



**AUSTRALIAN FISHERIES AND
AQUACULTURE INDUSTRY 2017/18:
ECONOMIC CONTRIBUTIONS
ESTIMATES REPORT**

**A Report to the Technical Advisory
Group**

30 September 2019

Prepared by

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PREFACE

This report presents estimates of the economic contribution of Australia's fisheries and aquaculture industries to the Australian community for 2017/18. It forms part of the *National Fisheries and Aquaculture Industry Contributions Study (FRDC project 2017-210)* which was funded by the Fisheries Research and Development Corporation (FRDC) on behalf of the Australian Government to produce evidence of industry's contributions. This study is an exciting step forward that lays the groundwork for the Australian seafood industry to celebrate its economic and other contributions and to showcase these to its communities and to Australians in general. The project was undertaken by the Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, with BDO EconSearch commissioned to provide the estimates presented in this report.

This is the first time the economic contribution of the Australian seafood industry has been reported. This report demonstrates a nationally consistent approach to estimating the industry's economic contributions and supports the ability for individual industries and jurisdictions to monitor trends in the size of contributions over time.

The estimates reported include economic contributions of: commercial fishing activity; aquaculture activity; associated processing activity. These estimates are for economic contributions of these activities in the State or Territory in which they occur, as well as to the national economy. The contribution of Commonwealth fisheries to the State or Territory in which catch is landed are also included. Commercial activities by Indigenous fishing and aquaculture businesses are included in commercial fishing and aquaculture activity. Commercial charter fishing activity is excluded. Fishery and aquaculture sector management activity (other than where these costs are recovered through licence fees) is excluded. Seafood processing of locally produced seafood is included and is attributed to the state/territory economy in which they occur. Inter-state trade flows (e.g. contribution of South Australian-produced aquaculture to the Victorian economy) are captured and reported.

Limitations of the estimates are due to data gaps and issues with data quality for some sub-sectors and for seafood processing. These were identified in the process of building a national data framework which supports the estimation of contributions and which is intended to help guide future data collection. Addressing this by collecting data on these sectors presents an opportunity to produce more comprehensive estimates in future.

These estimates of contribution can be used to compare the level of contributions of the fisheries, aquaculture and processing industries in different states or territories. Comparisons of these estimates can also be made with other productive industries (for example, beef or sheep). These will be less reliable due to differences in the number of sectors included (this study included only the catch/production and processing sectors), data availability and quality, and modelling across various studies.

Use of these estimates to predict impact of changes in the level of activity of fisheries and aquaculture industries is not advised. While results can be used to highlight the possible size and nature of impacts, further analysis would be required to estimate the actual impact on the economic measures of such changes.

Comparisons of the economic contributions of commercial fisheries and recreational fisheries (made as fishing-related expenditures generate direct and indirect economic impacts) need to be made very cautiously. The two activities are fundamentally different and require different input-output modelling approaches, and comparison can only be made where estimates are comprehensive. For commercial fisheries this requires that estimates include backward and forward linked sectors (for example, boat building sectors, as well as seafood retail sectors). For recreational fisheries this requires that only expenditures that are directly attributable to fishing are included in the estimate.

Use of estimates of economic contributions to predict the impact on a state or territory economy of changes in resource allocation between commercial and recreational fisheries can complement economic benefit or efficiency analysis. However, it will require further knowledge to determine how inputs would be redeployed in the economy by other sectors were commercial fishing no longer occurring, and how recreational fishers would spend their discretionary income on substitutable activities were they not able to recreationally fish.

We would like to acknowledge the input of the project's Technical Advisory Group whose members were as follows: Sean Pascoe (CSIRO); Robert Curtotti (ABARES); and Alistair McIlgorm (University of Wollongong).

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ABBREVIATIONS

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
AHECC	Australian Harmonised Export Commodity Classification
Cth	Commonwealth
CPI	Consumer Price Index
CPUE	catch per unit effort
FOB	Free on Board
FRDC	Fisheries Research and Development Corporation
FTE	full time equivalent
GDP	gross domestic product
GOS	gross operating surplus
GRP	gross regional product
GSP	gross state product
GVA	gross value added
GVP	gross value of production
HDR	Human Dimensions Research
HI	household income
I-O	input-output
IOPC	input-output product classification
MEY	maximum economic yield
MRIO	multi-region input-output
NeCTAR	National eResearch Collaboration Tools and Resources
NPF	Northern prawn fishery
NSCP	national seafood contributions project
PIRSA	Primary Industries and Regions South Australia
R&M	repairs and maintenance
RBA	Reserve Bank of Australia
ROI	return on investment
SA	South Australia
SA2	statistical area level 2
SARDI	South Australian Research and Development Institute
SIA	Seafood Industry Australia



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1 INTRODUCTION

1.1 Purpose and Scope

Discussions between Seafood Industry Australia (SIA) and Fisheries Research and Development Corporation (FRDC) identified the need to gather the information required to support the Australian fisheries and aquaculture industry to “tell its story” of its contributions to the national, state and regional economies and communities. FRDC’s Human Dimensions Research (HDR) Subprogram is addressing this by leading an FRDC-funded National Fisheries and Aquaculture Industry Contributions Project 2017-210 (referred to as the National Seafood Contributions Project, or NSCP). One of the aims of the NSCP is to:

1. Provide an estimate of the economic contribution of wildcatch fisheries and aquaculture to the Australian (national) economy, and of the economic contribution of jurisdictionally-based (State, Territory and Commonwealth) fisheries and aquaculture to their State/Territory economies.

This estimates report addresses this aim, and is part of a broader study, the National Seafood Economic Contributions Study, contributing towards the NSCP. The key objective of this report is to:

- i. Produce evidence of the economic contribution of Australia’s fisheries and aquaculture sectors to the Australian community that is relevant (fit for both intended use and audience), robust, transparent and repeatable.

The terms of reference for the broader National Seafood Economic Contribution Study are provided in Appendix 1.

As per the terms of reference for this estimates study, this report includes economic contribution estimates for commercial fishing activity in each of the jurisdictions (State/Territory and the Commonwealth) and nationally, and aquaculture production in each jurisdiction and nationally. Commercial fishing includes both Indigenous and non-indigenous activity. Commercial charter fishing activity is excluded. Fishing and aquaculture support services are included. Fishery/aquaculture sector management activity (other than where these costs are recovered through licence fees) is excluded. Seafood processing of locally caught/produced seafood is included and processing of imported seafood is excluded. Fishing support services and aquaculture support services are included in the analysis as the flow-on effects from the expenditures by the commercial fishing and aquaculture industry (further details of the scope of this study are provided in Section 2.1).

Estimates of economic contribution are reported at the State/Territory and national scales:

- State/Territory fishery contributions are reported towards their respective jurisdiction economies and nationally
- Likewise, State/Territory aquaculture contributions are reported towards their respective jurisdiction economies and nationally
- Commonwealth-managed fisheries are reported as contributions to individual State/Territory jurisdictions and in aggregate to the national economy
- The economic activity from processing of Australian caught/produced seafood is included and reported for the State/Territory economies they are located in and nationally
- Inter-state trade flows (e.g. contribution of SA aquaculture to Victorian economy) are captured and reported.

The report provides estimates of the following indicators of economic contribution for the 2017/18 year:

1. Gross value added (GVA)
2. Employment (FTE)
3. Household income (HI)
4. Gross Value of Production (GVP)
5. Gross Domestic Product and Gross State Product (GDP/GSP)
6. Value of Exports.

1.2 Relationship to Other Reports Produced by this Study

This estimates report is one output of the National Seafood Economic Contributions Study, addressing the Study's first objective. The Study has a further two objectives, which are to:

- Produce *national guidelines* to support practitioners, managers and industry in estimating economic contributions of selected fisheries and aquaculture activities at various scales.
- Produce a *national economic data framework* covering data collection, processing and management to support replication and improvement of the current economic evidence study in the future, other economic contribution studies at the regional level or by individual fishery/aquaculture industry, and economic impact assessments.

The three reports are complementary. The *national economic data framework* (BDO EconSearch 2019m), provides a framework for the types, collection and management of the data required to replicate - and improve - the national contributions study in the future, and to support other economic contribution studies and economic impact studies. The *national guidelines* (BDO EconSearch 2019n) provide in-depth guidance to practitioners, managers and industry in undertaking economic contribution studies both nationally and at the regional level or by individual fishery/aquaculture industry. This *national contributions* study presents the first attempt at quantifying the national economic contribution of the Australian seafood industry based on best available data and most appropriate methods within the data available and time/resource constraints of this study. It is a practical demonstration of the *guidelines* based upon the data discussed in the *framework*.

1.3 Outline of this Report

The remainder of this report includes:

- A description of the method of analysis and data (Section 2), which includes an explanation of the:
 - Study scope (Section 2.1)
 - Estimation process and the steps involved (Section 2.2)
 - Economic contribution indicators (Section 2.3)
 - Estimation of direct contributions for fishing/aquaculture production (Section 2.4) and processing (Section 2.5)
 - Estimation of the indirect contributions of these sectors (Section 2.6)
- Presentation of detailed results for each of the jurisdictions and nationally (Section 3)
- A summary of the results (Section 4).

2 METHOD OF ANALYSIS AND DATA

2.1 Study Scope

As described in Section 1.1, this report includes economic contribution estimates for commercial fishing activity in each of the jurisdictions (State/Territory and the Commonwealth) and nationally, and aquaculture production in each jurisdiction and nationally. Commercial charter fishing activity is excluded, as per the terms of reference. Based on best available data, a number of fisheries and aquaculture sectors have been excluded from the analysis, the reasons for which are described in Table 2-1 (fisheries) and Table 2-2 (aquaculture sectors).

Table 2-1 Fisheries excluded from the analysis

Fishery	Reason for exclusion
NSW Inland, NSW S37 permit	No catch/effort data published or means to estimate it
VIC Ocean Scallop, VIC Port Phillip Bay Dive Scallop, Gippsland Lakes Mussel Dive, Port Phillip Bay Mussel Bait, Snowy River Bait, Sydenham Inlet Bait	No catch/effort data published or means to estimate it
QLD Coral, QLD Marine Aquarium, QLD Sea Cucumber, QLD East Coast Pearl	No GVP data published or means to estimate it.
QLD Trochus, QLD Eel Juvenile	No catch
WA Broome Prawn, Cockburn Sound Mussel, Marine Aquarium Fish, Northern Shark, North Coast Shark, Peel-Harvey West Coast Crab, South Coast Trawl, Swan and Canning Rivers Crab, Temperate Demersal Shark, West Coast Sea Crustacean, West Coast Deep Sea Crab.	No catch/effort data available.
WA Albany/King George Sound Purse Seine, Cockburn Sound Crab, Mandurah to Bunbury Developing Crab, Onslow Prawn, Peel Harvey West Coast Crab, Pilbara fisheries (except Line), South West Trawl, West Coast Beach Bait, Exmouth Gulf Beach Seine and Mesh Net Managed Fishery, FBL condition 66 Cockburn Sound Fish Net	No catch/effort data published or means to estimate it
TAS Marine Plant	No basis to estimate costs
Cth Heard Island & McDonald Island, Cth Macquarie Island Toothfish	Negligible catch attributable to landing ports in the States and Northern Territory
Cth Torres Strait Bêche-de-mer	No GVP data published or means to estimate it
Cth Christmas Island and Cocos (Keeling) Islands, Norfolk Island, Cth South Tasman Rise Trawl, Cth Western Skipjack, Cth East Coast Deepwater Trawl, Cth Eastern Skipjack, Cth Torres Strait Trochus	No catch

Table 2-2 Aquaculture sectors excluded from the analysis

Aquaculture sector	Reason for exclusion
NSW Other Aquaculture	No published production data or means to estimate it.
VIC Ornamental Fish	No published GVP data or means to estimate it.
VIC Freshwater Eels, VIC Yabby	Negligible production.
VIC Other Aquaculture	No published production data or means to estimate it.
TAS Seahorses	No published production data or means to estimate it.
NT Algae	Negligible production.

The economic activity of sectors that supply goods and services to the commercial fishing and aquaculture industry are included in the analysis as the flow-on effects from the expenditures by the commercial fishing and aquaculture industry. This includes fishing support services and aquaculture support services.

The economic activity by Government agencies for fishery and aquaculture sector management is limited to those costs recovered through licence fees, as per the terms of reference (see Appendix 1).

The economic activity from processing of Australian caught/produced seafood is included and reported separately. The economic activity from processing of imported seafood is excluded.

The economic contributions of the national seafood industry are reported for (i) the State/Territory economies¹ in which the activity of the sector occurs, and (ii) nationally². Attribution of Commonwealth fisheries activity to States/Territories was based on primary landing ports and is described in more detail in Section 2.4.5. Inter-state trade flows resulting from fishing/production and processing activity is captured and reported separately.

Economic contributions are reported for the 2017/18 financial year. They are reported for direct contributions and contributions resulting from flow-on activity. More specifically, the following components of economic contribution were analysed and reported:

- direct impacts;
- flow-on (or indirect) impacts; and
- total impacts. Further details are provided in Section 2.3.2

As described in Section 1.1, the report provides estimates of the following indicators of economic contribution³:

- Gross value added (GVA)
- Employment (FTE)
- Household income (HI)

¹ New South Wales, Victoria, Queensland, South Australia, Western Australia, Tasmania and Northern Territory.

² Australia.

³ Note that further description of these indicators is provided in Section 2.3.1.

- Gross Domestic Product and Gross State Product (GDP/GSP)
- Gross value of production (GVP)
- Value of exports.

2.2 Overview of Approach

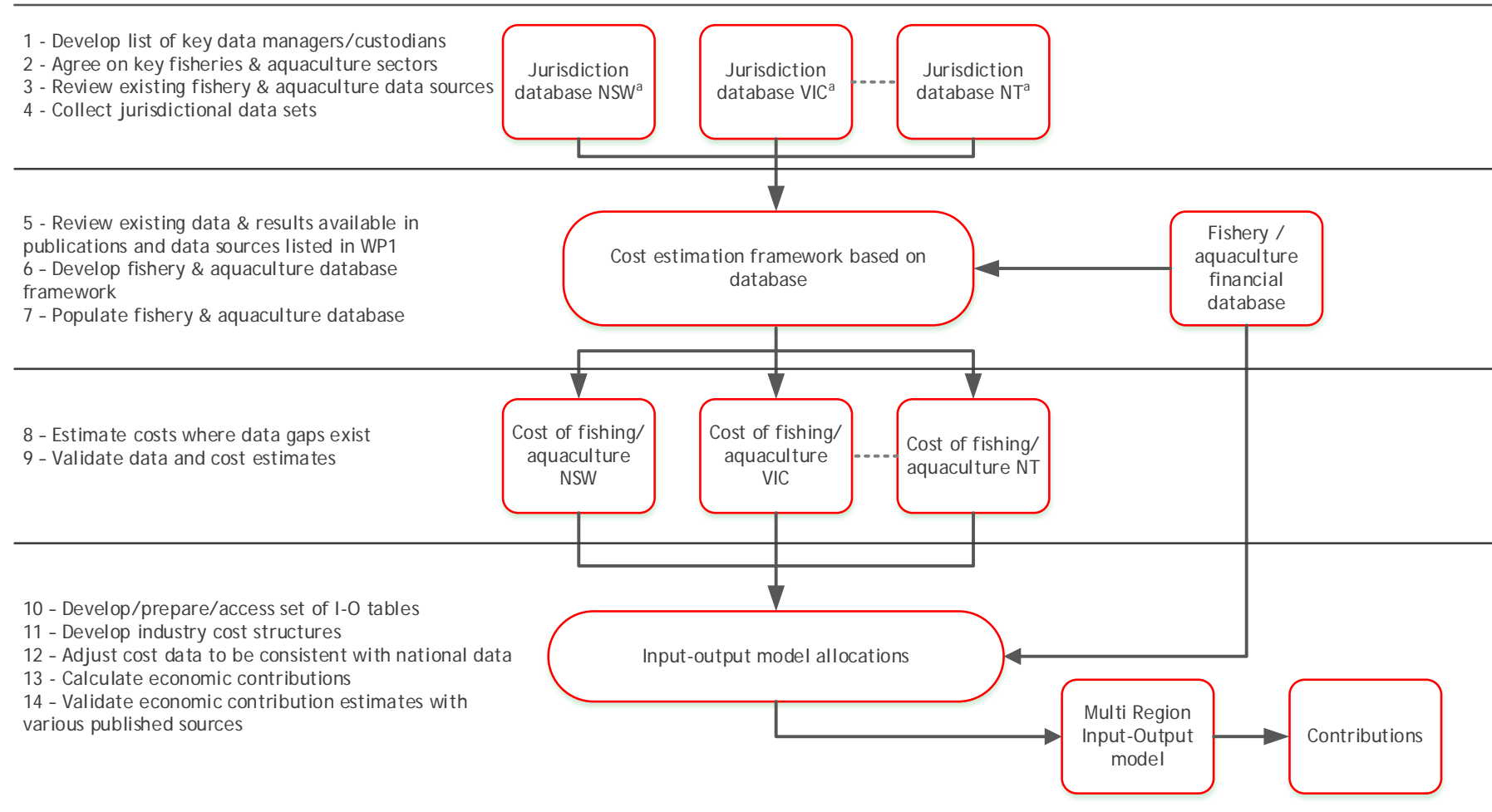
This section provides an overview of the steps undertaken to estimate the direct and flow-on economic contribution of fishing and aquaculture production and seafood processing in Australia. The following sections describe in more detail the economic indicators, methods and data used.

The process for estimating economic contributions is illustrated in Figure 2-1 and was undertaken in accordance with the steps described in BDO EconSearch (2018c) (*Recommendations about the Preferred Research Design for the National Contributions Study: Working Paper 3*)⁴. In keeping with WP3, the main steps have been:

1. Developing/updating the list of fisheries and aquaculture data managers/custodians in each of the jurisdictions.
2. Agreeing on a list of key fisheries and aquaculture sectors by jurisdiction that were included in the analysis (see Appendix 2). This list was confirmed with each jurisdiction.
3. Reviewing existing fisheries and aquaculture data sources detailed in *Data Needs and Data Availability for a National Contributions Study: Working Paper 2*³ (BDO EconSearch 2018b). These data are listed in Step 6.
4. Collecting jurisdictional data sets from managers/custodians and published source materials. Completion of this step produced a database for each jurisdiction, as shown in Figure 2-1.
5. Reviewing existing data and results available in the publications and data sources listed in *Identification and Critical Assessment of Recent Contributions Reports: Working Paper 1 - Literature Review*³ (BDO EconSearch 2018a) and through additional research/consultation. These reports presented data on catch, GVP, employment or business cost structures.

⁴ Working Papers 1-3 are summarised in Appendix 4.

Figure 2-1 Process for estimating economic contributions



^a Includes catch/production, GVP, boat length and effort data.

6. Developing a database framework on a jurisdictional basis (shown as the “Cost estimation framework” in Figure 2-1) that includes the following elements for each of the key fisheries and aquaculture sectors:
 - a. Catch/production
 - b. Price
 - c. GVP
 - d. Business costs/operating costs (representative cost structures)
 - e. Management costs (i.e. licence fees)⁵
 - f. Data update assumptions - data and assumptions used to modify data, particularly cost data that are not available for the study year. These update data included total days fished, price of fuel, business interest rates, CPI in relevant jurisdiction, wage price index
 - g. Export data
 - h. Employment data.
7. Populating the fishery and aquaculture database with best available information. This database links detailed cost data from existing surveys and studies into the framework.
8. Where there were data gaps, estimating proxy data using a ‘fishery matching’ approach, particularly in relation to industry cost data. This is described in more detail in Section 0 and Appendix 2 provides a list of matched fisheries and aquaculture sectors.
9. Validating fishery/sector matching and allocation of confidential data to fisheries with data custodians (completion of this step produces fishing and aquaculture production cost data for each jurisdiction, as shown in Figure 2-1).
10. Preparing the Multi Region RISE Input-Output model of the States and Territories (shown as the “Multi Region Input-Output model” in Figure 2-1). This is described in more detail in Section 2.6.
11. Developing industry cost structures from the database for adjustment consistent with the I-O tables prepared under item 10. The following adjustments were made for each item of expenditure:
 - a. Proportion imported to the jurisdiction
 - b. Proportion imported to Australia
 - c. Identifying any margins (wholesale, retail, transport, insurance, etc.) and allocating appropriately
 - d. Identifying any indirect taxes or subsidies and allocating appropriately.
12. Structuring the database so that the sum of activity across jurisdictions is consistent with the national data having account of inter-jurisdictional trade and transactions. This, with the previous step, is shown as “Input-output model allocations” in Figure 2-1.
13. Calculating the estimated economic contributions using the I-O consistent fishery/aquaculture data and the Multi Region Input-Output model.

⁵ As per the scope of works, management costs were limited to those costs recovered through licence fees.

14. Reviewing contribution estimates with other published data sources and studies to check validity of results. Adjustments to input data and assumptions were made where deemed necessary. The following studies were used in the review:

- a. ACIL Allen 2017, *Economic Contribution of the Western Rock Lobster Industry*
- b. Barclay et al. 2016, *Social and Economic Evaluation of NSW Coastal Aquaculture*
- c. BDO EconSearch 2019k (in press), *Economic Indicators of the Commercial Fisheries of South Australia*
- d. BDO EconSearch 2019l (in press), *Economic Contribution of Aquaculture to the South Australian State and Regional Economies 2017/18*
- e. KPMG 2015, *Economic Impact Assessment of the Tasmanian Aquaculture Industry*
- f. Voyer et al. 2016, *Social and Economic Evaluation of NSW Fisheries*
- g. WRI (in prep.), *Economic Impact of Victorian Commercial Fisheries and Aquaculture*⁶.

The following data sources were also used to check the validity of the contributions estimates

- a. Australian Bureau of Statistics (ABS) 2017, *Census of Population and Housing 2016*
- b. ABS 2019a, *Labour Force Detailed*
- c. ABS 2019b, *Australian Industry 2017-18*.

2.3 Economic Contribution Indicators

2.3.1 Indicators used

As per the terms of reference, the key indicators used in this report are:

Gross Value Added (GVA) is the output of an industry or sector minus intermediate consumption. GVA represents the value of all goods and services produced, minus the cost of all inputs and raw materials used to produce that good or service. Unlike gross product (discussed below), GVA does not include the value of net taxes (i.e. taxes minus subsidies). GVA provides a measure of the net contribution of fishing, aquaculture and processing to the State/Territory and national economies, excluding net taxes. It can be measured as household income (defined below) plus gross operating surplus. GVA is easier to estimate than gross product at an industry level as indirect taxes, which are difficult to allocate, are excluded. The National Accounts, for example, report GVA, but not GDP, at the industry level making this indicator more readily comparable with published statistics.

Employment is a measure of the number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalent (fte) jobs. This indicator provides a measure of the total employment contribution of fishing, aquaculture and processing to the State/Territory and national economies.

Household income is a measure of wages and salaries paid in cash and in kind, drawings by owner operators and other payments to labour including overtime payments, employer's superannuation contributions and

⁶ Project investigators from the NSCP (FRDC 2017-210) led an exercise comparing the estimated contributions for Victoria with (unpublished) estimates from FRDC project 2017-092, which also informed the review process.

income tax, but excluding payroll tax. This indicator provides a measure of the wages and salaries associated with the employment contribution of fishing, aquaculture and processing.

Gross product represents the total dollar value of all finalised goods and services produced over a specific time period and is considered as a measure of the size of the economy. At a national level, it is referred to as Gross Domestic Product (GDP); at the state level, Gross State Product (GSP); at a regional level, Gross Regional Product (GRP). Contribution to GDP/GSP/GRP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In other words, it can be measured as household income plus gross operating surplus and all taxes, less subsidies. GSP and GDP provides measures of the complete net contribution of fishing, aquaculture and processing to the State/Territory and national economies, respectively.

Gross value of production (GVP) is a measure of the gross revenue of goods and services produced by commercial organisations (e.g. farm-gate value of Tuna production, landed value of Rock Lobster). GVP needs to be used with care as it includes elements of double counting (e.g. the value of Tuna farm output includes the gross value of Tuna fishing). For this reason, only direct GVP is reported. GVP is a widely reported measure of the gross value of fishing, aquaculture and processing.

Two indicators are used to describe exports, namely *export quantity* and *value of exports*. **Exports** are recorded by state of origin, i.e. the State/Territory in which the final stage of production or manufacture occurs. Although this does not necessarily equate to the state in which the goods were loaded onto the international carrier, it does include interstate sourced seafood which undergoes further processing or packing. Export revenue contributes to the standard of living in the state/regional economy. **Export quantity**, unless otherwise stated, is reported in terms of gross weight. Gross weight refers to the shipping weight of goods in the packaged state, excluding the weight of containers.

Value of exports are measured on a free on board (fob) basis. This includes all production and other costs incurred up until the goods are placed on board the international carrier for export. FOB values exclude international insurance and transport costs. They include the value of the outside packaging in which the product is wrapped, but do not include the value of the international freight containers used for transporting the goods.

2.3.2 Categories of economic indicators

Estimates of economic contribution for GVA, employment, household income and GDP/GSP are presented in this study in terms of:

- direct contribution;
- flow-on (or indirect) contribution; and
- total contribution.

Direct contributions are the initial round of effects (i.e. GVA, employment, household income and GDP/GSP) generated by an economic activity (i.e. fishing, aquaculture production and processing).

Flow-on (or indirect) contributions are the sum of production-induced effects and consumption-induced effects. Production-induced effects are additional GVA, employment, household income and GDP/GSP resulting from re-spending by firms (e.g. boat builders, feed suppliers) that receive payments from the sale of goods and services to fishing, aquaculture production and processing firms. Consumption-induced effects are additional GVA, employment, household income and GDP/GSP resulting from re-spending by households that receive income from employment in direct and indirect activities.

Total contributions are the sum of direct and flow-on (indirect) contributions.

2.4 Estimating Direct Contribution for Fishing and Aquaculture Production

GVP, direct GVA, employment, household income and GDP/GSP were estimated from primary data (catch/production, prices, cost of production, licence fees, employment) collected from the fisheries and aquaculture industry data custodians and published sources, where available, for the individual fisheries/aquaculture sectors. These data are described in Section 2.4.1. Where these data were not available, they were imputed using the 'matched fishery/aquaculture sector' data with appropriate adjustments. The process for imputing fishery/aquaculture sector data is described further in Section 0.

Direct GVA is the sum of direct household income plus gross operating surplus (GOS). Direct household income was estimated as wages and salaries paid in cash and in kind, drawings by owner operators and other payments to labour including overtime payments, employer's superannuation contributions and income tax, but excluding payroll tax. GOS was estimated as value of output (i.e. GVP) less the cost of goods and services (including imports) used in producing the output (i.e. cost of production).

The method for attributing activity to jurisdictions from State managed fishing and aquaculture and Commonwealth managed fishing is described in Section 2.4.5.

The analysis of exports was based on a customised report from the ABS for *International Merchandise Trade, 2017-18* (ABS 2019c).

