



**VALUING WA SMALLER COMMERCIAL
FISHERIES ACROSS THE SUPPLY
CHAIN (FRDC PROJECT: 2022-038):
FINAL REPORT**

**A Report for Fisheries Research and
Development Corporation (FRDC)**

1 September 2023

Prepared by

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ISBN [978-0-6458962-0-6]

**Valuing WA Smaller Commercial Fisheries Across the Supply Chain: Final Report
FRDC Project: 2022-038**

2023

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The Fisheries Research and Development Corporation plans, invests in and manages fisheries research and development throughout Australia. It is a statutory authority within the portfolio of the federal Minister for Agriculture, Fisheries and Forestry, jointly funded by the Australian Government and the fishing industry.

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ABBREVIATIONS

| | |
|--------|---|
| ABS | Australian Bureau of Statistics |
| ANZSIC | Australian and New Zealand Standard Industrial Classification |
| COE | compensation of employees |
| DPIRD | Department of Primary Industries and Regional Development |
| FRDC | Fisheries Research and Development Corporation |
| Fte | full-time equivalent |
| GOS | gross operating surplus |
| GSP | gross state product |
| GVP | gross value of production |
| IMAS | Institute of Marine and Antarctic Studies |
| IO | Input-output |
| IOIG | Input-Output Industry Group |
| RISE | Regional Industrial Structure and Employment |
| SCPS | South Coast Purse-Seine |
| SDGDL | Southern Demersal Gillnet and Demersal Longline |
| TLS | taxes less subsidies |
| WA | Western Australia |
| WAFIC | Western Australian Fishing Industry Council |

ACKNOWLEDGMENTS

We would like to acknowledge the members of the Steering Committee for the contribution of their time and expert knowledge in this study. Their ongoing contribution is invaluable. We would also like to acknowledge the workshop and interview participants for the contribution of their time, knowledge and business information, without which this study would not have been possible. FRDC project 2022-038 Valuing WA smaller commercial fisheries across the supply chain is supported by funding from the FRDC on behalf of the Australian Government.

DOCUMENT HISTORY AND STATUS

| Doc Version | Doc Status | Issued To | Qty elec | Date | Reviewed | Approved |
|-------------|------------|--|-----------------|------------|----------|----------|
| 1 | Draft | Chris Izzo | 1 Word 1 PDF | 30/06/2023 | ADM | ADM |
| 2 | Draft | Phil Clark Peter Rogers Tony Della Bosca Eva Lai Chris Izzo Felicity Horn FRDC HDR Coordination Program | 1 Word 1 PDF | 7/07/2023 | ADM | ADM |
| 3 | Final | Phil Clark Peter Rogers Tony Della Bosca Eva Lai Chris Izzo Felicity Horn FRDC HDR Coordination Program | 1 Word 1 PDF | 1/09/2023 | ADM | ADM |

Last Saved: 1/09/2023 5:08:00 PM
File Name: https://bdocomau.sharepoint.com/sites/BDOEconSearch/Shared Documents/General/ES2234_WA Small Scale Fisheries Supply Chain/WA Supply Chains_FRDC 2022-038_Report_Final_230901.docx
Project Manager: Anders Magnusson
Principal Author/s: Anders Magnusson, Lisa Carlin, Abbie Dix, Meagan Magnusson and Alex Donnelly-Young
Name of Client: Fisheries Research and Development Corporation (FRDC)
Name of Project: Valuing WA Smaller Commercial Fisheries Across the Supply Chain (FRDC Project: 2022-038): Final Report
Document Version: 3
Job Number: ES2234

EXECUTIVE SUMMARY

This study aimed to produce information about the economic contribution of the supply chain of selected small scale fisheries in Western Australia (WA), as well as a method that can be applied to making these estimates for other fisheries.

Substantial research has been completed to estimate the economic contribution of commercial fisheries to Australia and its regional communities, and to produce guidelines that practitioners can apply to update and regionalise these estimates (FRDC project 2017-210 (FRDC and IMAS 2020)). However, past research has largely focused on the ‘upstream’ activity (the flow-on effects from commercial fishing from expenditure on inputs to fishing and expenditure of income derived from fishing). Little work has been done to describe the ‘downstream’ activity (what happens to the seafood product throughout the supply chain after it has been landed, that is, as the product moves from the point of landing to final consumers), the focus of this study.

This study makes three separate estimates of the economic contribution of a selection of case study fishery supply chains using three different levels of information. It then compares the sets of results for each case study to make conclusions about the quality versus cost of the approaches. Case study fisheries were also compared within each approach to make conclusions about how different types of supply chains influence the reliability of the derived estimates. The three approaches are:

- Approach 1 (A1) (minimal cost): published fishery production data and published national input-output (IO) profiles that describes inter-sector flows.
- Approach 2 (A2) (minimum consultation): the same as Approach 1 but also including a workshop with key stakeholders to inform the assumptions.
- Approach 3 (A3) (maximum data): the same as Approach 2 but also collecting primary data from businesses along the supply chain.

Results

Summary results for each approach to valuing small scale fishery supply chains are detailed in Table ES-1 by case study fishery for 2021/22. The A3 column presents the highest quality results.

Using the highest quality data (A3) the economic contribution of the fishery supply chains were:

- Octopus Fishery - \$34.2m in GSP, 369 fte jobs and \$19.8m in household income.
- Southern Demersal Gillnet and Demersal Longline Fishery - \$17.1m in GSP, 121 fte jobs and \$8.3m in household income.
- South Coast Purse Seine Fishery - \$7.2m in GSP, 60 fte jobs and \$3.8m in household income.

The Octopus Fishery was identified as a small scale fishery for the purpose of this analysis. However, consultation with supply chain businesses revealed that there are ambition for it to grow quickly and may not fit this definition of a small scale fishery in future.

Table ES-1 Case study fishery supply chain economic contribution by approach, 2021/22

| | South Coast Purse Seine Fishery | | | Southern Demersal Gillnet and Demersal Longline Fishery | | | Octopus Fishery | | |
|-------------------------------|---------------------------------|------------|------------|---|-------------|-------------|-----------------|-------------|-------------|
| | A1 | A2 | A3 | A1 | A2 | A3 | A1 | A2 | A3 |
| Direct Output (\$m) | 5.2 | 9.5 | 7.1 | 14.0 | 14.6 | 16.7 | 20.2 | 34.3 | 35.6 |
| GSP (\$m) | | | | | | | | | |
| Direct | 2.8 | 5.8 | 4.3 | 7.4 | 7.3 | 10.9 | 10.8 | 17.8 | 18.3 |
| Flow-on | 1.9 | 3.7 | 2.9 | 5.1 | 6.1 | 6.2 | 8.4 | 15.5 | 16.0 |
| Total | 4.7 | 9.5 | 7.2 | 12.6 | 13.5 | 17.1 | 19.1 | 33.3 | 34.2 |
| Employment (fte) | | | | | | | | | |
| Direct | 25 | 48 | 44 | 66 | 85 | 86 | 95 | 215 | 285 |
| Flow-on | 11 | 21 | 16 | 29 | 34 | 34 | 45 | 82 | 84 |
| Total | 35 | 69 | 60 | 94 | 119 | 121 | 140 | 297 | 369 |
| Household Income (\$m) | | | | | | | | | |
| Direct | 1.2 | 2.5 | 2.4 | 3.1 | 3.5 | 5.1 | 4.6 | 9.1 | 11.7 |
| Flow-on | 1.0 | 2.0 | 1.5 | 2.7 | 3.2 | 3.2 | 4.4 | 7.9 | 8.1 |
| Total | 2.2 | 4.5 | 3.8 | 5.9 | 6.7 | 8.3 | 8.9 | 17.1 | 19.8 |

Source: BDO EconSearch analysis

Comparison of approaches

The method used for comparing approaches involved combining the qualitative judgements of the research team. This involved the three researchers (project co-investigators) independently forming a set of frames for making judgements then generating evaluative judgements within those frames. No relevant best practice guidelines for supply chain economic contribution studies were identified. As such, these themes have been developed from the knowledge gathered throughout this study. The frames across all three researchers were then grouped into themes and key evaluative judgements were summarised together within each theme:

- Inclusion of economic activity - more economic activity can generally be included through in-depth consultation.
- Relative accuracy of different economic indicators - the ability for an approach to estimate the sales value at each supply-chain stage does not necessarily correlate with the ability to estimate economic contribution indicators such as employment and GSP due to the mix of data required for their calculation.
- Potential for capturing different data types - the nature of data collection activities in each approach led to different abilities and limitations regarding collection of specific types of data. This primarily depends on the requirement, ability, and willingness for supply chain businesses to provide the required data.
- Key practical challenges and achievable outputs - typically, estimating economic contribution of fisheries must be undertaken within practical constraints such as time, availability of information, willingness to provide information and cost.
- Cost of applying each approach - Cost is of clear importance when recommending a method and varies significantly between the approaches.

The evaluation of the three case study fisheries across the set of themes described above were then summarised together to support the overall recommendations (Table ES-2).

Table ES-2 Evaluation of each approach by comparison theme

| | Approach 1 Desktop | Approach 2 Workshop | Approach 3 Interviews |
|--|--|--|--|
| Inclusion of economic activity | Poor (most likely to underestimate) | Fair (likely to underestimate) | Good |
| Relative accuracy of different economic indicators | Poor (especially for GSP, fte and household income) | Fair (difficult to avoid bias) | Good |
| Potential for capturing different data types | Poor (no nuance possible) | Fair (high-level activity only, though this may be enough) | Good |
| Key practical challenges and achievable outputs | Good (easy to undertake) | Fair (risk of 'no-show' and unwillingness to share data at workshops) | Fair (significant time may be required) |
| Cost of applying each approach | Low | Mid 1.5x cost of Approach 1 | High 2.2x cost of Approach 1 |

Source: BDO EconSearch analysis

Recommendations

- We have little confidence in Approach 1 and do not recommend its use in the context explored by this study as:
 - Small-scale fishery supply chains are generally not well represented by average national statistics (we suspect that they underestimate economic contribution in this context).
 - Approach 1 results are very different to Approach 3 (with which we have higher confidence).
- Approach 2 and 3 are each workable, with the preferred approach depending on the fishery and research context:
 - If fishery businesses are reluctant to share data at workshops then Approach 3 may be preferred as there is a risk that workshops will fail.
 - If the supply chain is highly complex, such as including multiple species and products, each materially important, then Approach 3 may be preferred as there is a risk of not capturing sufficient information at a workshop.
 - If higher quality information is particularly valuable (i.e. the cost is considered affordable) then Approach 3 may be preferred.
 - Otherwise, Approach 2 is likely to be sufficient.
- Approach 2 is likely to be preferred in most fisheries with some exceptions made due to the above factors.

4. Having knowledgeable people, with a combined view of most of the supply chain, involved and attending workshops. This is critical to the success of Approach 2 and should include people representing seafood processing and food service, if possible.
5. Where Approach 2 is undertaken, we recommend that a few follow up interviews are undertaken as they are likely to add substantial quality assurance to the workshop approach. These interviews can be quick 'fact checks' with people recommended by workshop attendees or can capture anyone who failed to attend a planned workshop. Follow-up interviews are a second-best compared with including the right people in the workshop to begin with.

Keywords: Commercial fishery supply chain, Economic contribution, Downstream, WA small scale fisheries, Octopus Fishery, South Coast Purse Seine Fishery, Southern Demersal Gillnet and Demersal Longline Fishery.

1. INTRODUCTION

This study aimed to produce information about the economic contribution of the supply chain of selected small scale fisheries in Western Australia (WA), as well as a method that can be applied to making these estimates for other fisheries. This report is the second of several outputs from this study. It presents results and discussion which inform a set of guidelines for practitioners to undertake similar studies in future.

1.1. FRDC Project 2022-038 Summary

Background

The commercial fishing industry contributes economic activity to regional communities wherever it operates. This is a key contributor to many fisheries' social licence to operate, especially those fisheries in remote areas and those which are domestically focused, as the downstream activity that these fisheries generate and the upstream activity they support also tend to take place locally. This local activity generates economic activity and employment for the local communities in which they are based. Accurate and defensible measurement of this activity has become increasingly important and useful in recent years as debate over the allocation of fisheries resources to different sectors (e.g. commercial versus recreational fishing) has focused more on regional development.

Social and economic considerations are important along with biological and ecological factors in the context of fisheries management under an Ecologically Sustainable Development (ESD) framework (Barclay et al. 2017). In Australia, fisheries agencies and industry groups are committed to implementing the principles of ESD. Economic contribution is only one piece of the puzzle but nonetheless an important one.

Substantial research has been completed to estimate the economic contribution of commercial fisheries to Australia and its regional communities, and to produce guidelines that practitioners can apply to update and regionalise these estimates (FRDC project 2017-210 (FRDC and IMAS 2020)). However, past research has largely focused on the 'upstream' activity (also known as the flow-on effects from commercial fishing) and little work has been done to describe the 'downstream' activity and its flow-on effects (the value-adding or supply chain contribution of commercial fishing).

Both upstream and downstream activities are included in this report and, as such, it is important to distinguish between the two. 'Upstream' activity results from the expenditure on inputs and spending of wages by employees in businesses involved in producing the direct output and is referred to in this report as 'flow-on' activity. 'Downstream' activity relates to the direct output of subsequent stages of the supply chain, such as processing, wholesaling, food service and retailing of the caught fish. The upstream activity associated with the downstream activities throughout the supply chain are also included in flow-on activity.

The terms, 'supply chain' and 'value chain', are often used interchangeably, however Hobday *et. al.* (2014) makes a distinction that;

A supply chain is a schematic representation of the path that a product travels from, in the case of fisheries, capture to the consumer. A value chain is broadly defined as the value or feature added to the primary product by each level in the supply chain (Hobday et. al. 2014, p. 5).

Using this definition, the project sought to first map the supply chains of select WA Fisheries, that is, identified each node where value is created between fisher and consumer. We then developed value chains that identify the economic value added at each node and calculated the total value of the supply chain which was used to estimate their economic contribution.

The Food and Agriculture Organization (FAO) report titled *Revenue distribution through the seafood value chain* (Gudmundsson *et. al.* 2006) focused on ‘downstream’ activity, or the value added at each node of the value chain and developed a methodology to be applied to other fisheries. They also encouraged researchers to apply the methodology to other fisheries to investigate the distribution of revenue from seafood trade across the seafood value chain.

Measuring downstream effects presents additional challenges to upstream effects due to:

- Additional stakeholder types and industry groups involved beyond fishing itself
- Additional businesses along the supply chain which are larger, more strategic and hold commercial in confidence data
- Increased difficulty in the defensible attribution of supply chain activity to a specific fishery due to the potential for some supply chains to substitute inputs to regionally or internationally imported products.

None of these issues are insurmountable, but they can be costly to overcome. Large and high-value fisheries may be able to meet this cost and produce useful information. For instance, ACIL Allen Consulting has produced economic contribution studies for the large scale and high value Western Rock Lobster Industry value chain in 2017 and 2011 (ACIL Allen Consulting 2017 & 2022). However, the limited resources available to small scale fisheries make commissioning studies such as these less feasible. On the other hand, small scale fisheries are often more remote and domestically focused which, as discussed above, makes information about the economic contribution of their supply chains particularly useful.

This study aimed to facilitate production of this type of information for small scale fisheries, using case studies of selected fisheries in WA.

Objectives

The objectives of this study were to:

1. Recommend a method to map and value the supply chain of small scale fisheries in WA and to estimate the economic contribution at each node of the supply chain, including options for addressing gaps in data availability.
2. Develop an extension to the Australian Fisheries and Aquaculture Industry 2017/18 Practitioner Guidelines, for assessing supply chains and economic contributions of small scale fisheries.

Scope

The scope included making three separate estimates of the economic contribution for a selection of case study fishery supply chains using three different levels of information. The sets of results for each case study are then compared to make conclusions about the quality versus cost of the approaches. Case study fisheries were also compared within each approach to make conclusions about the economic contributions of different types of supply chains. The three approaches are:

- Approach 1 (minimal cost): published fishery production data and published national input-output (IO) profiles that describes inter-sector flows,
- Approach 2 (minimum consultation): the same as Approach 1 but also including a workshop with key stakeholders to inform the assumptions, and
- Approach 3 (maximum data): the same as Approach 2 but also collecting primary data from businesses along the supply chain.

1.2. Overview of this Report

The remainder of this report presents:

- The input-output (IO) methodology and a description of how each of the three approaches were undertaken (Section 2)
- Results for all three approaches by case study fishery (Section 3)
- An analysis comparing the approaches (Section 4 to 4.5)
- Recommendations which will help inform the guidelines (Section 4.6).

The accompanying deliverables for this study include:

- An addendum to the [Practitioner Guidelines](#) for the economic contribution of commercial fisheries to Australia and its regional communities (FRDC and IMAS 2020) to describe a practical method applicable for small scale fisheries.
- A fact sheet describing the supply chain contributions for each of the case study fisheries.
- A webinar for industry and practitioners with an overview of the study findings.

2. METHODOLOGY

Methods for estimating economic contribution under each approach are described in this section, beginning with a description of the input-output (IO) modelling used for all approaches. The method to compare approaches and form recommendations is also described.

2.1. Input-Output Methodology

The method employed for estimation of economic contributions was IO analysis which is the analytical basis of the RISE (Regional Industrial Structure and Employment) model. IO analysis is widely used in economic contribution analysis and is a practical method for measuring economic contributions at regional and state levels. RISE models were used to generate economic contribution results for each fishery and, where possible, contribution by sector, supply chain stage and region. Economic contribution indicators, defined in Table 2-1, were reported by fishery by region.

Estimates of the economic contribution of the fisheries and corresponding supply chains were modelled using the state of Western Australia as the region.

Table 2-1 Economic contribution indicators

| Indicator | Reason | Interpretation/Calculation |
|---------------------------|---|--|
| Output | The total contribution of the fishery to the state economy | The gross revenue of goods and services produced by commercial organisations plus gross expenditure by government agencies. This indicator needs to be used with care as it includes elements of double counting. |
| Gross state product (GSP) | The net contribution of the fishery to the state economy. | The net contribution of an activity to the state/regional economy. Contribution to GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. It can also be measured as household income plus other value added (gross operating surplus and all taxes, less subsidies). It represents payments to the primary inputs of production (labour, capital and land). Using GSP as a measure of economic contribution avoids the problem of double counting that may arise from using value of output for this purpose. |
| Employment | The total employment contribution of the fishery to the state/regional economy. | The number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalent jobs. |
| Household income | A measure of the wages and salaries attributable to the employment contribution of the fishery. | A component of GSP and is a measure of wages and salaries, drawings by owner operators and other payments to labour including overtime payments and income tax, but excluding payroll tax. |

2.2. Data Sources

The data sources for each approach are identified in Table 2-2 and described further in the Sections 2.4, 2.5 and 2.6.

