	6.25	0.66	6.38		
Common Pike Eel	4.17	0.91	2.67		
Bull Shark	3.25	0.78	2.86		
Sand Mullet	1.51	1.46	2.75		

Table 4 Catch statistic summary for the 10 species most abundant taxa in the Estuary General Meshing endorsement Region 3 over the last 5 fishing seasons. \* SAFS 2023 classifications are preliminary and may change prior to publication.

Taxa	5 year Average Landings (t)	5 year SD (t)	2022/23 Landings (t)	NSW Status	SAFS 2023 Status*
Sea Mullet	156.50	19.68	131.27	Sustainable	Sustainable
Luderick	35.58	4.69	31.65	Sustainable	Sustainable
Dusky Flathead	13.04	0.85	12.64	Sustainable	Sustainable
Yellowfin Bream	10.89	2.82	8.85	Sustainable	Sustainable
Sand Mullet	8.31	7.63	1.54		
Sand Whiting	5.11	0.88	3.82	Sustainable	Sustainable
Mulloway	4.16	2.57	2.82	Recovering	Recovering
Pinkeye Mullet	2.02	1.66	0.39		
Fantail Mullet	1.81	0.81	0.73		
Bigeye Trevally	0.61	0.30	1.06		

Table 5 Catch statistic summary for the 10 species most abundant taxa in the Estuary General Meshing endorsement Region 4 over the last 5 fishing seasons. \* SAFS 2023 classifications are preliminary and may change prior to publication.

Taxa	5 year Average Landings (t)	5 year SD (t)	2022/23 Landings (t)	NSW Status	SAFS 2023 Status*
Sea Mullet	278.41	20.18	285.87	Sustainable	Sustainable
Luderick	96.98	23.63	79.44	Sustainable	Sustainable
Yellowfin Bream	82.18	33.24	58.50	Sustainable	Sustainable
Dusky Flathead	75.52	3.86	70.18	Sustainable	Sustainable
Mulloway	20.86	8.71	30.89	Recovering	Recovering
Sand Whiting	11.98	3.39	9.98	Sustainable	Sustainable
Tailor	7.69	1.46	5.95		Sustainable
Sand Mullet	7.23	2.75	9.20		
Fantail Mullet	4.98	1.52	4.84		

<b>Striped Scat (Butterfish)</b>	2.46	0.76	3.43		
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Table 6 Catch statistic summary for the 10 species most abundant taxa in the Estuary General Meshing endorsement Region 5 over the last 5 fishing seasons. \* SAFS 2023 classifications are preliminary and may change prior to publication.

<b>Taxa</b>	<b>5 year Average Landings (t)</b>	<b>5 year SD (t)</b>	<b>2022/23 Landings (t)</b>	<b>NSW Status</b>	<b>SAFS 2023 Status*</b>
<b>Sea Mullet</b>	34.30	17.22	32.52	Sustainable	Sustainable
<b>Yellowfin Bream</b>	14.40	3.84	11.07	Sustainable	Sustainable
<b>Mulloway</b>	7.08	2.50	8.95	Recovering	Recovering
<b>Luderick</b>	5.42	3.12	5.26	Sustainable	Sustainable
<b>Dusky Flathead</b>	2.80	0.80	2.84	Sustainable	Sustainable
<b>Common Blacktip Shark</b>	2.70	1.70	2.25		Sustainable
<b>Fantail Mullet</b>	1.41	0.55	1.84		
<b>Silver Trevally</b>	1.32	0.40	1.27	Recovering	Depleted
<b>Sand Whiting</b>	1.21	0.42	0.82	Sustainable	Sustainable
<b>Tailor</b>	0.57	0.41	0.31		

Table 7 Catch statistic summary for the 10 species most abundant taxa in the Estuary General Meshing endorsement Region 6 over the last 5 fishing seasons. \* SAFS 2023 classifications are preliminary and may change prior to publication.