2.4.1 Input data

The data that were used to estimate the economic indicators is described following. A summary of the fisheries and aquaculture data available and used is provided in Section 2.4.2 and in-depth details are available in the *Economic Contributions Data Framework* (BDO EconSearch 2019m), which formed the basis of this study.

Catch/production

Fishery catch and aquaculture sector production data by individual fishery/aquaculture sector were mainly sourced from data custodians in each jurisdiction and, in some instances, were available from published sources.

Prices and GVP

As with catch/production, prices or GVP data by individual fishery/aquaculture sector were mainly sourced from data custodians in each jurisdiction and, in some instances, were available from published sources.

Employment data

As with catch/production, employment data (fte and total) by individual fishery/aquaculture sector were mainly sourced from data custodians in each jurisdiction and, in some instances, were available from published sources.

Cost of fishing/production

These are the business costs of the average boat/aquaculture business in their respective fishery/aquaculture sector and provide the representative cost structures for individual fisheries/aquaculture sectors. Cost of fishing/production data are required to establish the direct and indirect contributions to GVA and GSP/GDP. Specifically, it is used to calculate profitability and wages of fishing/aquaculture businesses and their patterns of expenditure.

The following costs were included for fisheries:

Variable costs:

- fuel, oil and grease for the boat (net of diesel fuel rebate)
- bait
- ice
- provisions
- crew payments
- fishing equipment, purchase and repairs (nets, pots, lines, etc.)
- repairs & maintenance: ongoing (slipping, painting, overhaul motor)
- Imputed owner/operator and unpaid family labour (variable component).

Fixed costs:

- imputed owner/operator and unpaid family labour (fixed component)
- insurance
- industry fees
- office & business administration (communication, stationery, accountancy fees)
- interest on loan repayments and overdraft
- leasing
- depreciation (used as an annualised cost of boat/business capital replacement).

Aquaculture cost of production included the same categories of fixed costs. Variable costs included:

- feed
- fry/fingerlings/spat/wild-caught tuna, etc.
- electricity
- fuel & oil
- repairs & maintenance
- paid labour
- other (e.g. security, packaging).

Management costs and licence fees

Licence fees, in a fully cost -recovered fishery/aquaculture sector reflect the total management costs associated with a jurisdiction's fisheries and aquaculture sectors and can be used as an estimate of management costs. However, for a majority of fisheries and aquaculture sectors management costs are not fully recovered through licence fees. Other than licence fee data, which are generally published, other management cost data was not readily available.

In this study, due to the limitations of data availability, management costs have been limited to those recovered through licence fees. This is a limitation of this study, which may mean that direct GSP/GDP and

direct GVA may be underestimated (from excluding some government expenditure) and the flow-ons of these indicators may also be underestimated.

Update data

These are data and assumptions that were used to update data, particularly cost data that are not available for the study year. These data were total days fished, number of active vessels, GVP, price of fuel, business interest rates, CPI in relevant jurisdiction and wage price index.

'Matching fishery/aquaculture sector' data

The approach used to derive cost of fishing/production estimates for fisheries/aquaculture sectors where these data were not available, or insufficiently specified for this study's purposes, is described in Section 0. The imputation data used for the fishery with missing data were:

- Total days fished
- Active vessels
- Average boat length
- GVP.

The imputation data used for the 'matching' fishery were:

- days fished
- boat length
- GVP
- depreciation rate
- employment (total and fte).

The imputation data used for the aquaculture sector with missing data were:

- production
- GVP.

The imputation data used for the 'matching' aquaculture sector were:

- Production
- GVP
- employment (total and fte).

Export data

The analysis of exports was based on a customised report from the ABS for *International Merchandise Trade, 2017-18* (ABS 2019c). A request was made to the ABS specifying the Australian Harmonised Export Commodity Classification Codes (AHECC) for seafood products. The AHECC requested are listed in Appendix 3. The data requested per code, were:

- Reference period (2017/18)
- Country of destination
- State of origin

- Quantity (kg)
- Value (FOB).

2.4.2 Data review

Extensive consultation with the data custodians in the jurisdictions was undertaken to identify best available data, agree fisheries/aquaculture sectors that are out of scope, have insufficient data, or negligible GVP (which were excluded from the analysis) and identify fisheries/aquaculture sectors that were to be included in the analysis but where data gaps existed. This section takes a national perspective to highlight the data gaps for fisheries and aquaculture. A detailed, jurisdiction level, review of available data is available in the accompanying *Australian Fisheries and Aquaculture Industry 2017/18: Economic Contributions Data Framework* report (BDO EconSearch 2019m).

The tables in this section show estimates of the proportion of each jurisdiction's total fishery or aquaculture GVP for which the relevant data are available, weighted by quality. If significant concerns about data quality were communicated to BDO EconSearch along with the data, or identified by BDO EconSearch during the NSCP, then a weight of 0.5 is applied to that *data item-fishery* pair when calculating the 'Proportion of GVP' estimate for that jurisdiction. If a data item is unavailable then a weight of 0 is applied to the GVP for that *data item-fishery* pair. A low proportion signals that a data item is a key data gap for the jurisdiction.

For example, in South Australia 'active licences' data are available for all commercial fisheries. If 'active licences' was the required data item then the estimate of quality-weighted GVP would be 100 per cent. However, 'active vessels' is the required data item and 'active licences' is only an estimate of this (assumes 1 vessel per licence). Due to this quality issue, each fishery (all fisheries in this case) is weighted by 0.5 and the resulting estimated quality-weighted GVP for that cell is 50 per cent.

It should be noted that fisheries with no price/GVP data are excluded from the total used to calculate the availability scores. This is necessary as GVP is the chosen metric to weight by, though each score is biased upwards as a consequence. For example, price unavailable for some commercial fisheries in Queensland and where it is available, it is outdated (so a weight of 0.5 is applied). The resulting proportion of 50 per cent is an overestimate of data availability as excluded fisheries are treated as though they have GVP of zero.

Fisheries

A national summary of data gaps for fisheries is presented in Table 2-3. The table summarises the availability of relevant data in each jurisdiction, weighted by GVP (within each jurisdiction) and data quality. The table omits small developmental and negligible GVP fisheries.

In general, data related to fisheries regulation and biological analysis are widely available - fishery level catch data are nationally available for around 96 per cent of GVP, effort for 81 per cent and active vessels for 74 per cent, after weighting by quality.

Price is also widely available (76% of GVP), allowing calculation of the most basic economic indicator - gross value of production. Where price is not 100 per cent available, this is usually due to quality issues where price is either outdated or reported on a species basis only.

Cost of fishing data are only available in jurisdictions and fisheries where specific economic analyses (such as fishery economic indicators or contributions) have been produced recently. Cost of fishing data collection usually occurs on an Ad Hoc basis. Almost all of South Australia's GVP has cost structure data, as does around half of GVP for Tasmania, Western Australia and Commonwealth fisheries. This represents around one quarter of national commercial fishing GVP.

Management cost and licence fee data are available where management costs are cost recovered through fees.

Boat length data are infrequently available. Where they are available, it is usually only for a single boat per licence.

Table 2-3 Data availability weighted by GVP and quality, 2017-18, fisheries

Jurisdiction	Catch	Price	Effort	Active vessels	Boat length	Mgmt. costs	Licence fees	Cost of fishing
NSW	100%	100%	100%	50%	0%	0%	66%	0%
VIC	100%	71%	100%	50%	0%	100%	51%	0%
QLD	100%	50%	100%	50%	50%	50%	50%	0%
SA	100%	100%	100%	50%	99%	100%	100%	99%
WA	100%	89%	100%	100%	22%	0%	0%	44%
TAS	100%	100%	99%	99%	99%	50%	50%	46%
NT	100%	100%	100%	100%	100%	100%	100%	0%
Comm.	83%	83%	15%	83%	0%	97%	0%	58%
Weighted National Average	96%	77%	80%	66%	35%	66%	43%	25%

Source: BDO EconSearch 2019m

Aquaculture

A national summary of data gaps for aquaculture sectors is presented in Table 2-4. The table summarises the availability of relevant data in each jurisdiction, weighted by GVP (within each jurisdiction) and data quality as for fisheries (Table 2-3Error! Reference source not found.).

In general, data related to regulation and calculating value of production (production, price, number of operators) are widely available (>90 per cent of GVP) with the notable exception of Northern Territory regarding the number of active operators. Western Australia also has low availability of number of active operators as data are unavailable for a single high-GVP sector, Pearl Oysters.

Licence fee data are also available from all jurisdictions where they apply, other than Western Australia and Northern Territory.

Cost structure data are available for few aquaculture sectors nationally. These sectors tend to be high in GVP so the quality weighted proportion of national GVP represented is 73 per cent. The key sectors are Salmonids in Tasmania, Oysters in New South Wales and Prawns in Queensland and Southern Bluefin Tuna in South Australia.

Management costs are the least available data item with 23 per cent of GVP represented nationally.

Table 2-4 Data availability weighted by GVP and quality, 2017-18, aquaculture

Jurisdiction	Prod.	Price	Active operators	Mgmt. costs	Licence fees	Cost of prod.
NSW	100%	100%	100%	100%	100%	71%
VIC	100%	100%	100%	100%	82%	0%
QLD	99%	99%	100%	0%	-	34%
SA	100%	100%	100%	100%	100%	50%
WA	21%	60%	21%	0%	0%	0%
TAS	100%	100%	100%	0%	98%	97%
NT	95%	95%	0%	0%	0%	0%
Weighted National Average	95%	97%	93%	23%	82%	73%

Source: BDO EconSearch 2019m

2.4.3 Addressing cost of fishing/production data gaps

Where survey-based financial data of sufficient quality were unavailable for fisheries/sectors, cost of fishing/production data were imputed. The method for imputing cost data involved “matching” fisheries/sectors lacking adequate cost data with a fishery (or aquaculture sector) of similar characteristics (e.g. fishing/production methods and target species) for which detailed costs were known⁷. This approach followed the method developed to support the analysis of the NSW commercial fisheries reform package (AgEconPlus et al. 2015). The method has also been used to provide economic information for NT fisheries to the Northern Territory Seafood Council (EconSearch 2018f) and Developing East Arnhem (EconSearch 2018g).

A complete list of all pairings of fisheries and aquaculture sectors can be found in Appendix 2.

The NSW fisheries were matched, rather than using an existing study (Voyer et al. 2016), due to difficulties in relating the reported cost structure data to defined fisheries (reported across mixed NSW fisheries). There was also no basis provided in the report on how to scale up to total state fishery, although this would have been done to derive state wide economic contribution estimates. As indicated in the report, the sample size was also quite low (less than 5 per cent of licences).

Some of the fisheries/sectors were matched (either in whole or in part) to a fishery/sector within their jurisdiction. For example, Tasmanian Abalone data were sourced from an earlier study of Tasmanian Abalone (Hartmann 2015 et al.) which was updated in line with the Tasmanian abalone dive rates study (Knuckey and Sen 2017). Table 2-5 summarises the cost of fishing data treatment for each jurisdiction.

⁷ Fisheries with adequate cost of fishing data comprised all SA fisheries except Miscellaneous (BDO EconSearch in press 2019a-j), WA Blue Swimmer Crab and Prawns (Daley & Putten 2018), WA Western Rock Lobster (ACIL Allen Consulting), Tasmanian Abalone (EconSearch 2013, Knuckey and Sen 2017) and Commonwealth fisheries Eastern Tuna and Billfish (Mobsby and Bath 2018), Northern Prawn (Mobsby et al. 2019), Southern and Eastern Scalefish and Shark (Bath et al. 2018), Torres Strait Prawn (Skirtun et al. 2015) and Bass Strait Central Scallop (George et al 2012). Aquaculture sectors with adequate cost of production data comprised NSW aquaculture sectors (Barclay et al. 2016), SA aquaculture sectors (BDO EconSearch in press 2019), Queensland Prawns (QDPIF 2008) and Tasmanian Salmonids (KPMG 2015).

Table 2-5 Cost of fishing data sources and treatment, by jurisdiction

Jurisdiction	Cost of fishing data sources and treatment
NSW	Matched to like fisheries in SA, for which studies exist.
VIC	Matched to like fisheries in SA, for which studies exist.
QLD	Matched to like SA and Commonwealth fisheries, for which studies exist.
SA	Based on existing studies (BDO EconSearch-a-j)
WA	Prawn and Blue Swimmer Crab (aggregated fisheries) based on existing study (Daley & Putten 2018) of Shark Bay Prawn and Blue Swimmer Crab fisheries (both major fisheries within their respective aggregated fisheries). Western Rock Lobster fishery was matched to the SA Southern Zone Rock Lobster fishery, with key fishing cost estimates adjusted in line with existing study (ACIL Allen 2017). Other fisheries matched to like fisheries in SA, for which studies exist.
TAS	Abalone based on a previous study undertaken by EconSearch (2013) updated to reflect costs reported in the 2017 review of Tasmanian abalone dive rates (Knuckey and Sen 2017). Commercial Dive and Shellfish fisheries were then each matched to the Tasmanian Abalone fishery. Remaining fisheries were matched to like fisheries in SA, for which studies exist.
NT	Matched to like SA and Commonwealth fisheries, for which studies exist.
Cth	Six fisheries based on existing studies. Remaining fisheries were matched to Commonwealth and SA fisheries, for which studies exist.

For fisheries, the costs in the matched fisheries were adjusted according to a range of factors that were known in both the matched fishery and the imputed fishery. These factors included:

- Days fished
- Days fished in fishery as a proportion of total days fished in all fisheries (estimated based on boat registration and average days fished per fishery details)
- Average boat length
- GVP in fishery.

These data together with detailed per boat cost data for the “matched” fishery were used to derive the cost structures for each commercial fishery lacking cost data. Cost items were estimated as follows:

- Fuel costs - adjusted by % of days fished & boat length adjustment
- Crew costs - adjusted by % revenue (GVP)
- Freight costs - adjusted by % revenue (GVP)
- Other variable costs - adjusted by % of days fished & boat length adjustment
- Repairs and maintenance - adjusted by % of days fished & boat length adjustment
- Other fixed costs - adjusted by % of days in fishery & boat length adjustment
- Boat/business capital replacement - adjusted by % depreciation rate from “matched fishery”

- Employment - adjusted by ratio of employment (total and fte) to GVP from “matched fishery”.

For aquaculture sectors, the detailed cost items in the matched sectors were adjusted by the production levels in the imputed sectors (i.e. ratio of cost to production from matched aquaculture sector). Employment was adjusted based on matched aquaculture sector GVP (i.e. ratio of employment to GVP from matched aquaculture sector).

The Victorian, Queensland (except for Prawns, which used an existing study), WA, Tasmanian and NT aquaculture sectors were matched to the nearest equivalent SA aquaculture sectors based on species/production systems. Cost of production was adjusted based on the matched aquaculture sector production (i.e. ratio of cost to production from matched aquaculture sector). Employment was adjusted based on matched aquaculture sector GVP (i.e. ratio of employment to GVP from matched aquaculture sector). NSW aquaculture sectors were based on a prior study of these sectors (Barclay et al. 2016) which aggregated the sectors into oysters and other aquaculture. Individual sectors were matched to these aggregated sectors.

2.4.4 Addressing other data gaps

Other input data gaps (discussed in section 2.4.1) occurred across some of the jurisdictions. Identified issues were data:

- suppressed due to confidentiality
- provided for years prior to 2017/18
- aggregated across multiple fisheries or aquaculture sectors
- unavailability (e.g. not collected or attributed to a fishery by data custodians).

Specific data gaps and measures used to overcome issues for each jurisdiction can be provided on request.

2.4.5 Attribution of activity to jurisdictions

The following approach was undertaken to attribute fishing and aquaculture activity to jurisdictions.

For State/Territory managed fishing and aquaculture, catch/production, GVP and effort were assumed to occur within the managing State/Territory.

For Commonwealth managed fishing, catch, GVP and effort were attributed to jurisdictions based on each fishery's primary landing port(s), as reported in the *Fishery Status Reports 2018* (Patterson et al. 2018). This attribution is straightforward where the fishery has primary landing ports in one jurisdiction. However, many Commonwealth managed fisheries have more than one jurisdiction with a primary landing port, and further data manipulation was required to allocate production and GVP to the relevant jurisdictions. The *Australian Fisheries and Aquaculture Statistics 2017* (Mobsby 2018) report provides production and GVP by major fish groups (across all sectors) by jurisdiction:

- by location of catch and production (Table S6 in Mobsby 2018). This table provides fishery/aquaculture production by State, which includes catch occurring outside of a jurisdiction but landed within its boundaries.
- by State (Table S5 in Mobsby 2018). This table provides fishery and aquaculture data by location of catch/production, i.e. States/Territories and the Commonwealth.

The difference between these two estimates, for each species group by State, was used to identify the Commonwealth component of production and GVP for these species. This method follows advice provided by ABARES for this study.

The Northern Prawn Fishery (NPF) was an exception. An existing study (BDO EconSearch 2018f) identified 11 out of 52 NPF vessels to have the NT as their primary landing port in 2015/16. Assuming primary landing ports have not changed significantly since, this information was used to attribute NPF catch.

Catch landed in ports outside the nominated jurisdictions (i.e. ports in the States and Northern Territory) was excluded, e.g. Torres Strait Tropical Rock Lobster fishery catch landed at Daru in PNG, Heard Island and Macquarie Island fishery catch landed in Mauritius. Whilst Australian businesses operate in these fisheries, and therefore some direct GVA is likely to flow back into the Australian economy, it was not possible within the resource constraints of this study to determine what proportion of direct GVA and into which jurisdictional economies it would flow and was therefore conservatively excluded.

2.4.6 Exports

The analysis of exports was based on a customised report from the ABS for *International Merchandise Trade, 2017-18* (ABS 2019c). Exports (quantity and FOB value) were reported by species/category for each State of origin. The State of origin is the State/Territory in which the final stage of production or manufacture occurs and may not be the State/Territory where the fish was caught/produced.

2.5 Estimating Direct Contribution for Processing

Processors often source seafood inputs from more than one jurisdiction within Australia and from overseas. Due to data limitations and time/resource constraints of this project a 'top down' approach, using the MRIO model, *ABS Australian Industry* (ABS 2019b) and *ABS National Accounts Input-Output Tables* (ABS 2019d) data was undertaken to estimate the GVP, cost of production and direct employment for the processing sector in each State/Territory.

Processing GVP in each jurisdiction was estimated as follows:

1. *Estimate total GVP in the processing sector in each State/Territory:* The total value of output produced by the seafood processing sector for each State/Territory was sourced from the ABS publication *Australian Industry* (ABS 2019b). These estimates included the value of processing both local seafood inputs (i.e. seafood fished/produced in Australia) and imported seafood inputs.
2. *Estimate the proportion of local seafood inputs to total seafood inputs:* To exclude the activity in the processing sector from imported seafood inputs, the proportion of local seafood inputs to total seafood inputs was estimated. This was calculated from the *ABS National Accounts Input-Output Tables* (ABS 2019d) as the value of purchases by the processing sector from the Australian aquaculture and fishing sectors excluding imports⁸ divided by the value of purchases by the processing sector from Australian aquaculture and fishing sectors including imported seafood⁹, estimated to be 92 per cent.

⁸ Estimates sourced from Table 5 (Industry by Industry Flow Table (Direct Allocation of Imports)) of the ABS Australian National Accounts: Input-Output Tables, 2016-17, ABS Cat. No. 5209.0.

⁹ Estimates sourced from Table 8 (Industry by Industry Flow Table (Indirect Allocation of Imports)) of the ABS Australian National Accounts: Input-Output Tables, 2016-17, ABS Cat. No. 5209.0.

3. *Estimate processing GVP resulting from the processing of local seafood:* Processing GVP of Australian sourced seafood inputs was then calculated by multiplying the GVP of the seafood processing sector by the proportion of Australian sourced seafood inputs (Step 2). This calculation implies that the processing of imported seafood inputs creates similar value, on a per unit basis, as the processing of Australian sourced seafood inputs.

Cost of production for processing in each State/Territory was derived from the transactions data of the MRIO model (i.e. purchases by the seafood processing sector) adjusted by proportion of local seafood inputs to total seafood inputs (i.e. 92 per cent local seafood inputs). The employment profiles for the seafood processing sectors for each State/Territory within the MRIO were, likewise, adjusted by proportion of local seafood inputs to total seafood inputs to give direct employment estimates.

It should be noted that while the processing of overseas imports was excluded from the analysis, the estimated contribution in each jurisdiction included all Australian caught seafood processed in the jurisdiction, not just seafood caught in that jurisdiction.

2.6 Estimating Indirect Contribution

The previous two sections detailed the production of financial estimates directly related to fishery, aquaculture and processing activities. The next step is to account for flow-on or indirect effects generated by these activities.

To illustrate this, consider the example of an average fishing business that, in the course of its operation, purchases goods and services from other sectors. These goods and services would include fuel, maintenance and repair services, and, of course, labour. Suppliers and employees, in turn, engage in further expenditure, and so on. These flow-on or indirect effects are part of the contribution of fishing related businesses on the Australian economy. They must be added to the direct effects (which are expenditures made in immediate support of the fishing or downstream business itself) in order to arrive at a measure of the total contribution of Australian fisheries.

The flow-on effects of State fisheries, Commonwealth fisheries and aquaculture sectors for each jurisdiction were estimated using multi-region input-output (MRIO) analysis¹⁰.

The estimates of economic contribution presented in this report are generated by an extension of the conventional input-output method. Over the past decade BDO EconSearch has developed an extended input-output model known as the RISE model (Regional Industry Structure & Employment). These extensions have included the addition of population and unemployment “sectors”, as well as capacity to analyse productivity and price change effects and inclusion of multiple regions.

A national multi region IO RISE model, including a region for each State and Territory, for 2017/18 was prepared specifically for this project, consistent with the I-O method and data sources in EconSearch (2017). The model includes one region for each State and Territory in Australia and captures the interstate trade effects between them. At the core of the MRIO RISE model is the multi region input-output transactions table (MRIO table) which captures the transactions between sectors within each State and Territory and between each State and Territory. The MRIO table was built, and reconciled to the National I-O table, using the Industrial Ecology Virtual Laboratory (IE Lab) framework¹¹.

¹⁰ For further discussion of the use of input-output modelling in contribution studies, see BDO EconSearch (2019n).

¹¹ For further details about the IE Lab framework, see BDO EconSearch (2019n).

To estimate regional economic contribution, the MRIO RISE model requires information on the magnitude of various expenditures and where they occur. Also needed is information on how the sectors receiving this expenditure share their expenditures among the various sectors from whom they buy, and so on, for the further expenditure rounds. The data described in Sections 2.4 and 2.5 were used to determine the direct expenditures only. For expenditure in subsequent rounds, a set of assumptions based within the I-O model on average inter-sector expenditure were used. For example, if households in the economy spent 13 per cent of their income on food on average, it was assumed that, for instance, those working in retail trade that supply commercial fishers did likewise.

The MRIO RISE model provides industry multipliers (in terms of employment, GVA, GDP/GSP and household income), which are applied to expenditure estimates to formulate flow-on (indirect) contribution estimates and, by summing the direct and flow-on contributions, total contributions.

2.6.1 Final demand profile

Final demand profiles for the fishing and aquaculture industry expenditures were produced as input into the MRIO RISE model. The expenditure data was disaggregated by industry sector (retail, transport, personal and other services, etc.) and converted from 'purchasers' prices', into 'basic prices'.

The conversion of expenditure estimates from purchasers (i.e. what fishing businesses and seafood processors pay) to basic prices (i.e. what service providers and other businesses receive) was as follows.

Net taxes (taxes minus subsidies) and marketing and transport margins were reallocated to make the data consistent with accounting conventions used in the MRIO RISE model. This process ensured that margins, such as retail and transport margins, were allocated to the appropriate sectors, taxes were properly identified and that imports to Australia were not included as part of the economic contribution estimation process.

The final adjustment to the base data was allocation of expenditure data in basic prices to the relevant input-output sectors (78 intermediate sectors, other value added or imports) in which the expenditure occurred, thus compiling a profile of sales to final demand. This process was undertaken for each State and Territory and the results aggregated to form a single final demand profile for Australia by State/Territory.

3 ECONOMIC CONTRIBUTION

3.1 New South Wales

3.1.1 Catch and GVP

Table 3-1 presents the catch, production and GVP of the highest valued NSW fisheries, Commonwealth fisheries operating within the State and aquaculture sectors in 2017/18. The table provides an indication of which fisheries and aquaculture sectors are key economic contributors to the State. The values presented in Table 3-1 suggest the majority of economic contribution (from State managed fisheries and aquaculture) was generated by the top five fisheries and aquaculture sectors.

3.1.2 Economic contribution

Estimates of the economic contribution generated in 2017/18 by NSW fisheries, Commonwealth fisheries operating within the State and aquaculture are presented in Table 3-2.

Contribution to GVA...

In 2017/18, total fishery and aquaculture GVA in NSW was \$374 million, \$130 million generated by fishing and aquaculture directly, \$46 million by processing activities and \$198 million in other sectors of the State economy. Unlike GSP, GVA does not include the value of taxes minus subsidies.

Employment and Household Income...

In 2017/18, NSW fishing and aquaculture was responsible for the direct employment of around 1,672 full-time equivalents (fte) and processing created employment of around 462 fte jobs state-wide. Flow-on business activity was estimated to generate a further 1,396 fte jobs state-wide. The total employment contribution in NSW was estimated to be 3,530 fte jobs.

Personal income of \$76 million was earned in the fishing and aquaculture sectors (wages of employees and estimated drawings by owner/operators) and \$25 million in processing in NSW. An additional \$129 million was earned by wage earners in other businesses in the State as a result of fishing, aquaculture and associated processing activities. The total household income contribution in NSW was \$230 million.

Contribution to GSP...

As noted in Section 2.3.1, contribution to GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In 2017/18, total fishery and aquaculture contribution to GSP in NSW was \$408 million, \$130 million generated by fishing and aquaculture directly, \$59 million by processing activities and \$219 million in other sectors of the State economy.

Table 3-1 Catch, production and GVP of the top five contributors (by GVP) to NSW commercial fishing and aquaculture in 2017/18

Rank	Description	Catch / Production (t) ^a	GVP (\$m)	Value per unit (\$/kg) ^b
<i>Fisheries (state managed)</i>				
1	Ocean Trawl	2,928	27	9.21
2	Estuary General	2,873	25	8.81
3	Lobster	166	12	69.89
4	Ocean Trap & Line	1,167	11	9.81
5	Ocean Hauling	2,004	7	3.56
	Other fisheries	1,843	15	8.31
	Total wild caught	10,982	98	
<i>Fisheries (Commonwealth managed)</i>				
1	Small Pelagic ^d	n.p.	n.p.	n.p.
2	Eastern Tuna and Billfish	1,922	17	8.58
3	Southern and Eastern Scalefish and Shark (Commonwealth Trawl Sector)	2,858	12	4.31
4	Southern and Eastern Scalefish and Shark (Gillnet Hook and Trap Sector)	1,044	7	6.33
	Total wild caught	7,781	55	
<i>Aquaculture</i>				
1	Sydney Rock Oyster	5,989	49	8.14
2	Black Tiger Prawn	284	6	20.48
3	Hatchery Species	n.a.	5	n.a.
4	Murray Cod	266	5	18.38
5	Other Oyster	173	3	17.81
	Other sectors	467	9	19.94
	Total production^c	1,017	77	

^a Production of Sydney Rock Oyster and Other Oysters are reported per thousand dozen.