Table 2-2 Data sources for each approach

| Data items | Approach 1 (Minimal cost approach) | Approach 2 (Minimal consultation approach) ^a | Approach 3 (Maximum data approach) ^a |
|--|--|--|--|
| Fishery production statistics | Published production statistics (State of the Fisheries 2020/21 (Newman et al. 2021) and 2021/22 data by special request to DPIRD) | | |
| Fishery financials and employment | Published national input-output (IO) profiles (ABS 2022) | | Primary data from survey/interview |
| Supply chain flows | Published national IO profiles (ABS 2022) | Estimated by workshop with stakeholders, starting from IO table estimates. | Primary data from survey/interview |
| Supply chain financials and employment | Published national IO profiles (ABS 2022) | Published national IO profiles (ABS 2022) | Primary data from survey/interview |

^a It may be necessary to fill some data gaps with information from the lower level approach

2.3. Fishery selection

We first defined exactly what a “small scale fishery” was within the context of this study to enable us to select fisheries within that definition for inclusion. The following definition was agreed with the steering committee:

Fisheries in WA that support regionally significant economic activity through their relatively low gross value of production and associated local supply chains.

In 2020/21 there were 49 distinct commercial fisheries with recorded activity (catch) in WA. However, some of these fisheries are very large in value and their supply chains have been well investigated (e.g. West Coast Rock Lobster Managed Fishery (ACIL Allen 2022 and 2017 and Hobday *et. al.* 2014)). Other fisheries have too few operators for non-confidential production data to be published. As such, we developed criteria to narrow down which fisheries would fall within the “small scale fishery” definition and be useful as case study fisheries.

Data from 2020/21 on catch, gross value of production (GVP) and number of active vessels and businesses for all fisheries in WA was sourced from the Department of Primary Industries and Regional Development (DPIRD). Then, the following criteria were developed in consultation with the steering committee and applied:

- 1) Include fisheries with more than three vessels operating (data for those fisheries with fewer than three vessels are confidential).
- 2) Include fisheries with more than three businesses operating (data for those fisheries with fewer than three businesses are also confidential).

- 3) Include fisheries with GVP greater than \$100,000 but less than \$10m. Fisheries with a GVP over \$10m were deemed to be large and inconsistent with the small scale fishery definition for this study. Additionally, many of these large fisheries already have well defined value chains (e.g. rock lobster and prawn fisheries).
- 4) Exclude the rock lobster, prawn, abalone and scallop fisheries. These fisheries were excluded based on steering committee consensus that they would not be useful to include in this study. The rationale being that these fisheries are generally of high value and tend to be export focused fisheries with shorter supply chains. These fisheries were specifically excluded in case they were not filtered out by criteria 1-3.
- 5) Exclude the Open Access in the North Coast (NC), Gascoyne Coast (GC) and West Coast (WC) Bioregions and the Lake Argyle inland fishery since they are state-wide fisheries and do not fit the 'regional significance' part of the definition.

An evaluation of the fisheries against the selection criteria is presented in Table 2-3.

Table 2-3 Fisheries categorised against the evaluation criteria

| Fishery Name | Bioregion | State-wide Sub Bioregion/s ^a | Confidential (<3 boats or businesses) | GVP <\$100,000) | GVP >10 million | Other reason (selection criteria 4-5) | Proposed Fishery Inclusion |
|---|-------------|---|---------------------------------------|-----------------|-----------------|---------------------------------------|----------------------------|
| Shark Bay Crab Managed Fishery | Gascoyne | | | | | | ✓ |
| Southern Demersal Gillnet & Demersal Longline Managed Fishery | South Coast | | | | | | ✓ |
| Mackerel Managed Fishery | Statewide | NC | | | | | ✓ |
| West Coast Demersal Scalefish (Interim) Managed Fishery | West Coast | | | | | | ✓ |
| Gascoyne Demersal Scalefish Managed Fishery | Gascoyne | | | | | | ✓ |
| South Coast Line and Fish Trap | South Coast | | | | | | ✓ |
| South Coast Purse-Seine Managed Fishery | South Coast | | | | | | ✓ |
| South Coast Crustacean Managed Fishery | South Coast | | | | | | ✓ |
| South Coast Estuarine Managed Fishery | South Coast | | | | | | ✓ |
| West Coast Estuarine Managed Fishery | West Coast | | | | | | ✓ |
| Shark Bay Beach Seine and Mesh Net Managed Fishery | Gascoyne | | | | | | ✓ |
| Kimberley Gillnet and Barramundi Managed Fishery | North Coast | | | | | | ✓ |
| South West Coast Beach Net Fishery (Order) | West Coast | | | | | | ✓ |
| West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery | West Coast | | | | | | ✓ |
| South Coast Nearshore Netting | South Coast | | | | | | ✓ |
| West Coast Deep Sea Crustacean Managed Fishery | West Coast | | | | | | ✓ |
| Octopus Interim Managed Fishery | Statewide | WC | | | | | ✓ |
| Pilbara Line Fishery (Condition) | North Coast | | x | | | | |
| Cockburn Sound (Line and Pot) Managed Fishery | West Coast | | x | | | | |
| West Coast Purse Seine Fishery | West Coast | | x | | | | |
| Pilbara Trap Managed Fishery | North Coast | | x | | | | |
| Abrolhos Islands and Mid-West Trawl Managed Fishery | West Coast | | x | | | | |
| Purse Seine Developing Fishery | North Coast | | x | | | | |
| Open Access in the NC, GC and WC Bioregions | Statewide | | | | | x | |
| West Coast Rock Lobster Managed Fishery | West Coast | | | | | x | |

| Fishery Name | Bioregion | State-wide Sub Bioregion/s ^a | Confidential (<3 boats or businesses) | GVP <\$100,000) | GVP >10 million | Other reason (selection criteria 4-5) | Proposed Fishery Inclusion |
|---|-------------|---|---------------------------------------|-----------------|-----------------|---------------------------------------|----------------------------|
| Shark Bay Prawn Managed Fishery | Gascoyne | | | | | x | |
| Northern Demersal Scalefish Managed Fishery | North Coast | | | | x | | |
| Pilbara Fish Trawl (Interim) Managed Fishery | North Coast | | | | x | | |
| Exmouth Gulf Prawn Managed Fishery | North Coast | | | | | x | |
| Abalone Managed Fishery | State-wide | WC, SC | | | | x | |
| Shark Bay Scallop Managed Fishery | Gascoyne | | | | | x | |
| Kimberley Prawn Managed Fishery | North Coast | | | | | x | |
| Nickol Bay Prawn Managed Fishery | North Coast | | | | | x | |
| FBL condition 55 Lake Argyle | Nthn Inland | | | | | x | |
| South West Coast Salmon Managed Fishery | South Coast | | | x | | | |
| South Coast Salmon Managed Fishery | South Coast | | | x | | | |
| Kimberley Crab Managed Fishery | North Coast | | | x | | | |
| Open Access in the South Coast Bioregion | South Coast | | | x | | | |
| FBL condition 84 SW Coast Estuaries | South Coast | | x | | | | |
| Broome Prawn Managed Fishery | North Coast | | x | | | | |
| West Coast (Beach Bait Fish Net) Managed Fishery | West Coast | | x | | | | |
| West Australian Sea Cucumber Fishery | State-wide | | x | | | | |
| Exmouth Gulf Beach Seine and Mesh Net Managed Fishery | North Coast | | x | | | | |
| Pilbara Crab Managed Fishery | North Coast | | x | | | | |
| Cockburn Sound (Fish Net) Managed Fishery | West Coast | | x | | | | |
| Mandurah to Bunbury Developing Crab Fishery | West Coast | | x | | | | |
| South West Trawl Fishery | West Coast | | x | | | | |
| Onslow Prawn Managed Fishery | North Coast | | x | | | | |
| FBL condition 73 South Coast Trawl Fishery | South Coast | | x | | | | |

^a WC = West Coast, SC = South Coast, GC = Gascoyne Coast, NC = North Coast. 'x' means the fishery has been excluded for the reason in the associated column heading. The evaluation of each fishery ended once one 'x' was assigned. '□' means the fishery has been included in the first stage of the project. Some fisheries are classified in a 'state-wide' bioregion but principally fish in 1 or 2 bioregions, which have been identified in the State-wide Sub Bioregion/s column.

Source: BDO EconSearch analysis

2.4. Approach 1

Approach 1 used published fishery production data and published national input-output (IO) profiles that describe inter-sector flows. This is considered a minimal cost approach. Given the ease of access of the data, Approach 1 was applied to all small scale fisheries that were identified in Table 2-3.

This section outlines Approach 1, the minimal cost approach, to valuing commercial fishery supply chains. The method applied has three primary data types (Table 2-2):

1. *Gross value of production (GVP)* for each fishery sourced by special request from DPIRD (pers. comm. 2022). This was sourced through a standard data request for non-confidential information.
2. *Production characteristics of supply chain business activities* sourced from various IO tables within the ABS Australian National Accounts for the 2019-20 financial year (ABS 2022).
3. *Supply chain flows*, that is the volume of production received at each node of the supply chain, sourced from various publications as outlined further below.

Each of these data types are described in more detail in the following sections.

Gross value of production (GVP)

GVP refers to the value of the total annual catch for individual fisheries, fishing sectors or the fishing industry as a whole, and is measured in dollar terms. GVP, generally reported on an annual basis, is the quantity of catch for the year multiplied by landed beach prices¹.

The 17 fisheries selected for inclusion in Approach 1 are listed in Table 2-4, along with their bioregion, GVP, volume of catch, beach price and number of vessels for 2020/21. The 2020/21 data was compared against the selection criteria for each fishery to identify the 17 fisheries included in Approach 1.

¹ Beach price refers to the price received by commercial fishers at the "port level" for their catch, and is generally expressed in terms of \$/kg. Some processing costs are included in the beach price, as some processing occurs on the boat. Other processing costs are not included in the beach price, as processing operations are assumed to occur further along the value chain. The use of beach prices also removes the effect of transfer pricing by the firm if it is vertically integrated into the value chain.

Table 2-4 Catch, value and vessels, 2020/21, by included fishery

| Fishery Name | Abbrev. | Bio-region ^a | GVP 2020/21 (\$m) | Live weight (t) | Beach Price (\$/kg) ^b | Vessels (no) |
|---|---------|-------------------------|-------------------|-----------------|----------------------------------|--------------|
| Gascoyne Demersal Scalefish | GDS | GC | 1.4 | 152 | 9.41 | 55 |
| Shark Bay Beach Seine and Mesh Net | SBBSMN | GC | 0.6 | 144 | 4.26 | 7 |
| Shark Bay Crab | SBC | GC | 5.3 | 525 | 10.08 | 23 |
| Kimberley Gillnet and Barramundi | KGB | NC | 0.6 | 71 | 8.56 | 4 |
| Mackerel | M | NC | 3.7 | 306 | 12.01 | 19 |
| South Coast Crustacean | SCC | SC | 1.0 | 23 | 44.09 | 8 |
| South Coast Estuarine | SCE | SC | 1.0 | 206 | 4.87 | 24 |
| South Coast Line and Fish Trap | SCLF | SC | 1.4 | 152 | 9.41 | 55 |
| South Coast Nearshore Netting | SCN | SC | 0.1 | 44 | 2.82 | 20 |
| South Coast Purse-Seine | SCPS | SC | 1.4 | 1,225 | 1.10 | 8 |
| Southern Demersal Gillnet and Demersal Longline | SDGDL | SC | 4.2 | 915 | 4.59 | 17 |
| South West Coast Beach Net Fishery (Order) | SWCBN | WC | 0.2 | 62 | 4.02 | 9 |
| West Coast Deep Sea Crustacean | WCDSC | WC | 9.6 | 180 | 53.17 | 6 |
| West Coast Demersal Gillnet and Demersal Longline | WCDGDL | WC | 0.2 | 52 | 3.71 | 4 |
| West Coast Demersal Scalefish | WCDS | WC | 2.1 | 208 | 10.30 | 35 |
| West Coast Estuarine | WCE | WC | 1.0 | 178 | 5.60 | 9 |
| Octopus | O | WC | 4.7 | 370 | 12.66 | 27 |

^a WC = West Coast, SC = South Coast, GC = Gascoyne Coast, NC = North Coast.

^b That is, the average beach price across all species caught in each fishery provided by DPIRD pers. comm.

Source: DPIRD pers. comm. 2022 and BDO EconSearch analysis

The three case study fisheries selected for inclusion in Approaches 2 and 3 are listed in Table 2-5, along with their bioregion, GVP, volume of catch, beach price and number of vessels for 2021/22. The 2021/22 data was used to model the supply chain analysis of the case study fisheries for Approach 1, 2, and 3². These three case studies were chosen in consultation with the Steering Committee because of their likely receptiveness to participate in workshops and interviews and for their diversity of supply chain.

Table 2-5 Catch, value and vessels, 2021/22, by case study fishery

| Fishery Name | Abbrev. | Bio-region ^a | GVP 2021/22 (\$m) | Live weight (t) | Beach Price (\$/kg) | Vessels (no) |
|---|---------|-------------------------|-------------------|-----------------|---------------------|--------------|
| South Coast Purse-Seine | SCPS | SC | 1.8 | 1,636 | 1.12 | 7 |
| Southern Demersal Gillnet and Demersal Longline | SDGDL | SC | 4.9 | 1,025 | 4.79 | 17 |
| Octopus | O | WC | 7.1 | 594 | 11.97 | 24 |

^a WC = West Coast, SC = South Coast.

Source: DPIRD pers. comm. 2023 and BDO EconSearch analysis

² A the time of the decision of which fisheries to include as case studies only 2020/21 data were available.

Production characteristics of supply chain business activities

IO tables for a region report the sales from each industry to each other industry, as well as the purchases from each industry from each other industry. For example, they report sales from the fishing sector to the seafood processing sector and other sectors. Subsequently, those sectors also have sales to other sectors. By applying these flows in sequence we can estimate the transfers between some nodes of a supply chain as well as the value-added and employment associated with those flows.

The Australian Bureau of Statistics (ABS) Australian National Accounts for the 2019-20 financial year (ABS 2022) were used for this purpose. These present national totals, which means we are using national averages for all seafood in Approach 1. For fishing sectors this means we are using fishing activity from all fisheries and regions in Australia and for other supply chain stages we also incorporate aquaculture and imported seafood products into our averages.

An important consideration in using IO tables for this purpose is whether supply chain sectors (beyond the initial production sector) are defined as margin sectors in the IO table. This avoids double counting of purchases of seafood along the supply chain. For example, the value of a fish sold in a retail fish shop is based upon the value of the fish sold by the commercial fisher plus the value sold by the fish processor and the wholesaler. However, if we sum the whole sale value at each stage, we would be counting the value of the fish multiple times. Therefore, for each stage of the supply chain beyond the initial production stage, only the margin should be added to the value of the subsequent stage.

Key to the Approach 1 estimates of margins at each stage of the supply chain for each fishery, is the application of production functions of business activities from various IO tables in the ABS Australian National Accounts (ABS 2022). The relevant input-output industry groups (IOIG) and corresponding ANZSIC classes involving seafood are detailed in Table 2-6.

Each IOIG includes many more industries, but only the seafood components have been listed in the table to characterise the activities represented by each stage. Descriptive explanations of the activities intended to be included in each supply chain stage are:

- **Fishing** - Activity mainly engaged in the capture or harvest and sale of seafood by commercial operators. Can include some minor processing (e.g. filleting, freezing, etc.) on-board prior to sale.
- **Processed seafood manufacturing** - Activity mainly engaged in processing seafood, such as skinning, scaling or shelling, grading, filleting, boning, crumbing, battering, freezing and cooking.
- **Wholesale trade** - Activity mainly engaged in purchase and on selling, the commission based buying, and the commission based selling of seafood, without significant transformation, to businesses. Wholesaling is often characterised by high value and/or bulk volume transactions, and customers are generally reached through trade-specific contacts. Includes import and export activities.
- **Retail trade** - Activity mainly engaged in the purchase and on selling, commission based buying, and commission based selling of seafood, without significant transformation, to the general public.
- **Food and beverage service** - Activity mainly engaged in selling meals and snacks for consumption by customers both on and off-site. This includes restaurants, fast food and fish fry activities.

A challenge in delineating supply chain stages is that it can be difficult to isolate and value activity along a vertically integrated supply chain. Vertical integration occurs where different stages of production are carried out in succession by different parts of the same business. The output of one stage becomes the input to the next stage, with only the output of the final stage being sold on the market (ABS 2006). The ABS

classifies vertically integrated activities according to their predominant activity, using value added. If no information is available to assess value added, or there are two or more activities of equal value, then the activity is classified according to the last or final stage of production where most of the value added is generally assumed to lie (ABS 2006).

Table 2-6 Relevant seafood business activities

| Input-Output Industry Group (IOIG) | | Relevant Seafood Activities (ANZSIC Class) | |
|------------------------------------|---|--|--|
| 0401 | Fishing, hunting and trapping | 0411 | Rock lobster and crab potting |
| | | 0412 | Prawn fishing |
| | | 0413 | Line fishing |
| | | 0414 | Fish trawling, seining and netting |
| | | 0419 | Other fishing |
| 1102 | Processed seafood manufacturing | 1120 | Seafood processing |
| 3301 | Wholesale trade | 3601 | General line grocery wholesaling |
| | | 3604 | Fish and seafood wholesaling |
| | | 3609 | Other grocery wholesaling |
| 3901 | Retail trade | 4110 | Supermarket and grocery stores |
| | | 4121 | Fresh meat, fish and poultry retailing |
| 4501 | Food and beverage services ^a | 4511 | Cafes and restaurants |
| | | 4512 | Takeaway food services |
| | | 4513 | Catering services |
| | | 4520 | Pubs, taverns and bars |
| 4601 | Road transport | 4610 | Road freight transport |

^a The IOIG food and beverage services is referred to as food services throughout the remainder of the report.

Source: ABS 2006 and 2022

Some sectors, by nature of what they sell or the service they provide, are accounted for in IO framework as margin sectors (i.e. the *cost of goods sold* has been excluded from revenue and expenditure). Production characteristics can be taken directly from the IO tables for these sectors. However, for most sectors this is not the case and for them to be represented appropriately for supply chain analysis they need to be transformed into margin sectors. For the sectors analysed in Approach 1, this was required only for the processed seafood manufacturing sector. To do so, the value of seafood purchases was subtracted from the expenditures and revenue for the sector and the sector was re-expressed in terms of ‘per dollar of seafood purchased’, such as spending on intermediate sectors (i.e. spending on inputs necessary to the transformation of the product) and primary inputs to production (compensation of employees (COE), gross operating surplus (GOS) and taxes less subsidies (TLS)). The resulting supply chain margin for each sector is

detailed in Table 2-7. The margin is the sum of the intermediate production (excluding seafood purchases for sectors beyond production), COE, GOS and TLS. Employment in full-time equivalent (FTE) terms from the IO tables was also re-expressed as employment per dollar of COE margin as presented in.