<b>Taxa</b>	<b>5 year Average Landings (t)</b>	<b>5 year SD (t)</b>	<b>2022/23 Landings (t)</b>	<b>NSW Status</b>	<b>SAFS 2023 Status*</b>
<b>Sea Mullet</b>	84.51	24.97	57.73	Sustainable	Sustainable
<b>Luderick</b>	49.62	4.85	52.94	Sustainable	Sustainable
<b>Dusky Flathead</b>	16.39	2.79	15.41	Sustainable	Sustainable
<b>Black Bream</b>	10.11	5.20	5.44		Undefined
<b>Yellowfin Bream</b>	9.00	3.92	5.63	Sustainable	Sustainable
<b>Sand Whiting</b>	7.97	2.47	5.65	Sustainable	Sustainable
<b>Mulloway</b>	4.40	4.99	13.10	Recovering	Recovering
<b>Fantail Mullet</b>	3.11	1.86	3.71		
<b>Tailor</b>	2.36	0.89	3.62		Sustainable
<b>Silver Trevally</b>	1.71	0.37	1.46	Recovering	Depleted

Table 8 Catch statistic summary for the 10 species most abundant taxa in the Estuary General Meshing endorsement Region 7 over the last 5 fishing seasons. \* SAFS 2023 classifications are preliminary and may change prior to publication.

<b>Taxa</b>	<b>5 year Average Landings (t)</b>	<b>5 year SD (t)</b>	<b>2022/23 Landings (t)</b>	<b>NSW Status</b>	<b>SAFS 2023 Status*</b>
<b>Sea Mullet</b>	21.12	8.26	9.07	Sustainable	Sustainable

Luderick	16.24	2.86	13.35	Sustainable	Sustainable
Yellowfin Bream	9.36	7.19	3.69	Sustainable	Sustainable
Black Bream	6.44	3.69	3.23		Undefined
Sand Mullet	4.95	1.79	2.41		
Dusky Flathead	3.07	0.27	3.40	Sustainable	Sustainable
Silver Trevally	2.90	0.75	3.16	Recovering	Depleted
Australian Salmon	1.77	1.61	3.13		Sustainable
Tarwhine	1.32	1.46	0.51		
Tailor	1.00	0.20	0.87		Sustainable

## Fishery Quota Usage

### Overall and Regional Quota Usage

Between 2018/19 and 2022/23, the quota has been consistently under used both overall and across all Estuary General Regions (Figure 1). Overall usage has averaged 42.2% with average usage in the individual regions ranging from 33.4 – 50.9%. While there are large differences in the size of the quota between the regions the overall usage percentages show large portions of unused quota. Details of quota size and usage can be seen in Table 9.