^b Value per unit of Sydney Rock Oyster and Other Oysters are by dollars per dozen.

^c Production totals excludes Sydney Rock Oyster and Other Oysters (reported by '000 dozen).

^d Small Pelagic GVP and catch are confidential but have been estimated to the accuracy required for the purpose of this study. This estimate should not be used for any other purpose so has been marked not published (n.p.).

Source: NSW DPI, ABARES and BDO EconSearch Analysis

Table 3-2 Economic contribution of commercial fishing and aquaculture to NSW, 2017/18

	Gross value added (\$m)	Employment (fte jobs)	Household Income (\$m)	Contribution to GSP (\$m)	GVP (\$m)
<i>Fishing (state fisheries)</i>					
Direct					
Fishing	55	616	27	55	98
Processing	19	196	11	25	39
Indirect (all other sectors) ^a					
Production induced	30	227	25	35	-
Consumption induced	52	351	29	55	-
<i>Total indirect</i>	<i>82</i>	<i>578</i>	<i>54</i>	<i>90</i>	<i>-</i>
Total^b	156	1,391	92	170	137
<i>Fishing (Commonwealth fisheries)</i>					
Direct					
Fishing	24	250	14	24	55
Processing	11	110	6	14	22
Indirect (all other sectors) ^a					
Production induced	20	167	17	23	-
Consumption induced	30	205	17	32	-
<i>Total indirect</i>	<i>51</i>	<i>372</i>	<i>34</i>	<i>56</i>	<i>-</i>
Total^b	85	733	53	93	77
<i>Aquaculture</i>					
Direct					
Production	52	806	35	52	77
Processing	15	155	8	20	31
Indirect (all other sectors) ^a					
Production induced	18	118	14	21	-
Consumption induced	48	327	27	51	-
<i>Total indirect</i>	<i>66</i>	<i>445</i>	<i>41</i>	<i>73</i>	<i>-</i>
Total^b	133	1,406	85	145	108
<i>Fishing & Aquaculture Total</i>					
Direct					
Catch & Production	130	1,672	76	130	230
Processing	46	462	25	59	93
Indirect (all other sectors) ^a					
Production induced	68	513	56	80	-
Consumption induced	130	883	73	139	-
<i>Total indirect</i>	<i>198</i>	<i>1,396</i>	<i>129</i>	<i>219</i>	<i>-</i>
Total^b	374	3,530	230	408	323

^a The GVP of seafood processing has been modified to exclude the value of fish caught or produced. This has been done so the value of production attributed directly to fish processing is shown and the value of production attributable to fishing and aquaculture is excluded.

^b Indirect GVP effects are excluded to avoid double counting.

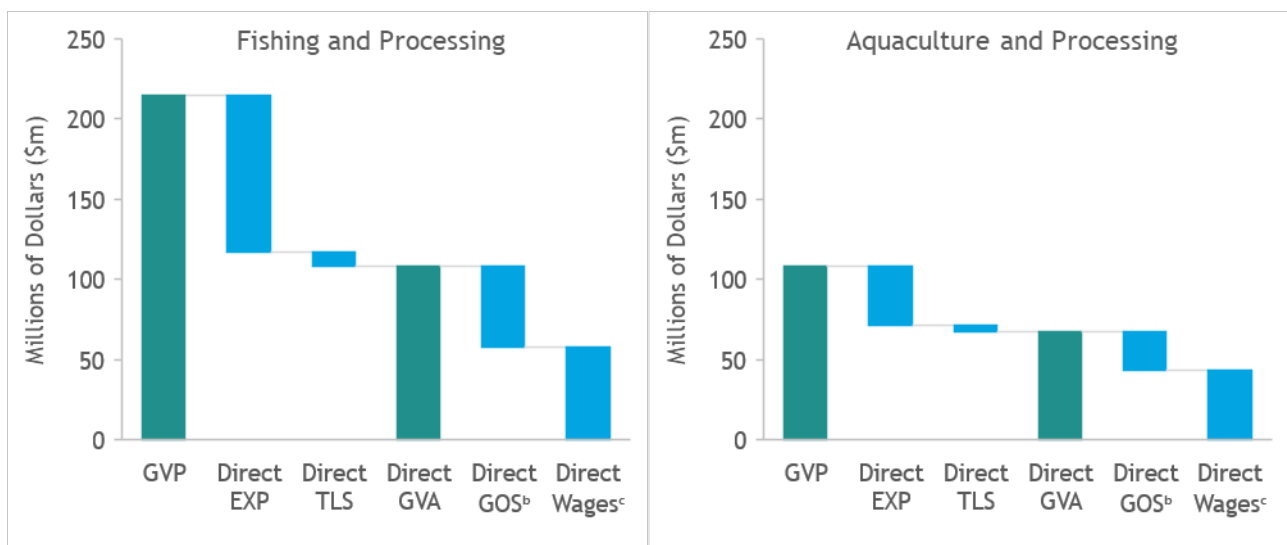
^c Totals may not sum due to rounding.

Source: NSW DPI, Barclay et al. (2016), BDO EconSearch (2019 2019b,c,d,g,i,j), Mobsby and Bath (2018), Bath et al. (2018) and BDO EconSearch Analysis

3.1.3 Comparing GVP and GVA

Direct gross value added (GVA) is calculated by subtracting non-wage business expenditure (such as fuel, trade services, professional services and transport services) including taxes less subsidies (EXP and TLS) from GVP. It can also be calculated by summing the wages (including an imputed wage for owner operators) and gross operating surplus (GOS - a measure of business profit before tax) generated by businesses. Figure 3-1 shows these calculations for NSW with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$109 million of GVP from fishing and associated processing is retained as direct GVA, as is around \$68 million of GVP from aquaculture and associated processing.

Figure 3-1 Composition of commercial fishing^a, aquaculture and processing GVP and direct GVA, NSW, 2017/18



^a State and Commonwealth managed fisheries.

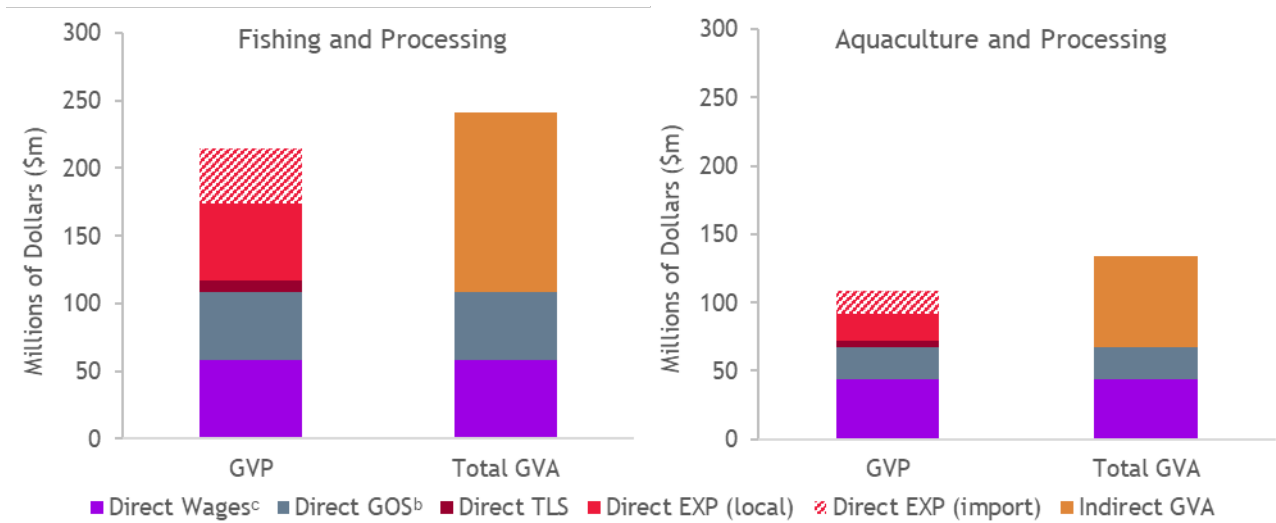
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

Direct GVA is smaller than GVP as non-wage business expenditure (EXP) and taxes less subsidies (TLS) are subtracted from GVP, leaving only wages and GOS. Adding indirect GVA to this results in total GVA (direct plus indirect GVA). In this case, indirect GVA is comprised of wages and GOS generated by businesses in all other sectors of the economy supported by within-jurisdiction (local) expenditures by the fishing, aquaculture and processing sectors. Figure 3-2 shows these calculations for NSW with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$132 million of indirect GVA is supported by fishing and associated processing activity, as is around \$66 million by aquaculture and associated processing.

Figure 3-2 Composition of commercial fishing^a, aquaculture and processing GVP and total GVA, NSW, 2017/18



^a State and Commonwealth managed fisheries.

^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

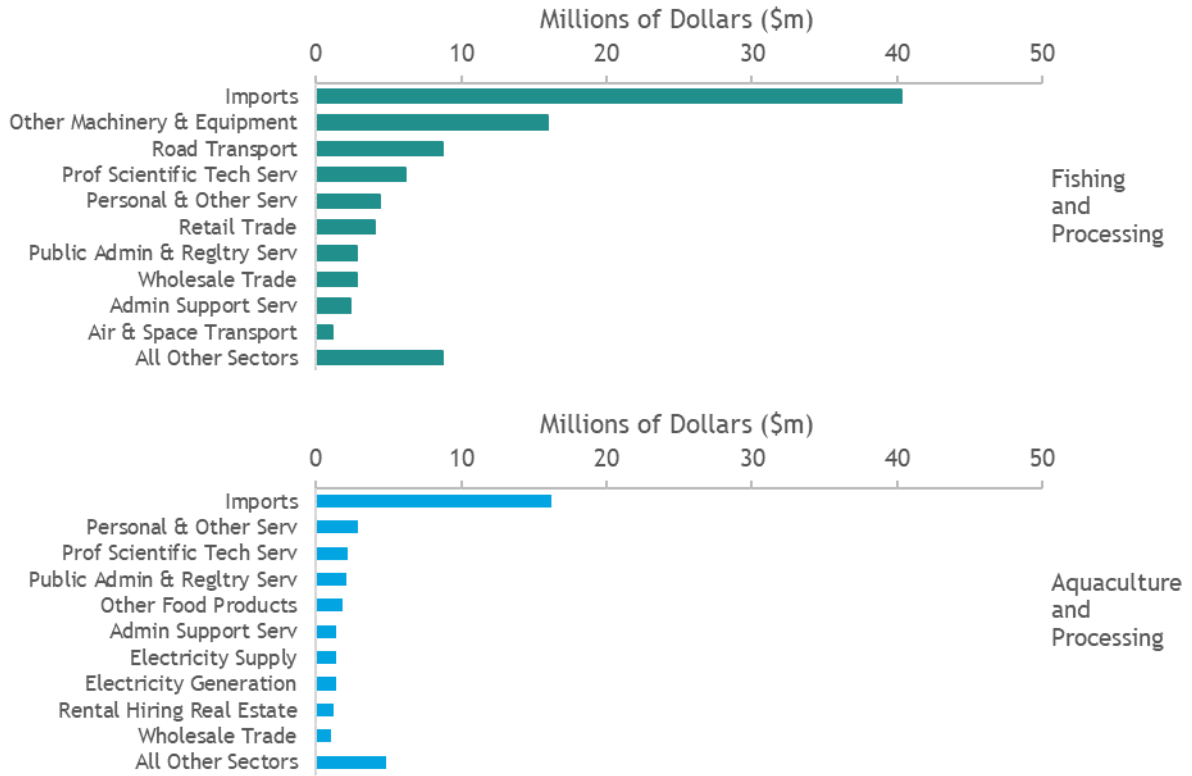
^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

3.1.4 Expenditure

Expenditure by fishing, aquaculture and processing businesses that supports indirect GVA in other sectors is summarised in Figure 3-3. The figure shows the top 10 sectors receiving payments due to NSW fishing and associated processing in the top pane and from aquaculture and associated processing in the bottom pane. Imports include the imported component of items manufactured outside of Australia, such as fuel and some equipment. In total, around \$57 million of local expenditure was made due to NSW fishing and associated processing activity and around \$20 million due to aquaculture and associated processing. This represents around 59 and 55 per cent of total non-wage business expenditure respectively, the balance being imported from outside the jurisdiction.

Figure 3-3 Expenditure within-jurisdiction due to commercial fishing^a, aquaculture and processing activity, NSW, 2017/18



Source: BDO EconSearch Analysis

3.1.5 Exports

The quantity, value and average unit value of seafood products exported overseas from NSW are reported in Table 3-3. Southern bluefin tuna was the highest valued individual seafood product exported in 2017/18, followed by Abalone and Rock Lobster. Together, these three categories accounted for over 50 per cent of seafood exports from NSW.

Table 3-3 NSW overseas seafood exports, top contributors by export value, 2017/18

Rank	Seafood Category ^a	Export Quantity		Export Value ^b		Average Value (\$/kg)
		(tonnes)	(%)	(\$m)	(%)	
1	Southern bluefin tuna	373	21%	5.5	26%	14.86
2	Abalone	56	3%	3.0	14%	53.13
3	Rock lobster	34	2%	2.5	12%	72.76
4	Other frozen fish	526	29%	2.3	11%	4.41
5	Yellowfin tuna	137	8%	1.9	9%	13.58
6	Shrimp & prawns	205	11%	1.0	5%	4.84
7	Preserved fish	219	12%	0.9	4%	4.24
8	Bigeye tuna	67	4%	0.8	4%	12.00
9	Crabs	16	1%	0.6	3%	38.71
10	Swordfish	31	2%	0.4	2%	13.53
	Other ^c	134	7%	2.1	10%	
	Total^d	1,798	100%	21.1	100%	11.63

^a Ranked by export value. Seafood categories are defined in Appendix 3.

^b Export values are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^c "Other" includes Ornamental fish, of which export quantity is measured by number of specimens. The reported export quantity and export price figures exclude Ornamental fish due to differences in units of measurement.

^d Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

3.2 Victoria

3.2.1 Catch and GVP

Table 3-4 presents the catch, production and GVP of the highest valued VIC fisheries, Commonwealth fisheries operating within the State and aquaculture sectors in 2017/18. The table provides an indication of which fisheries and aquaculture sectors are key economic contributors to the State. The values presented in Table 3-4 suggest the majority of economic contribution (Table 3-5) was generated by Abalone and Southern Rock Lobster (state managed fisheries), Small Pelagic and Southern and Eastern Scalefish and Shark Trawl and GHT sectors (Commonwealth managed fisheries) and Abalone and Salmonids aquaculture sectors.

3.2.2 Economic contribution

Estimates of the economic contribution generated in 2017/18 by VIC fisheries, Commonwealth fisheries operating within the State and aquaculture are presented in Table 3-5.

Contribution to GVA...

In 2017/18, total fishery and aquaculture GVA in VIC was \$355 million, \$110 million generated by fishing and aquaculture directly, \$44 million by processing activities and \$201 million in other sectors of the State economy. Unlike GSP, GVA does not include the value of taxes minus subsidies.

Employment and Household Income...

In 2017/18, VIC fishing and aquaculture was responsible for the direct employment of around 920 full-time equivalents (fte) and processing created employment of around 548 fte jobs State-wide. Flow-on business activity was estimated to generate a further 1,706 fte jobs state-wide. The total employment contribution in VIC was estimated to be 3,174 fte jobs.

Personal income of \$52 million was earned in the fishing and aquaculture sectors (wages of employees and estimated drawings by owner/operators) and \$21 million in processing in VIC. An additional \$125 million was earned by wage earners in other businesses in the State as a result of fishing, aquaculture and associated processing activities. The total household income contribution in VIC was \$198 million.

Contribution to GSP...

As noted in Section 2.3.1, contribution to GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In 2017/18, total fishery and aquaculture contribution to GSP in VIC was \$388 million, \$110 million generated by fishing and aquaculture directly, \$63 million by processing activities and \$215 million in other sectors of the State economy.

Table 3-4 Catch, production and GVP of the top five contributors (by GVP) to VIC commercial fishing and aquaculture in 2017/18

Rank	Description	Catch / Production (t)	GVP (\$m)	Value per unit (\$/kg)
<i>Fisheries (state managed)</i>				
1	Abalone	756	27	35.62
2	Southern Rock Lobster	314	25	81.10
3	Offshore	1,788	4	2.15
4	Corner inlet	321	2	7.42
5	Port Phillip Bay	265	2	6.58
	Other fisheries	381	2	6.22
	Total wild caught	3,825	63	
<i>Fisheries (Commonwealth managed)</i>				
1	Small Pelagic ^a	n.p.	n.p.	n.p.
2	Southern and Eastern Scalefish and Shark (Commonwealth Trawl Sector)	6,592	28	4.31
3	Southern and Eastern Scalefish and Shark (Gillnet Hook and Trap Sector)	2,407	15	6.33
4	Bass Strait Central Zone Scallop	1,552	3	2.04
5	Southern Squid Jig	176	0	2.75
	Total wild caught	15,240	92	
<i>Aquaculture</i>				
1	Abalone	525	25	48.06
2	Salmonids	1,179	14	11.65
3	Blue Mussel & Other Molluscs	1,346	5	3.85
4	Warm Water Finfish	294	3	9.81
	Total production	3,344	47	

^a Small Pelagic GVP and catch are confidential but have been estimated to the accuracy required for the purpose of this study. This estimate should not be used for any other purpose so has been marked not published (n.p.).

Source: VFA, ABARES and BDO EconSearch Analysis

Table 3-5 Economic contribution of commercial fishing and aquaculture to VIC, 2017/18

	Gross value added (\$m)	Employment (fte jobs)	Household Income (\$m)	Contribution to GSP (\$m)	GVP (\$m)
<u>Fishing (state fisheries)</u>					
Direct					
Fishing	46	257	16	46	63
Processing	14	170	7	19	40
Indirect (all other sectors) ^a					
Production induced	24	212	16	25	-
Consumption induced	33	263	19	36	-
<i>Total indirect</i>	57	475	35	61	-
Total^b	116	903	58	126	103
<u>Fishing (Commonwealth fisheries)</u>					
Direct					
Fishing	41	434	25	41	92
Processing	20	250	10	29	59
Indirect (all other sectors) ^a					
Production induced	47	443	33	49	-
Consumption induced	59	466	34	64	-
<i>Total indirect</i>	106	909	67	113	-
Total^b	166	1,593	102	182	152
<u>Aquaculture</u>					
Direct					
Production	24	229	11	24	47
Processing	10	127	5	15	30
Indirect (all other sectors) ^a					
Production induced	16	144	10	17	-
Consumption induced	22	177	13	24	-
<i>Total indirect</i>	38	322	23	41	-
Total^b	72	678	39	79	77
<u>Fishing & Aquaculture Total</u>					
Direct					
Catch & Production	110	920	52	110	202
Processing	44	548	21	63	130
Indirect (all other sectors) ^a					
Production induced	87	799	59	91	-
Consumption induced	114	907	67	124	-
<i>Total indirect</i>	201	1,706	125	215	-
Total^b	355	3,174	198	388	332

^a Indirect GVP effects are excluded to avoid double counting

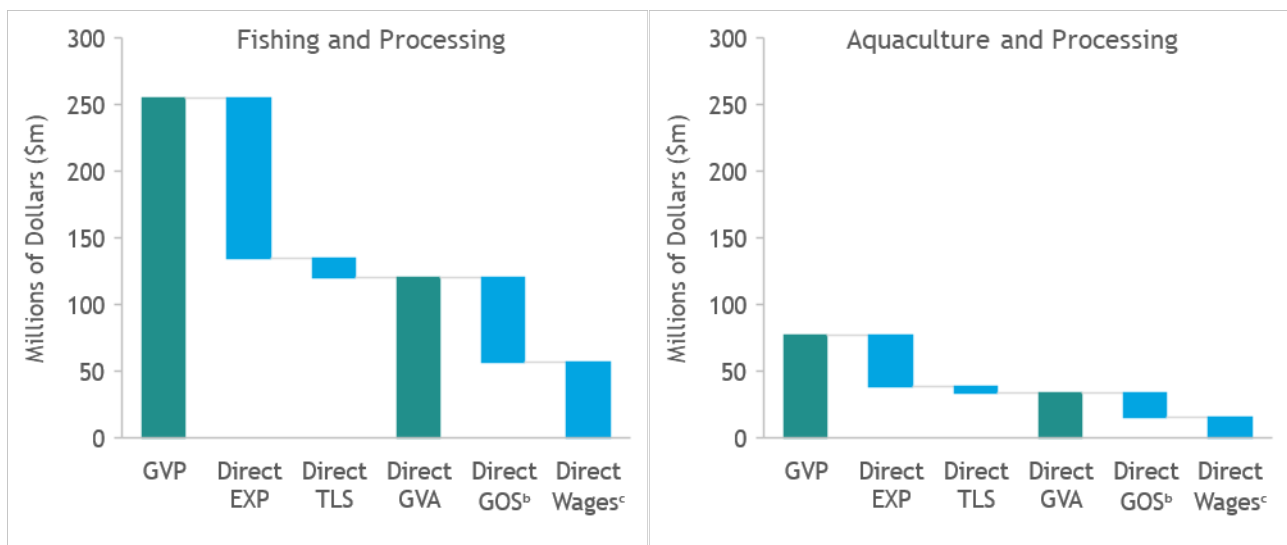
^b Totals may not sum due to rounding.

Source: VFA, BDO EconSearch (2019c,d,g,l,j,l), Bath et al. (2018), George et al. (2012) and BDO EconSearch Analysis

3.2.3 Comparing GVP and GVA

Direct gross value added (GVA) is calculated by subtracting non-wage business expenditure (such as fuel, trade services, professional services and transport services) including taxes less subsidies (EXP and TLS) from GVP. It can also be calculated by summing the wages (including an imputed wage for owner operators) and gross operating surplus (GOS - a measure of business profit before tax) generated by businesses. Figure 3-4 shows these calculations for VIC with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$120 million of GVP from fishing and associated processing is retained as direct GVA, as is around \$34 million of GVP from aquaculture and associated processing.

Figure 3-4 Composition of commercial fishing^a, aquaculture and processing GVP and direct GVA, VIC, 2017/18



^a State and Commonwealth managed fisheries.

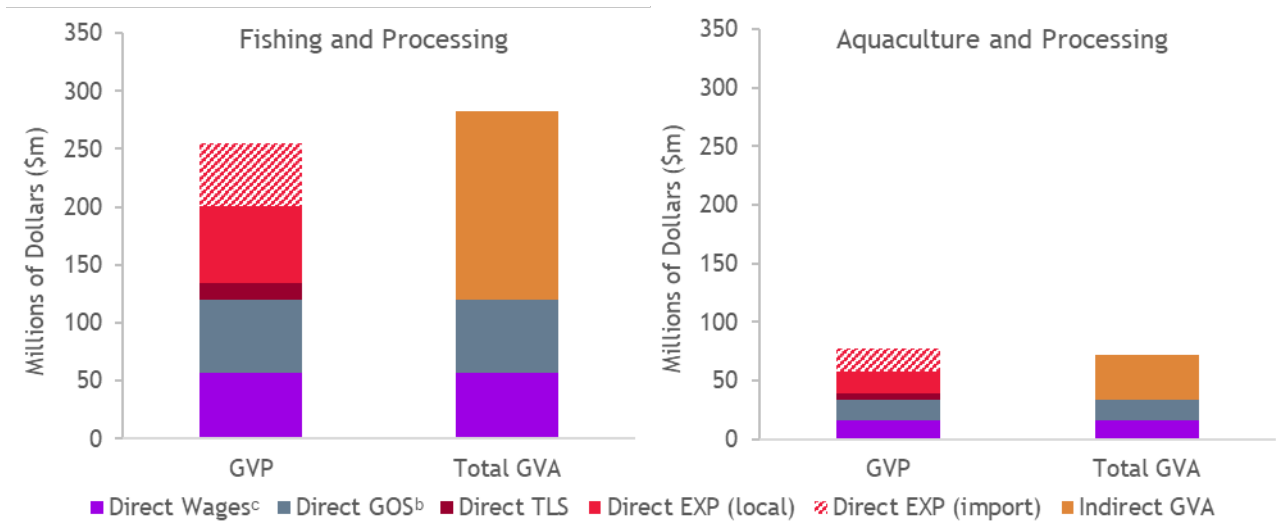
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

Direct GVA is smaller than GVP as non-wage business expenditure (EXP) and taxes less subsidies (TLS) are subtracted from GVP, leaving only wages and GOS. Adding indirect GVA to this results in total GVA (direct plus indirect GVA). In this case, indirect GVA is comprised of wages and GOS generated by businesses in all other sectors of the economy supported by within-jurisdiction (local) expenditures by the fishing, aquaculture and processing sectors. Figure 3-5 shows these calculations for VIC with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$163 million of indirect GVA is supported by fishing and associated processing activity, as is around \$38 million by aquaculture and associated processing.