Table 2-7 Supply chain margins (per \$ of seafood use)

| | Fishing, hunting & trapping ^a | Processed seafood manufacturing | Wholesale trade | Retail trade | Food service | Road transport |
|--------------------------|--|---------------------------------|-----------------|--------------|--------------|----------------|
| Seafood | - | 1.00 | 1.00 | 1.00 | 1.00 | - |
| Intermediate | 0.51 | 0.28 | 0.15 | 0.08 | 1.03 | 0.58 |
| COE | 0.11 | 0.16 | 0.10 | 0.08 | 0.75 | 0.25 |
| TLS | 0.02 | -0.01 | 0.00 | 0.00 | -0.02 | 0.03 |
| GOS | 0.36 | 0.33 | 0.06 | 0.04 | 0.24 | 0.14 |
| Margin | - | 0.77 | 0.31 | 0.20 | 2.00 | - |
| Revenue | 1.00 | 1.77 | 1.31 | 1.20 | 3.00 | 1.00 |
| Employment (FTE/\$m COE) | 25.61 | 19.07 | 11.35 | 18.89 | 26.18 | 15.61 |

^a Per dollar of revenue.

Source: ABS 2022 and BDO EconSearch analysis

The margins detailed in Table 2-7 are expressed per dollar of seafood sold for each sector. For the fishing, hunting and trapping sector the margin was expressed per dollar of seafood sold in the IO tables (ABS 2022), so no further transformation was required. For the processed seafood manufacturing sector this calculation was part of the transformation to a margin sector, as described earlier. For sectors that were already defined as margin sectors (retail trade, wholesale trade, food services) within the IO framework we had to estimate the margins. For the retail trade and wholesale trade sectors margins were estimated using retail and wholesale margin tables (ABS 2022) for sales by seafood processing to households. For the food service and transport sectors data were not available from the IO tables, so margins for these sectors were based on our best judgement. For the food service sector we applied a 200 per cent margin (based on information sourced in Jeswanth 2023 and Ledovskikh 2023) and for the road transport we applied a 5 per cent margin. These margins are an important factor to compare and test through Approach 2 and 3.

Supply chain flows

In approach 1 we defined a domestic focused supply chain as one where no or little product is sent to export and the majority of product flows through to local consumers via the retail and food service sectors. In contrast, we defined an export focused supply chain as one where the majority of production is exported prior to, or post, local processing. The small scale fisheries selected for this study were classified by these two types of supply chain as detailed in Table 2-8. In all likelihood the export classified fisheries would sell a proportion of their final product domestically, but we differentiated them as domestic or export focused based on their dominant sales market. Approaches 2 and 3 intertwine the nuances of both export and domestic sales.

Although the definition of small scale fisheries adopted in this study relates to regionally significant domestic supply chains, including some export focused fisheries allowed us to compare and discuss the differences between domestic and export focused fishery supply chains. As such, export focused fisheries were not excluded when selecting fisheries to include in Approach 1.

Table 2-8 Fishery by supply chain type

| Domestic Focused Fisheries | | Export Focused Fisheries |
|----------------------------------|---|--------------------------------|
| Gascoyne Demersal Scalefish | South Coast Nearshore Netting | South Coast Crustacean |
| Shark Bay Beach Seine and Mesh | South Coast Purse-Seine | West Coast Deep Sea Crustacean |
| Shark Bay Crab | Southern Demersal Gillnet & Demersal Longline | |
| Kimberley Gillnet and Barramundi | South West Coast Beach Net Fishery | |
| Mackerel | West Coast Demersal Gillnet & Demersal Longline | |
| South Coast Estuarine | West Coast Demersal Scalefish | |
| South Coast Line and Fish Trap | West Coast Estuarine | |
| Octopus | | |

Box 1 Summarising the implications of the generalised supply chain model used in Approach 1

It is important to note that, at this stage, the method has used information from national IO tables, some reviewed literature about fisheries supply chains, and researcher judgement. It does not include any primary or secondary data about the specific fisheries to be analysed, beyond GVP. Some high-level summaries can be calculated at this stage to demonstrate the utility of this generalised analysis and to use as a point of comparison against the more specific analyses that follow in Approach 1 as well as Approach 2 and 3. For example, the ratio of *final sales value at the end of the supply chain to beach price* can be calculated as 2.5 for domestic fisheries and 1.4 for export focused fisheries. Implying that for each \$1 of fish landed at beach price, the estimated final sales value at the end of a domestic supply chain is \$2.5, or for an export focused supply chain it is \$1.4.

A multiplier of 2.5 is comparable, albeit, slightly more conservative than that found by Christensen *et. al.* (2014) of 2.9 for Peruvian fisheries. They also make a similar conclusion to our domestic versus export supply chain comparison in that longer supply chains (e.g. those that extend beyond processing and wholesale) result in higher multipliers.

The plausibility of the scale of this uplift for a domestic supply chain can be verified using a simple example of a load of finfish with a typical whole beach price of \$10/kg, and recovery rate of 50 per cent (average final weight divided by whole weight which is a higher recovery rate than filleting to account for some sales of whole fish). In this example a load of finfish is landed and sold by the fisher for \$10/kg, at the end of the supply chain it is sold for $\$10/\text{kg} \times 2.5 = \$25/\text{kg}$. With a recovery rate of 50 per cent, this implies that the final processed price of the fish is $\$25/\text{kg} / 0.5 = \$50/\text{kg}$, a plausible average price for final sales of finfish.

To illustrate the different flows of economic activity along the two types of supply chains, flow maps are present below and flow tables in Appendix 2. A domestic focused supply chain flow map is shown in Figure 2-1 and detailed in Appendix Table 2-1, whilst an export focused supply chain flow map is shown in Figure 2-2 and detailed in Appendix Table 2-2.

In addition to the flows illustrated on the maps, a 5 per cent transport margin was added to each business to business flow. These maps were developed through a literature review of supply chains in WA. Whilst the literature review investigated supply chains across many fishery types, two specific references were used to develop the maps, flows in the IO tables (ABS 2022) and the Seafood CRC project 2009/709 (Howieson *et. al.* 2014). The maps provide the estimates of supply chain flows under Approach 1 and a starting point to be further developed through Approach 2 and 3.

Figure 2-1 Domestic focused supply chain flows

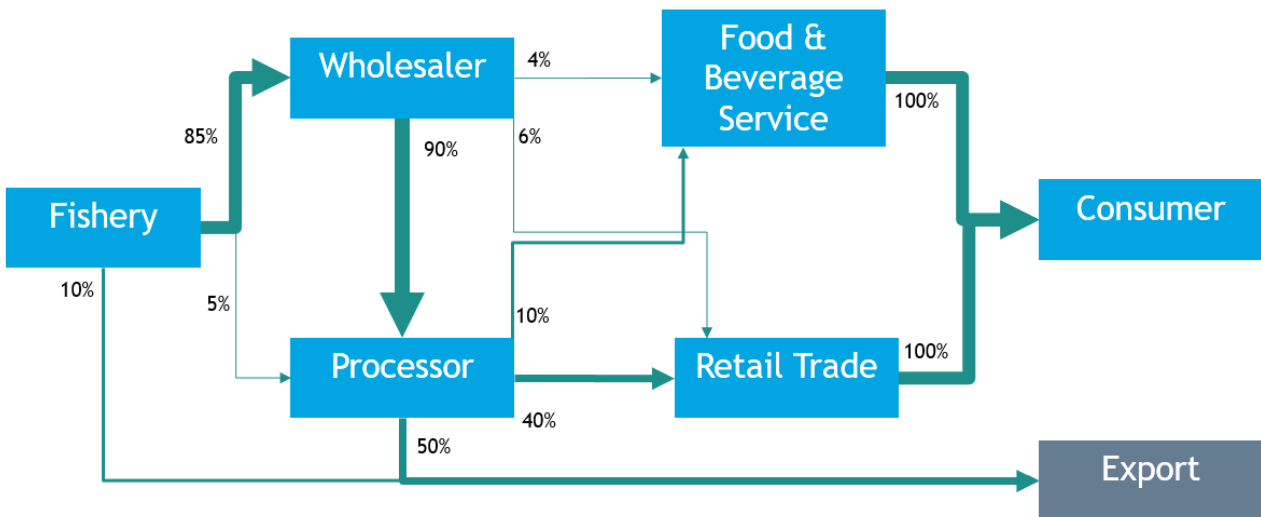
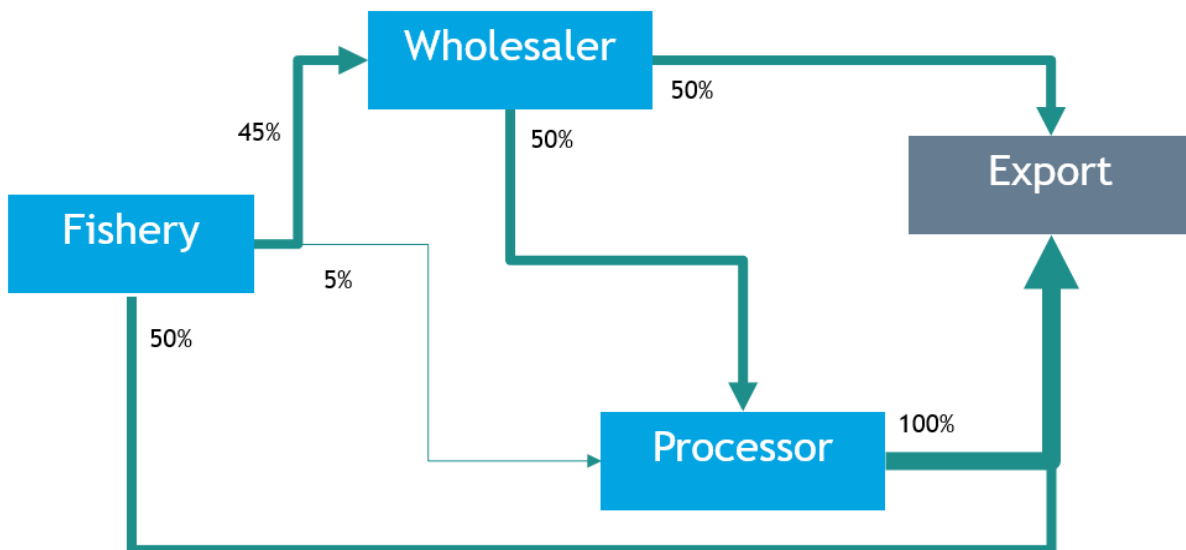


Figure 2-2 Export focused supply chain



Some key points to aid understanding of the maps above and throughout the report are:

- Blue boxes are stages in the supply chain. These may be separate businesses, different stages on a vertically integrated business, or a mix of both. The box includes a name, description and information about the margin or price in square brackets.
- Grey boxes represent sales to buyers outside of the region.
- Green arrows are the flows of product between stages of the supply chain. Larger arrows represent larger flows.
- The % numbers represent the % of sales value from a stage.
- Orange boxes identify transport margins and specify their value as a % of product value.

2.5. Approach 2

Approach 2 was the same as Approach 1 but also included workshops with key stakeholders to inform the assumptions. This is considered a minimum consultation approach.

2.5.1. Workshop

Four fisheries were initially selected in consultation with the project steering committee to be potential case studies. These four fisheries were narrowed down to three after contacting key people in these fisheries to see how receptive they were to the study. The case study fisheries chosen were the South Coast Purse Seine Fishery, the Southern Demersal Gillnet and Demersal Longline Fishery, and the Octopus Fishery.

The next step was completing industry consultation to collect data required for Approach 2. Workshops for Approach 2 were held on:

1. 09/03/2023 for the South Coast Purse Seine Fishery
2. 21/03/2023 for the Octopus Fishery
3. 28/03/2023 for the Southern Demersal Gillnet and Demersal Longline Fishery.

The workshops were run by BDO EconSearch members who drew a supply chain on-screen with guidance, open communication and information provided from attendees about the selected fishery's supply chain. The aim was to generate a qualitative description of the fishery's supply chain and a supply chain flow map to visually capture the flows and nodes of the supply chain. Key uncertainties and gaps in knowledge were also identified and noted throughout the process.

All three workshops were successful and achieved the intended outcomes. All participants appeared to be satisfied with the experience. Table 2-9 details the number of contacts invited to participate in each workshop and the number of total workshop attendees. A write up of each workshop outcomes are provided in Appendix 1 and summarised by fishery below.

Table 2-9 Workshop participation

| Fishery Name | Number of contacts invited to participate | Number of workshop attendees |
|---|---|------------------------------|
| South Coast Purse-Seine Fishery | 4 | 4 |
| Southern Demersal Gillnet and Demersal Longline Fishery | 7 | 3 |
| Octopus Fishery | 5 | 4 |

Source: BDO EconSearch analysis

South Coast Purse Seine Fishery

In the South Coast Purse Seine Fishery, Australian Sardines (the product) are caught by fishing businesses and then either supplied to processors, or processed by the fishing business themselves. The processors prepare the product for either the bait (70 per cent of product) or human consumption (30 per cent of product) markets. The product prepared for the bait market is sold to wholesalers who then on-sell the product to retailers. The retailers then sell directly to consumers (for example, recreational fishers). The product prepared for the human consumption market is sold to wholesalers who then on-sell the product to retailers or food service businesses. The product is then sold directly to the consumer as a retail product or as part of a prepared meal.

Key uncertainties of workshop participants included the proportion of human consumption product that goes to the food service industry, the human consumption product wholesale and retail margin, the bait product wholesale and retail margin, transport margins beyond wholesaling, and additional products not included in the supply chain flow map that are sold in small quantities.

Octopus Fishery

In the Octopus Fishery, Octopus (the product) are caught by fishing businesses and then either supplied to processors, or processed by the fishing business themselves. The processors prepare the product primarily as raw frozen tentacles (84 per cent of product) or value-added products (16 per cent of product) (including steam cooked and marinated). The raw frozen tentacles product is sold to wholesalers, food service businesses or exported overseas. The product sold to wholesalers is distributed to food service businesses who prepare and sell directly to the consumer as part of a prepared meal. The value-add product is sold to wholesale and retail businesses or exported overseas. The wholesalers supply the product to retail businesses, which then sell the product directly to the consumer as a retail product.

Key uncertainties of workshop participants included the total value reported by DPIRD for Octopus and how this relates to the beach price, the processor margin, the transport margin, market destination location and types of value-add products, and additional small operations not included in the supply chain flow map that buy raw frozen tentacles to marinate then sell into local retail.

Southern Demersal Gillnet and Demersal Longline Fishery

In the Southern Demersal Gillnet and Demersal Longline fishery, various species of shark (approximately 85 per cent of GVP) and scalefish (approximately 15 per cent of GVP) are caught by fishing businesses. As a result of the dominance of shark catch and difficulties defining the scalefish supply chain it was decided between workshop participants that the focus of the supply chain for this fishery should be on the shark product. As a result, scalefish catch was excluded from the discussion.

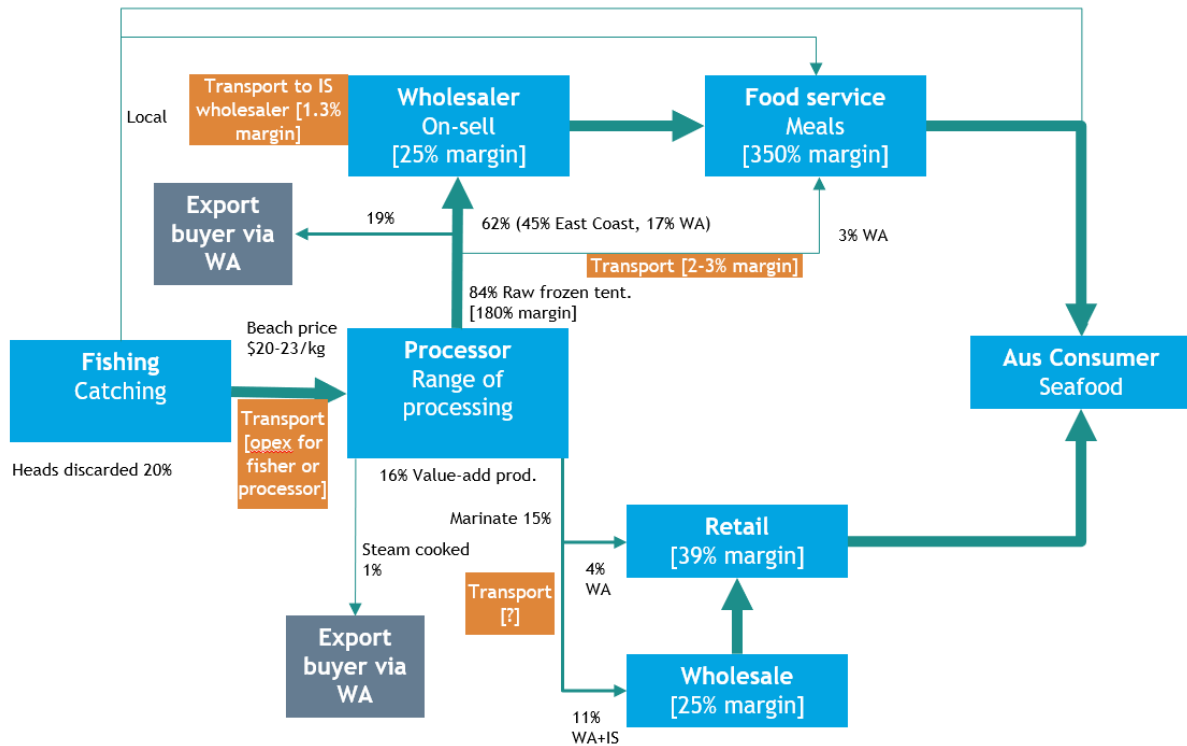
The fishers catch shark and supply it to local processors (80-85 per cent of shark) or local food service businesses, retail businesses, or directly to the consumer (15-20 per cent of shark). The processors sell the product to interstate wholesalers or to food service and retail businesses in WA. The food service and retail businesses sell the product directly to the consumer as a retail product or as part of a prepared meal. The processors also remove the fins and belly flaps of the shark and sell those to an interstate buyer. The other proportion of the product not supplied to processors is sold to food service businesses, retail businesses or directly to the consumer. The local buyers fillet the product themselves and then directly sell the product to the consumer, sell the product as part of a prepared meal, or consume the product themselves.

Key uncertainties of workshop participants included the scalefish component of the fishery and the transport margins.

2.5.2. Supply chain analysis

The results of the workshops were used to refine the supply chain analysis method used in Approach 1. The flows of the product to each supply chain node, including the associated recovery rate, were revised in line with the outcomes of the workshop. The supply chain flow map for each fishery used in Approach 2 is shown in Figure 2-3 to Table 2-5. The resulting supply chain margins for each fishery and sector that were added to the model are detailed in Table 2-10 to Table 2-12. These maps were developed in the workshops then integrated into the model. The assumptions applied to models based on the flow maps are detailed in Appendix Table 2-3 to Appendix Table 2-5. Where possible the margin at each node of the supply chain was also revised, and the other modelling factors (intermediate, COE, GOS, TLS, revenue, and employment) were adjusted using their proportional relationship with the margin established in Approach 1 (Section 2.4).