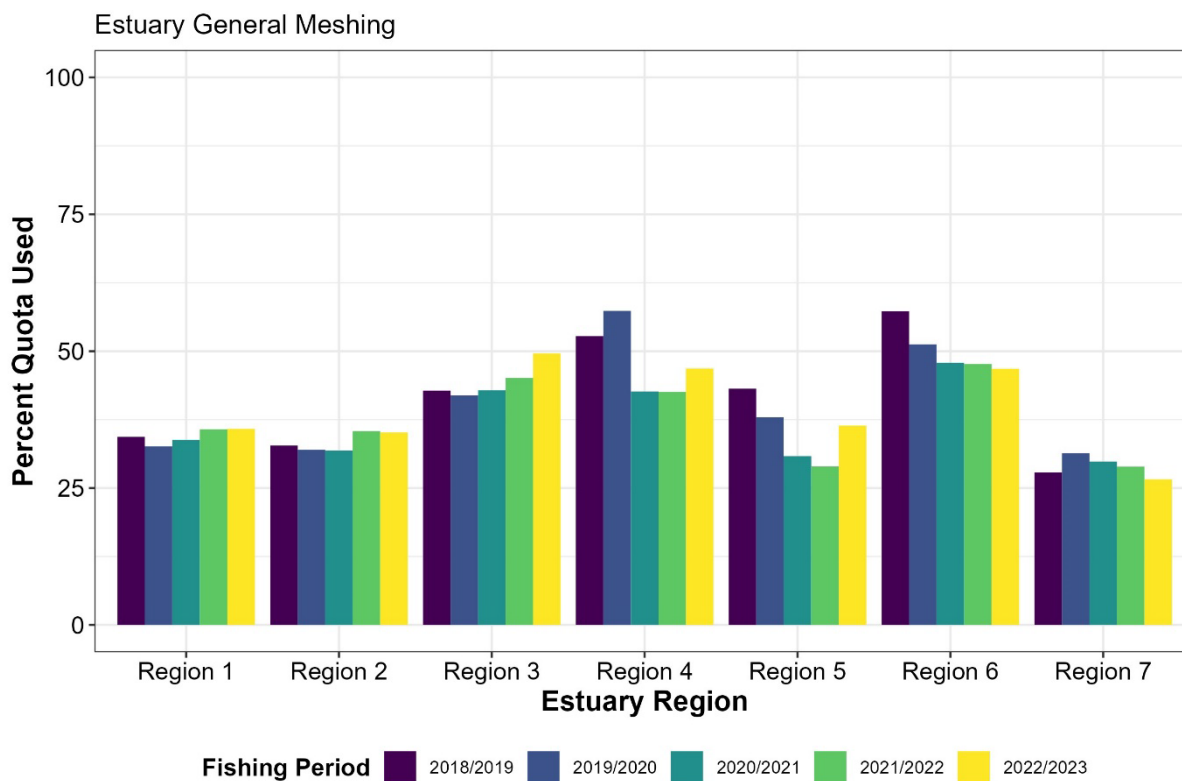


Figure 1 Estuary General Meshing quota usage in each region over the past 5 financial years.

Table 9 Quota usage statistics.

Region	Interim Quota	5 year average usage	5 year standard deviation	Usage in 2022/23	5 years % used average	5 years % used SD	% used in 2022/23
<b>Overall</b>	38656	16294.6	880.9	16263	42.2	2.3	42.1
<b>1</b>	2002	689	24.4	717	34.4	1.2	35.8
<b>2</b>	7709	2571.6	114.8	2709	33.4	1.5	35.1
<b>3</b>	4846	2158	133	2403	44.5	2.7	49.6
<b>4</b>	15196	7333.6	798.2	7118	48.3	5.3	46.8
<b>5</b>	2731	951.6	139	938	34.8	5.1	34.3
<b>6</b>	3651	1856.8	125	1708	50.9	3.4	46.8
<b>7</b>	2521	724	44.5	670	28.7	1.8	26.6

## Effort usage by fishing business

It is important to recognise that fishing businesses operate independently, and individual quota usage patterns may not be reflected in regional averages. Figure 2 shows histograms of quota usage by fishing businesses, showing that over the last 5 years, patterns have been stable with many businesses using <10% of their quota (>90 businesses) and then a roughly equal portion of businesses using a range of quota levels right up to 100% quota usage (and in a few cases >100%).

To understand the quota usage patterns at a regional scale, Figure 3 shows the distribution of quota usages by fishing businesses in each region. Most regions show a similar pattern of usage to the overall patterns with a larger number of businesses having low usage and a lower roughly even spread across all other usage levels. Region 4 shows a higher proportion of fishing businesses operating near their quota (>80% usage). Region 3 shows a lower proportion of fishing businesses with very low usage with an even distribution of effort across all quota usage levels.

It is worth noting that a single fisher can own multiple fishing businesses and in this case they may allocate quota to a single business then transfer the quota across multiple businesses as needed.