Figure 3-5 Composition of commercial fishing^a, aquaculture and processing GVP and total GVA, VIC, 2017/18



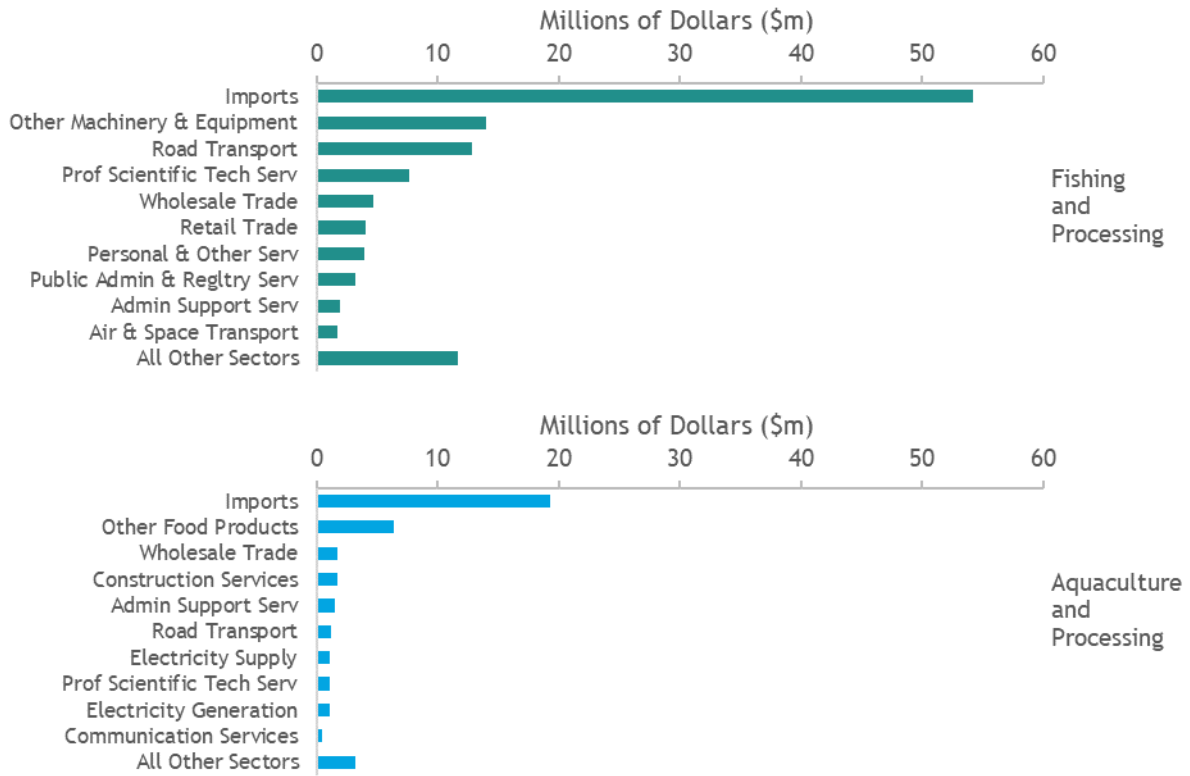
^a State and Commonwealth managed fisheries.
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.
^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

3.2.4 Expenditure

Expenditure by fishing, aquaculture and processing businesses that supports indirect GVA in other sectors is summarised in Figure 3-6. The figure shows the top 10 sectors receiving payments due to VIC fishing and associated processing in the top pane and from aquaculture and associated processing in the bottom pane. Imports include the imported component of items manufactured outside of Australia, such as fuel and some equipment. In total, around \$66 million of local expenditure was made due to VIC fishing and associated processing activity and around \$19 million due to aquaculture and associated processing. This represents around 55 and 50 per cent of total non-wage business expenditure respectively, the balance being imported from outside the jurisdiction.

Figure 3-6 Expenditure within-jurisdiction due to commercial fishing^a, aquaculture and processing activity, VIC, 2017/18



Source: BDO EconSearch Analysis

3.2.5 Exports

The quantity, value and average unit value of seafood products exported overseas from Victoria are reported in Table 3-6. Rock Lobster was the highest valued individual seafood product exported in 2017/18, followed by Abalone. Together, these two categories accounted for over 90 per cent of seafood exports from Victoria.

Table 3-6 Victorian overseas seafood exports, top contributors by export value, 2017/18

Rank	Seafood Category ^a	Export Quantity		Export Value ^b		Average Value (\$/kg)
		(tonnes)	(%)	(\$m)	(%)	
1	Rock lobster	1,589	40%	159.1	67%	100.1
2	Abalone	748	19%	58.7	25%	78.5
3	Sea cucumbers	148	4%	7.9	3%	53.4
4	Atlantic & pacific bluefin tuna	81	2%	3.1	1%	38.9
5	Preserved fish	369	9%	2.6	1%	7.1
6	Atlantic & pacific salmon	625	16%	1.3	1%	2.1
7	Other frozen fish	191	5%	0.8	0%	4.0
8	Crabs	5	0%	0.5	0%	98.7
9	Trout	6	0%	0.5	0%	71.2
10	Other molluscs	5	0%	0.4	0%	78.8
	Other ^c	244	6%	2.4	1%	
	Total^d	4,012	100%	237.3	100%	59.1

^a Ranked by export value. Seafood categories are defined in Appendix 3.

^b Export values are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^c "Other" includes Ornamental fish, of which export quantity is measured by number of specimens. The reported export quantity and export price figures exclude Ornamental fish due to differences in units of measurement.

^d Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

3.3 Queensland

3.3.1 Catch and GVP

Table 3-7 presents the catch, production and GVP of the highest valued QLD fisheries, Commonwealth fisheries operating within the State and aquaculture sectors in 2017/18. The table provides an indication of which fisheries and aquaculture sectors are key economic contributors to the State. The values presented in Table 3-7 suggest the majority of economic contribution (from State managed fisheries and aquaculture) was generated by the top five fisheries and aquaculture sectors. However, about 21 per cent of Queensland State fishery GVP was generated by other fisheries, suggesting a relatively significant economic contribution of smaller fisheries in Queensland. Six Commonwealth managed fisheries operate within the State, of which three fisheries (Northern Prawn, Eastern Tuna and Billfish and Torres Strait Rock Lobster) generate over 90 per cent of Commonwealth fishery GVP within QLD.

3.3.2 Economic contribution

Estimates of the economic contribution generated in 2017/18 by QLD fisheries, Commonwealth fisheries operating within the State and aquaculture are presented in Table 3-8.

Contribution to GVA...

In 2017/18, total fishery and aquaculture GVA in QLD was \$479 million, \$234 million generated by fishing and aquaculture directly, \$16 million by processing activities and \$229 million in other sectors of the State economy. Unlike GSP, GVA does not include the value of taxes minus subsidies.

Employment and Household Income...

In 2017/18, QLD fishing and aquaculture was responsible for the direct employment of around 1,995 full-time equivalents (fte) and processing created employment of around 162 fte jobs state-wide. Flow-on business activity was estimated to generate a further 1,871 fte jobs state-wide. The total employment contribution in QLD was estimated to be 4,027 fte jobs.

Personal income of \$92 million was earned in the fishing and aquaculture sectors (wages of employees and estimated drawings by owner/operators) and \$9 million in processing in QLD. An additional \$141 million was earned by wage earners in other businesses in the State as a result of fishing, aquaculture and associated processing activities. The total household income contribution in QLD was \$242 million.

Contribution to GSP...

As noted in Section 2.3.1, contribution to GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In 2017/18, total fishery and aquaculture contribution to GSP in QLD was \$494 million, \$234 million generated by fishing and aquaculture directly, \$23 million by processing activities and \$238 million in other sectors of the State economy.

Table 3-7 Catch, production and GVP of the top five contributors (by GVP) to QLD commercial fishing and aquaculture in 2017/18

Rank	Description	Catch / Production (t)	GVP (\$m)	Value per unit (\$/kg)
<i>Fisheries (state managed)</i>				
1	East Coast Trawl	6,794	85	12.56
2	Coral Reef Finfish	1,410	31	21.82
3	East Coast Inshore	3,228	13	4.03
4	Mud Crab	1,036	10	9.85
5	Tropical Rock Lobster	159	10	62.66
	Other fisheries	5,438	40	7.30
	Total wild caught	18,064	189	
<i>Fisheries (Commonwealth managed)</i>				
1	Northern Prawn	5,931	94	15.91
2	Eastern Tuna and Billfish	2,615	22	8.58
3	Torres Strait Rock Lobster	283	13	45.21
4	Torres Strait Prawn	241	4	16.44
5	Torres Strait Spanish Mackerel	93	1	9.11
6	Torres Strait Finfish	28	0	11.90
7	Coral Seas ^a	n.p.	n.p.	n.p.
	Total wild caught	9,234	135	
<i>Aquaculture</i>				
1	Prawns	3,921	75	19.05
2	Barramundi	3,061	27	8.77
3	Confidential Sectors ^b	176	2	13.08
4	Other Freshwater Fish ^c	137	2	13.23
5	Hatchery	n.a.	2	n.a.
	Other sectors	144	4	28.48
	Total production	7,439	111	

^a Coral Seas GVP and catch are confidential but have been estimated to the accuracy required for the purpose of this study. This estimate should not be used for any other purpose so has been marked not published (n.p.).

^b Confidential sectors include marine fish, worms, sea cucumbers, algae and ulva, crustaceans and other bivalves.

^c Other freshwater fish include, jade perch, Murray cod and eel-tailed catfish.

n.a. not available

Source: QDAF, ABARES and BDO EconSearch Analysis

Table 3-8 Economic contribution of commercial fishing and aquaculture to QLD, 2017/18

	Gross value added (\$m)	Employment (fte jobs)	Household Income (\$m)	Contribution to GSP (\$m)	GVP (\$m)
<u>Fishing (state fisheries)</u>					
Direct					
Fishing	100	1,082	42	100	189
Processing	7	70	4	10	15
Indirect (all other sectors) ^a					
Production induced	44	411	33	46	-
Consumption induced	58	443	31	61	-
<i>Total indirect</i>	<i>103</i>	<i>854</i>	<i>64</i>	<i>107</i>	<i>-</i>
Total^b	210	2,007	110	217	204
<u>Fishing (Commonwealth fisheries)</u>					
Direct					
Fishing	74	380	27	74	135
Processing	5	50	3	7	11
Indirect (all other sectors) ^a					
Production induced	32	297	24	33	-
Consumption induced	40	303	21	42	-
<i>Total indirect</i>	<i>72</i>	<i>600</i>	<i>46</i>	<i>75</i>	<i>-</i>
Total^b	150	1,030	75	156	146
<u>Aquaculture</u>					
Direct					
Production	60	532	22	60	111
Processing	4	41	2	6	9
Indirect (all other sectors) ^a					
Production induced	25	192	15	25	-
Consumption induced	30	225	16	31	-
<i>Total indirect</i>	<i>55</i>	<i>417</i>	<i>31</i>	<i>56</i>	<i>-</i>
Total^b	119	990	56	121	120
<u>Fishing & Aquaculture Total</u>					
Direct					
Catch & Production	234	1,995	92	234	435
Processing	16	162	9	23	34
Indirect (all other sectors) ^a					
Production induced	101	900	73	103	-
Consumption induced	128	971	69	135	-
<i>Total indirect</i>	<i>229</i>	<i>1,871</i>	<i>141</i>	<i>238</i>	<i>-</i>
Total^b	479	4,027	242	494	469

^a Indirect GVP effects are excluded to avoid double counting

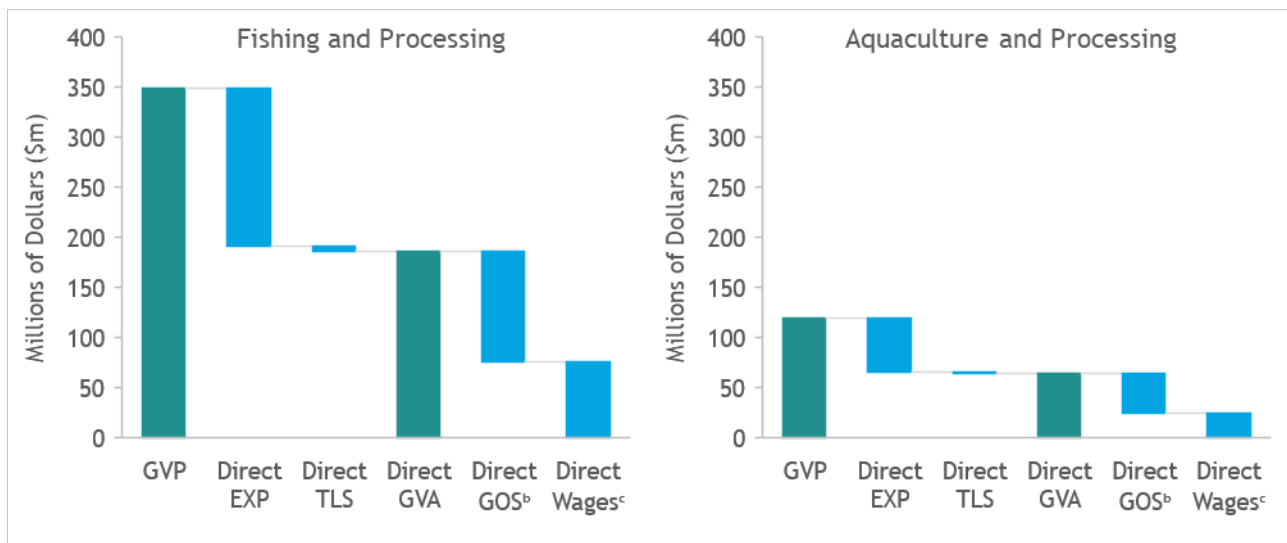
^b Totals may not sum due to rounding.

Source: QDAF, BDO EconSearch (2019c,f,g,i,l), Mobsby and Bath (2018), Skirtun et al. (2015), Mobsby et al (2019) and BDO EconSearch Analysis

3.3.3 Comparing GVP and GVA

Direct gross value added (GVA) is calculated by subtracting non-wage business expenditure (such as fuel, trade services, professional services and transport services) including taxes less subsidies (EXP and TLS) from GVP. It can also be calculated by summing the wages (including an imputed wage for owner operators) and gross operating surplus (GOS - a measure of business profit before tax) generated by businesses. Figure 3-7 shows these calculations for QLD with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$186 million of GVP from fishing and associated processing is retained as direct GVA, as is around \$64 million of GVP from aquaculture and associated processing.

Figure 3-7 Composition of commercial fishing^a, aquaculture and processing GVP and direct GVA, QLD, 2017/18



^a State and Commonwealth managed fisheries.

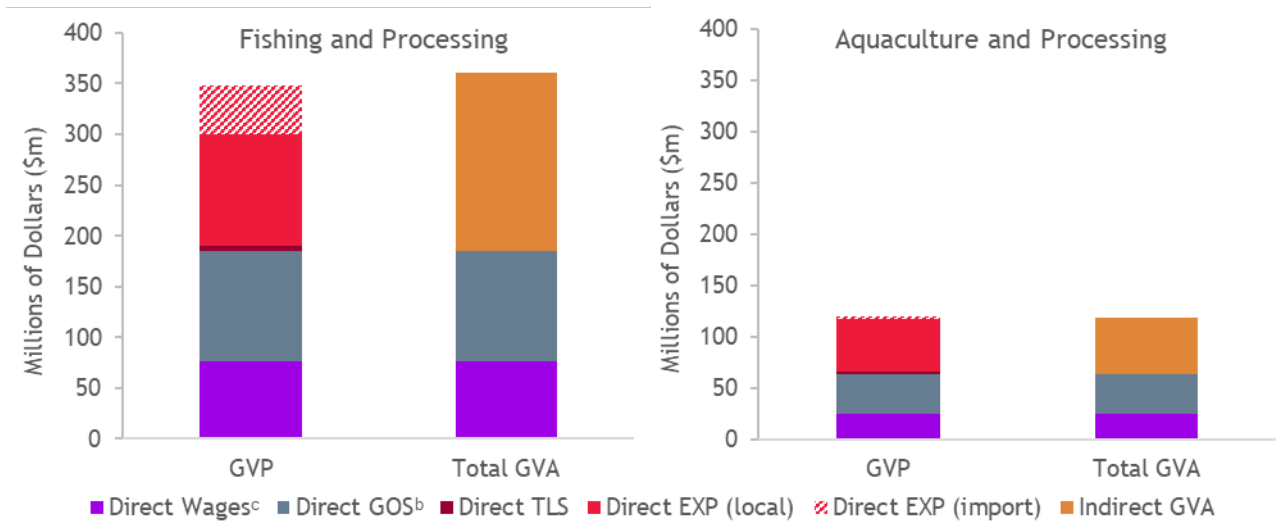
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

Direct GVA is smaller than GVP as non-wage business expenditure (EXP) and taxes less subsidies (TLS) are subtracted from GVP, leaving only wages and GOS. Adding indirect GVA to this results in total GVA (direct plus indirect GVA). In this case, indirect GVA is comprised of wages and GOS generated by businesses in all other sectors of the economy supported by within-jurisdiction (local) expenditures by the fishing, aquaculture and processing sectors. Figure 3-8 shows these calculations for QLD with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$175 million of indirect GVA is supported by fishing and associated processing activity, as is around \$55 million by aquaculture and associated processing.

Figure 3-8 Composition of commercial fishing^a, aquaculture and processing GVP and total GVA, QLD, 2017/18



^a State and Commonwealth managed fisheries.

^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

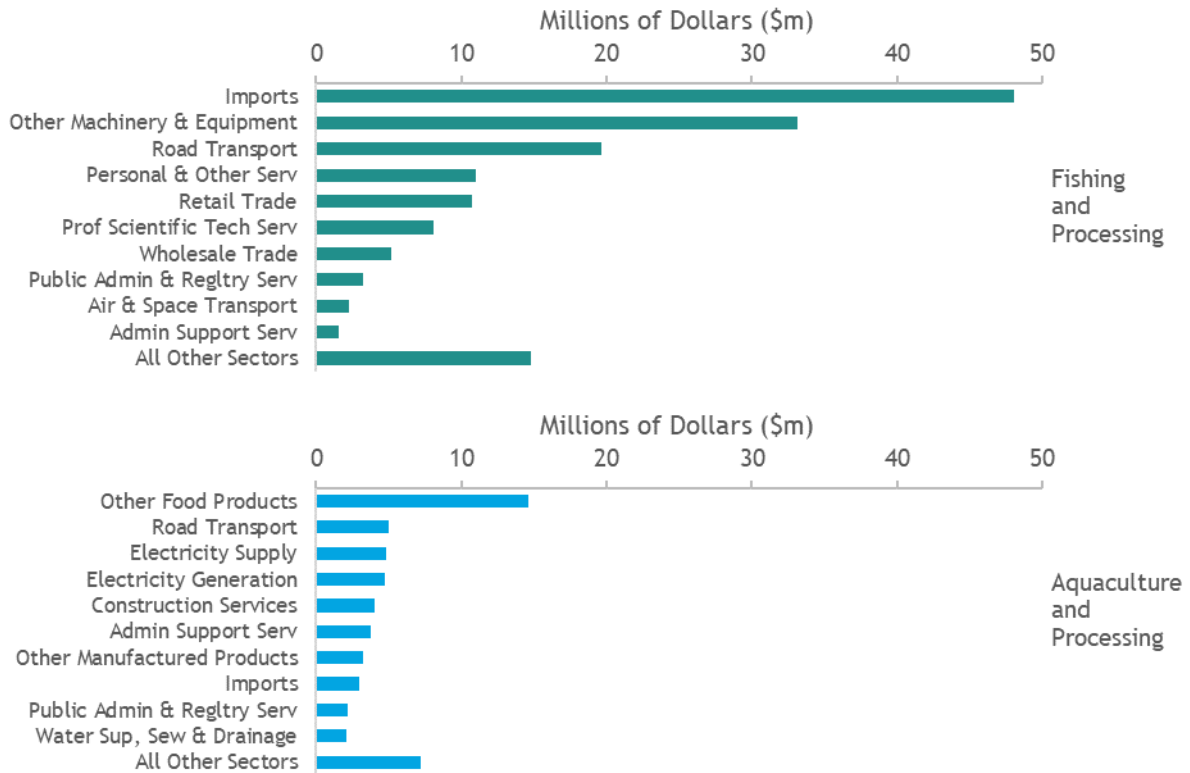
^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

3.3.4 Expenditure

Expenditure by fishing, aquaculture and processing businesses that supports indirect GVA in other sectors is summarised in Figure 3-9. The figure shows the top 10 sectors receiving payments due to QLD fishing and associated processing in the top pane and from aquaculture and associated processing in the bottom pane. Imports include the imported component of items manufactured outside of Australia, such as fuel and some equipment. In total, around \$109 million of local expenditure was made due to QLD fishing and associated processing activity and around \$51 million due to aquaculture and associated processing. This represents around 69 and 95 per cent of total non-wage business expenditure respectively, the balance being imported from outside the jurisdiction.

Figure 3-9 Expenditure within-jurisdiction due to commercial fishing^a, aquaculture and processing activity, QLD, 2017/18



Source: BDO EconSearch Analysis

3.3.5 Exports

The quantity, value and average unit value of seafood products exported overseas from Queensland are reported in Table 3-9. Shrimp and prawns was the highest valued individual seafood product exported in 2017/18, followed by Rock Lobster. Together, these two categories accounted for almost 50 per cent of seafood exports from Queensland.

Table 3-9 Queensland overseas seafood exports, top contributors by export value, 2017/18

Rank	Seafood Category ^a	Export Quantity		Export Value ^b		Average Value (\$/kg)
		(tonnes)	(%)	(\$m)	(%)	
1	Shrimp & prawns	2,638	28%	51.8	30%	19.6
2	Rock lobster	390	4%	29.5	17%	75.6
3	Trout	329	4%	13.1	7%	39.6
4	Other live fish	269	3%	11.8	7%	44.1
5	Fish livers, roes & milt	286	3%	9.7	6%	34.0
6	Sea cucumbers	128	1%	9.4	5%	73.5
7	Other frozen fish	2,345	25%	7.3	4%	3.1
8	Yellowfin tuna	454	5%	6.9	4%	15.2
9	Swordfish	430	5%	5.9	3%	13.6
10	Abalone	76	1%	4.5	3%	59.2
	Other ^c	1,956	21%	24.3	14%	
	Total^d	9,301	100%	174.0	100%	18.5

^a Ranked by export value. Seafood categories are defined in Appendix 3.

^b Export values are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^c "Other" includes Ornamental fish, of which export quantity is measured by number of specimens. The reported export quantity and export price figures exclude Ornamental fish due to differences in units of measurement.

^d Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

3.4 South Australia

3.4.1 Catch and GVP

Table 3-10 presents the catch, production and GVP of the highest valued SA fisheries, Commonwealth fisheries operating within the State and aquaculture sectors in 2017/18. The table provides an indication of which fisheries and aquaculture sectors are key economic contributors to the State. The values presented in Table 3-10 suggest the majority of economic contribution from State managed fisheries and aquaculture was generated by the top five fisheries and aquaculture sectors. Of particular significance is the SA Rock Lobster Fishery, which represented about 47 per cent of SA managed fishery GVP. Two Commonwealth fisheries operate within the State (Southern Bluefin Tuna and Southern and Eastern Scalefish and Shark GAB Sector) contributing an estimated 10 per cent of total fisheries and aquaculture GVP.

3.4.2 Economic contribution

Estimates of the economic contribution generated in 2017/18 by SA fisheries, Commonwealth fisheries operating within the State and aquaculture are presented in Table 3-11.

BDO EconSearch prepares annual economic contribution estimates as part of reports to PIRSA on South Australia's commercial fisheries and aquaculture sectors (2019a-l). It is important to note that, while the same values for GVP were used in those reports, estimates of indirect activity are different. This study reports results for SA using different assumptions to the reports prepared for PIRSA to enable the comparison of jurisdictions on like terms. The difference in results is due to the inclusion of transport, retail and food service downstream activity, slightly different treatment of processing activity and the use of a single-region input-output model in the report to PIRSA.

Contribution to GVA...

In 2017/18, total fishery and aquaculture GVA in SA was \$698 million, \$264 million generated by fishing and aquaculture directly, \$54 million by processing activities and \$380 million in other sectors of the State economy. Unlike GSP, GVA does not include the value of taxes minus subsidies.

Employment and Household Income...

In 2017/18, SA fishing and aquaculture was responsible for the direct employment of around 2,239 full-time equivalents (fte) and processing created employment of around 696 fte jobs state-wide. Flow-on business activity was estimated to generate a further 3,354 fte jobs state-wide. The total employment contribution in SA was estimated to be 6,288 fte jobs.

Personal income of \$124 million was earned in the fishing and aquaculture sectors (wages of employees and estimated drawings by owner/operators) and \$27 million in processing in SA. An additional \$234 million was earned by wage earners in other businesses in the State as a result of fishing, aquaculture and associated processing activities. The total household income contribution in SA was \$385 million.

Contribution to GSP...

As noted in Section 2.3.1, contribution to GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In 2017/18, total fishery and aquaculture contribution to GSP in SA was \$739 million, \$264 million generated by fishing and aquaculture directly, \$73 million by processing activities and \$403 million in other sectors of the State economy.

Table 3-10 Catch, production and GVP of the top five contributors (by GVP) to SA commercial fishing and aquaculture in 2017/18

Rank	Description	Catch / Production (t)	GVP (\$m)	Value per unit (\$/kg)
<i>Fisheries (state managed)</i>				
1	Rock Lobster	1,554	121	77.82
2	Prawns	2,434	43	17.59
3	Abalone	700	27	38.88
4	Sardine	43,293	26	0.61
5	Marine Scalefish Fishery	2,303	23	9.88
	Other fisheries	6,994	20	2.82
	Total wild caught	57,278	260	
<i>Fisheries (Commonwealth managed)</i>				
1	Southern Bluefin Tuna	5,512	42	7.63
2	Southern and Eastern Scalefish and Shark (Great Australian Bight Trawl Sector)	1,936	10	5.12
	Total wild caught	7,448	52	
<i>Aquaculture</i>				
1	Tuna	8,000	126	15.75
2	Marine Finfish	2,487	30	12.01
3	Oysters	2,177	20	9.26
4	Abalone	399	14	35.69
5	Freshwater Finfish	390	5	13.51
	Other sectors	2,533	9	3.68
	Total production	15,986	205	

Source: PIRSA, ABARES and BDO EconSearch Analysis

Table 3-11 Economic contribution of commercial fishing and aquaculture to SA, 2017/18

	Gross value (\$m)	Employment (fte jobs)	Household (\$m)	Contribution (\$m)	GVP (\$m)
<u>Fishing (state fisheries)</u>					
Direct					
Fishing	175	1,296	81	175	260
Processing	28	358	14	37	73
Indirect (all other sectors) ^a					
Production induced	84	828	60	90	-
Consumption induced	115	894	63	122	-
<i>Total indirect</i>	<i>199</i>	<i>1,722</i>	<i>123</i>	<i>212</i>	<i>-</i>
Total^b	402	3,375	217	424	333
<u>Fishing (Commonwealth fisheries)</u>					
Direct					
Fishing	22	273	12	22	52
Processing	5	70	3	7	14
Indirect (all other sectors) ^a					
Production induced	24	244	18	26	-
Consumption induced	24	188	13	26	-
<i>Total indirect</i>	<i>48</i>	<i>432</i>	<i>31</i>	<i>51</i>	<i>-</i>
Total^b	76	774	46	81	66
<u>Aquaculture</u>					
Direct					
Production	67	670	31	67	205
Processing	21	268	10	28	55
Indirect (all other sectors) ^a					
Production induced	68	699	46	71	-
Consumption induced	64	501	35	68	-
<i>Total indirect</i>	<i>132</i>	<i>1,200</i>	<i>81</i>	<i>140</i>	<i>-</i>
Total^b	220	2,138	122	235	260
<u>Fishing & Aquaculture Total</u>					
Direct					
Catch & Production	264	2,239	124	264	517
Processing	54	696	27	73	142
Indirect (all other sectors) ^a					
Production induced	176	1,771	123	187	-
Consumption induced	204	1,582	111	216	-
<i>Total indirect</i>	<i>380</i>	<i>3,354</i>	<i>234</i>	<i>403</i>	<i>-</i>
Total^b	698	6,288	385	739	659

^a Indirect GVP effects are excluded to avoid double counting

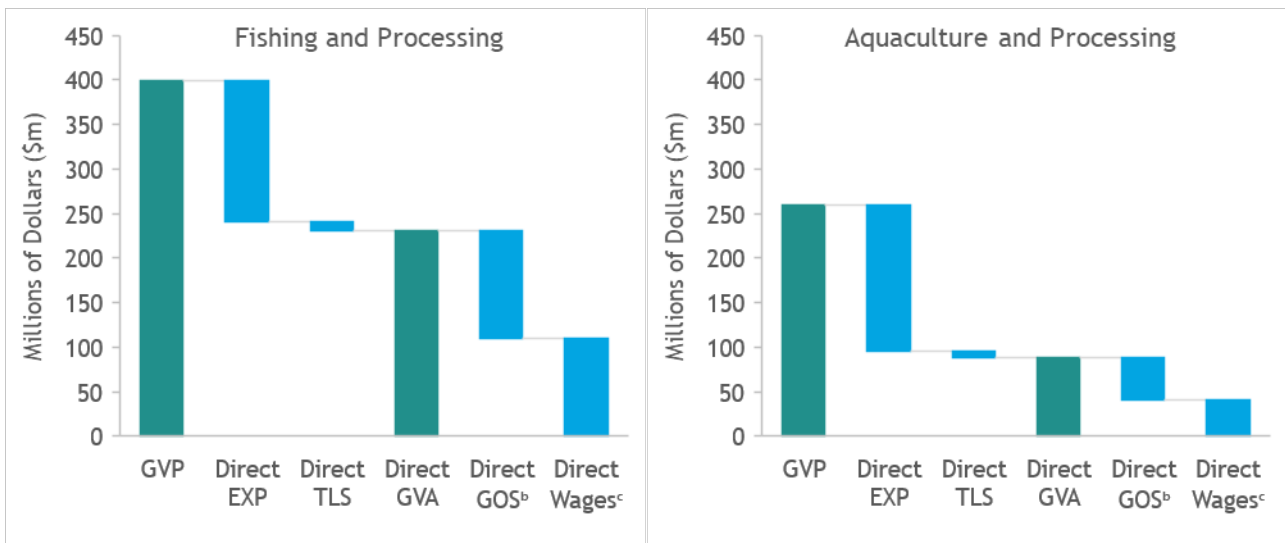
^b Totals may not sum due to rounding.