Figure 2-3 Octopus Fishery supply chain flows, Approach 2



Source: BDO EconSearch analysis and fishery workshop

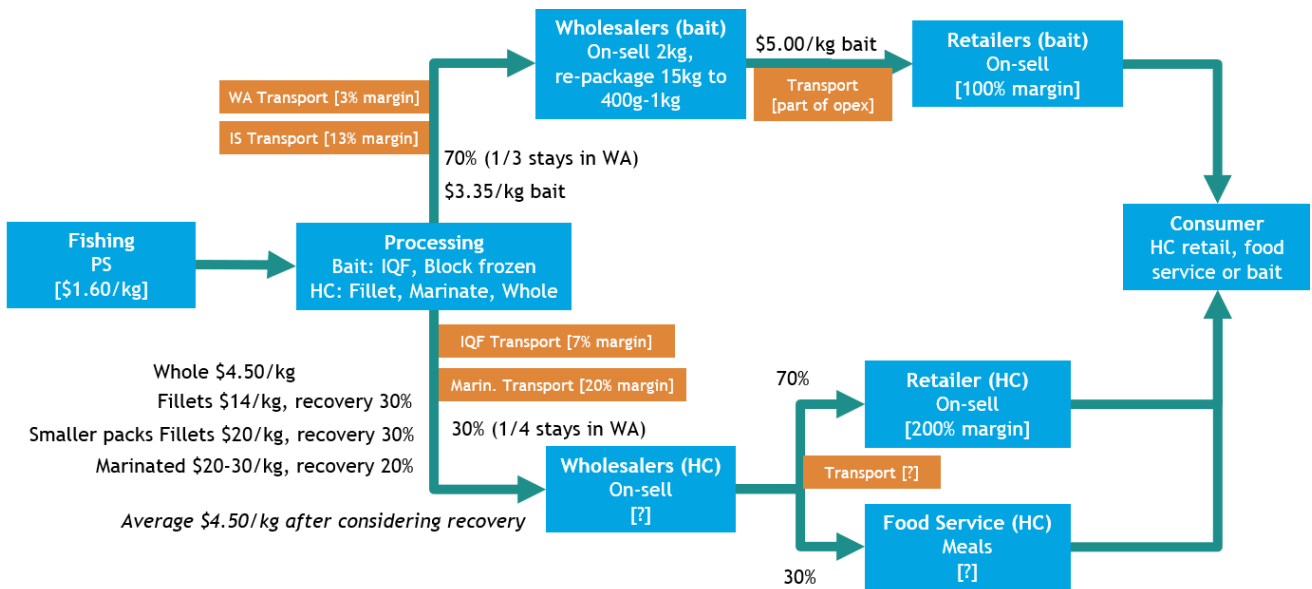
Table 2-10 Octopus Fishery supply chain margins, Approach 2 (per \$ of seafood use)

| | Fishing, hunting & trapping ^a | Processed seafood manufacturing | Wholesale trade/ Exporter | Retail trade | Food service | Road transport |
|--------------------------|--|---------------------------------|---------------------------|--------------|--------------|----------------|
| Seafood | - | 1.00 | 1.00 | 1.00 | 1.00 | - |
| Intermediate | 0.51 | 0.29 | 0.12 | 0.16 | 1.80 | 0.58 |
| COE | 0.11 | 0.17 | 0.08 | 0.15 | 1.32 | 0.25 |
| GOS | 0.36 | 0.35 | 0.05 | 0.08 | 0.42 | 0.14 |
| TLS | 0.02 | -0.01 | 0.00 | 0.00 | -0.04 | 0.03 |
| Margin | - | 0.79 | 0.25 | 0.39 | 3.50 | - |
| Revenue | 1.00 | 1.79 | 1.25 | 1.39 | 4.50 | 1.00 |
| Employment (fte/\$m COE) | 25.61 | 19.07 | 11.35 | 18.89 | 26.18 | 15.61 |

^a Per dollar of revenue.

Source: ABS 2022 and BDO EconSearch analysis

Figure 2-4 South Coast Purse Seine Fishery supply chain flows, Approach 2



Source: BDO EconSearch analysis and fishery workshop

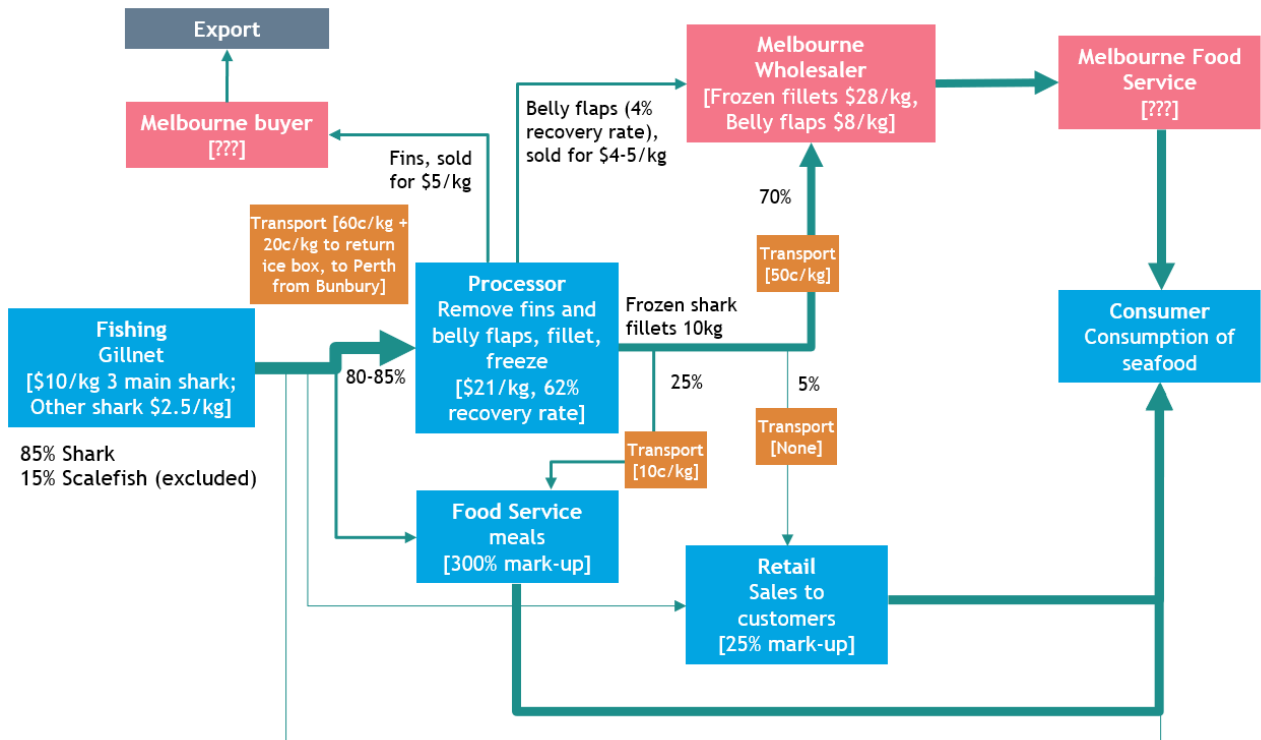
Table 2-11 South Coast Purse Seine Fishery supply chain margins, Approach 2 (per \$ of seafood use)

| | Fishing, hunting & trapping ^a | Processed seafood manufacturing | Wholesale trade | Retail trade | Food service | Road transport |
|--------------------------|--|---------------------------------|-----------------|--------------|--------------|----------------|
| Seafood | - | 1.00 | 1.00 | 1.00 | 1.00 | - |
| Intermediate | 0.51 | 0.48 | 0.21 | 0.49 | 1.03 | 0.58 |
| COE | 0.11 | 0.28 | 0.15 | 0.45 | 0.75 | 0.25 |
| GOS | 0.36 | 0.57 | 0.09 | 0.25 | 0.24 | 0.14 |
| TLS | 0.02 | -0.02 | 0.00 | -0.01 | -0.02 | 0.03 |
| Margin | - | 1.31 | 0.45 | 1.18 | 2.00 | - |
| Revenue | 1.00 | 2.31 | 1.45 | 2.18 | 3.00 | 1.00 |
| Employment (fte/\$m COE) | 25.61 | 19.07 | 11.35 | 18.89 | 26.18 | 15.61 |

^a Per dollar of revenue.

Source: ABS 2022 and BDO EconSearch analysis

Figure 2-5 Southern Demersal Gillnet & Demersal Longline Fishery supply chain flows, Approach 2



Source: BDO EconSearch analysis and fishery workshop

Table 2-12 Southern Demersal Gillnet & Demersal Longline Fishery supply chain margins, Approach 2 (per \$ of seafood use)

| | Fishing, hunting & trapping ^a | Processed seafood manufacturing | Wholesale trade | Retail trade | Food service | Road transport |
|--------------------------|--|---------------------------------|-----------------|--------------|--------------|----------------|
| Seafood | - | 1.00 | 1.00 | 1.00 | 1.00 | - |
| Intermediate | 0.51 | 0.21 | 0.15 | 0.10 | 1.55 | 0.58 |
| COE | 0.11 | 0.12 | 0.10 | 0.10 | 1.13 | 0.25 |
| GOS | 0.36 | 0.25 | 0.06 | 0.05 | 0.36 | 0.14 |
| TLS | 0.02 | -0.01 | 0.00 | 0.00 | -0.04 | 0.03 |
| Margin | - | 0.57 | 0.31 | 0.25 | 3.00 | - |
| Revenue | 1.00 | 1.57 | 1.31 | 1.25 | 4.00 | 1.00 |
| Employment (fte/\$m COE) | 25.61 | 19.07 | 11.35 | 18.89 | 26.18 | 15.61 |

^a Per dollar of revenue.

Source: ABS 2022 and BDO EconSearch analysis

2.6. Approach 3

Approach 3 was the same as Approach 2 but also involved collecting primary data through in depth interviews of businesses along the supply chain. This is considered a maximum data approach.

2.6.1. Business interviews

The participants involved in the fishery workshops were invited to complete individual and confidential business interviews to collect data to value each supply chain node. As part of the business interview, workshop attendees were also asked to invite others involved in the fishery to participate in interviews and share contact details of their buyers and suppliers. Information was collected on the business activities, input and output of the focus fishery’s product, employment, operational costs, capital costs and revenue. The interview template used for the business interviews is detailed in Appendix 3.

Businesses participated in the interview process in a variety of formats, including phone interviews and email correspondence. Businesses also provided a varying amount of information based on their business size, operation type and level of involvement in the fishery. Table 2-13 details the number of contacts invited to participate in each fishery and the total number of respondents that participated in the interview process. Businesses that participated in the interviews had a variety of operation types, including fishers, processors, wholesalers, retailers, food service. Many interviewed businesses had activity relating to multiple of the listed operation types.

Table 2-13 Interview participation

| Fishery name | Number of contacts invited to participate | Number of respondents |
|---|---|-----------------------|
| South Coast Purse-Seine Fishery | 7 | 6 |
| Southern Demersal Gillnet and Demersal Longline Fishery | 9 | 5 |
| Octopus Fishery | 6 | 5 |

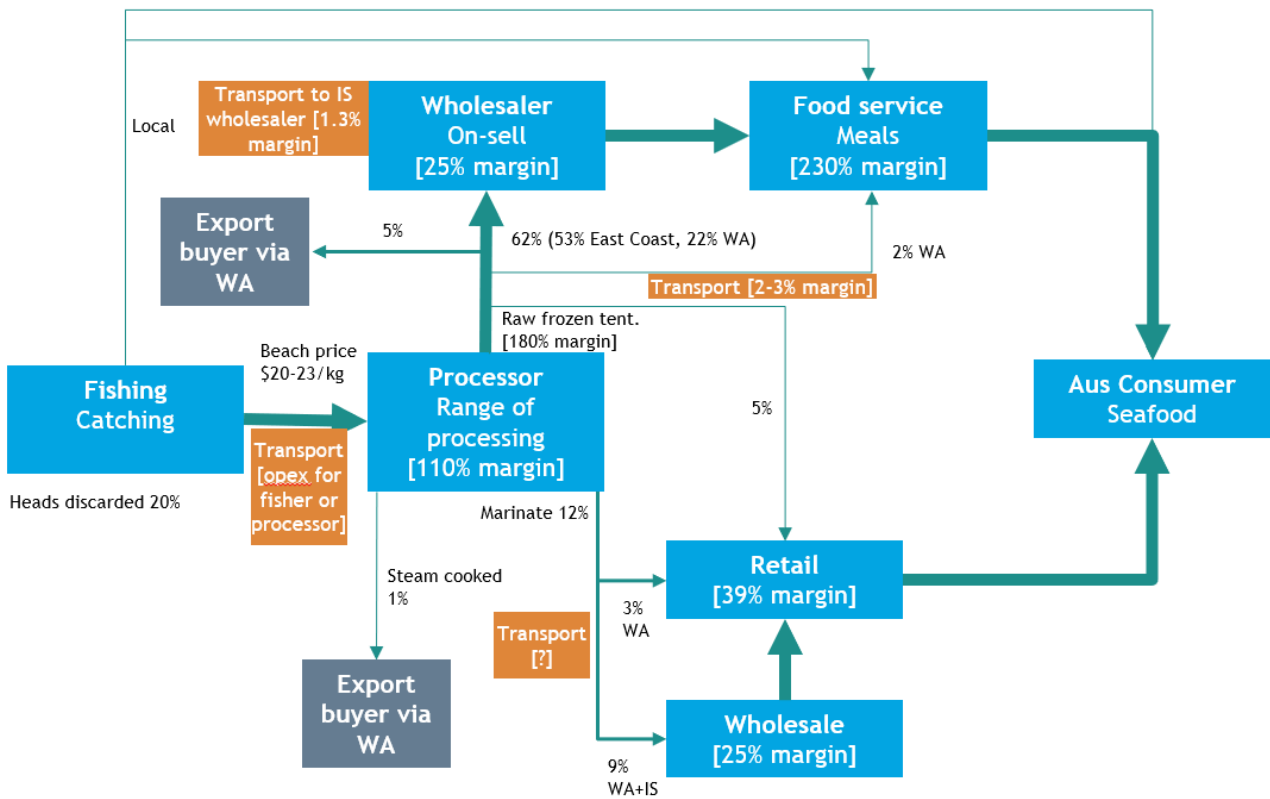
Source: BDO EconSearch analysis

2.6.2. Supply chain analysis

The data received through the business interviews were used to refine the supply chain analysis method used in Approach 2. The flows of the product to each supply chain node including the associated recovery rate were revised in line with the business interview data. The supply chain flow map for each fishery used in Approach 3 is shown in Figure 2-6 to Figure 2-8. These maps were developed in the workshops, revised using the data received through the business interviews, and then integrated into the model. The assumptions applied to model based on the flow maps are detailed in Appendix Table 2-1 to Appendix Table 2-8.

Where possible the margin at each node of the supply chain was also revised, and the other modelling factors (intermediate, COE, GOS, TLS, revenue, and employment), were adjusted depending on data availability using either the data from the business interviews or their proportional relationship with the margin established in Approach 1 (Section 2.4). The resulting supply chain margins for each fishery and sector that were added to the model are detailed in Table 2-14 to Table 2-16.

Figure 2-6 Octopus Fishery supply chain flows, Approach 3



Source: BDO EconSearch analysis, fishery workshop and business interviews

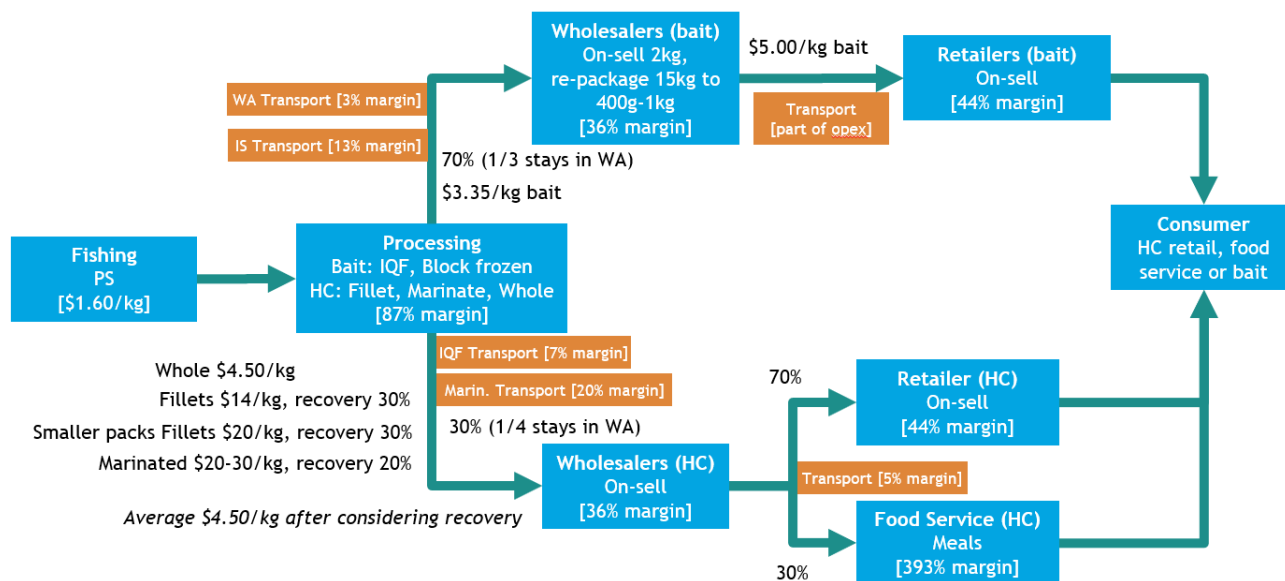
Table 2-14 Octopus Fishery supply chain margins, Approach 3 (per \$ of seafood use)

| | Fishing, hunting & trapping ^a | Processed seafood manufacturing | Wholesale trade/ Exporter | Retail trade | Food service | Road transport |
|--------------------------|--|---------------------------------|---------------------------|--------------|--------------|----------------|
| Seafood | - | 1.00 | 1.00 | 1.00 | 1.00 | - |
| Intermediate | 0.46 | 0.15 | 0.12 | 0.16 | 1.18 | 0.58 |
| COE | 0.36 | 0.26 | 0.08 | 0.15 | 0.87 | 0.25 |
| GOS | 0.18 | 0.32 | 0.05 | 0.08 | 0.28 | 0.14 |
| TLS | 0.00 | 0.00 | 0.00 | 0.00 | -0.03 | 0.03 |
| Margin | - | 1.10 | 0.25 | 0.39 | 2.30 | - |
| Revenue | 1.00 | 2.10 | 1.25 | 1.39 | 3.30 | 1.00 |
| Employment (fte/\$m COE) | 16.38 | 36.41 | 11.35 | 18.89 | 26.18 | 15.61 |

^a Per dollar of revenue.