### Estuarine Meshing

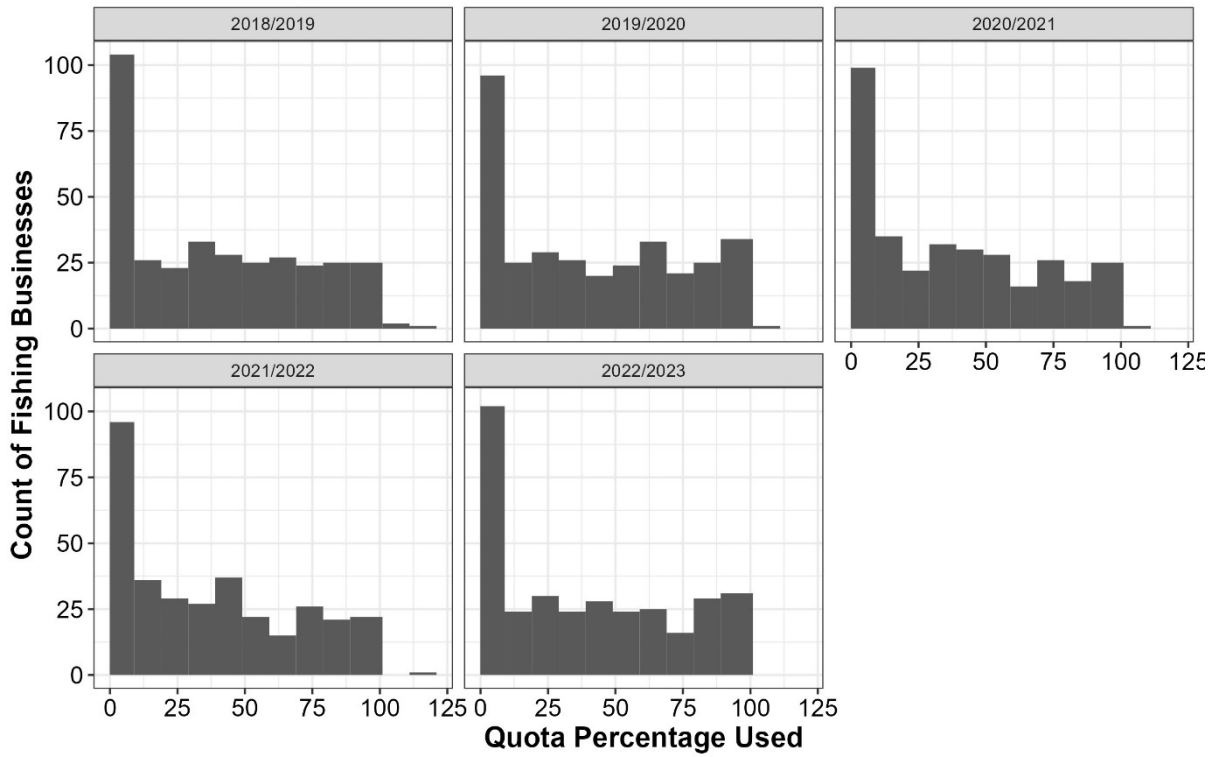


Figure 2 Quota usage by fishing businesses over time. Histograms show the number of fishing businesses in each quota usage bin (bin widths are 10%).