Source: PIRSA, BDO EconSearch (2019a-d,f-j,l), Bath et al. (2018) and BDO EconSearch Analysis

3.4.3 Comparing GVP and GVA

Direct gross value added (GVA) is calculated by subtracting non-wage business expenditure (such as fuel, trade services, professional services and transport services) including taxes less subsidies (EXP and TLS) from GVP. It can also be calculated by summing the wages (including an imputed wage for owner operators) and gross operating surplus (GOS - a measure of business profit before tax) generated by businesses. Figure 3-10 shows these calculations for SA with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$230 million of GVP from fishing and associated processing is retained as direct GVA, as is around \$88 million of GVP from aquaculture and associated processing.

Figure 3-10 Composition of commercial fishing^a, aquaculture and processing GVP and direct GVA, SA, 2017/18



^a State and Commonwealth managed fisheries.

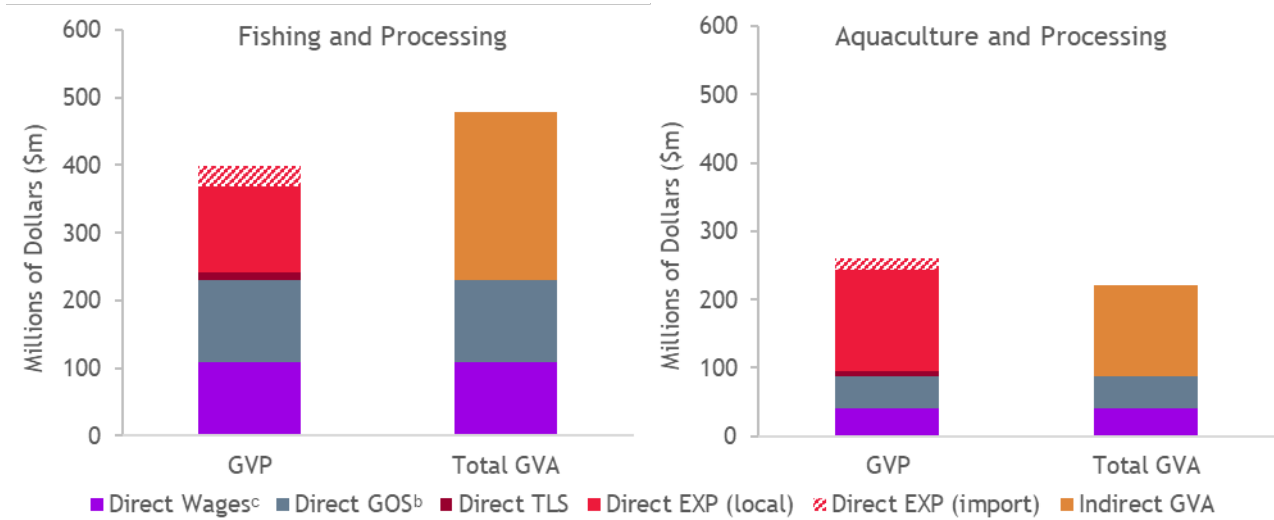
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

Direct GVA is smaller than GVP as non-wage business expenditure (EXP) and taxes less subsidies (TLS) are subtracted from GVP, leaving only wages and GOS. Adding indirect GVA to this results in total GVA (direct plus indirect GVA). In this case, indirect GVA is comprised of wages and GOS generated by businesses in all other sectors of the economy supported by within-jurisdiction (local) expenditures by the fishing, aquaculture and processing sectors. Figure 3-11 shows these calculations for SA with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$248 million of indirect GVA is supported by fishing and associated processing activity, as is around \$132 million by aquaculture and associated processing.

Figure 3-11 Composition of commercial fishing^a, aquaculture and processing GVP and total GVA, SA, 2017/18



^a State and Commonwealth managed fisheries.

^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

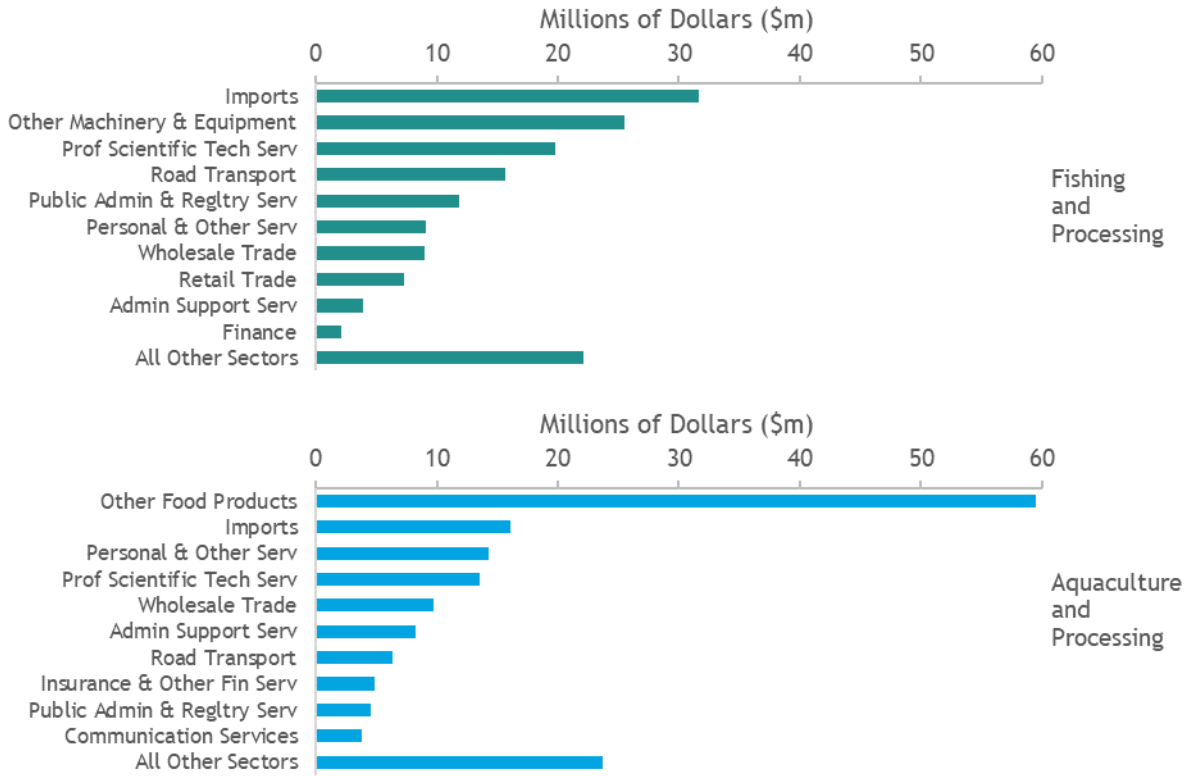
^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

3.4.4 Expenditure

Expenditure by fishing, aquaculture and processing businesses that supports indirect GVA in other sectors is summarised in Figure 3-12. The figure shows the top 10 sectors receiving payments due to SA fishing and associated processing in the top pane and from aquaculture and associated processing in the bottom pane. Imports include the imported component of items manufactured outside of Australia, such as fuel and some equipment. In total, around \$126 million of local expenditure was made due to SA fishing and associated processing activity and around \$149 million due to aquaculture and associated processing. This represents around 80 and 90 per cent of total non-wage business expenditure respectively, the balance being imported from outside the jurisdiction.

Figure 3-12 Expenditure within-jurisdiction due to commercial fishing^a, aquaculture and processing activity, SA, 2017/18



Source: BDO EconSearch Analysis

3.4.5 Exports

The quantity, value and average unit value of seafood products exported overseas from SA are reported in Table 3-12. Southern Bluefin Tuna was the highest valued individual seafood product exported in 2017/18, followed by Rock Lobster and Abalone. Together, these three categories accounted for over 85 per cent of seafood exports from SA.

Table 3-12 SA overseas seafood exports, top contributors by export value, 2017/18

Rank	Seafood Category ^a	Export Quantity		Export Value ^b		Average Value (\$/kg)
		(tonnes)	(%)	(\$m)	(%)	
1	Southern bluefin tuna	8,040	75%	115.0	48%	14.3
2	Rock lobster	605	6%	57.2	24%	94.5
3	Abalone	411	4%	34.1	14%	83.1
4	Other fresh fish	673	6%	12.9	5%	19.1
5	Other frozen fish	290	3%	5.2	2%	18.0
6	Other molluscs	32	0%	4.4	2%	140.2
7	Shrimp & prawns	88	1%	2.0	1%	23.0
8	Mussels	235	2%	1.9	1%	8.1
9	Atlantic & pacific salmon	80	1%	1.5	1%	18.3
10	Oysters	94	1%	1.2	0%	12.4
	Other	130	1%	2.1	1%	15.9
	Total^c	10,678	100%	237.5	100%	22.2

^a Ranked by export value. Seafood categories are defined in Appendix 3.

^b Exports are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^c Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

3.5 Western Australia

3.5.1 Catch and GVP

Table 3-13 presents the catch, production and GVP of the highest valued WA fisheries, Commonwealth fisheries operating within the State and aquaculture sectors in 2017/18. The table provides an indication of which fisheries and aquaculture sectors are key economic contributors to the State. The values presented in Table 3-13 suggest the majority of economic contribution from State managed fisheries and aquaculture was generated by the top five fisheries and aquaculture sectors. Of particular significance is the WA Western Rock Lobster Fishery, which represented about 75 per cent of WA managed fishery GVP.

3.5.2 Economic contribution

Estimates of the economic contribution generated in 2017/18 by WA fisheries, Commonwealth fisheries operating within the State and aquaculture are presented in Table 3-14.

Contribution to GVA...

In 2017/18, total fishery and aquaculture GVA in WA was \$989 million, \$411 million generated by fishing and aquaculture directly, \$119 million by processing activities and \$458 million in other sectors of the State economy. Unlike GSP, GVA does not include the value of taxes minus subsidies.

Employment and Household Income...

In 2017/18, WA fishing and aquaculture was responsible for the direct employment of around 1,932 full-time equivalents (fte) and processing created employment of around 969 fte jobs state-wide. Flow-on business activity was estimated to generate a further 3,381 fte jobs state-wide. The total employment contribution in WA was estimated to be 6,281 fte jobs.

Personal income of \$106 million was earned in the fishing and aquaculture sectors (wages of employees and estimated drawings by owner/operators) and \$57 million in processing in WA. An additional \$276 million was earned by wage earners in other businesses in the State as a result of fishing, aquaculture and associated processing activities. The total household income contribution in WA was \$438 million.

Contribution to GSP...

As noted in Section 2.3.1, contribution to GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In 2017/18, total fishery and aquaculture contribution to GSP in WA was \$1,060 million, \$411 million generated by fishing and aquaculture directly, \$174 million by processing activities and \$475 million in other sectors of the State economy.

Table 3-13 Catch, production and GVP of the top five contributors (by GVP) to WA commercial fishing and aquaculture in 2017/18^a

Rank	Description	Catch / Production (t) ^b	GVP (\$m)	Value per unit (\$/kg) ^c
<i>Fisheries (state managed)</i>				
1	Western Rock Lobster	6,333	392	61.86
2	Prawn	3,169	46	14.47
3	Scallop	1,297	11	8.14
4	Demersal Trap	1,223	10	7.92
5	Abalone	173	7	42.50
	Other fisheries	9,161	54	5.95
	Total wild caught	21,356	520	
<i>Fisheries (Commonwealth managed)</i>				
1	Western Tuna Billfish	344	2	6.22
	Other fisheries ^f	53	1	19.01
	Total wild caught	397	3	
<i>Aquaculture</i>				
1	Pearl Oyster	n.a.	77	n.a.
2	Barramundi	1,083	12	10.95
3	Other Species ^d	150	4	23.62
4	Marron	51	2	32.32
5	Ornamental Invertebrates	208	1	4.52
	Other sectors	218	2	9.70
	Total production^e	1,502	98	

^a 2017/18 GVP estimates are updated from 2016/17 published data, which was the latest year of available data. Catch/production reported for 2016/17 (latest year of available data).

^b Production of Ornamental Invertebrates are reported by number (in thousands) produced.

^c Value per unit of Ornamental Invertebrates are by dollars per number produced.

^d Other Species refers to production where there were less than three contributing licences. Over the last 10 years this has included artemia, abalone, black bream, Mahi mahi, live rock, mulloway, Murray cod, pink snapper, prawns, rotifers, western rock oysters and yellowtail kingfish.

^e Production totals excludes Ornamental Invertebrates (reported by no. '000).

^f Includes estimated production in the confidential North West Slope Trawl and Western Deepwater Trawl fisheries.

n.a. not available

Source: WPIRD, ABARES and BDO EconSearch Analysis

Table 3-14 Economic contribution of commercial fishing and aquaculture to WA, 2017/18

	Gross value added (\$m)	Employment (fte jobs)	Household Income (\$m)	Contribution to GSP (\$m)	GVP (\$m)
<u>Fishing (state fisheries)</u>					
Direct					
Fishing	338	1,348	74	338	520
Processing	114	927	54	167	238
Indirect (all other sectors) ^a					
Production induced	229	1,780	150	231	-
Consumption induced	184	1,267	98	196	-
<i>Total indirect</i>	<i>413</i>	<i>3,047</i>	<i>249</i>	<i>427</i>	<i>-</i>
Total^b	865	5,322	377	932	758
<u>Fishing (Commonwealth fisheries)</u>					
Direct					
Fishing	1	11	1	1	3
Processing	1	6	0	1	1
Indirect (all other sectors) ^a					
Production induced	2	13	1	2	-
Consumption induced	1	9	1	1	-
<i>Total indirect</i>	<i>3</i>	<i>22</i>	<i>2</i>	<i>3</i>	<i>-</i>
Total^b	5	39	3	6	5
<u>Aquaculture</u>					
Direct					
Production	72	573	31	72	98
Processing	4	36	2	6	9
Indirect (all other sectors) ^a					
Production induced	14	120	10	15	-
Consumption induced	28	192	15	30	-
<i>Total indirect</i>	<i>42</i>	<i>312</i>	<i>25</i>	<i>44</i>	<i>-</i>
Total^b	118	920	58	123	107
<u>Fishing & Aquaculture Total</u>					
Direct					
Catch & Production	411	1,932	106	411	620
Processing	119	969	57	174	249
Indirect (all other sectors) ^a					
Production induced	245	1,913	161	248	-
Consumption induced	214	1,468	114	227	-
<i>Total indirect</i>	<i>458</i>	<i>3,381</i>	<i>276</i>	<i>475</i>	<i>-</i>
Total^b	989	6,281	438	1,060	869

^a Indirect GVP effects are excluded to avoid double counting

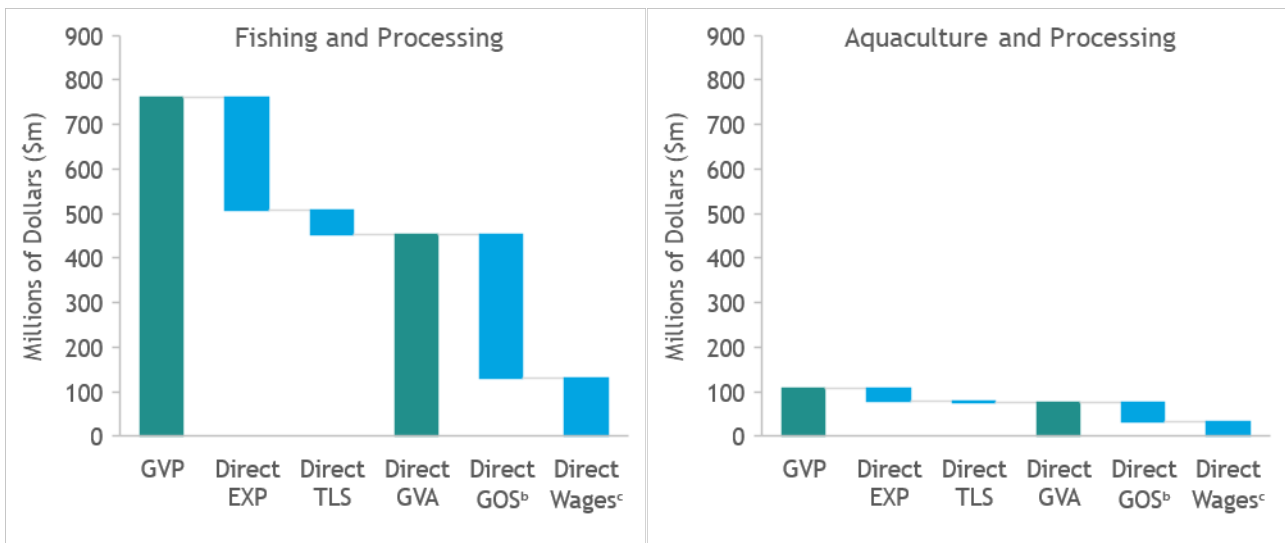
^b Totals may not sum due to rounding.

Source: WA DPIRD, ACIL Allen (2017), Daley & Pullen (2018), BDO EconSearch (2019b,c,d,f,g,h,i,j,l) and BDO EconSearch Analysis

3.5.3 Comparing GVP and GVA

Direct gross value added (GVA) is calculated by subtracting non-wage business expenditure (such as fuel, trade services, professional services and transport services) including taxes less subsidies (EXP and TLS) from GVP. It can also be calculated by summing the wages (including an imputed wage for owner operators) and gross operating surplus (GOS - a measure of business profit before tax) generated by businesses. Figure 3-13 shows these calculations for WA with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$454 million of GVP from fishing and associated processing is retained as direct GVA, as is around \$76 million of GVP from aquaculture and associated processing.

Figure 3-13 Composition of commercial fishing^a, aquaculture and processing GVP and direct GVA, WA, 2017/18



^a State and Commonwealth managed fisheries.

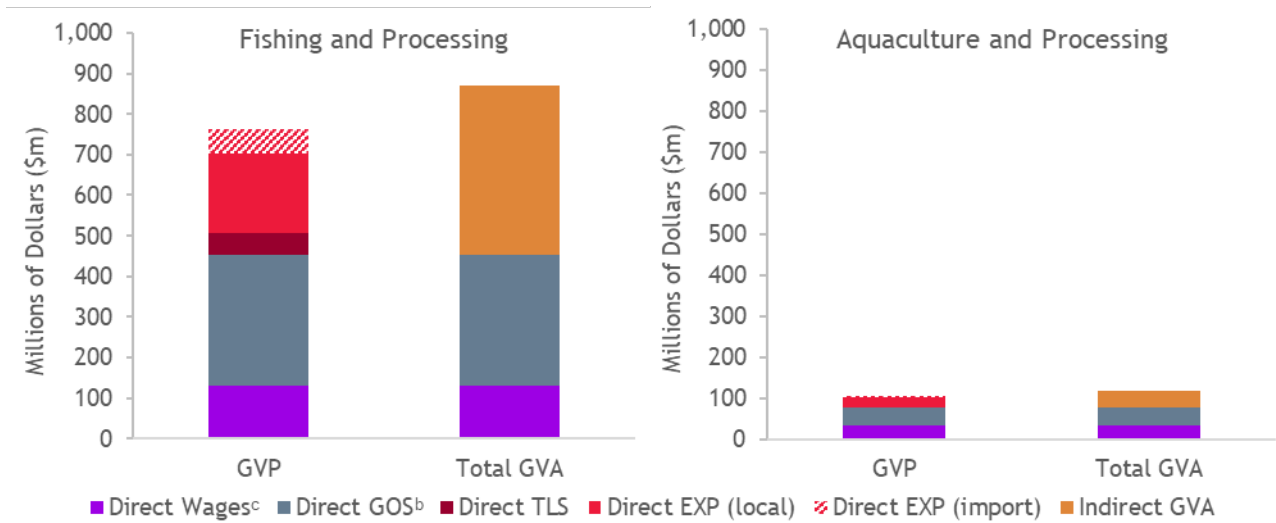
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

Direct GVA is smaller than GVP as non-wage business expenditure (EXP) and taxes less subsidies (TLS) are subtracted from GVP, leaving only wages and GOS. Adding indirect GVA to this results in total GVA (direct plus indirect GVA). In this case, indirect GVA is comprised of wages and GOS generated by businesses in all other sectors of the economy supported by within-jurisdiction (local) expenditures by the fishing, aquaculture and processing sectors. Figure 3-14 shows these calculations for WA with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$416 million of indirect GVA is supported by fishing and associated processing activity, as is around \$42 million by aquaculture and associated processing.

Figure 3-14 Composition of commercial fishing^a, aquaculture and processing GVP and total GVA, WA, 2017/18



^a State and Commonwealth managed fisheries.

^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

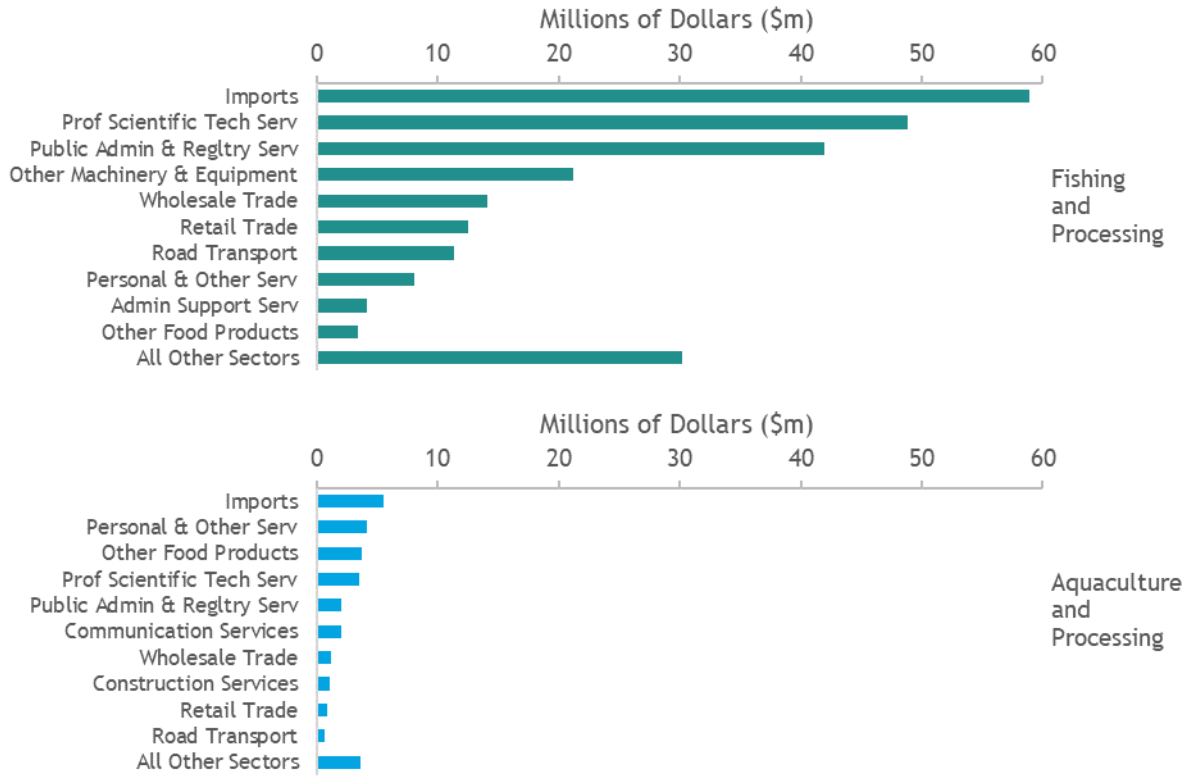
^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

3.5.4 Expenditure

Expenditure by fishing, aquaculture and processing businesses that supports indirect GVA in other sectors is summarised in Figure 3-15. The figure shows the top 10 sectors receiving payments due to WA fishing and associated processing in the top pane and from aquaculture and associated processing in the bottom pane. Imports include the imported component of items manufactured outside of Australia, such as fuel and some equipment. In total, around \$196 million of local expenditure was made due to WA fishing and associated processing activity and around \$23 million due to aquaculture and associated processing. This represents around 77 and 81 per cent of total non-wage business expenditure respectively, the balance being imported from outside the jurisdiction.

Figure 3-15 Expenditure within-jurisdiction due to commercial fishing^a, aquaculture and processing activity, WA, 2017/18



Source: BDO EconSearch Analysis

3.5.5 Exports

The quantity, value and average unit value of seafood products exported overseas from WA are reported in Table 3-15. Rock Lobster was the highest valued individual seafood product exported in 2017/18, followed by Shrimp and prawns. Together, these two categories accounted for 95 per cent of seafood exports from WA.