Source: ABS 2022 and BDO EconSearch analysis

Figure 2-7 South Coast Purse Seine Fishery supply chain flows, Approach 3



Source: BDO EconSearch analysis, fishery workshop and business interviews

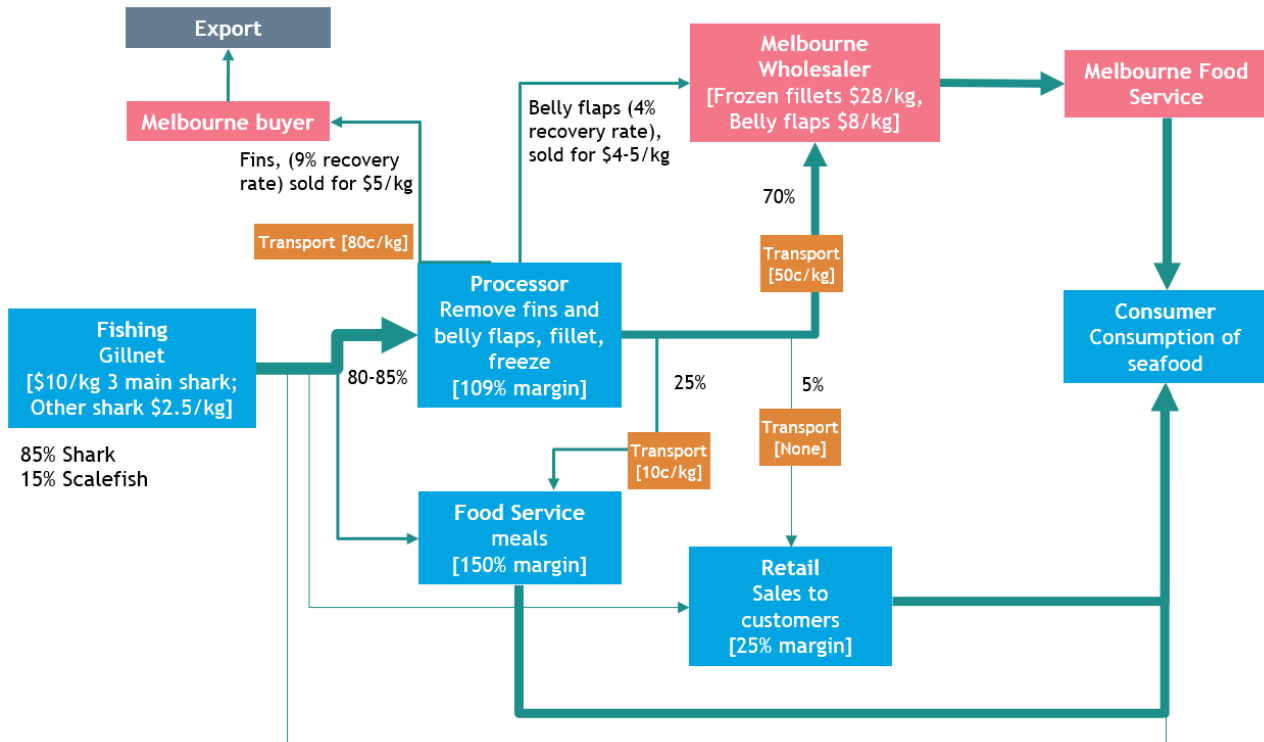
Table 2-15 South Coast Purse Seine Fishery supply chain margins, Approach 3 (per \$ of seafood use)

| | Fishing, hunting & trapping ^a | Processed seafood manufacturing | Wholesale trade | Retail trade | Food service | Road transport |
|--------------------------|--|---------------------------------|-----------------|--------------|--------------|----------------|
| Seafood | - | 1.00 | 1.00 | 1.00 | 1.00 | - |
| Intermediate | 0.48 | 0.27 | 0.05 | 0.18 | 2.02 | 0.58 |
| COE | 0.32 | 0.28 | 0.11 | 0.17 | 1.48 | 0.25 |
| GOS | 0.20 | 0.32 | 0.19 | 0.09 | 0.47 | 0.14 |
| TLS | 0.00 | 0.00 | 0.00 | 0.00 | -0.05 | 0.03 |
| Margin | - | 0.87 | 0.36 | 0.44 | 3.93 | - |
| Revenue | 1.00 | 1.87 | 1.36 | 1.44 | 3.00 | 1.00 |
| Employment (fte/\$m COE) | 15.48 | 22.11 | 12.50 | 18.89 | 26.18 | 15.61 |

^a Per dollar of revenue.

Source: ABS 2022 and BDO EconSearch analysis

Figure 2-8 Southern Demersal Gillnet & Demersal Longline Fishery supply chain flows, Approach 3



Source: BDO EconSearch analysis, fishery workshop and business interviews

Table 2-16 Southern Demersal Gillnet & Demersal Longline Fishery supply chain margins, Approach 3 (per \$ of seafood use)

| | Fishing, hunting & trapping ^a | Processed seafood manufacturing | Wholesale trade | Retail trade | Food service | Road transport |
|--------------------------|--|---------------------------------|-----------------|--------------|--------------|----------------|
| Seafood | - | 1.00 | 1.00 | 1.00 | 1.00 | - |
| Intermediate | 0.52 | 0.16 | 0.15 | 0.10 | 0.50 | 0.58 |
| COE | 0.15 | 0.26 | 0.10 | 0.10 | 0.96 | 0.25 |
| GOS | 0.33 | 0.68 | 0.06 | 0.05 | 0.04 | 0.14 |
| TLS | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 |
| Margin | - | 1.09 | 0.31 | 0.25 | 1.50 | - |
| Revenue | 1.00 | 2.09 | 1.31 | 1.25 | 2.50 | 1.00 |
| Employment (fte/\$m COE) | 13.28 | 14.29 | 11.35 | 18.89 | 19.24 | 15.61 |

^a Per dollar of revenue.

Source: ABS 2022 and BDO EconSearch analysis

2.7. Comparing Approaches

The method used for comparing approaches involved combining the qualitative judgements of the research team. This involved the three researchers (project co-investigators) independently forming a set of frames for making judgements then generating evaluative judgements within those frames. The frames across all three researchers were then grouped into themes and key evaluative judgements were summarised together within each theme. Final independent peer review of the method and the guidelines was undertaken by FRDC on presentation of this final report.

This method allowed the framing for the analysis to emerge from the knowledge gathered throughout the study, and for the recommendations to be formed based on multiple independent evaluations of the themes.

The resulting themes used to compare the studies were:

- Inclusion of economic activity - more economic activity can generally be included through in-depth consultation.
- Relative accuracy of different economic indicators - if the goal is to understand only the local contribution of a fishery, then it becomes less important to value the entire supply chain.
- Potential for capturing different data types - the nature of data collection activities in each approach lead to different abilities and limitations regarding collection of specific types of data. This primarily depends on the requirement, ability, and willingness for supply chain businesses to provide the required data.
- Key practical challenges and achievable outputs - typically, estimating economic contribution of fisheries must be undertaken within practical constraints such as time, availability of information, willingness to provide information and cost.
- Cost of applying each approach - Cost is of clear importance when recommending a method and varies significantly between the approaches.

Relevant best practice guidelines for supply chain studies do not exist. As such, these themes have been developed from the knowledge gathered throughout this study, as specified earlier. Some themes included multiple different frames by which to compare the approaches. All relevant frames are presented in the comparison section along with a synthesis of the evaluations within each theme.

The evaluations across the set of themes were then summarised together to support the overall recommendations.

3. RESULTS

The supply chain economic contribution results of the three approaches for each case study fishery are detailed by fishery below.

3.1. Octopus Fishery

The Octopus Fishery supply chain economic contribution results for each of the three approaches are detailed in Table 3-1.

The Octopus Fishery was identified as a small scale fishery for the purpose of this analysis. However, consultation with supply chain businesses revealed that it is expected to grow quickly and may not fit this definition of a small scale fishery in the near future. This does not mean the fishery supply chain is precluded from being evaluated using these approaches, rather that the fishery may not be considered small scale in future years.

Fishing contribution

GVP (direct fishing output) of the Octopus Fishery in 2021/22 was \$7.1m (DPIRD pers. comm.) under approach 1 and \$9.1m under approaches 2 and 3. Octopus are landed fresh on ice with heads removed. The direct fishery contribution was estimated to be \$3.5m in GSP, 20 fte jobs and \$0.8m in household income under Approach 1, \$4.4m in GSP, 26 fte jobs and \$1.0m in household income under Approach 2 and \$4.9m in GSP, 54 fte jobs and \$3.3m in household income under Approach 3.

Downstream contribution

The direct downstream contribution (i.e. processing, wholesaling, retailing, food service and transport activities) was estimated to be \$7.3m in GSP, 75 fte jobs and \$3.8m in household income under Approach 1, \$13.4m in GSP, 189 fte jobs and \$8.1m in household income under Approach 2 and \$13.3m in GSP, 231 fte jobs and \$8.4m in household income under Approach 3.

Flow-on contribution

The total flow-on contribution was estimated to be \$8.4m in GSP, 45 fte jobs and \$4.4m in household income under Approach 1, \$15.5m in GSP, 82 fte jobs and \$7.9m in household income under Approach 2 and \$16.0m in GSP, 84 fte jobs and \$8.1m in household income under Approach 3.

Total contribution

The total contribution was estimated to be \$19.1m in GSP, 140 fte jobs and \$8.9m in household income under Approach 1, \$33.3m in GSP, 297 fte jobs and \$17.1m in household income under Approach 2 and \$34.2m in GSP, 369 fte jobs and \$19.8m in household income under Approach 3.

Table 3-1 Octopus Fishery supply chain economic contribution by approach, 2021/22

| | Output (\$m) | GSP (\$m) | Employment (fte) | Household Income (\$m) |
|---------------------------------|--------------|-------------|------------------|------------------------|
| Approach 1 | | | | |
| Direct Fishing | 7.1 | 3.5 | 20 | 0.8 |
| Direct Downstream | | | | |
| Processed seafood manufacturing | 5.7 | 3.6 | 23 | 1.2 |
| Wholesale trade | 1.9 | 1.0 | 7 | 0.6 |
| Retail trade | 1.2 | 0.7 | 8 | 0.4 |
| Food service | 3.3 | 1.6 | 32 | 1.2 |
| Export | 0.0 | 0.0 | 0 | 0.0 |
| Road Transport | 1.0 | 0.4 | 4 | 0.3 |
| Total Direct | 20.2 | 10.8 | 95 | 4.6 |
| Total Flow-on | | 8.4 | 45 | 4.4 |
| Total Contribution | | 19.1 | 140 | 8.9 |
| Approach 2 | | | | |
| Direct Fishing | 9.1 | 4.4 | 26 | 1.0 |
| Direct Downstream | | | | |
| Processed seafood manufacturing | 7.3 | 4.6 | 29 | 1.5 |
| Wholesale trade | 0.9 | 0.5 | 3 | 0.3 |
| Retail trade | 0.5 | 0.3 | 4 | 0.2 |
| Food service | 14.8 | 7.2 | 146 | 5.6 |
| Export | 1.0 | 0.5 | 4 | 0.3 |
| Road Transport | 0.6 | 0.3 | 2 | 0.2 |
| Total Direct | 34.3 | 17.8 | 215 | 9.1 |
| Total Flow-on | | 15.5 | 82 | 7.9 |
| Total Contribution | | 33.3 | 297 | 17.1 |
| Approach 3 | | | | |
| Direct Fishing | 9.1 | 4.9 | 54 | 3.3 |
| Direct Downstream | | | | |
| Processed seafood manufacturing | 10.0 | 5.3 | 85 | 2.3 |
| Wholesale trade | 1.2 | 0.6 | 4 | 0.4 |
| Retail trade | 0.9 | 0.5 | 6 | 0.3 |
| Food service | 13.3 | 6.5 | 131 | 5.0 |
| Export | 0.3 | 0.2 | 1 | 0.1 |
| Road Transport | 0.7 | 0.3 | 3 | 0.2 |
| Total Direct | 35.6 | 18.3 | 285 | 11.7 |
| Total Flow-on | | 16.0 | 84 | 8.1 |
| Total Contribution | | 34.2 | 369 | 19.8 |

Source: BDO EconSearch analysis

3.2. South Coast Purse Seine Fishery

The South Coast Purse Seine Fishery supply chain economic contribution results for each of the three approaches are detailed in Table 3-2.

Fishing contribution

GVP (direct fishing output) of the South Coast Purse Seine Fishery in 2021/22 was \$1.8m (DPIRD pers. comm) under approach 1 and \$2.6m under approaches 2 and 3. Sardines are landed whole, fresh on ice. The direct fishery contribution was estimated to be \$0.9m in GSP, 5 fte jobs and \$0.2m in household income under Approach 1, \$1.3m in GSP, 8 fte jobs and \$0.3m in household income under Approach 2 and \$1.4m in GSP, 13 fte jobs and \$0.8m in household income under Approach 3.

Downstream contribution

The direct downstream contribution (i.e. processing, wholesaling, retailing, food service and transport activities) was estimated to be \$1.9m in GSP, 19 fte jobs and \$1.0m in household income under Approach 1, \$4.5m in GSP, 41 fte jobs and \$2.2m in household income under Approach 2 and \$2.9m in GSP, 30 fte jobs and \$1.5m in household income under Approach 3.

Flow-on contribution

The total flow-on contribution was estimated to be \$1.9m in GSP, 11 fte jobs and \$1.0m in household income under Approach 1, \$3.7m in GSP, 21 fte jobs and \$2.0m in household income under Approach 2 and \$2.9m in GSP, 16 fte jobs and \$1.5m in household income under Approach 3.

Total contribution

The total contribution was estimated to be \$4.7m in GSP, 35 fte jobs and \$2.2m in household income under Approach 1, \$9.5m in GSP, 69 fte jobs and \$4.5m in household income under Approach 2 and \$7.2m in GSP, 59 fte jobs and \$3.8m in household income under Approach 3.

Table 3-2 South Coast Purse Seine Fishery supply chain economic contribution by approach, 2021/22

| | Output (\$m) | GSP (\$m) | Employment (fte) | Household Income (\$m) |
|---------------------------------|--------------|------------|------------------|------------------------|
| Approach 1 | | | | |
| Direct Fishing | 1.8 | 0.9 | 5 | 0.2 |
| Direct Downstream | | | | |
| Processed seafood manufacturing | 1.5 | 0.9 | 6 | 0.3 |
| Wholesale trade | 0.5 | 0.3 | 2 | 0.2 |
| Retail trade | 0.3 | 0.2 | 2 | 0.1 |
| Food service | 0.8 | 0.4 | 8 | 0.3 |
| Export | 0.0 | 0.0 | 0 | 0.0 |
| Road Transport | 0.3 | 0.1 | 1 | 0.1 |
| Total Direct | 5.2 | 2.8 | 25 | 1.2 |
| Total Flow-on | | 1.9 | 11 | 1.0 |
| Total Contribution | | 4.7 | 35 | 2.2 |
| Approach 2 | | | | |
| Direct Fishing | 2.6 | 1.3 | 8 | 0.3 |
| Direct Downstream | | | | |
| Processed seafood manufacturing | 3.4 | 2.2 | 14 | 0.7 |
| Wholesale trade | 0.9 | 0.5 | 3 | 0.3 |
| Retail trade | 2.6 | 1.5 | 18 | 1.0 |
| Food service | 0.4 | 0.2 | 4 | 0.2 |
| Export | 0.0 | 0.0 | 0 | 0.0 |
| Road Transport | 0.3 | 0.1 | 1 | 0.1 |
| Total Direct | 10.2 | 5.8 | 48 | 2.5 |
| Total Flow-on | | 3.7 | 21 | 2.0 |
| Total Contribution | | 9.5 | 69 | 4.5 |
| Approach 3 | | | | |
| Direct Fishing | 2.6 | 1.4 | 13 | 0.8 |
| Direct Downstream | | | | |
| Processed seafood manufacturing | 2.3 | 1.6 | 16 | 0.7 |
| Wholesale trade | 0.5 | 0.5 | 2 | 0.2 |
| Retail trade | 0.8 | 0.5 | 6 | 0.3 |
| Food service | 0.6 | 0.3 | 6 | 0.2 |
| Export | 0.0 | 0.0 | 0 | 0.0 |
| Road Transport | 0.3 | 0.1 | 0 | 0.1 |
| Total Direct | 7.1 | 4.3 | 43 | 2.4 |
| Total Flow-on | | 2.9 | 16 | 1.5 |
| Total Contribution | | 7.2 | 59 | 3.8 |

Source: BDO EconSearch analysis

3.3. Southern Demersal Gillnet & Demersal Longline Fishery

The Southern Demersal Gillnet and Demersal Longline Fishery supply chain economic contribution results for each of the three approaches are detailed in Table 3-3.

Fishing contribution

GVP (direct fishing output) of the Southern Demersal Gillnet and Demersal Longline Fishery in 2021/22 was \$4.9m (DPIRD pers. comm.) under Approach 1 and \$6.1m under Approaches 2 and 3. Shark and scalefish are landed fresh on ice. The direct fishery contribution was estimated to be \$2.4m in GSP, 14 fte jobs and \$0.6m in household income under Approach 1, \$3.0m in GSP, 18 fte jobs and \$0.7m in household income under Approach 2 and \$3.0m in GSP, 12 fte jobs and \$0.9m in household income under Approach 3.

Downstream contribution

The direct downstream contribution (i.e. processing, wholesaling, retailing, food service and transport activities) was estimated to be \$5.1m in GSP, 52 fte jobs and \$2.6m in household income under Approach 1, \$4.4m in GSP, 67 fte jobs and \$2.8m in household income under Approach 2 and \$7.9m in GSP, 74 fte jobs and \$4.2m in household income under Approach 3.

Flow-on contribution

The total flow-on contribution was estimated to be \$5.1m in GSP, 29 fte jobs and \$2.7m in household income under Approach 1, \$6.1m in GSP, 34 fte jobs and \$3.2m in household income under Approach 2 and \$6.2m in GSP, 34 fte jobs and \$3.2m in household income under Approach 3.

Total contribution

The total contribution was estimated to be \$12.6m in GSP, 94 fte jobs and \$5.9m in household income under Approach 1, \$13.5m in GSP, 119 fte jobs and \$6.7m in household income under Approach 2 and \$17.1m in GSP, 121 fte jobs and \$8.3m in household income under Approach 3.