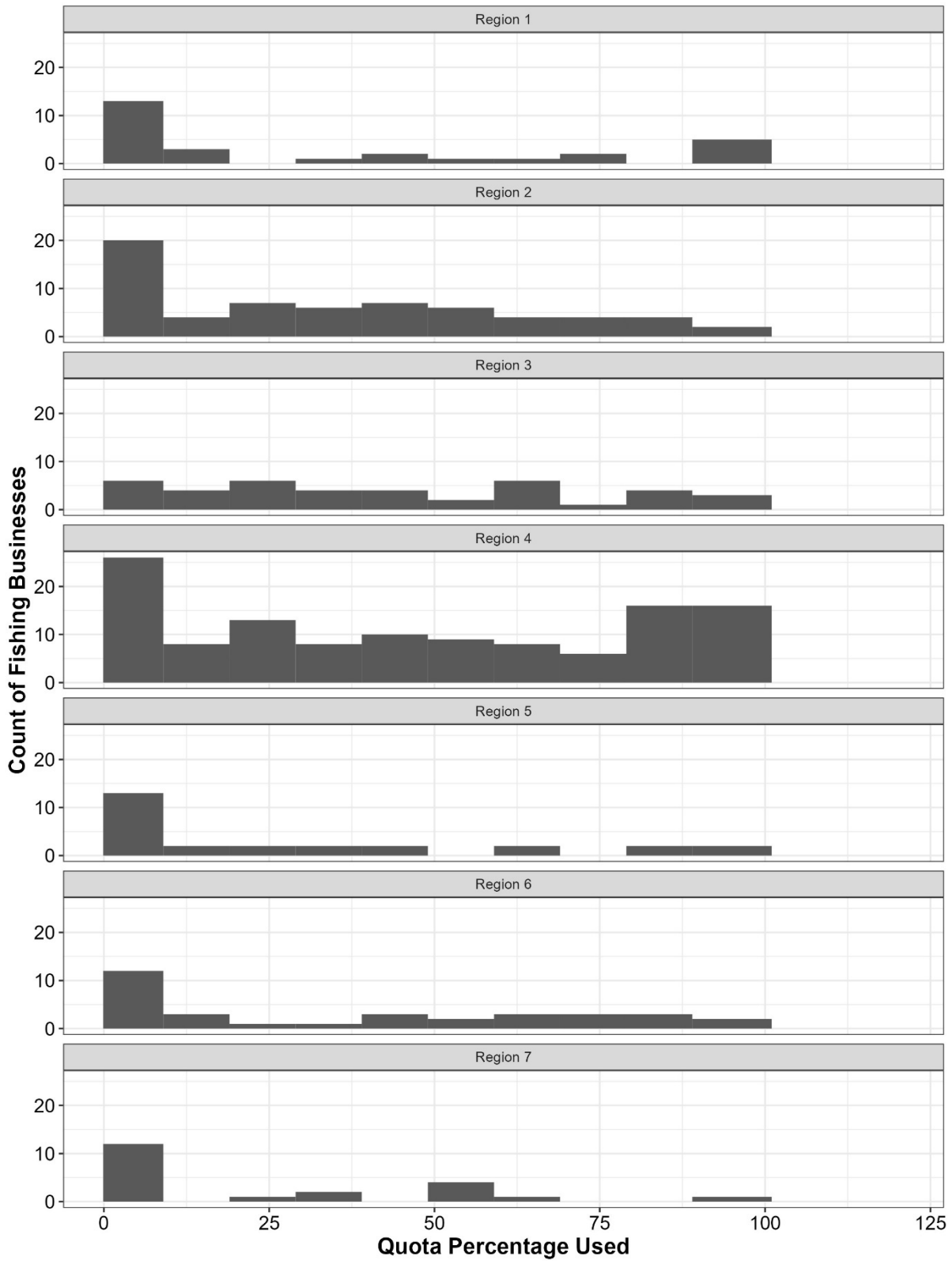


Figure 3 Quota usage by region in the 2022/23 fishing period. Histograms show the number of fishing businesses in each quota usage bin (bin widths are 10%).

## Discussion and matters for consideration by the TAFC

In the mixed species Estuary General meshing endorsement, a large number of species are reported but the bulk of the catch (90%) is represented by only 6 species: Sea Mullet, Luderick, Yellowfin Bream, Dusky Flathead, Mulloway and Sand Whiting. Of these species, all except Mulloway are currently assessed as 'sustainable' in NSW. Mulloway is currently assessed as 'recovering' and a harvest strategy is currently under development to guide rebuilding of the stock. Species which are less commonly caught but have current stock status classifications other than 'sustainable' are Silver trevally (recovering), Blue swimmer crab (depleting) and School shark ('depleted' based on SAFS 2023). Catches of each of these species from the Meshing fishery represent very small proportions of the total NSW catch and/or inter-jurisdictional catches so they do not represent a significant fishing mortality for these species.

Between 2018/19 and 2022/23, the effort quotas for the Estuary General Meshing fishery were grossly underutilised. Under the current quotas (*Transitional Fishing Determinations*) there are substantial levels of latent effort in all regions. The current assessment methods for the key species caught under the meshing endorsement do not allow forecasting of the impact that full use of the current quotas may have on the sustainability of species but a potential doubling (or more) of effort would substantially increase fishing mortality on all species. Development of more advanced integrated model-based assessments has commenced (as detailed in the species assessments) using 'Stock Assessment Continuum' and 'Stock Synthesis' software tools and, subject to acceptance of the modelling, it will be possible to forecast biomass trajectories for key species. In the meantime, the levels of latent effort in the Meshing fishery and the potential for increased fishing mortality if it is deployed represent a key issue for consideration by the TAFC. Associated with this consideration are the potential economic and social impacts of reductions in TAE on the fishing businesses that have been using a high proportion of their quotas allocated under the *Transitional Fishing Determinations*.

Of the 6 species that dominate Meshing catches, Mulloway have been assessed as being the most depleted. If the species-specific harvest strategy for Mulloway effectively controls fishing mortality during the 'recovering' phase such that biomass will continue to rebuild, then the determination of TAEs for the Estuary General Meshing fishery can be determined based on the other main species. Consideration of whether or not the current status of the Mulloway stock is a 'limiting factor' for the determination of Meshing TAEs will be informed by the TAFC's awareness and evaluation of the Mulloway Harvest Strategy.

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