Table 3-15 WA overseas seafood exports, top contributors by export value, 2017/18

Rank	Seafood Category ^a	Export Quantity		Export Value ^b		Average Value (\$/kg)
		(tonnes)	(%)	(\$m)	(%)	
1	Rock lobster	6,587	77%	505.7	92%	76.8
2	Shrimp & prawns	886	10%	15.4	3%	17.3
3	Toothfish	157	2%	8.8	2%	56.0
4	Scallops	154	2%	7.3	1%	47.4
5	Abalone	35	0%	4.4	1%	125.9
6	Crabs	183	2%	3.0	1%	16.4
7	Other frozen fish	313	4%	1.9	0%	6.1
8	Other fresh fish	93	1%	0.7	0%	7.8
9	Ornamental fish ^c	6	0%	0.6	0%	94.7
10	Swordfish	34	0%	0.5	0%	13.9
	Other	103	1%	1.7	0%	16.9
	Total^d	8,544	100%	550.0	100%	64.3

^a Ranked by export value. Seafood categories are defined in Appendix 3.

^b Export values are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^c Export quantity of "Ornamental fish" is measured by number of specimens. The reported "Ornamental fish" export quantity and price are per '000 specimens exported. Total seafood export quantity and price exclude "Ornamental fish" due to differences in units of measurement.

^d Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

3.6 Tasmania

3.6.1 Catch and GVP

Table 3-16 presents the catch, production and GVP of the highest valued TAS fisheries, Commonwealth fisheries operating within the State and aquaculture sectors in 2017/18. The table provides an indication of which fisheries and aquaculture sectors are key economic contributors to the State. The values presented in Table 3-16 suggest the majority of economic contribution (Table 3-17) was generated by Southern Rock Lobster and Abalone (state managed fisheries) and Salmonids and Oysters aquaculture sectors.

3.6.2 Economic contribution

Estimates of the economic contribution generated in 2017/18 by TAS fisheries, Commonwealth fisheries operating within the State and aquaculture are presented in Table 3-17.

Contribution to GVA...

In 2017/18, total fishery and aquaculture GVA in TAS was \$1,150 million, \$490 million generated by fishing and aquaculture directly, \$44 million by processing activities and \$615 million in other sectors of the State economy. Unlike GSP, GVA does not include the value of taxes minus subsidies.

Employment and Household Income...

In 2017/18, TAS fishing and aquaculture was responsible for the direct employment of around 2,987 full-time equivalents (fte) and processing created employment of around 423 fte jobs state-wide. Flow-on business activity was estimated to generate a further 5,393 fte jobs state-wide. The total employment contribution in TAS was estimated to be 8,803 fte jobs.

Personal income of \$196 million was earned in the fishing and aquaculture sectors (wages of employees and estimated drawings by owner/operators) and \$24 million in processing in TAS. An additional \$377 million was earned by wage earners in other businesses in the State as a result of fishing, aquaculture and associated processing activities. The total household income contribution in TAS was \$597 million.

Contribution to GSP...

As noted in Section 2.3.1, contribution to GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In 2017/18, total fishery and aquaculture contribution to GSP in TAS was \$1,187 million, \$490 million generated by fishing and aquaculture directly, \$61 million by processing activities and \$636 million in other sectors of the State economy.

Table 3-16 Catch, production and GVP of the top five contributors (by GVP) to TAS commercial fishing and aquaculture in 2017/18

Rank	Description	Catch / Production (t) ^a	GVP (\$m)	Value per unit (\$/kg) ^b
<i>Fisheries (state managed)</i>				
1	Rock Lobster	1,148	93	81.26
2	Abalone	1,473	86	58.69
3	Scalefish	378	4	11.04
4	Giant Crab & Octopus	132	3	22.98
5	Commercial Dive	321	1	3.46
	Other fisheries	7	0	12.21
	Total wild caught	3,458	188	
<i>Fisheries (Commonwealth managed)</i>				
1	Southern and Eastern Scalefish and Shark (Commonwealth Trawl Sector)	1,332	6	4.31
2	Southern and Eastern Scalefish and Shark (Gillnet Hook and Trap Sector)	487	3	6.33
3	Bass Strait Central Zone Scallop	1,447	3	2.04
4	Southern Squid Jig	30	0	2.75
	Total wild caught	3,296	12	0.00
<i>Aquaculture</i>				
1	Salmonids	60,048	865	14.40
2	Oysters	2,523	23	9.18
3	Abalone	98	3	35.00
4	Mussels	592	2	4.00
	Total production^c	60,738	894	

^a Production of Oysters are reported per thousand dozen.

^b Value per unit of Oysters are by dollars per dozen.

^c Production totals excludes Oysters (reported by '000 dozen).

Source: DPIPWE, IMAS, ABARES and BDO EconSearch Analysis

Table 3-17 Economic contribution of commercial fishing and aquaculture to TAS, 2017/18

	Gross value added (\$m)	Employment (fte jobs)	Household Income (\$m)	Contribution to GSP (\$m)	GVP (\$m)
<u>Fishing (state fisheries)</u>					
Direct					
Fishing	147	705	34	147	188
Processing	8	73	4	11	15
Indirect (all other sectors) ^a					
Production induced	28	248	20	28	-
Consumption induced	41	317	21	43	-
<i>Total indirect</i>	<i>69</i>	<i>564</i>	<i>41</i>	<i>71</i>	<i>-</i>
Total^b	224	1,342	79	229	203
<u>Fishing (Commonwealth fisheries)</u>					
Direct					
Fishing	6	69	3	6	12
Processing	0	5	0	1	1
Indirect (all other sectors) ^a					
Production induced	4	36	3	4	-
Consumption induced	5	37	2	5	-
<i>Total indirect</i>	<i>9</i>	<i>73</i>	<i>5</i>	<i>9</i>	<i>-</i>
Total^b	15	146	9	15	13
<u>Aquaculture</u>					
Direct					
Production	337	2,213	159	337	894
Processing	36	345	20	50	73
Indirect (all other sectors) ^a					
Production induced	275	2,705	193	280	-
Consumption induced	263	2,052	138	276	-
<i>Total indirect</i>	<i>538</i>	<i>4,757</i>	<i>330</i>	<i>556</i>	<i>-</i>
Total^b	911	7,315	508	943	966
<u>Fishing & Aquaculture Total</u>					
Direct					
Catch & Production	490	2,987	196	490	1,094
Processing	44	423	24	61	89
Indirect (all other sectors) ^a					
Production induced	307	2,988	215	312	-
Consumption induced	308	2,405	161	323	-
<i>Total indirect</i>	<i>615</i>	<i>5,393</i>	<i>377</i>	<i>636</i>	<i>-</i>
Total^b	1,150	8,803	597	1,187	1,182

^a Indirect GVP effects are excluded to avoid double counting

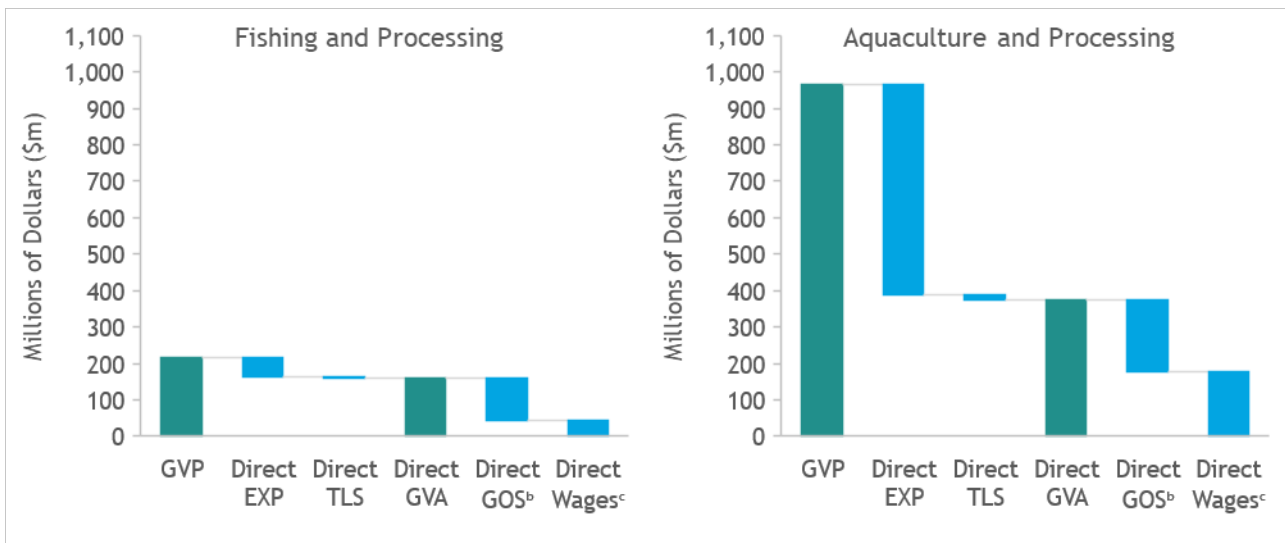
^b Totals may not sum due to rounding.

Source: DPIWE, IMAS, Knuckey & Sen (2017), KPMG (2015), EconSearch (2013), BDO EconSearch (2019b,c,f,g,h,i,l), Bath et al. (2018), George et al. (2012), KPMG (2015) and BDO EconSearch Analysis

3.6.3 Comparing GVP and GVA

Direct gross value added (GVA) is calculated by subtracting non-wage business expenditure (such as fuel, trade services, professional services and transport services) including taxes less subsidies (EXP and TLS) from GVP. It can also be calculated by summing the wages (including an imputed wage for owner operators) and gross operating surplus (GOS - a measure of business profit before tax) generated by businesses. Figure 3-16 shows these calculations for TAS with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$161 million of GVP from fishing and associated processing is retained as direct GVA, as is around \$373 million of GVP from aquaculture and associated processing.

Figure 3-16 Composition of commercial fishing^a, aquaculture and processing GVP and direct GVA, TAS, 2017/18



^a State and Commonwealth managed fisheries.

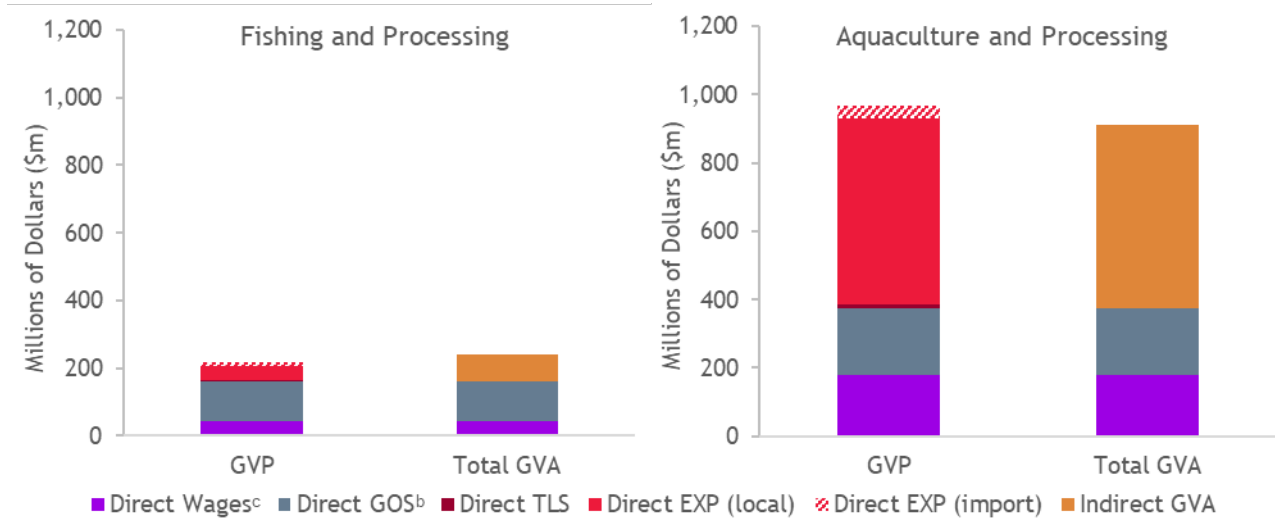
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

Direct GVA is smaller than GVP as non-wage business expenditure (EXP) and taxes less subsidies (TLS) are subtracted from GVP, leaving only wages and GOS. Adding indirect GVA to this results in total GVA (direct plus indirect GVA). In this case, indirect GVA is comprised of wages and GOS generated by businesses in all other sectors of the economy supported by within-jurisdiction (local) expenditures by the fishing, aquaculture and processing sectors. Figure 3-17 shows these calculations for TAS with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$77 million of indirect GVA is supported by fishing and associated processing activity, as is around \$538 million by aquaculture and associated processing.

Figure 3-17 Composition of commercial fishing^a, aquaculture and processing GVP and total GVA, TAS, 2017/18



^a State and Commonwealth managed fisheries.

^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

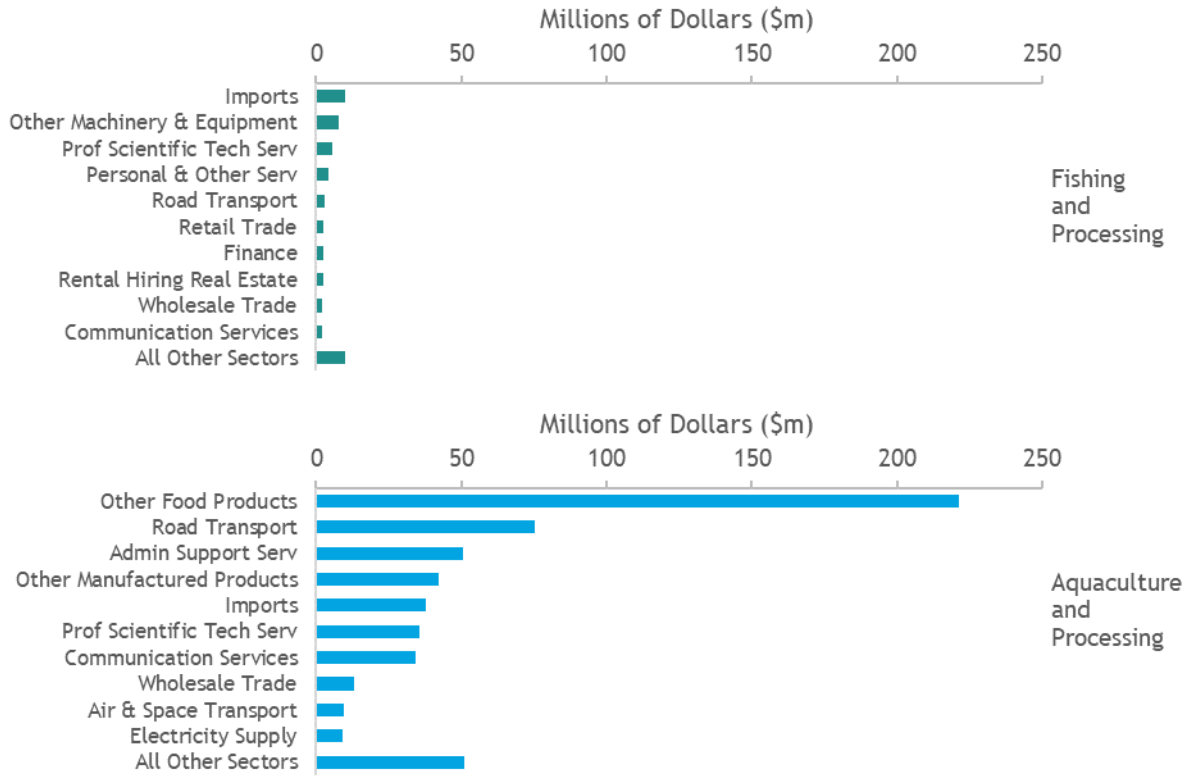
^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

3.6.4 Expenditure

Expenditure by fishing, aquaculture and processing businesses that supports indirect GVA in other sectors is summarised in Figure 3-18. The figure shows the top 10 sectors receiving payments due to TAS fishing and associated processing in the top pane and from aquaculture and associated processing in the bottom pane. Imports include the imported component of items manufactured outside of Australia, such as fuel and some equipment. In total, around \$42 million of local expenditure was made due to TAS fishing and associated processing activity and around \$542 million due to aquaculture and associated processing. This represents around 81 and 93 per cent of total non-wage business expenditure respectively, the balance being imported from outside the jurisdiction.

Figure 3-18 Expenditure within-jurisdiction due to commercial fishing^a, aquaculture and processing activity, TAS, 2017/18



Source: BDO EconSearch Analysis

3.6.5 Exports

The quantity, value and average unit value of seafood products exported overseas from Tasmania are reported in Table 3-18. Atlantic and Pacific Salmon was the highest valued individual seafood product exported in 2017/18, followed by Abalone. Together, these two categories accounted for almost 90 per cent of seafood exports from Tasmania.

Table 3-18 Tasmanian overseas seafood exports, top contributors by export value, 2017/18

Rank	Seafood Category ^a	Export Quantity		Export Value ^b		Average Value (\$/kg)
		(tonnes)	(%)	(\$m)	(%)	
1	Atlantic & pacific salmon	11,414	87%	129.0	53%	11.3
2	Abalone	1,095	8%	84.7	35%	77.3
3	Rock lobster	136	1%	14.1	6%	103.9
4	Toothfish	308	2%	11.3	5%	36.6
5	Trout	86	1%	1.2	1%	14.3
6	Eels	29	0%	0.6	0%	21.0
7	Fish livers, roes & milt	7	0%	0.4	0%	66.6
8	Preserved fish	2	0%	0.2	0%	83.6
9	Oysters	7	0%	0.1	0%	17.7
10	Sea cucumbers	1	0%	0.1	0%	146.2
	Other ^c	30	0%	0.1	0%	
	Total^d	13,113	100%	241.9	100%	18.4

^a Ranked by export value. Seafood categories are defined in Appendix 3.

^b Export values are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^c "Other" includes Ornamental fish, of which export quantity is measured by number of specimens. The reported export quantity and export price figures exclude Ornamental fish due to differences in units of measurement.

^d Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

3.7 Northern Territory

3.7.1 Catch and GVP

Table 3-19 presents the catch, production and GVP of the highest valued NT fisheries, Commonwealth fisheries operating within the State and aquaculture sectors in 2017/18. The table provides an indication of which fisheries and aquaculture sectors are key economic contributors to the Territory. The values presented in Table 3-19 suggest the majority of economic contribution from Territory managed fisheries was generated by the top five fisheries. Of particular significance is the NT Demersal and Mud Crab fisheries, which together make up more than half of NT managed fishery GVP.

3.7.2 Economic contribution

Estimates of the economic contribution generated in 2017/18 by NT fisheries, Commonwealth fisheries operating within the Territory and aquaculture are presented in Table 3-20.

Contribution to GVA...

In 2017/18, total fishery and aquaculture GVA in NT was \$136 million, \$52 million generated by fishing and aquaculture directly, \$8 million by processing activities and \$76 million in other sectors of the Territory economy. Unlike GSP, GVA does not include the value of taxes minus subsidies.

Employment and Household Income...

In 2017/18, NT fishing and aquaculture was responsible for the direct employment of around 417 full-time equivalents (fte) and processing created employment of around 22 fte jobs territory-wide. Flow-on business activity was estimated to generate a further 501 fte jobs territory-wide. The total employment contribution in NT was estimated to be 941 fte jobs.

Personal income of \$27 million was earned in the fishing and aquaculture sectors (wages of employees and estimated drawings by owner/operators) and \$2 million in processing in NT. An additional \$41 million was earned by wage earners in other businesses in the Territory as a result of fishing, aquaculture and associated processing activities. The total household income contribution in NT was \$71 million.

Contribution to GSP...

As noted in Section 2.3.1, contribution to GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In 2017/18, total fishery and aquaculture contribution to GSP in NT was \$143 million, \$52 million generated by fishing and aquaculture directly, \$13 million by processing activities and \$78 million in other sectors of the Territory economy.

Table 3-19 Catch, production and GVP of the top five contributors (by GVP) to NT commercial fishing and aquaculture in 2017/18

Rank	Description	Catch / Production (t)	GVP (\$m)	Value per unit (\$/kg)
<i>Fisheries (state managed)</i>				
1	Demersal	3,590	19	5.19
2	Mud Crab	325	10	30.18
3	Timor Reef	763	5	6.27
4	Barramundi	598	4	6.80
5	Offshore Net & Line	649	4	5.56
	Other fisheries	597	5	8.97
	Total wild caught	6,522	46	
<i>Fisheries (Commonwealth managed)</i>				
1	Northern Prawn	1,591	25	15.91
	Total wild caught^b	1,591	25	0.00
<i>Aquaculture</i>				
	Total production^a	2,342	25	

^a Production is presented as a total due to confidentiality reasons.

^b Also includes a small amount of activity in the confidential North West Slope Trawl fishery.

Source: NT DPIR, ABARES and BDO EconSearch Analysis

Table 3-20 Economic contribution of commercial fishing and aquaculture to NT, 2017/18

	Gross value added (\$m)	Employment (fte jobs)	Household Income (\$m)	Contribution to GSP (\$m)	GVP (\$m)
<u>Fishing (state fisheries)</u>					
Direct					
Fishing	27	228	12	27	46
Processing	4	11	1	6	11
Indirect (all other sectors) ^a					
Production induced	11	96	10	11	-
Consumption induced	26	151	10	27	-
<i>Total indirect</i>	37	248	20	38	-
Total^b	68	487	33	71	57
<u>Fishing (Commonwealth fisheries)</u>					
Direct					
Fishing	14	57	5	14	25
Processing	2	6	1	3	6
Indirect (all other sectors) ^a					
Production induced	6	53	6	6	-
Consumption induced	12	68	4	12	-
<i>Total indirect</i>	18	121	10	18	-
Total^b	34	184	16	35	31
<u>Aquaculture</u>					
Direct					
Production	11	132	11	11	25
Processing	2	6	1	3	6
Indirect (all other sectors) ^a					
Production induced	5	36	4	5	-
Consumption induced	17	97	6	17	-
<i>Total indirect</i>	22	133	10	22	-
Total^b	35	271	22	37	31
<u>Fishing & Aquaculture Total</u>					
Direct					
Catch & Production	52	417	27	52	97
Processing	8	22	2	13	23
Indirect (all other sectors) ^a					
Production induced	23	185	20	22	-
Consumption induced	54	316	21	56	-
<i>Total indirect</i>	76	501	41	78	-
Total^b	136	941	71	143	120

^a Indirect GVP effects are excluded to avoid double counting

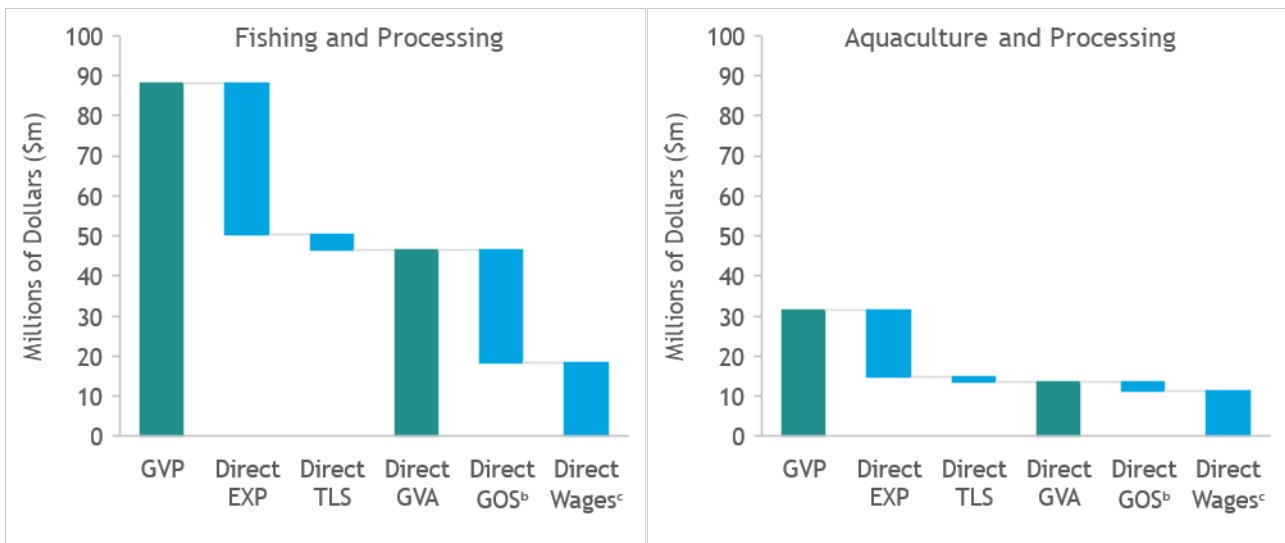
^b Totals may not sum due to rounding.

Source: NT DIPR, BDO EconSearch (2019c,f,g,h,i), Mobsby et al. (2019) and BDO EconSearch Analysis

3.7.3 Comparing GVP and GVA

Direct gross value added (GVA) is calculated by subtracting non-wage business expenditure (such as fuel, trade services, professional services and transport services) including taxes less subsidies (EXP and TLS) from GVP. It can also be calculated by summing the wages (including an imputed wage for owner operators) and gross operating surplus (GOS - a measure of business profit before tax) generated by businesses. Figure 3-19 shows these calculations for NT with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$47 million of GVP from fishing and associated processing is retained as direct GVA, as is around \$13 million of GVP from aquaculture and associated processing.

Figure 3-19 Composition of commercial fishing^a, aquaculture and processing GVP and direct GVA, NT, 2017/18



^a Territory and Commonwealth managed fisheries.

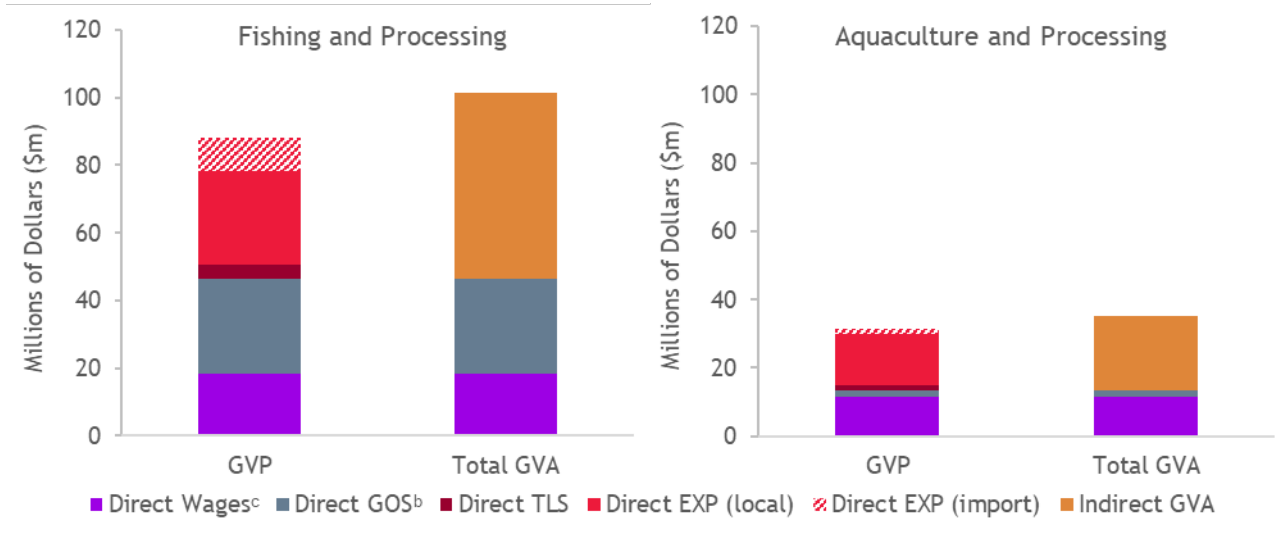
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

Direct GVA is smaller than GVP as non-wage business expenditure (EXP) and taxes less subsidies (TLS) are subtracted from GVP, leaving only wages and GOS. Adding indirect GVA to this results in total GVA (direct plus indirect GVA). In this case, indirect GVA is comprised of wages and GOS generated by businesses in all other sectors of the economy supported by within-jurisdiction (local) expenditures by the fishing, aquaculture and processing sectors. Figure 3-20 shows these calculations for NT with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$55 million of indirect GVA is supported by fishing and associated processing activity, as is around \$22 million by aquaculture and associated processing.