Table 3-3 Southern Demersal Gillnet & Demersal Longline Fishery supply chain economic contribution by approach, 2021/22

| | Output (\$m) | GSP (\$m) | Employment (fte) | Household Income (\$m) |
|---------------------------------|--------------|-------------|------------------|------------------------|
| Approach 1 | | | | |
| Direct Fishing | 4.9 | 2.4 | 14 | 0.6 |
| Direct Downstream | | | | |
| Processed seafood manufacturing | 4.0 | 2.5 | 16 | 0.8 |
| Wholesale trade | 1.3 | 0.7 | 5 | 0.4 |
| Retail trade | 0.8 | 0.5 | 6 | 0.3 |
| Food service | 2.3 | 1.1 | 22 | 0.9 |
| Export | 0.0 | 0.0 | 0 | 0.0 |
| Road Transport | 0.7 | 0.3 | 3 | 0.2 |
| Total Direct | 14.0 | 7.4 | 66 | 3.1 |
| Total Flow-on | | 5.1 | 29 | 2.7 |
| Total Contribution | | 12.6 | 94 | 5.9 |
| Approach 2 | | | | |
| Direct Fishing | 6.1 | 3.0 | 18 | 0.7 |
| Direct Downstream | | | | |
| Processed seafood manufacturing | 1.8 | 1.1 | 7 | 0.4 |
| Wholesale trade | 0.2 | 0.1 | 1 | 0.1 |
| Retail trade | 0.2 | 0.1 | 2 | 0.1 |
| Food service | 5.6 | 2.7 | 55 | 2.1 |
| Export | 0.0 | 0.0 | 0 | 0.0 |
| Road Transport | 0.6 | 0.2 | 2 | 0.1 |
| Total Direct | 14.6 | 7.3 | 85 | 3.5 |
| Total Flow-on | | 6.1 | 34 | 3.2 |
| Total Contribution | | 13.5 | 119 | 6.7 |
| Approach 3 | | | | |
| Direct Fishing | 6.1 | 3.0 | 12 | 0.9 |
| Direct Downstream | | | | |
| Processed seafood manufacturing | 5.5 | 4.7 | 19 | 1.3 |
| Wholesale trade | 0.0 | 0.0 | 0 | 0.0 |
| Retail trade | 0.2 | 0.1 | 1 | 0.1 |
| Food service | 4.3 | 2.8 | 52 | 2.7 |
| Export | 0.0 | 0.0 | 0 | 0.0 |
| Road Transport | 0.5 | 0.2 | 2 | 0.1 |
| Total Direct | 16.7 | 10.9 | 86 | 5.1 |
| Total Flow-on | | 6.2 | 34 | 3.2 |
| Total Contribution | | 17.1 | 121 | 8.3 |

Source: BDO EconSearch analysis

4. COMPARISON OF APPROACHES

An objective of the project is to recommend an approach for quantifying the economic contribution of small scale fisheries in future. In this section, we frame comparisons of the approaches across several themes and make a recommendation for undertaking such studies in future.

The comparison is organised using a set of themes:

- Inclusion of economic activity
- Relative accuracy of different economic indicators
- Potential for capturing different data types
- Key practical challenges and achievable outputs
- Cost of applying each approach.

The comparative evaluations of approaches are then summarised together across the themes to inform our recommendation.

4.1. Inclusion of Economic Activity

Understanding how the included economic activity may change based on the approach taken is useful for understanding potential bias in aggregate level economic contribution results produce through any of the approaches.

The relationship between economic contribution results and approach is illustrated in Figure 4-1. The figure shows that economic contribution estimates generally increased as more information was included into the analysis. This was mostly due to higher estimates of supply chain (post-fishing) and flow-on economic activity.

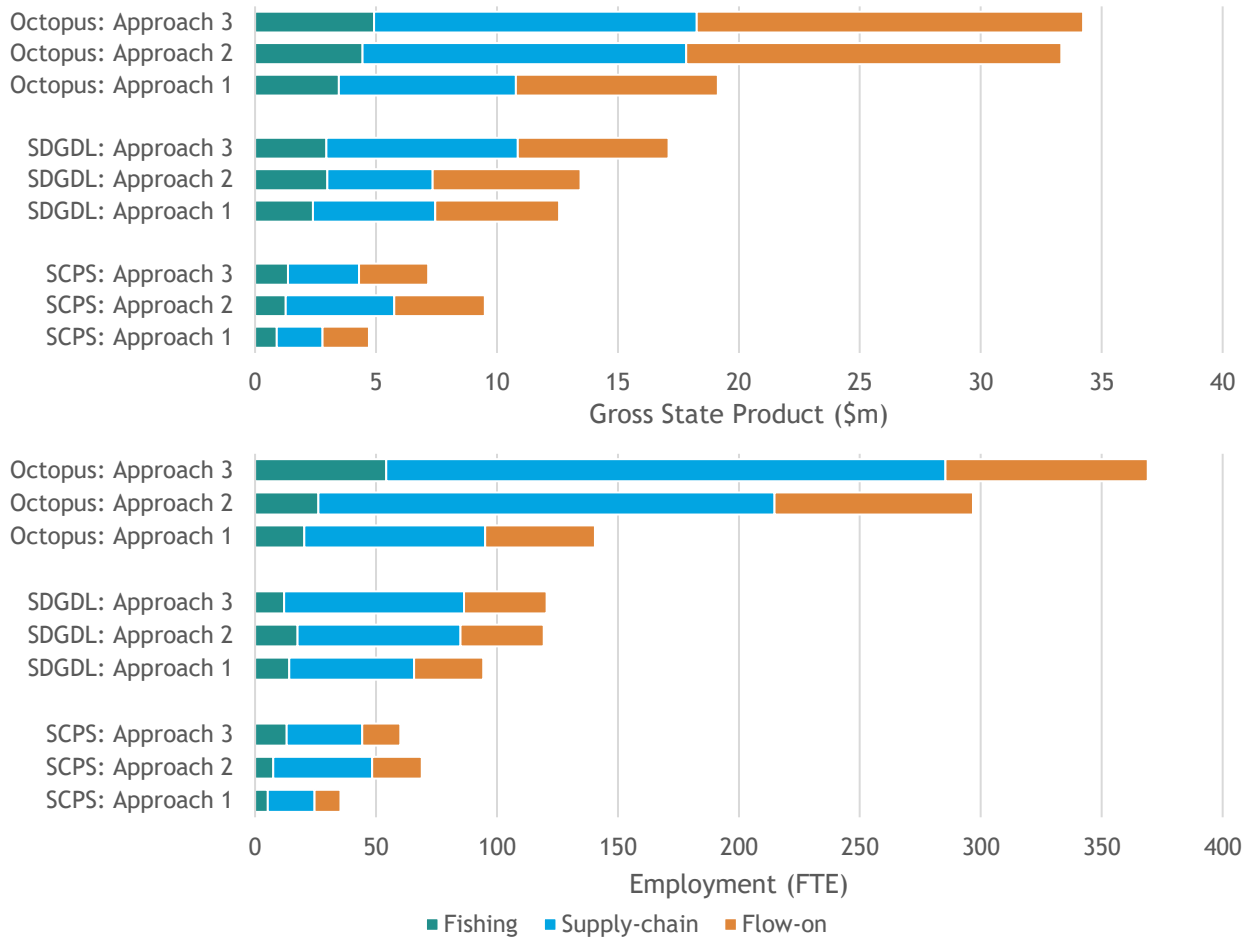
While we have only analysed small scale fisheries so cannot test this hypothesis, this relationship may be due to small scale fisheries having longer and more 'local' supply chains relative to the national seafood industry (from which assumptions are taken under Approach 1) which may tend to be more export focused. If this is true, then using more context specific information can be expected to increase the estimated level of economic contribution from a fishery.

It is also likely that the level of contribution was higher in Approach 3 as this was the only approach where capital expenditure by fishing businesses, and the associated economic contribution, was able to be included. This information is best sourced through interviews or surveys and, therefore, precludes it from being used in Approaches 1 and 2.

The relationship between direct output (revenue) and approach is illustrated in Figure 4-2, where the coloured bars show the revenue attributed to each stage of the supply chain. The most variable stage was food service, with significantly more revenue being attributed here in Approaches 2 and 3 than in 1, except for the South Coast Purse Seine Fishery which has a relatively low food service component when compared to retail trade (i.e. Sardines are mostly sold for bait rather than in restaurants for consumption).

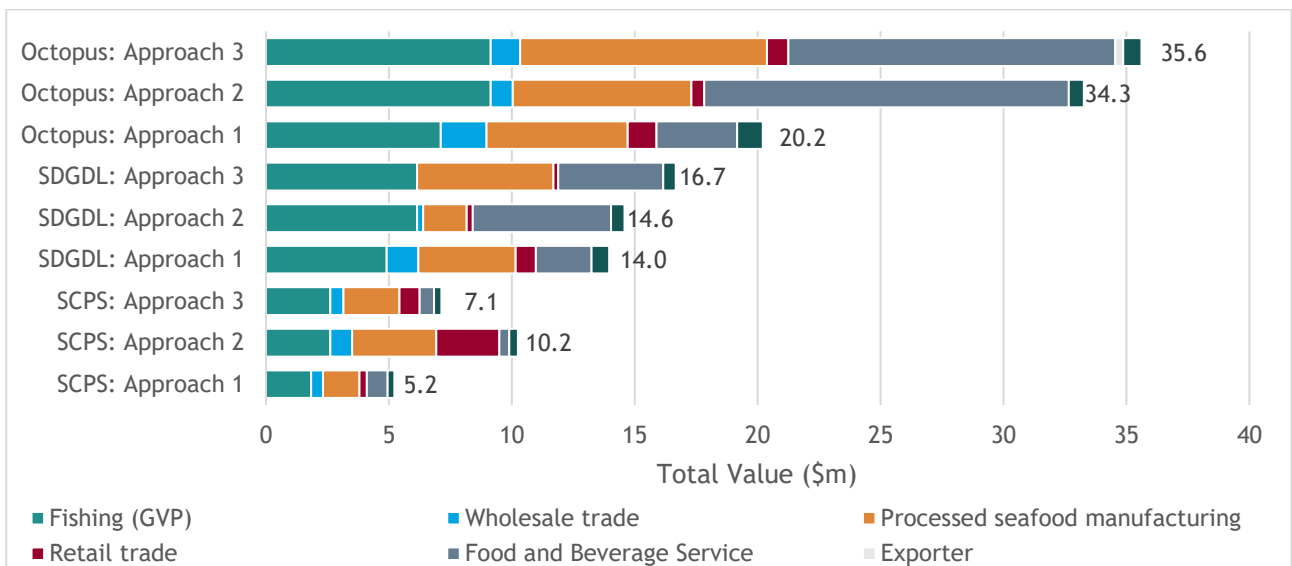
In summary, the included economic activity generally increased with more information, especially where the fishery has a significant food service market. This may be due to the longer and more 'local' supply chains of the small scale fisheries analysed.

Figure 4-1 Direct and flow-on GSP and employment, comparison of approaches



Source: BDO EconSearch analysis

Figure 4-2 Total direct output by fishery, approach and supply chain node



Source: BDO EconSearch analysis

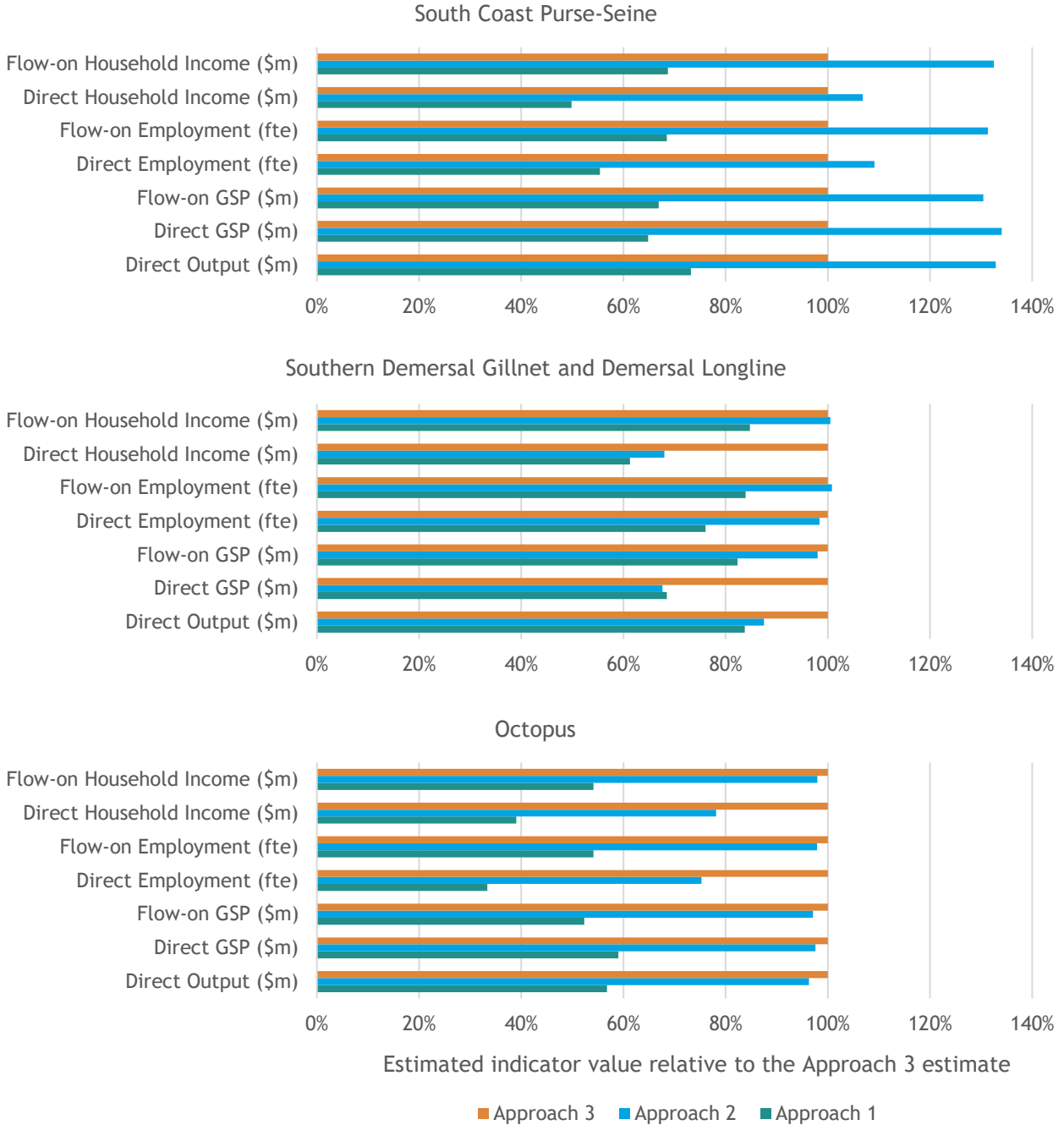
4.2. Relative Accuracy of Different Economic Indicators

Understanding the strengths of each approach in terms of producing specific types of economic contribution information may help to design research that is relevant to the fishery and policy context that the research seeks to address.

Figure 4-3 compares, for each fishery, the estimates for a set of key indicators of economic contribution across the three approaches relative to the Approach 3 estimates. The bars are normalised such that the Approach 3 estimate is equal to 100 per cent for each indicator, revealing the relative differences between the approaches. The revealed relationships may help to design research that targets quality estimates of certain types of indicators. The comparison shows that estimates of the more useful economic contribution indicators (such as fte and GSP) were more variable across the approaches than direct output (a less useful indicator of economic contribution). Approach 1 underestimated the more useful indicators further than its underestimate of direct output, suggesting that this is not a suitable approach for estimating economic contribution for small scale fisheries.

Other dimensions of economic contribution indicators should also be considered. For example, if the local regional contribution is particularly important to the fishery and/or a policy decision, one key question to answer is what economic contribution you are intending to value, i.e. contribution of a fishery in a region versus contribution of a whole supply chain including beyond the region. If the goal is to capture the entire supply chain, then the approaches undertaken in this study would suffice. However, if the goal is to understand only the local contribution of a fishery then it becomes less important to value the entire supply chain. We observed that as we investigated more of the supply chain (e.g. beyond fishing and processing/wholesaling), less activity occurred locally. Largely, the regional contribution of a fishery is focused on the fishing and processing/wholesaling activities with other activity (retail, food service, transport) mostly occurring outside the local region. For this reason, we modelled economic contributions to WA in this study, rather than to local regions, since the purpose of the study was to capture the whole supply chain.

Figure 4-3 Relative levels of economic contribution indicators for each fishery, comparison of approaches



Source: BDO EconSearch analysis

4.3. Potential for Capturing Different Data Types

The nature of data collection activities in each approach lead to different limitations regarding collection of specific types of data. This primarily depends on the requirement, ability and willingness for supply chain businesses to provide the required data. Table 4-1 summarises these aspects across key dimensions.

Table 4-1 Comparison of key metrics and effort required to repeat for each approach

| | Approach 1 Desktop | Approach 2 Workshop | Approach 3 Interviews |
|--|-----------------------|------------------------|--------------------------|
| Identifiable through Approach: | | | |
| Producers in the fishery | × | ✓ | ✓ |
| Regions relevant for the fishery | × | ✓ | ✓ |
| Stages and flows of the supply chain | × | Partial | ✓ |
| Margins at each stage of the supply chain | × | Partial | ✓ |
| Consumers and markets of the final product | × | ✓ | ✓ |
| Other limiting factors: | | | |
| Possible without business cooperation | ✓ | × | × |
| Possible with < 5 businesses | ✓ | × | × |
| Appropriate for complex supply chains | × | ✓ | ✓ |
| Appropriate for multi species/multi gear fisheries | × | × | ✓ |

Source: BDO EconSearch analysis

Approach 1 does not require provision of data by businesses, so businesses do not need to be able or willing to provide information. However, it is not possible to collect important nuanced information such as stages and structure of the supply chain, location of activities, margins and any other complexity.

Approach 2 provides the potential to collect each of the data types to some extent. Where the potential to collect some data types was limited, this was due to gaps in knowledge with a small group in a workshop environment (structure and stages of a supply chain) or sensitivity of participants sharing information in a workshop setting (margins and prices). Further, the brevity and summary nature of the workshop setting meant complexities of multi-species and multi-method fisheries could not be explored. Instead, the workshops focused on the most material aspects of the supply chains.

Approach 3 provided the greatest potential to collect each type of data, however confidentiality is still a limiting factor for particularly small fisheries.

The increase in data availability between approaches informs changes in key modelling assumptions. The notable changes applied to the model between each approach are summarised in Table 4-2.

Table 4-2 Key modelling assumption changes between each approach for each fishery

| Key assumption changes between Approach 1 and 2 | Key assumption changes between Approach 2 and 3 |
|--|---|
| Southern Demersal Gillnet and Demersal Longline Fishery | |
| <ul style="list-style-type: none"> Flow of product to each supply chain node for shark (85% of Fishery GVP). Includes revising flow from each node and % recovery rate. Processor (shark component only) and retail business (total fishery) structures using business margins. Transport margins for fisher and processor nodes. | <ul style="list-style-type: none"> Flow of product to each supply chain node for scalefish (15% of fishery GVP). Fisher, processor, and food service business structures using business interview data. |
| South Coast Purse Seine Fishery | |
| <ul style="list-style-type: none"> Flow of product to each supply chain node. Processor, wholesaler, and retail business structures using business margins. Transport margins for processor node. | <ul style="list-style-type: none"> Fisher, processor, and wholesaler business structures using business interview data. Retail business structures using business margins. |
| Octopus Fishery | |
| <ul style="list-style-type: none"> Flow of product to each supply chain node. Stages of the supply chain (to include an exporter). Processor (raw tentacles only, 84% of product), wholesaler, retail, and food service business (total fishery) structures using business margins. Transport margins for all nodes. | <ul style="list-style-type: none"> Flow of product to each supply chain node (further refined). Fisher and processor business structures using business interview data. Food service business structures using business margins. |

Source: BDO EconSearch analysis

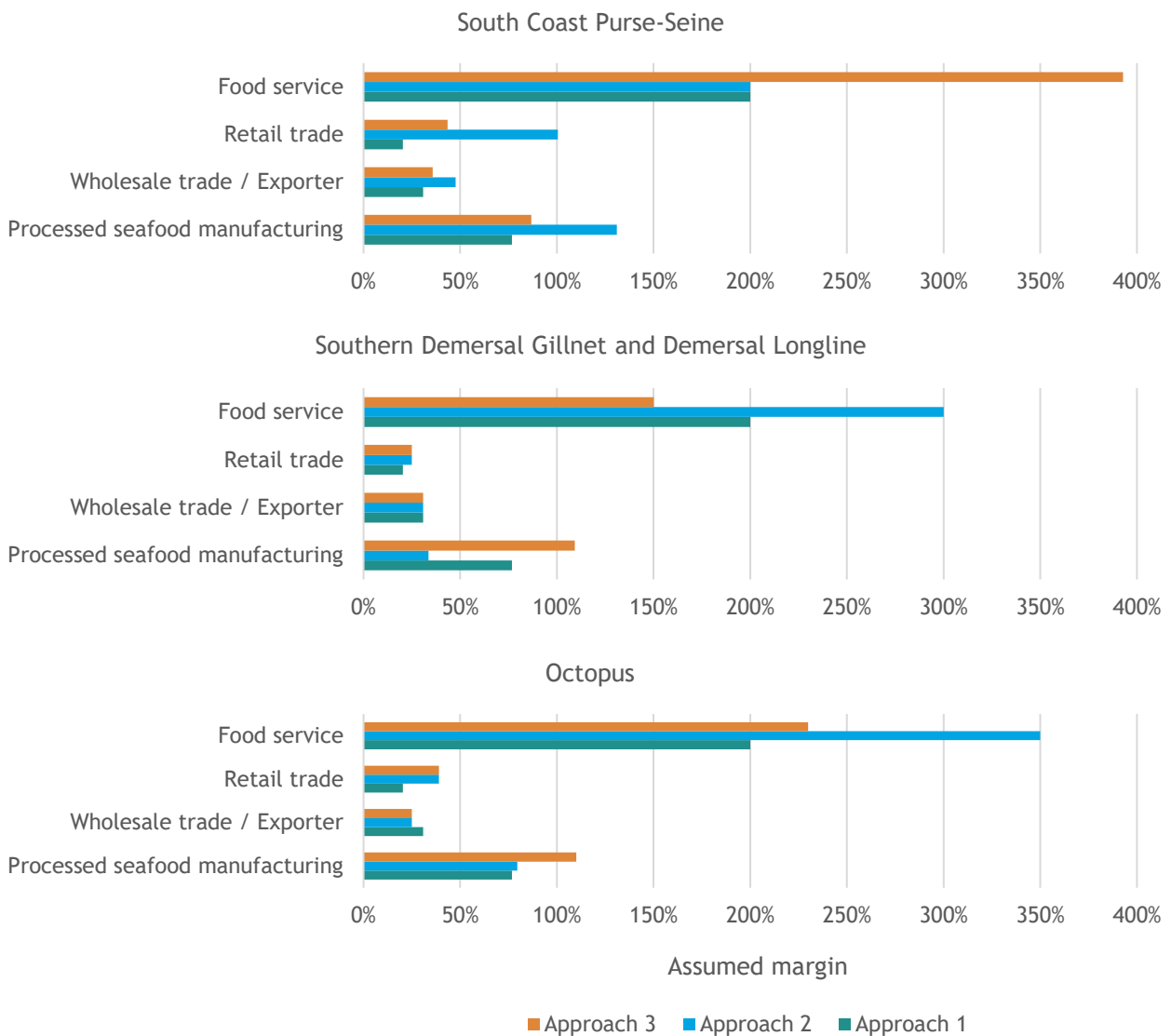
As noted in Table 4-2, the change in margins between approaches was a fundamental assumption change for each fishery. Figure 4-4 compares the assumed margin for each supply chain node for each fishery across approaches.

Margins for retail and wholesale trade were the least variable across the approaches³. This may be due to the operational nature of these sectors and their somewhat ‘standard’ business models of purchasing a range of products to on-sell at similar profit margins. These margins likely reflect the well-understood nature of retail and wholesale trade business models, rather than the specific characteristics of the fisheries in question.

In comparison, the seafood processing and food service stages showed wide variation across the approaches. This suggests that particular effort should be focused on these sectors when designing a study of the economic contribution of fishery supply chains.

³ The exception being an overestimate of the retail margin in the South Coast Purse Seine fishery workshop at which there were no retailers present

Figure 4-4 Assumed margin applied to modelling for each fishery, comparing approaches



Source: BDO EconSearch analysis

4.4. Key Practical Challenges and Achievable Outputs

Typically, estimating economic contribution of fisheries must be undertaken within practical constraints such as time, availability of information, willingness to provide information and cost. Table 4-3 notes the key practical challenges and achievable outcomes of each approach.

Approach 1 presented significant barriers to achieving any nuance in the estimates due to unavailability of information beyond production and gross value of production (GVP). We also found through later approaches that GVP at Approach 1 was contestable and required revising. This was shown through beach prices used to estimate GVP generally being higher when collected through Approaches 2 and 3 than when relying on published estimates used under Approach 1.

Approach 2 involved holding a workshop with key supply chain businesses. These were straight-forward to arrange and to conduct online and allowed us to have confidence in value (an improvement on Approach 1).

The barriers were due to the workshop environment, where participating at a given time with other businesses in the supply chain meant that some businesses were unable to attend at the agreed time or were reluctant to share sensitive information. Having knowledgeable people with a combined view of most of the supply chain is critical to the success of Approach 2.

Approach 3 addressed the limitations from Approach 2 as businesses were willing and able to provide additional detail in an interview setting. However, Approach 3 took substantially longer to complete than expected as we waited to receive information from interviewees. Another challenge was identifying participants who were not already involved in the workshop, without breaching privacy by being provided with personal contact details without permission.

Table 4-3 Challenges and output achieved for each approach

| Approach | Key challenges for each approach | Achievable output for each approach |
|------------------------|---|--|
| Approach 1: Desktop | <ul style="list-style-type: none"> Lack of context for all aspects of the supply chain including stages, flows, and margins GVP and price uncertainty | <ul style="list-style-type: none"> Catch quantity GVP in most cases |
| Approach 2: Workshop | <ul style="list-style-type: none"> Privacy of information Strategic behaviour Workshop attendance at the agreed date/time | <ul style="list-style-type: none"> Online supply chain mapping using screen sharing Confidence in GVP and price |
| Approach 3: Interviews | <ul style="list-style-type: none"> Identifying and contacting businesses Time allowance to receive completed responses | <ul style="list-style-type: none"> Confidence in stages, flows and margins of interviewed businesses Confidence in GVP and price |

Source: BDO EconSearch analysis

4.5. Cost of Applying Each Approach

Cost is of clear importance when recommending a method and varies significantly between the approaches. Table 4-4 provides our estimate of the cost that would be required to estimate the economic contribution of small-scale fishery supply chains for one, three or ten fisheries. This covers small scale fisheries as defined in this report. Larger fisheries may be significantly more costly due to a larger number of interviews.

Table 4-4 Estimated effort required to repeat for each approach

| | Approach 1 Desktop | Approach 2 Workshop | Approach 3 Interviews |
|--|--------------------|---------------------|-----------------------|
| Time required to repeat approach - Fixed time | 36 hours | 40 hours | 44 hours |
| Time required to repeat approach - Time per fishery | 4 hours | 20 hours | 44 hours |
| Cost to repeat for one fishery (assuming 1 hour = \$250) | \$10k | \$15k | \$22k |
| Cost to repeat for three fisheries (assuming 1 hour = \$250) | \$12k | \$25k | \$44k |
| Cost to repeat for ten fisheries (assuming 1 hour = \$250) | \$19k | \$60k | \$121k |

Source: BDO EconSearch analysis

4.6. Synthesis and Recommendations

The findings from comparing the three approaches from the set of themes are summarised in Table 4-5

Table 4-5 Evaluation of each approach by comparison theme

| | Approach 1 Desktop | Approach 2 Workshop | Approach 3 Interviews |
|--|--|---|--|
| Inclusion of economic activity | Poor (most likely to underestimate) | Fair (likely to underestimate) | Good |
| Relative accuracy of different economic indicators | Poor (especially for GSP, fte and household income) | Fair (difficult to avoid bias) | Good |
| Potential for capturing different data types | Poor (no nuance possible) | Fair (high-level activity only, though this may be enough) | Good |
| Key practical challenges and achievable outputs | Good (easy to undertake) | Fair (risk of 'no-show' and reluctance to share data at workshops) | Fair (significant time may be required) |
| Cost of applying each approach | Low | Mid 1.5x cost of Approach 1 | High 2.2x cost of Approach 1 |

Source: BDO EconSearch analysis

Recommendations

- We have very little confidence in Approach 1 and do not recommend its use in the context explored by this study as:
 - Small-scale fishery supply chains are generally not well represented by average national statistics (we suspect that they underestimate economic contribution in this context).
 - Approach 1 results are considerably different to Approach 3 (with which we have higher confidence).
- Approach 2 and 3 are each workable, with the preferred approach depending on the fishery and research context:
 - If fishery businesses are reluctant to share data at workshops then Approach 3 may be preferred as there is a risk that workshops will be less informative.
 - If the supply chain is highly complex, such as including multiple species and products, each materially important, then Approach 3 may be preferred as there is a risk of not capturing sufficient information at a workshop.
 - If higher quality information is particularly valuable (i.e. the cost is considered affordable) then Approach 3 may be preferred.
 - Otherwise, Approach 2 is likely to be sufficient.
- Approach 2 is likely to be preferred in most fisheries with some exceptions made due to the above factors.

4. Having knowledgeable people, with a combined view of most of the supply chain, involved and attending workshops. This is critical to the success of Approach 2 and should include people representing seafood processing and food service, if possible.
5. Where Approach 2 is undertaken, we recommend that a few follow up interviews are undertaken as they are likely to add substantial quality assurance to the workshop approach. These interviews can be quick 'fact checks' with people recommended by workshop attendees or can capture anyone who failed to attend a planned workshop. Follow-up interviews are a second-best compared with including the right people in the workshop to begin with.

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Disclaimer

The assignment is a consulting engagement as outlined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 17. Consulting engagements employ an assurance practitioner's technical skills, education, observations, experiences and knowledge of the consulting process. The consulting process is an analytical process that typically involves some combination of activities relating to: objective-setting, fact-finding, definition of problems or opportunities, evaluation of alternatives, development of recommendations including actions, communication of results, and sometimes implementation and follow-up.

The nature and scope of work has been determined by agreement between BDO and the Client. This consulting engagement does not meet the definition of an assurance engagement as defined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 10.

Except as otherwise noted in this report, we have not performed any testing on the information provided to confirm its completeness and accuracy. Accordingly, we do not express such an audit opinion and readers of the report should draw their own conclusions from the results of the review, based on the scope, agreed-upon procedures carried out and findings.

GLOSSARY

Beach price: refers to the price received by commercial fishers at the "port level" for their catch, and is generally expressed in terms of \$/kg.

Contribution to GSP: is a measure of the net contribution of an activity to the state/regional economy. Contribution to GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. It can also be measured as household income plus other value added (gross operating surplus and all taxes, less subsidies). It represents payments to the primary inputs of production (labour, capital and land). Using contribution to GSP as a measure of economic contribution avoids the problem of double counting that may arise from using value of output for this purpose.

Direct activity: activity at businesses associated with the output generated by catching, on-selling and/or value-adding fishery products throughout the supply chain.

Downstream activity: descriptor for the direct activity of stages of the supply chain succeeding fishing, such as processing, wholesaling, food service and retailing of the caught fish.

Economic contribution: Contribution of an industry or business activity to an economy usually expressed in terms of employment and gross regional/state/domestic product.

Employment: is a measure of the number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalent jobs.

Flow-on activity: activity resulting from the expenditure on inputs and spending of wages by employees in businesses involved in producing the direct activity throughout the supply chain.

Household income: is a component of Gross State Product (GSP) and is a measure of wages and salaries, drawings by owner operators and other payments to labour including overtime payments and income tax, but excluding payroll tax.

Supply chain: is a schematic representation of the path that a product travels from, in the case of fisheries, capture to the consumer.

Value of output: is a measure of the gross revenue of goods and services produced by commercial organisations plus gross expenditure by government agencies. This indicator needs to be used with care as it includes elements of double counting.

APPENDIX 1 Workshop Outcomes

South Coast Purse Seine fishery

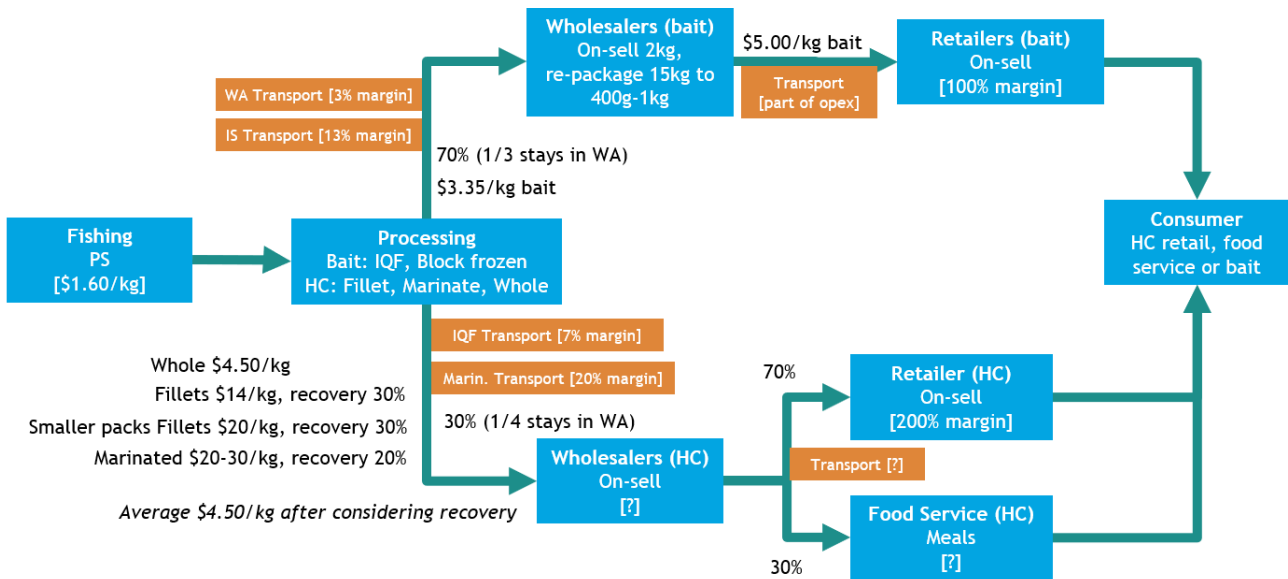
The workshop involved an open discussion about the South Coast Purse Seine fishery's supply chain and BDO EconSearch drawing a supply chain on-screen with guidance and information provided from all attendees. A description of the supply chain is presented below and is followed by a visual supply chain map and associated key points of discussion that were noted while drawing the map.

Description of the supply chain

In the South Coast Purse Seine fishery, sardines (the product) are caught by fishing businesses and then either supplied to processors, or processed by the fishing business themselves. The processors prepare the product for either the 1) Bait or 2) Human consumption markets. Each is described below.

- 1) Approximately 70% of the total caught product goes to the bait market with the supply chain to consumer consisting of:
 - a. The fishers supply the product to local processors, or process the product locally themselves. The processors package the product into cartons as Individually Quick Frozen (IQF) (typically 15kg or 5kg) or frozen blocks (typically 2kg).
 - b. The processors supply the product to wholesalers, located approximately 1/3 in WA and 2/3 interstate. Wholesalers re-package the IQF cartons into smaller packages (typically 400g-1kg) and on-sell the frozen blocks.
 - c. The wholesalers supply the product to retailers, which sell directly to the consumer.
- 2) Approximately 30% of the total caught product goes to the human consumption market with the supply chain to consumer consisting of:
 - a. The fishers supply the product to local processors, or process the product locally themselves. The processors then either package the product whole, fillet the product and then sell the fillets in small trays (200g-500g), or marinate the fillets before selling.
 - b. The processors supply the product to wholesalers, located approximately ¼ in WA and ¾ interstate. The wholesalers typically re-package the whole product into smaller packages (400g-1kg) and on-sell the other products (fillets).
 - c. The wholesalers supply the product to retailers or food service businesses, which then sell the product directly to the consumer as a retail product or as part of a prepared meal.

Map of the supply chain



Workshop attendees noted the below key points about the supply chain map:

- The proportion of human consumption product that goes to the food service industry is uncertain and would require speaking with wholesalers to understand.
- The human consumption product wholesale mark-up is unknown and would require speaking with wholesalers to understand.
- The human consumption retail market margin of 200% is uncertain and would require speaking with retailers to understand.
- The bait product wholesale and retail margin is uncertain, but this is more confident than the human consumption mark-ups.
- Transport margins beyond wholesaling are uncertain.
- In addition to the products on the supply chain map there are also small quantities and/or current opportunities for producing dried, local bait and international export products.

Octopus fishery

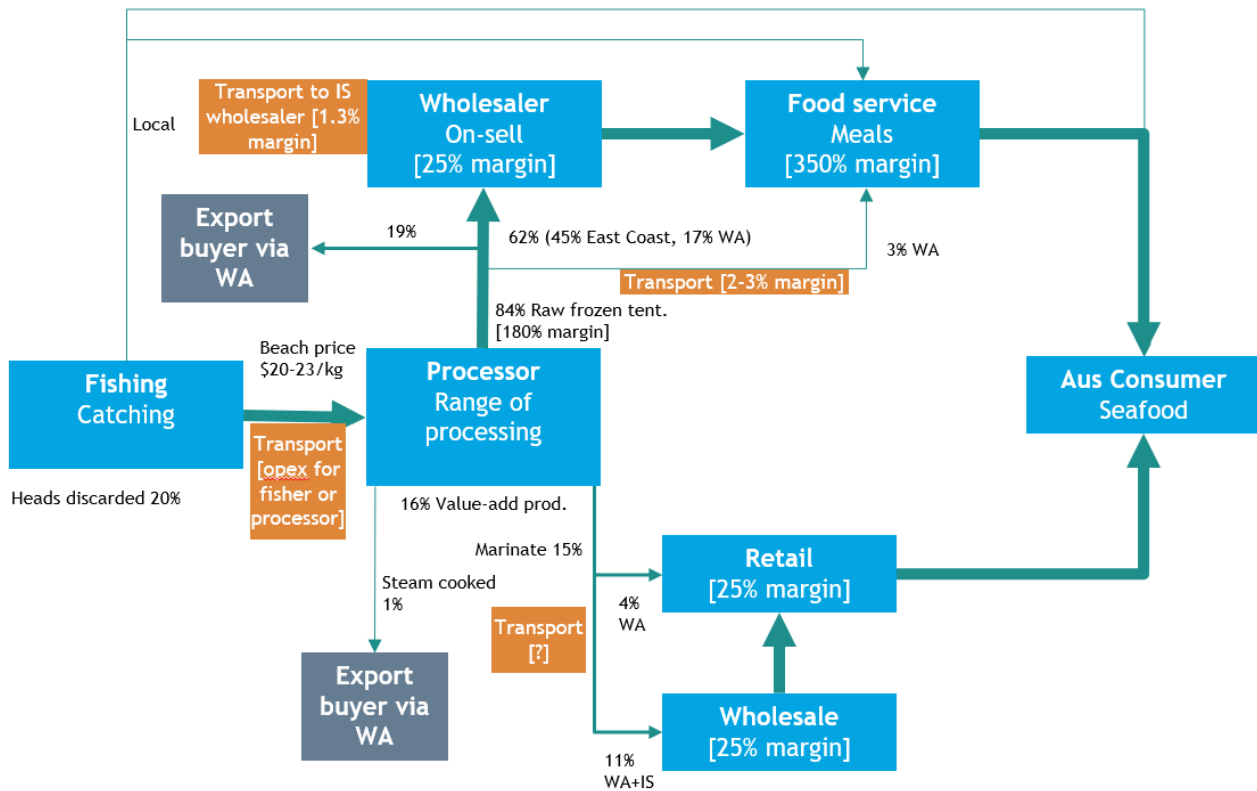
The workshop involved an open discussion about the Octopus fishery's supply chain and BDO EconSearch drawing a supply chain on-screen with guidance and information provided from all attendees. A description of the supply chain is presented below and is followed by a visual supply chain map and associated key points of discussion that were noted while drawing the map.