Figure 3-20 Composition of commercial fishing^a, aquaculture and processing GVP and total GVA, NT, 2017/18



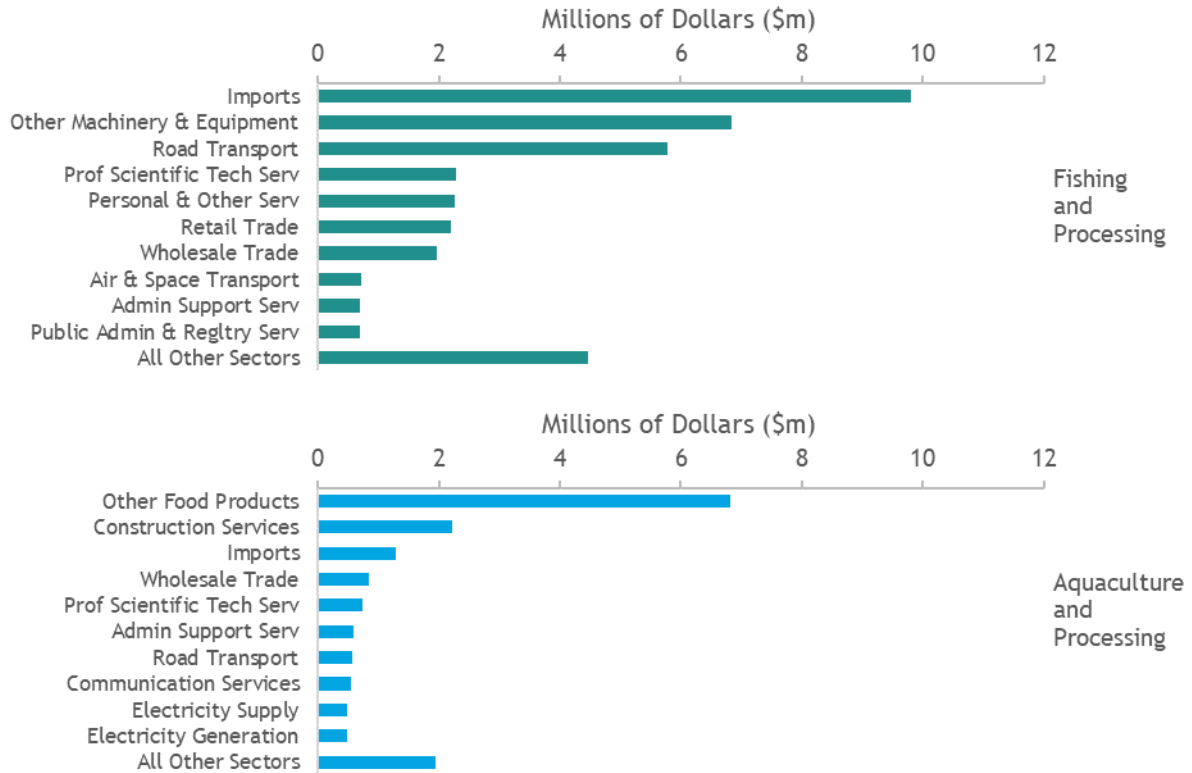
^a Territory and Commonwealth managed fisheries.
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.
^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

3.7.4 Expenditure

Expenditure by fishing, aquaculture and processing businesses that supports indirect GVA in other sectors is summarised in Figure 3-21. The figure shows the top 10 sectors receiving payments due to NT fishing and associated processing in the top pane and from aquaculture and associated processing in the bottom pane. Imports include the imported component of items manufactured outside of Australia, such as fuel and some equipment. In total, around \$28 million of local expenditure was made due to NT fishing and associated processing activity and around \$15 million due to aquaculture and associated processing. This represents around 74 and 92 per cent of total non-wage business expenditure respectively, the balance being imported from outside the jurisdiction.

Figure 3-21 Expenditure within-jurisdiction due to commercial fishing^a, aquaculture and processing activity, NT, 2017/18



Source: BDO EconSearch Analysis

3.7.5 Exports

The quantity, value and average unit value of seafood products exported overseas from NT are reported in Table 3-21. Crabs was the highest valued individual seafood product exported in 2017/18, followed by other fresh fish. Together, these two categories accounted for 100 per cent of seafood exports from NT.

Table 3-21 NT overseas seafood exports, top contributors by export value, 2017/18

Rank	Seafood Category ^a	Export Quantity		Export Value ^b		Average Value
		(tonnes)	(%)	(\$m)	(%)	(\$/kg)
1	Crabs	14	76%	0.5	90%	36.5
2	Other fresh fish	4	24%	0.1	10%	12.8
Total^c		18	100%	0.6	100%	30.8

^a Ranked by export value. Seafood categories are defined in Appendix 3.

^b Export values are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^c Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

3.8 Australia

3.8.1 Catch and GVP

Table 3-22 presents the catch, production and GVP of fisheries, aquaculture and associated processing in each State and Territory of Australia in 2017/18. The table provides an indication of which jurisdictions are key economic contributors to Australia. The values presented in Table 3-22 suggest, for both fishing and aquaculture, over half of economic contribution was generated by two jurisdictions (South Australia and Western Australia (state managed fishing) and Tasmania and South Australia (aquaculture)).

3.8.2 Economic contribution

Estimates of the economic contribution generated in 2017/18 by State fisheries, Commonwealth fisheries and aquaculture are presented in Table 3-23.

It is important to note that economic contributions measured at the national level (Table 3-23) exceed the combined State and Territory economic contributions (reported in sections 3.1 to 3.7). This is because economic activity generated across jurisdictions was not reported in the previous sections. The results reported in Sections 3.1 to 3.7 show the economic contribution of the seafood industry in each jurisdiction on the economy of that jurisdiction. The results do not include interregional effects, i.e. 'spill overs' to other jurisdictions from interregional trade, which are included in Table 3-23 below.

Contribution to GVA...

In 2017/18, total fishery and aquaculture GVA in Australia was \$5,289 million, \$1,692 million generated by fishing and aquaculture directly, \$330 million by processing activities and \$3,267 million in other sectors of the economy. Unlike GDP, GVA does not include the value of taxes minus subsidies.

Employment and Household Income...

In 2017/18, Australian fishing and aquaculture was responsible for the direct employment of around 12,162 full-time equivalents (fte) and processing created employment of around 3,280 fte jobs Australia-wide. Flow-on business activity was estimated to generate a further 25,811 fte jobs Australia-wide. The total employment contribution in Australia was estimated to be 41,254 fte jobs.

Personal income of \$673 million was earned in the fishing and aquaculture sectors (wages of employees and estimated drawings by owner/operators) and \$165 million in processing in Australia. An additional \$1,958 million was earned by wage earners in other businesses in Australia as a result of fishing, aquaculture and associated processing activities. The total household income contribution in Australia was \$2,796 million.

Contribution to GDP...

As noted in Section 2.3.1, contribution to GDP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In 2017/18, total fishery and aquaculture contribution to GDP in Australia was \$5,597 million, \$1,692 million generated by fishing and aquaculture directly, \$464 million by processing activities and \$3,441 million in other sectors of the economy.

Table 3-22 Catch, production and GVP of States ranked by GVP of commercial fishing and aquaculture in 2017/18

Rank	Description	Catch / Production (t) ^a	GVP (\$m)
<i>Fisheries (state managed)</i>			
1	Western Australia	21,356	520
2	South Australia	57,278	260
3	Queensland	18,064	189
4	Tasmania	3,458	188
5	New South Wales	10,982	98
6	Victoria	3,825	63
7	Northern Territory	6,522	46
	Total wild caught	121,484	1,363
<i>Fisheries (Commonwealth managed)</i>			
1	Queensland	9,234	135
2	Victoria	15,240	92
3	New South Wales	7,781	55
4	South Australia	7,448	52
5	Northern Territory	1,591	25
6	Tasmania	3,296	12
7	Western Australia	397	3
	Total wild caught	44,987	375
<i>Aquaculture</i>			
1	Tasmania	60,738	894
2	South Australia	15,986	205
3	Queensland	7,439	111
4	Western Australia	1,502	98
5	New South Wales	1,017	77
6	Victoria	3,344	47
7	Northern Territory	2,342	25
	Total production	92,369	1,457

^a Catch/production reported for 2016/17 (latest year of available data) for WA state managed fisheries and aquaculture and Commonwealth managed fisheries.

^b Total excludes the Heard Island & McDonald Island, Macquarie Island Toothfish and South Tasman Rise Trawl fisheries. See Appendix 2 for further detail.

Sources: NSW DPI, VFA, QDAF, PIRSA, WPIRD, DPIPWE, IMAS, NT DPIR, ABARES and BDO EconSearch Analysis

Table 3-23 Economic contribution of commercial fishing and aquaculture to Australia, 2017/18

	Gross value added (\$m)	Employment (fte jobs)	Household Income (\$m)	Contribution to GDP (\$m)	GVP (\$m)
<u>Fishing (state fisheries)</u>					
Direct					
Fishing	887	5,533	286	887	1,363
Processing	193	1,806	94	275	432
Indirect (all other sectors) ^a					
Production induced	673	5,351	427	712	-
Consumption induced	853	6,269	473	902	-
<i>Total indirect</i>	<i>1,526</i>	<i>11,621</i>	<i>900</i>	<i>1,614</i>	<i>-</i>
Total^b	2,607	18,959	1,280	2,777	1,795
<u>Fishing (Commonwealth fisheries)</u>					
Direct					
Fishing	181	1,474	87	181	375
Processing	44	496	22	62	115
Indirect (all other sectors) ^a					
Production induced	170	1,481	121	179	-
Consumption induced	237	1,757	132	252	-
<i>Total indirect</i>	<i>407</i>	<i>3,238</i>	<i>253</i>	<i>431</i>	<i>-</i>
Total^b	632	5,209	362	674	489
<u>Aquaculture</u>					
Direct					
Production	623	5,155	300	623	1,457
Processing	93	978	48	128	213
Indirect (all other sectors) ^a					
Production induced	507	4,590	340	523	-
Consumption induced	827	6,362	466	873	-
<i>Total indirect</i>	<i>1,334</i>	<i>10,952</i>	<i>805</i>	<i>1,396</i>	<i>-</i>
Total^b	2,050	17,086	1,153	2,147	1,669
<u>Fishing & Aquaculture Total</u>					
Direct					
Catch & Production	1,692	12,162	673	1,692	3,195
Processing	330	3,280	165	464	759
Indirect (all other sectors) ^a					
Production induced	1,350	11,423	888	1,414	-
Consumption induced	1,917	14,389	1,070	2,027	-
<i>Total indirect</i>	<i>3,267</i>	<i>25,811</i>	<i>1,958</i>	<i>3,441</i>	<i>-</i>
Total^b	5,289	41,254	2,796	5,597	3,954

^a Indirect GVP effects are excluded to avoid double counting

^b Totals may not sum due to rounding.

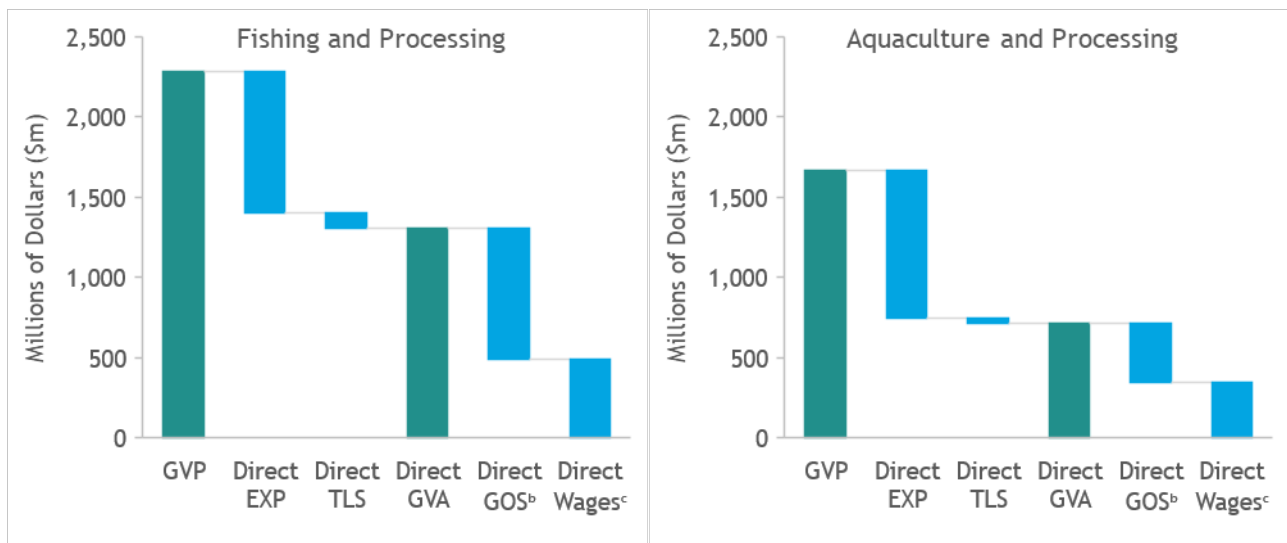
^c The indirect contributions presented in Table 3-23 are greater than the sum of economic contributions by State (presented in previous tables). This is due to the State contribution tables excluding indirect economic contribution occurring outside of State boundaries.

Source: ABARES, NSW DPI, VFA, QDAF, PIRSA, WA DPIRD, Tas. DPIPWE, IMAS, NT DPIR, Barclay et al. (2016), BDO EconSearch (2019a-d,f-j,l), ACIL Allen (2017), Daley & Putten (2018), KPMG (2015), Knuckey & Sen (2017), EconSearch (2013), Mobsby and Bath (2018), Mobsby et al. (2019), Bath et al (2018), Skirtun et al. (2015), George et al. (2012) and BDO EconSearch Analysis

3.8.3 Comparing GVP and GVA

Direct gross value added (GVA) is calculated by subtracting non-wage business expenditure (such as fuel, trade services, professional services and transport services) including taxes less subsidies (EXP and TLS) from GVP. It can also be calculated by summing the wages (including an imputed wage for owner operators) and gross operating surplus (GOS - a measure of business profit before tax) generated by businesses. Figure 3-22 shows these calculations for Australia with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$1,306 million of GVP from fishing and associated processing is retained as direct GVA, as is around \$716 million of GVP from aquaculture and associated processing.

Figure 3-22 Composition of commercial fishing^a, aquaculture and processing GVP and direct GVA, Australia, 2017/18



^a State and Commonwealth managed fisheries.

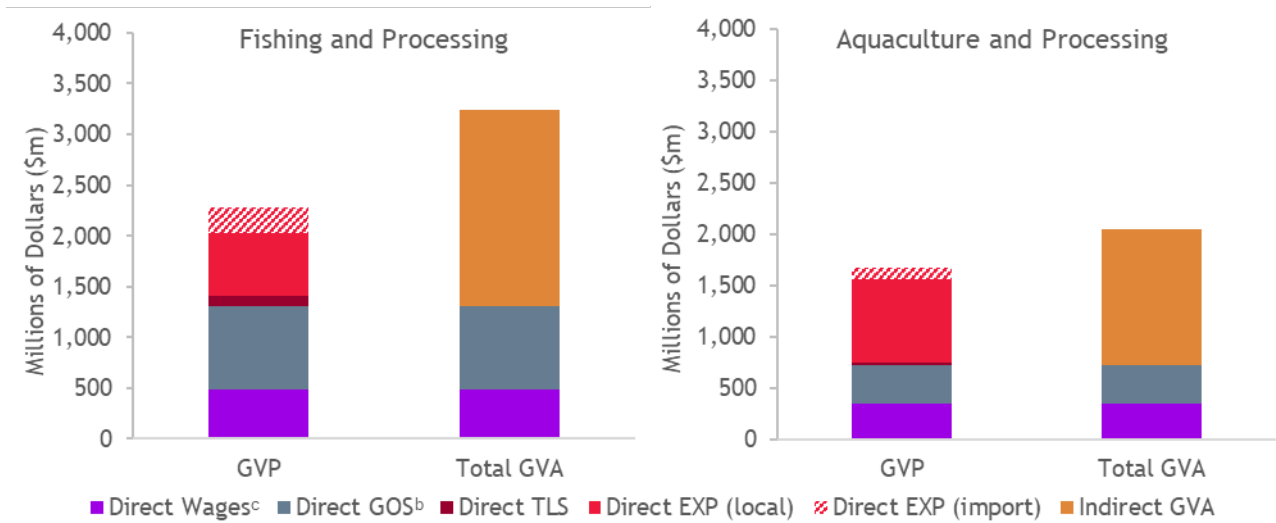
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.

^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.

Source: BDO EconSearch Analysis

Direct GVA is smaller than GVP as non-wage business expenditure (EXP) and taxes less subsidies (TLS) are subtracted from GVP, leaving only wages and GOS. Adding indirect GVA to this results in total GVA (direct plus indirect GVA). In this case, indirect GVA is comprised of wages and GOS generated by businesses in all other sectors of the economy supported by domestic (local) expenditures by the fishing, aquaculture and processing sectors. Figure 3-23 shows these calculations for Australia with fishing and associated processing in the left pane and aquaculture and associated processing in the right pane. Around \$1,933 million of indirect GVA is supported by fishing and associated processing activity, as is around \$1,334 million by aquaculture and associated processing.

Figure 3-23 Composition of commercial fishing^a, aquaculture and processing GVP and total GVA, Australia, 2017/18

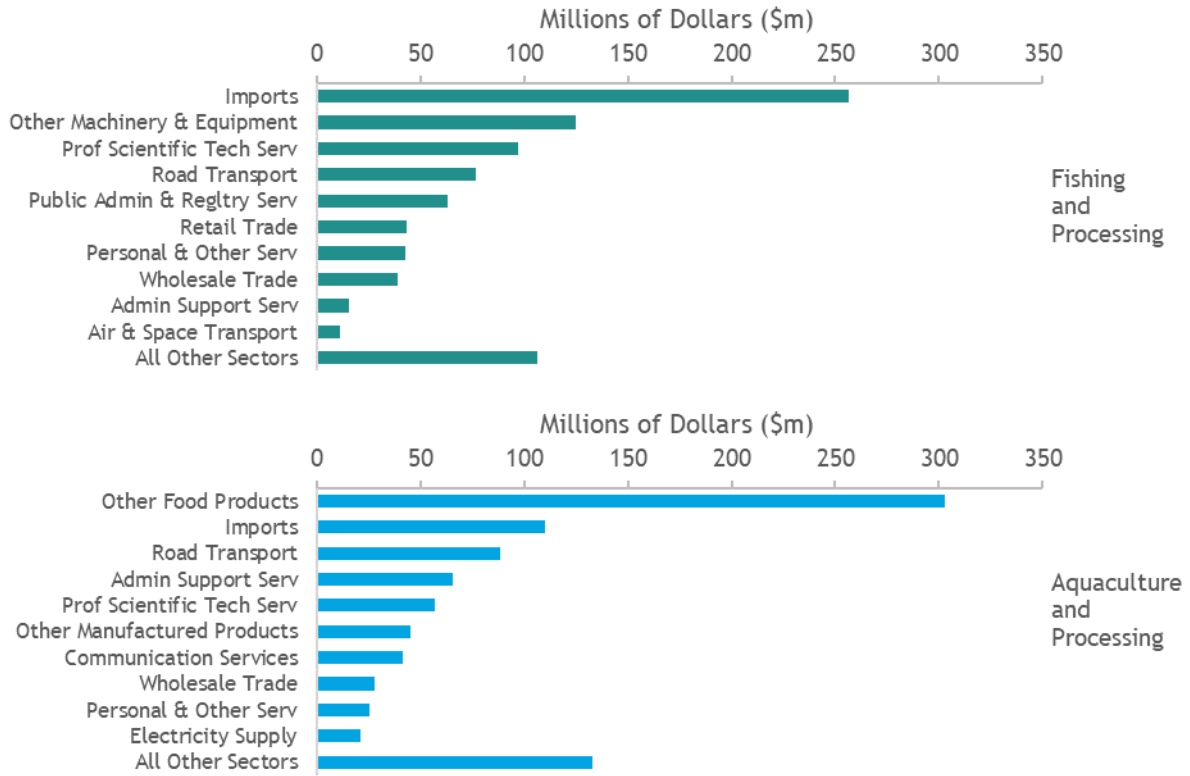


^a State and Commonwealth managed fisheries.
^b Gross operating surplus - aggregate for fishing and processing of locally caught product.
^c Wages include an imputed wage for owner operators - aggregate figure for fishing and processing.
 Source: BDO EconSearch Analysis

3.8.4 Expenditure

Expenditure by fishing, aquaculture and processing businesses that supports indirect GVA in other sectors is summarised in Figure 3-24. The figure shows the top 10 sectors receiving payments due to Australian fishing and associated processing in the top pane and from aquaculture and associated processing in the bottom pane. Imports include the imported component of items manufactured outside of Australia, such as fuel and some equipment. In total, around \$620 million of domestic expenditure was made due to Australian fishing and associated processing activity and around \$809 million due to aquaculture and associated processing. This represents around 71 and 88 per cent of total non-wage business expenditure respectively, the balance being imported from outside the jurisdiction.

Figure 3-24 Expenditure within Australia due to commercial fishing^a, aquaculture and processing activity, Australia, 2017/18



Source: BDO EconSearch Analysis

3.8.5 Exports

The quantity, value and average unit value of seafood products exported overseas from Australia are reported in Table 3-24. Rock Lobster was the highest valued individual seafood product exported in 2017/18, followed by Abalone. Together, these two categories accounted for over 65 per cent of seafood exports from Australia.

Table 3-24 Australian overseas seafood exports, top contributors by export value, 2017/18

Rank	Seafood Category ^a	Export Quantity		Export Value ^b		Average Value (\$/kg)
		(tonnes)	(%)	(\$m)	(%)	
1	Rock lobster	9,341	20%	768.1	53%	82.2
2	Abalone	2,420	5%	189.3	13%	78.2
3	Atlantic & pacific salmon	12,134	26%	132.1	9%	10.9
4	Southern bluefin tuna	8,553	18%	121.6	8%	14.2
5	Shrimp & prawns	3,830	8%	70.4	5%	18.4
6	Toothfish	465	1%	20.1	1%	43.1
7	Other frozen fish	3,665	8%	17.5	1%	4.8
8	Sea cucumbers	276	1%	17.4	1%	62.9
9	Other fresh fish	890	2%	15.1	1%	17.0
10	Trout	428	1%	14.8	1%	34.7
	Other ^c	5,461	12%	96.0	7%	17.0
	Total^d	47,464	100%	1,462.3	100%	30.7

^a Ranked by export value. Seafood categories are defined in Appendix 3.

^b Export values are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^c "Other" includes Ornamental fish, of which export quantity is measured by number of specimens. The reported export quantity and export price figures exclude Ornamental fish due to differences in units of measurement.

^d Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

4 SUMMARY

This *national contributions* study presents the first attempt at quantifying the national economic contribution of the Australian seafood industry based on best available data. It uses the most appropriate methods given the data available and time/resource constraints of this study. It provides an estimate of the economic contribution of wildcatch fisheries and aquaculture to the Australian (national) economy, and of the economic contribution of jurisdictionally-based (State, Territory and Commonwealth) fisheries and aquaculture to their State/Territory economies.

This section presents a summary of the economic contribution of fishing and aquaculture to the Australian economy in 2017/18 by jurisdiction. The tables allow comparison of the economic significance of fisheries and aquaculture across the individual jurisdictions in terms of GVA (Table 4-1), fte employment (Table 4-2) household income (Table 4-3) and contribution to GSP/GDP (Table 4-4). The tables also present, for each jurisdiction, the indirect economic contributions within the jurisdiction and in the rest of Australia.

Taking GVA in NSW in 2017/18 as an example (left column of Table 3-2), around \$130 million of GVA was directly generated by fishing and aquaculture activities and a further \$46 million was generated by associated processing resulting in direct GVA of \$176 million. Indirect GVA generated in other sectors of the NSW economy due to the fishing, aquaculture and processing activity generated a further \$198 million resulting in a total GVA of \$374 million, which matches the value reported in Section 3.1 (Table 3-2). Table 4-1 extends this estimate by adding a further \$28 million of GVA generated in the rest of Australia due to the activity described above (both direct and indirect) occurring in NSW. This activity occurring in the rest of Australia is commonly referred to as the result of 'linkages' or 'inter-regional effects'.

Overall, the contribution to GVA of commercial fishing, aquaculture and associated processing to Australia in 2017/18 was estimated to be approximately \$5,289 million, comprising \$2,022 million in direct contribution from commercial fishing, aquaculture and associated processing activity and \$3,267 million in indirect contribution from flow-on activities in other sectors (Table 4-1). The total contribution to employment in Australia from the national fishing and aquaculture industry, including processing, was estimated to be 41,254 fte jobs in 2017/18 (Table 4-2), comprising an estimated 15,442 fte jobs in the fishing, aquaculture and processing sectors (direct contribution) and a further estimated 25,811 fte jobs supported in other sectors of the national economy due to the fishing, aquaculture and processing activity (indirect contribution). Of these indirect fte jobs, 44 per cent were estimated to be generated by production induced activities and 56 per cent generated by consumption induced activities.

The contribution to national household income by the commercial fishing, aquaculture and associated processing in 2017/18 was estimated to be \$2,796 million in total, \$838 million directly and \$1,958 million through flow-on contribution (Table 4-3). The total contribution to GDP in Australia from the national fishing and aquaculture industry, including processing, was estimated to be \$5,597 million in 2017/18 (Table 4-4), comprising an estimated \$2,156 million direct contribution from the fishing, aquaculture and processing sectors and an estimated \$3,442 million indirect contribution from other sectors of the national economy as a result of the fishing, aquaculture and processing activity. In other words, for every dollar contributed directly to GDP by the national fishing and aquaculture industry, a total of about \$2.60 was contributed to GDP through direct and flow-on activities. The equivalent contribution multipliers (known as Type II multipliers) for GVA, fte employment and household income were about 2.6, 2.7 and 3.3 respectively. *These multipliers are context-specific and should not be used as generally applicable ratios in other studies, in particular they should not be used in economic impact studies.* A more detailed discussion of the derivation, use and interpretation of multipliers is provided in the *Guidelines* (BDO EconSearch 2019n).