Description of the supply chain

In the Octopus fishery, Octopus (the product) are caught by fishing businesses and then either supplied to processors, or processed by the fishing business themselves. The processors prepare the product primarily as 1) Raw frozen tentacles or 2) Value-added products (including steam cooked and marinated). The supply chain for each product type is described below. A very small proportion is sold directly from the boat to food service businesses and consumers. Note that the percentages described in the text below describe the product flows in terms of the total supplied to each supply chain node, whereas the percentages in the supply chain map describe the product flows as a proportion of the original catch.

- 1) Approximately 84% of the total caught product is processed into raw frozen tentacles with the supply chain to consumer consisting of:
 - a. The fishers supply the product to local processors, or process the product themselves. The processors process and package the product into raw frozen tentacles.
 - b. The processors primarily supply the product to wholesalers (74% of the raw frozen tentacles), located approximately 30% in WA and 70% interstate (East Coast). A smaller proportion of the raw frozen tentacles are exported overseas (23% of the raw frozen tentacles) or sold directly to local food service businesses in WA (3% of the raw frozen tentacles).
 - c. The raw frozen tentacles that are supplied to wholesalers are then distributed to food service businesses.
 - d. The food service businesses then prepare the product and sell directly to the consumer as part of a prepared meal.
- 2) Approximately 16% of the total caught product is processed into value-add products (steam cooked and marinated) with the supply chain to consumer consisting of:
 - a. The fishers supply the product to local processors, or process the product themselves. The processors then steam cook the product (6% of value-add products) or steam cook and then marinate the product before selling (94% of value-add products).
 - b. The processors export the steam cooked product overseas (6% of value-add products), and sell the marinated product to either wholesale or retail businesses (94% of value-add products). The proportion of these sales located within WA or interstate, as well as between retail and wholesale is unknown.
 - c. The wholesalers supply the product to retail businesses, which then sell the product directly to the consumer as a retail product.

Map of the supply chain



Workshop attendees noted the below key points about the supply chain map:

- There is uncertainty about the total value reported by DPIRD for Octopus and how this relates to the beach price. After Octopus are caught, their heads are discarded, and these heads account for 20-25% of the total weight caught. It is important to note that the beach price included above (\$20-\$23/kg) does not include head weight. BDO EconSearch will investigate how this relates to the weight and price reported by DPIRD.
- The processor margin is uncertain as it varies based on the type of processing. There are a variety of types of value-adding activity occurring across the supply chain by a variety of businesses. This complexity makes it difficult to estimate the average margin for processors in the fishery.
- Transport margins are uncertain and would require further investigation from workshop attendees.
- Market destination location and type proportions for marinated product are uncertain and would require further investigation from workshop attendees.
- In addition to the activity on the supply chain map there are also a few very small operations that buy raw frozen tentacles to marinate then sell into local retail.
- Most international export leaves WA by sea. Some leaves by air and via the eastern states, but this unusual and due to recent supply chain disruptions.

Southern Demersal Gillnet and Demersal Longline fishery

The workshop involved an open discussion about the Southern Demersal Gillnet and Demersal Longline fishery's supply chain and BDO EconSearch drawing a supply chain on-screen with guidance and information provided from all attendees. A description of the supply chain is presented below and is followed by a visual supply chain map and associated key points of discussion that were noted while drawing the map. One workshop participant was unable to attend the workshop and input from them was collected in a separate phone call after the workshop.

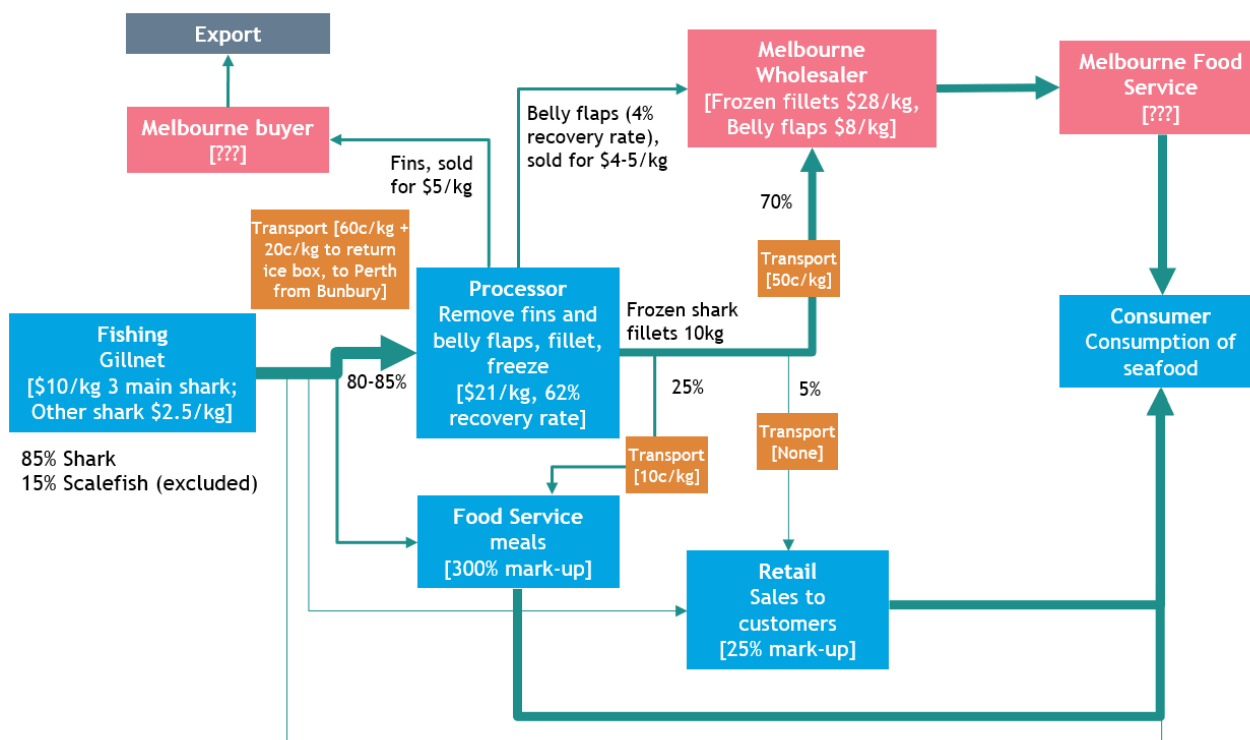
Description of the supply chain

In the Southern Demersal Gillnet and Demersal Longline fishery, shark (~85% of GVP) and scalefish (~15% of GVP) are caught by fishing businesses. As a result of the dominance of shark catch and difficulties defining the scalefish supply chain it was decided between workshop participants that the focus of the supply chain for this fishery should be on the shark product, as described below (see first note below the map for further explanation).

The fishers catch shark and supply it to 1) local processors (approximately 80-85% of total shark caught) or supply it to 2) local food service businesses, retail businesses or directly to the consumer (approximately 15-20% of total shark caught).

- d. The fishers supply 80-85% of total shark caught to WA processors.
 - i. The processors remove the fins and belly flaps from the shark and sell the majority of fins and belly flaps to a Melbourne buyer for international export.
 - ii. The processors fillet the shark and freeze the fillets into 10 kilogram cartons.
 - iii. The processors supply 70% of the 10 kilogram cartons to a wholesaler in Melbourne.
 - 1. The Melbourne wholesaler distributes the product to food service businesses including restaurants and fish and chips shops.
 - 2. The food service businesses sell the product directly to the consumer in 150 gram portions as part of a prepared meal.
 - iv. The processors supply 25% of the 10 kilogram cartons directly to WA food service businesses including restaurants and fish and chips shops.
 - 1. The food service businesses sell the product directly to the consumer in 150 gram portions as part of a prepared meal.
 - v. The processors supply 5% of the 10 kilogram cartons directly to their WA retail businesses. The retailers sell the product directly to the consumer.
- e. The fishers supply 15-20% of total shark caught to WA food service businesses, retail businesses or directly to the consumer. The proportion supplied to each market is uncertain.
 - i. The local buyers fillet the product themselves. These buyers then directly sell the product to the consumer, sell the product as part of a prepared meal, or consume the product themselves.

Map of the supply chain



Workshop attendees noted the below key points about the supply chain map:

- This supply chain is for shark only and excludes the scalefish caught by the fishery. The scalefish component of the fishery is a small proportion of the overall value of the fishery (approximately 15% of GDP), with the remainder consisting of shark (approximately 85%). The scalefish component would require a second workshop and further investigation to accurately describe the supply chain of the product due to the price variation between species. Note that all scalefish stays in WA.
- Prior to February 2023, fishers removed the fins of the shark before supplying them to processors. Fishers now supply the shark to the processor with the fins on (now a regulatory requirement). This reduced the recovery rate of the shark processors from 71% to 62%. The beach price per kilogram remained the same to compensate for the loss in revenue of fin sales.
- A small proportion of fins are sold locally but most are sent interstate and exported.
- Beyond the wholesaler, the product is not differentiated from imported product. The prices are therefore currently driven by the price of imported product. Country of origin labelling would change that and increase demand for local product as local consumers are assumed to prefer local product.
- Freight between fishers and processors is a barrier to improving supply chain efficiency. If the processors use their own truck, there are no issues. If not, freight is difficult as couriers are not supportive of transporting fresh seafood, the cost is expensive, the route is longer and reduces the quality of the product, freight companies have poor service over weekends, and ice boxes need to be returned for extra cost.
- Processors remove belly flaps and sell those similarly to fins.

APPENDIX 2 Supply Chain Flows

Appendix Table 2-1 Domestic focused supply chain flows, Approach 1^a

| Supply chain flows: Domestic Sales | | Sales from... | | | | | |
|------------------------------------|---------------------------------|---------------|-----------------|---------------------------------|--------------|--------------|----------|
| | | Fishing | Wholesale trade | Processed seafood manufacturing | Retail trade | Food Service | Consumer |
| Sales to... | Fishing | | | | | | |
| | Wholesale trade | 85% | | | | | |
| | Processed seafood manufacturing | 5% | 90% | | | | |
| | Retail trade | 0% | 6% | 40% | | | |
| | Food Service | 0% | 4% | 10% | 0% | | |
| | Consumer or Export | 10% | 0% | 50% | 100% | 100% | |

^a The Approach 1 fisheries that were considered to have domestic focused supply chains are listed in Table 2-8.

Appendix Table 2-2 Export focused supply chain flows, Approach 1^a

| Supply chain flows: Domestic Sales | | Sales from... | | | | | |
|------------------------------------|---------------------------------|---------------|-----------------|---------------------------------|--------------|--------------|----------|
| | | Fishing | Wholesale trade | Processed seafood manufacturing | Retail trade | Food Service | Consumer |
| Sales to... | Fishing | | | | | | |
| | Wholesale trade | 45% | | | | | |
| | Processed seafood manufacturing | 5% | 50% | | | | |
| | Retail trade | 0% | 0% | 0% | | | |
| | Food Service | 0% | 0% | 0% | 0% | | |
| | Consumer or Export | 50% | 50% | 100% | 0% | 0% | |

^a The Approach 1 fisheries that were considered to have export focused supply chains are listed in Table 2-8.

Appendix Table 2-3 South Coast Purse Seine Fishery supply chain flows, Approach 2

| Supply chain flows | | Sales from... | | | | | |
|--------------------|---------------------------------|---------------|---------------------------------|-----------------|--------------|--------------|----------|
| | | Fishing | Processed seafood manufacturing | Wholesale trade | Retail trade | Food Service | Consumer |
| Sales to... | Fishing | | | | | | |
| | Processed seafood manufacturing | 100% | | | | | |
| | Wholesale trade | 0% | 31% | | | | |
| | Retail trade | 0% | 0% | 93% | | | |
| | Food Service | 0% | 0% | 7% | 0% | | |
| | Consumer or Export | 0% | 69% | 0% | 100% | 100% | |

Appendix Table 2-4 South Coast Purse Seine Fishery supply chain flows, Approach 3

| Supply chain flows | | Sales from... | | | | | |
|--------------------|---------------------------------|---------------|---------------------------------|-----------------|--------------|--------------|----------|
| | | Fishing | Processed seafood manufacturing | Wholesale trade | Retail trade | Food Service | Consumer |
| Sales to... | Fishing | | | | | | |
| | Processed seafood manufacturing | 100% | | | | | |
| | Wholesale trade | 0% | 31% | | | | |
| | Retail trade | 0% | 0% | 93% | | | |
| | Food Service | 0% | 0% | 7% | 0% | | |
| | Consumer or Export | 0% | 69% | 0% | 100% | 100% | |

Appendix Table 2-5 Southern Demersal Gillnet and Demersal Longline Fishery supply chain flows, Approach 2

| Supply chain flows | | Sales from... | | | | | |
|--------------------|---------------------------------|---------------|-----------------|---------------------------------|--------------|--------------|----------|
| | | Fishing | Wholesale trade | Processed seafood manufacturing | Retail trade | Food Service | Consumer |
| Sales to... | Fishing | | | | | | |
| | Wholesale trade | 13% | | | | | |
| | Processed seafood manufacturing | 71% | 90% | | | | |
| | Retail trade | 4% | 6% | 10% | | | |
| | Food Service | 7% | 4% | 19% | 0% | | |
| | Consumer or Export | 5% | 0% | 71% | 100% | 100% | |

Appendix Table 2-6 Southern Demersal Gillnet and Demersal Longline Fishery supply chain flows, Approach 3

| Supply chain flows | | Sales from... | | | | |
|--------------------|---------------------------------|---------------|---------------------------------|--------------|--------------|----------|
| | | Fishing | Processed seafood manufacturing | Retail trade | Food Service | Consumer |
| Sales to... | Fishing | | | | | |
| | Processed seafood manufacturing | 83% | | | | |
| | Retail trade | 4% | 5% | | | |
| | Food Service | 9% | 22% | 0% | | |
| | Consumer or Export | 4% | 74% | 100% | 100% | |

Appendix Table 2-7 Octopus Fishery supply chain flows, Approach 2

| Supply chain flows | | Sales from... | | | | | | |
|--------------------|---------------------------------|---------------|---------------------------------|--------------------|--------------------|--------------|--------------|----------|
| | | Fishing | Processed seafood manufacturing | Wholesale trade WA | Wholesale trade IS | Retail trade | Food Service | Consumer |
| Sales to... | Fishing | | | | | | | |
| | Processed seafood manufacturing | 100% | | | | | | |
| | Wholesale trade WA | 0% | 22% | | | | | |
| | Wholesale trade IS | 0% | 51% | | | | | |
| | Retail trade | 0% | 4% | 15% | 0% | | | |
| | Food Service | 0% | 3% | 85% | 0% | 0% | 0% | |
| | Consumer or Export | 0% | 20% | 0% | 100% | 100% | 100% | |

Appendix Table 2-8 Octopus Fishery supply chain flows, Approach 3

| Supply chain flows | | Sales from... | | | | | | |
|--------------------|---------------------------------|---------------|---------------------------------|--------------------|--------------------|--------------|--------------|----------|
| | | Fishing | Processed seafood manufacturing | Wholesale trade WA | Wholesale trade IS | Retail trade | Food Service | Consumer |
| Sales to... | Fishing | | | | | | | |
| | Processed seafood manufacturing | 100% | | | | | | |
| | Wholesale trade WA | 0% | 25% | | | | | |
| | Wholesale trade IS | 0% | 59% | | | | | |
| | Retail trade | 0% | 8% | 11% | 0% | | | |
| | Food Service | 0% | 2% | 89% | 0% | 0% | | |
| | Consumer or Export | 0% | 5% | 0% | 100% | 100% | 100% | |

APPENDIX 3 Business Interview Template

Interview Template - FRDC Project 2022-038

| | | | | | | | | | | | | |
|--|--|-----------------------|--|----------------|-------|-----------------------------------|------------|------------------------------------|--------------|------------|------------|------------|
| Interviewer: | | Interviewee: | | Business name: | | Date: | | Place: | | | | |
| Scope | | | Employment | | | Trends/Time context | | | | | | |
| Time period | 2021/22 | | Total jobs | | | Was 2021/22 an unusual year? How? | | | | | | |
| Regions | Local, WA, Aus, OS | | Location of jobs (see Regions) | | | | | | | | | |
| Activities | All catch from the fishery and all supply-chain activities to consumers. | | FTE equiv. | | | | | | | | | |
| | | | Wages <i>e.g. average wage? share of catch?</i> | | | | | | | | | |
| | | | Describe unpaid labour | | | | | | | | | |
| | | | | | | | | | | | | |
| Primary product input <i>Forms, suppliers (location), prices, quantities, values</i> | | | Business activities | | | Products (and by-products) | | | | | | |
| | | | Location | | | Product | Value (\$) | Destinations | | | | |
| | | | In-scope activities | | | | | | | | | |
| | | | Out of scope activities | | | | | | | | | |
| | | | What percentage of activity described on this sheet is in-scope? (OPEX, empl, etc) | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | TOTAL REVENUE (\$) | | | | | | |
| | | | | | | | | | | | | |
| Other OPEX | | | CAPEX in last 5 years | | | | | Profitability | | | | |
| Item | Value (\$ or %) | Sources (see regions) | Item | Year | Value | Source (see regions) | % in scope | GOS=TR-TC | | | | |
| Wages | | | | | | | | ... OR ... | | | | |
| | | | | | | | | Large profit | Small profit | Break even | Small loss | Large loss |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | Description of mark-ups or margins | | | | |
| | | | | | | | | | | | | |
| TOTAL COSTS (\$) | | | CAPEX plans in next 5 years? | | | | | | | | | |



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