Table 4-1 Contribution (GVA - \$m) by jurisdiction of commercial fishing, aquaculture and associated processing to Australia, 2017/18

Gross value added (\$m)	Jurisdiction							Total State & Territories
	NSW	Vic.	Qld.	SA	WA	Tas.	NT	
Direct								
Production	130	110	234	264	411	490	52	1,692
Processing	46	44	16	54	119	44	8	330
(1) <i>Total direct</i>	<i>176</i>	<i>154</i>	<i>250</i>	<i>318</i>	<i>530</i>	<i>534</i>	<i>60</i>	<i>2,022</i>
Indirect (within jurisdiction)								
Production induced	68	87	101	176	245	307	23	1,007
Consumption induced	130	114	128	204	214	308	54	1,152
(2) <i>Total indirect (within jurisdiction)</i>	<i>198</i>	<i>201</i>	<i>229</i>	<i>380</i>	<i>458</i>	<i>615</i>	<i>76</i>	<i>2,159</i>
(1+2) Total (within jurisdiction)	374	355	479	698	989	1,150	136	4,181
Indirect (rest of Australia)								
Production induced	10	39	21	23	191	56	2	342
Consumption induced	18	36	58	123	203	308	20	765
(3) <i>Total indirect (rest of Australia)</i>	<i>28</i>	<i>75</i>	<i>79</i>	<i>146</i>	<i>394</i>	<i>364</i>	<i>22</i>	<i>1,108</i>
(1+2+3) Total (within Australia)	402	430	558	844	1,383	1,513	159	5,289

Source: Section 3 for within jurisdiction contributions and BDO EconSearch analysis.

Table 4-2 Contribution (Employment - fte) by jurisdiction of commercial fishing, aquaculture and associated processing to Australia, 2017/18

Employment (fte)	Jurisdiction							Total State & Territories
	NSW	Vic.	Qld.	SA	WA	Tas.	NT	
Direct								
Production	1,672	920	1,995	2,239	1,932	2,987	417	12,162
Processing	462	548	162	696	969	423	22	3,280
(1) <i>Total direct</i>	<i>2,134</i>	<i>1,467</i>	<i>2,157</i>	<i>2,934</i>	<i>2,900</i>	<i>3,410</i>	<i>440</i>	<i>15,442</i>
Indirect (within jurisdiction)								
Production induced	513	799	900	1,771	1,913	2,988	185	9,069
Consumption induced	883	907	971	1,582	1,468	2,405	316	8,533
(2) <i>Total indirect (within jurisdiction)</i>	<i>1,396</i>	<i>1,706</i>	<i>1,871</i>	<i>3,354</i>	<i>3,381</i>	<i>5,393</i>	<i>501</i>	<i>17,602</i>
(1+2) Total (within jurisdiction)	3,530	3,174	4,027	6,288	6,281	8,803	941	33,044
Indirect (rest of Australia)								
Production induced	64	253	136	150	1,357	381	13	2,354
Consumption induced	129	247	413	951	1,500	2,463	153	5,856
(3) <i>Total indirect (rest of Australia)</i>	<i>193</i>	<i>500</i>	<i>549</i>	<i>1,101</i>	<i>2,857</i>	<i>2,844</i>	<i>166</i>	<i>8,209</i>
(1+2+3) Total (within Australia)	3,723	3,674	4,576	7,389	9,138	11,647	1,107	41,254

Source: Section 3 for within jurisdiction contributions and BDO EconSearch analysis.

Table 4-3 Contribution (Household Income - \$m) by jurisdiction of commercial fishing, aquaculture and associated processing to Australia, 2017/18

Household Income (\$m)	Jurisdiction							Total State & Territories
	NSW	Vic.	Qld.	SA	WA	Tas.	NT	
Direct								
Production	76	52	92	124	106	196	27	673
Processing	25	21	9	27	57	24	2	165
(1) <i>Total direct</i>	<i>101</i>	<i>73</i>	<i>100</i>	<i>151</i>	<i>162</i>	<i>220</i>	<i>30</i>	<i>838</i>
Indirect (within jurisdiction)								
Production induced	56	59	73	123	161	215	20	708
Consumption induced	73	67	69	111	114	161	21	615
(2) <i>Total indirect (within jurisdiction)</i>	<i>129</i>	<i>125</i>	<i>141</i>	<i>234</i>	<i>276</i>	<i>377</i>	<i>41</i>	<i>1,323</i>
(1+2) Total (within jurisdiction)	230	198	242	385	438	597	71	2,161
Indirect (rest of Australia)								
Production induced	6	22	12	14	94	32	1	180
Consumption induced	10	20	34	74	116	189	12	455
(3) <i>Total indirect (rest of Australia)</i>	<i>15</i>	<i>42</i>	<i>46</i>	<i>88</i>	<i>210</i>	<i>221</i>	<i>13</i>	<i>635</i>
(1+2+3) Total (within Australia)	246	241	288	473	648	818	83	2,796

Source: Section 3 for within jurisdiction contributions and BDO EconSearch analysis.

Table 4-4 Contribution (GSP/GDP - \$m) by jurisdiction of commercial fishing, aquaculture and associated processing to Australia, 2017/18

Contribution to GSP/GDP (\$m)	Jurisdiction							Total State & Territories
	NSW	Vic.	Qld.	SA	WA	Tas.	NT	
Direct								
Production	130	110	234	264	411	490	52	1,692
Processing	59	63	23	73	174	61	13	464
(1) <i>Total direct</i>	<i>189</i>	<i>173</i>	<i>256</i>	<i>336</i>	<i>585</i>	<i>551</i>	<i>65</i>	<i>2,156</i>
Indirect (within jurisdiction)								
Production induced	80	91	103	187	248	312	22	1,043
Consumption induced	139	124	135	216	227	323	56	1,220
(2) <i>Total indirect (within jurisdiction)</i>	<i>219</i>	<i>215</i>	<i>238</i>	<i>403</i>	<i>475</i>	<i>636</i>	<i>78</i>	<i>2,263</i>
(1+2) Total (within jurisdiction)	408	388	494	739	1,060	1,187	143	4,419
Indirect (rest of Australia)								
Production induced	10	40	21	24	214	58	2	371
Consumption induced	19	38	61	130	213	325	21	807
(3) <i>Total indirect (rest of Australia)</i>	<i>29</i>	<i>78</i>	<i>83</i>	<i>154</i>	<i>428</i>	<i>383</i>	<i>23</i>	<i>1,179</i>
(1+2+3) Total (within Australia)	437	466	577	893	1,488	1,570	167	5,597

Source: Section 3 for within jurisdiction contributions and BDO EconSearch analysis.

As described earlier, the *national contributions* study presents the results from a first attempt at quantifying the national economic contribution of the Australian seafood industry based on best available data and most appropriate methods within the data available and time/resource constraints of this study. There are a number of limitations and some of the results should be viewed as preliminary with significant opportunity to improve in the future with improved primary data collection.

The main limitation was limited availability of cost of fishing/production data. Complete cost of fishing data were available for the NSW Abalone fishery, SA fisheries, WA Shark Bay Prawn and Crab fisheries, Tasmanian Abalone and Rock Lobster fisheries and major Commonwealth fisheries (Eastern Tuna and Billfish, Northern Prawn, Southern and Eastern Scalefish, Shark, Torres Strait Prawn and Bass Strait Central Zone Scallop). Likewise for aquaculture production, cost of production data were available for the NSW and SA aquaculture sectors¹², the Tasmanian Salmonid sector and for Queensland Prawns in the Bowen-Burdekin Aquaculture Precinct. This meant that for other fisheries and aquaculture sectors cost data were imputed by a 'matched' fishery/aquaculture sector approach. Where cost data were unavailable, there was significant reliance on the SA fisheries and aquaculture sectors data for generating the expenditure profiles and ultimately the economic contribution estimates for the remaining fisheries and aquaculture sectors.

Due to limited data availability, management costs have been restricted to those recovered through licence fees. This may mean that direct GSP/GDP and direct GVA may be underestimated (from excluding some government expenditure) and the flow-ons of these indicators may also be underestimated.

Processors often source seafood inputs from more than one jurisdiction within Australia and from overseas. Ideally, a 'bottom up' approach for generating input data using seafood scorecard data and surveys of processors would produce the best input data. However, these approaches are resource intensive and were beyond the resources of this national study. This project used the next best alternative of a 'top down' approach, using the MRIO model and *ABS National Accounts Input-Output* data to estimate the GVP, cost of production and direct employment for the processing sector in each State/Territory. This top down approach is expected to produce reasonably accurate estimates at the national level, but may be less accurate at the level of the States/Territories.

Table 4-5 and Table 4-6 provide a summary of the value and quantity, respectively, of Australian seafood exports by jurisdiction in 2017/18. By value, Western Australia, with its large export orientated rock lobster industry, accounted for almost 38 per cent of total seafood exports. Tasmania, South Australia and Victoria followed, each with around 16 per cent of the total, while Queensland, the other major contributor, accounted for approximately 12 per cent.

¹² It should be further noted that the SA aquaculture data are not primary data, rather a profile of a typical farm cost structure which is updated and reviewed by industry. The NSW data are primary data, but aggregated across multiple aquaculture sectors.

Table 4-5 Value of Australian seafood exports by jurisdiction and by top contributors to export value^a, 2017/18

Rank	Seafood Category ^b	NSW		Vic.		Qld.		SA		WA		Tas.		NT		Total (\$m)
		(\$m)	(% of Aus)	(\$m)	(% of Aus)	(\$m)	(% of Aus)	(\$m)	(% of Aus)	(\$m)	(% of Aus)	(\$m)	(% of Aus)	(\$m)	(% of Aus)	
1	Rock lobster	2.5	0%	159.1	21%	29.5	4%	57.2	7%	505.7	66%	14.1	2%	0.0	0%	768.1
2	Abalone	3.0	2%	58.7	31%	4.5	2%	34.1	18%	4.4	2%	84.7	45%	0.0	0%	189.3
3	Atlantic & pacific salmon	0.2	0%	1.3	1%	0.0	0%	1.5	1%	0.1	0%	129.0	98%	0.0	0%	132.1
4	Southern bluefin tuna	5.5	5%	0.2	0%	0.9	1%	115.0	95%	0.0	0%	0.0	0%	0.0	0%	121.6
5	Shrimp & prawns	1.0	1%	0.2	0%	51.8	74%	2.0	3%	15.4	22%	0.0	0%	0.0	0%	70.4
6	Toothfish	0.0	0%	0.0	0%	0.0	0%	0.0	0%	8.8	44%	11.3	56%	0.0	0%	20.1
7	Other frozen fish	2.3	13%	0.8	4%	7.3	42%	5.2	30%	1.9	11%	0.0	0%	0.0	0%	17.5
8	Sea cucumbers	0.0	0%	7.9	46%	9.4	54%	0.0	0%	0.0	0%	0.1	0%	0.0	0%	17.4
9	Other fresh fish	0.2	2%	0.0	0%	1.1	7%	12.9	85%	0.7	5%	0.0	0%	0.1	0%	15.1
10	Trout	0.1	1%	0.5	3%	13.1	88%	0.0	0%	0.0	0%	1.2	8%	0.0	0%	14.8
	Other	6.2	7%	8.7	9%	56.5	59%	9.6	10%	13.0	14%	1.5	2%	0.5	1%	96.0
	Total^c	21.1	1%	237.3	16%	174.0	12%	237.5	16%	550.0	38%	241.9	17%	0.6	0%	1,462.3

^a Export values are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^b Ranked by export value. Seafood categories are defined in Appendix 3.

^c Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

Table 4-6 Quantity of Australian seafood exports, by top contributors to export value^a and State and Territory, 2017/18

Rank	Seafood Category ^b	NSW		Vic.		Qld.		SA		WA		Tas.		NT		Total (tonnes)
		(tonnes)	(% of Aus)	(tonnes)	(% of Aus)	(tonnes)	(% of Aus)	(tonnes)	(% of Aus)	(tonnes)	(% of Aus)	(tonnes)	(% of Aus)	(tonnes)	(% of Aus)	
1	Rock lobster	34	0%	1,589	17%	390	4%	605	6%	6,587	71%	136	1%	0	0%	9,341
2	Abalone	56	2%	748	31%	76	3%	411	17%	35	1%	1,095	45%	0	0%	2,420
3	Atlantic & pacific salmon	10	0%	625	5%	1	0%	80	1%	3	0%	11,414	94%	0	0%	12,134
4	Southern bluefin tuna	373	4%	13	0%	127	1%	8,040	94%	0	0%	0	0%	0	0%	8,553
5	Shrimp & prawns	205	5%	13	0%	2,638	69%	88	2%	886	23%	1	0%	0	0%	3,830
6	Toothfish	0	0%	0	0%	0	0%	0	0%	157	34%	308	66%	0	0%	465
7	Other frozen fish	526	14%	191	5%	2,345	64%	290	8%	313	9%	0	0%	0	0%	3,665
8	Sea cucumbers	0	0%	148	54%	128	46%	0	0%	0	0%	1	0%	0	0%	276
9	Other fresh fish	19	2%	6	1%	93	11%	673	76%	93	10%	0	0%	4	0%	890
10	Trout	6	1%	6	1%	329	77%	0	0%	0	0%	86	20%	0	0%	428
	Other ^c	569	10%	672	12%	3,172	58%	491	9%	470	9%	73	1%	14	0%	5,461
	Total^{c,d}	1,798	4%	4,012	8%	9,301	20%	10,678	22%	8,544	18%	13,113	28%	18	0%	47,464

^a Export values are in terms of Free on Board (FOB) values. FOB values exclude the cost of freight and merchandise insurance involved in shipping the goods beyond the place of export up to the customs frontier of the importing country.

^b Ranked by export value. Seafood categories are defined in Appendix 3.

^c Excludes "Ornamental fish", of which export quantity is measured by number of specimens.

^d Totals may not sum due to rounding.

Source: ABS (2019) and BDO EconSearch Analysis

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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.

APPENDIX 1 Terms of Reference for the National Seafood Economic Contribution Study

Goal / Priority	<p>This project aligns with the following HDR Subprogram RD&E goal and priority: Goal 4. Effective engagement to achieve socially-supported fisheries and aquaculture Priority 4.3. Social and economic contributions of fisheries and aquaculture</p>
Need	<p>Discussions between SIA and FRDC have identified the need to gather the information required to support the Australian fisheries and aquaculture industry to “tell its story” of its contributions to the national, state and regional economies and communities. FRDC’s HDR Subprogram will address this need by leading an FRDC-funded National Fisheries and Aquaculture Industry Contributions Project 2017-210 (referred to as the National Seafood Contributions Project, or NSC Project) which will:</p> <ol style="list-style-type: none"> 1. Provide an estimate of the economic contribution of wildcatch fisheries and aquaculture to the Australian (national) economy, and of the economic contribution of jurisdictionally-based (State, Territory and Commonwealth) fisheries and aquaculture make to their State/Territory economies; 2. Provide measures of the range of social and economic contributions made by specific, selected fisheries/aquaculture sectors at the regional or product scale; and 3. Develop a robust and nationally-consistent framework to support data collection and estimation of contributions in the future. <p>This project will address 1. and 3. above by:</p> <ol style="list-style-type: none"> I. Producing evidence of the economic contribution of Australia’s fisheries and aquaculture sectors to the Australian community that is relevant (fit for both intended use and audience), robust, transparent and repeatable. II. Producing national guidelines to support practitioners, managers and industry in estimating economic contributions of selected fisheries and aquaculture activities at various scales. III. Producing a national economic data framework covering data collection, processing and management to support replication and improvement of the current economic evidence study in the future, other economic contribution studies at the regional level or by individual fishery/aquaculture industry, and economic impact assessments. <p>In achieving I. the project will:</p> <ul style="list-style-type: none"> ➤ Include estimates for commercial fishing (Indigenous and non-Indigenous) in each of the jurisdictions (State/Territory and the Commonwealth) and Nationally, and aquaculture production in each jurisdiction and Nationally. Seafood processing (ANZSIC 1120) will be included, based on the ability to identify activity included in this class attributable to the processing of locally caught seafood, rather than imports. Estimates of contributions from processing activity will be reported separately. That part of industry class 0529, Other Agriculture and Fishing Support Services that relate to expenditure by industry on support services will be included. Commercial charter fishing activity and management activity (other than where cost recovered) is not within scope. ➤ Estimates of economic contribution will be reported at the State/Territory and National scales. At minimum therefore, there will be estimates provided of (for example) the contribution of the NT fisheries to the NT economy; Tasmanian aquaculture to Tasmanian economy; and Australian fisheries to the national economy. The following questions regarding scale will be finalised as the project progresses:

	<ul style="list-style-type: none"> ○ Whether the contribution of Commonwealth-managed fisheries will be reported as contribution to individual State/Territory jurisdictions or in aggregate to the national economy, or both; ○ The extent to which cross-jurisdictional contribution leakages (e.g. contribution of NSW aquaculture to Victorian economy) can be identified and reported separately, without unacceptable compromise to the robustness of estimates. <p>➤ Provide estimates of the following indicators of economic contribution for the 2017/18 year and based on the best available data:</p> <ol style="list-style-type: none"> 1. Gross value added (GVA) 2. Employment (FTE) 3. Household income (HI) <p>In addition to the total value of the indicator, the following components will be identified for each contribution: direct, production-induced and consumption-induced components.</p> <p>The following additional indicators of economic activity will also be reported:</p> <ol style="list-style-type: none"> 4. Gross Value of Production(GVP) 5. Gross Domestic Product and Gross State Product (GDP/GSP) 6. Value of Exports <p>➤ Estimates of economic contributions will be derived using the I-O modelling approach and will use the Industrial Ecology Virtual Laboratory (IE Lab) framework.</p> <p>➤ The estimation of economic contributions to be in accordance with the steps described in Working Paper #3, Proposed Data Collection and Management Plan.</p> <p>➤ BDO/EconSearch will consult with the Technical Advisory Group (TAG) regarding the outstanding questions of study design and any proposed changes to study design.</p> <p>➤ BDO/EconSearch will provide feedback to the Project Steering Group (PSG) on any communication products developed based on the outputs of the project to ensure appropriate use/interpretation of contribution estimates.</p> <p>Project outputs will comprise:</p> <ol style="list-style-type: none"> 1. Technical Report including <ol style="list-style-type: none"> a. Statement of purpose of study, and final scale and scope specifications; b. Description of indicators and estimation methods, including any important assumptions; c. Description of data (best available at the time of the study), including documentation of sources, collection protocols and any important assumptions; d. Presentation of results; e. Explanation of results, including interpretation, caveats and limitations; f. Identification of individual fishery and aquaculture sectors for which sufficient data currently exists to generate robust estimates of contribution at the State/Territory scale.
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	<p>A final draft of the Technical Report will be subject to a quality assurance review by an independent, internationally recognised expert to be appointed by the PSG. BDO/EconSearch to address quality assurance review comments and to provide the TAG with a written response to reviewer comments explaining how comments have been addressed.</p> <ol style="list-style-type: none"> 2. National Guidelines for Estimating Economic Contributions in Fisheries and Aquaculture including <ol style="list-style-type: none"> a. A step-by-step guide describing consistent processes and protocols for estimating economic contributions at the national, state and regional levels covering: <ol style="list-style-type: none"> i. The use of terminology and language ii. Steps in the estimation process (based on HDR 9-step process) iii. Data collection and processing iv. Data and modelling assumptions v. Preparation of modelling framework vi. Reporting and interpretation of results 3. National Economic Contributions Data Framework, including <ol style="list-style-type: none"> a. Updated audit of current data availability and quality b. Update of network of data custodians and managers c. Assessment of data gaps and needs to support replication and improvement of the current Economic Evidence study in the future, other economic contribution studies at the regional level or by fishery/aquaculture industry, and economic impact assessments. d. Priorities for addressing data gaps (quality/coverage) e. Suggested roles and responsibilities of data managers and custodians and of framework governance f. Scan of barriers to uptake (including cost, capability and buy-in) g. Recommendations for implementation of data framework, including options for resourcing and training needs.
Planned outcomes	<ul style="list-style-type: none"> • Ability for the seafood sector to 'tell its story' of contribution based on evidence that is relevant, robust, transparent and repeatable. • Enhanced capacity for practitioners, managers and industry to estimate economic contributions at various scales in a consistently relevant, robust, transparent and repeatable manner. • Improved quality and coverage of economic data available for future contribution studies and economic impact studies.

APPENDIX 2 Key Fisheries and Aquaculture Sectors and Database Matching Schedules

Appendix Table 2-1 NSW fisheries and database matching schedule

NSW Fishery	Like Fishery ^a	Comments
Abalone	SA Abalone	Selected based on gear usage (diver hand collection) and target species (Abalone)
Estuary General	SA Lakes and Coorong (Net Only)	Selected based on gear usage, product type and environment (net fishing, multi species and Coorong similarities to estuarine environments)
Estuary Prawn Trawl	SA Spencer Gulf Prawn	Selected based on gear usage and product type (trawl and prawns)
Lobster	SA Rock Lobster Southern Zone	Selected based on gear usage (pots) and target species (Lobster)
Ocean Hauling	SA Marine Scalefish (Net & Line)	Selected based on gear usage and product type (net fishing and multi species)
Ocean Hauling Purse Seine	SA Sardine	Selected based on gear usage and vessel characteristics (net fishing and larger boats)
Ocean Trap & Line	SA Marine Scalefish (Net & Line)	Selected based on gear usage (lines) and product type (marine scalefish)
Ocean Trawl	SA Spencer Gulf Prawn	Selected based on gear usage (trawl)
Sea Urchin & Turban Shell	SA Abalone	Selected based on gear usage (diver hand collection)

^a Cost of fishing data sourced from BDO EconSearch (2019b,c,d,g,i,j)

Source: BDO EconSearch analysis

Appendix Table 2-2 NSW aquaculture and database matching schedule

NSW Aquaculture	Like Sector ^a	Comments
Black Tiger Prawn	NSW Other Aquaculture	Selected based on species produced and State specific data
Yabby	NSW Other Aquaculture	Selected based on species produced and State specific data
Barramundi	NSW Other Aquaculture	Selected based on species produced and State specific data
Golden/ Silver Perch	NSW Other Aquaculture	Selected based on species produced and State specific data
Murray Cod	NSW Other Aquaculture	Selected based on species produced and State specific data
Rainbow Trout	NSW Other Aquaculture	Selected based on species produced and State specific data
Hatchery Species	NSW Other Aquaculture	Selected based on species produced and State specific data
Sydney Rock Oyster	NSW Oyster	Selected based on species produced and State specific data
Other Oyster	NSW Oyster	Selected based on species produced and State specific data
Oyster Spat	NSW Oyster	Selected based on species produced and State specific data

^a Cost of production data sourced from Barclay et al (2016). Other aquaculture represents all non-oyster production in NSW.

Source: BDO EconSearch analysis

Appendix Table 2-3 Victorian fisheries and database matching schedule

Vic. Fishery	Like Fishery ^a	Comments
Abalone	SA Abalone	Selected based on gear usage (diver hand collection) and target species (Abalone)
Net and line	SA Marine Scalefish Fishery (net & line)	Selected based on gear usage and product type (net fishing and multi species)
Eel	SA Abalone Fishery (boat associated costs removed)	Catch method involves setting up traps nearshore. Should have a similar cost structure to other harvesting operations which do not use boats.
Bait	SA Marine Scalefish Fishery (net & line)	Selected based on gear usage and product type (net fishing and multi species)
Other ^b	SA Sardine	Closest selection based on gear usage (purse seine) and product type (sardines) of major contributor to GVP
Inshore Trawl	SA Spencer Gulf Prawn Fishery	Selected based on gear usage (trawl)
Ocean	SA Marine Scalefish Fishery (net & line)	Selected based on gear usage (net fishing)
Sea Urchin & Turban Shell	SA Abalone Fishery	Selected based on gear usage (diver hand collection)
Southern Rock Lobster	SA Rock Lobster Southern Zone	Selected based on gear usage (pots) and target species (Southern Rock Lobster)
Wrasse	SA Marine Scalefish Fishery (line only)	Selected based on gear usage and product type (line fishing and scalefish)

^a Cost of fishing data sourced from BDO EconSearch (2019c,d,g,l,j)

^b Confidential fisheries which include Purse Seine, Giant Crab and Scallop fisheries

Source: BDO EconSearch analysis

Appendix Table 2-4 Victorian aquaculture and database matching schedule

Vic. Aquaculture	Like Sector ^a	Comments
Salmonids	SA Fresh Water Finfish	Selected based on species produced (trout species and Barramundi)
Warm Water Finfish (Inland)	SA Fresh Water Finfish	Selected based on species produced (freshwater finfish, e.g. Murray Cod, Silver Perch)
Abalone	SA Abalone	Selected based on species produced (Abalone)
Blue Mussel & Other Molluscs	SA Mussel	Selected based on species produced (Mussels)

^a Cost of production data sourced from BDO EconSearch (2019l)

Source: BDO EconSearch analysis

Appendix Table 2-5 Queensland fisheries and database matching schedule

Qld. Fishery	Like Fishery ^a	Comments
Blue Swimmer Crab	SA Blue Crab	Selected based on gear usage (pots) and target species (Blue Swimmer Crab).
Coral	Excluded	Excluded as catch and GVP data unavailable. Effort is available but problematic as days fished may be double-counted in other fisheries.
Coral Reef and Deep Water Fin Fish Fisheries	SA Marine Scalefish (Line)	Selected based on gear usage (line fishing) and product type (multi-species).
Tropical Rock Lobster	SA Abalone	Selected based on gear usage (diver hand collection) and type of product (high-value export).
East Coast Inshore	SA Marine Scalefish (Net & Line)	Selected based on gear usage (net and line fishing) and product type (multi-species).
East Coast Trawl	Northern Prawn Fishery	Selected based on gear (trawl nets) and product type (primarily prawns).
Other Commercial Harvest	Excluded	Excluded as data availability is limited.
Spanish Mackerel	SA Marine Scalefish (Line)	Selected based on gear usage (line).
Other Commercial Trawl	Northern Prawn Fishery	Selected based on gear (trawl nets).
Gulf Of Carpentaria Inshore Fin Fish	SA Marine Scalefish (Net & Line)	Selected based on gear usage (line and net) and product type (multi-species).
Gulf of Carpentaria Line	SA Marine Scalefish (Line)	Selected based on gear usage (line) and product type (multi-species).
Marine Aquarium	Excluded	Excluded as catch and GVP are unavailable. Effort is available but problematic as days fished may be double-counted in other fisheries.
Mud Crab	SA Blue Crab	Selected based on gear usage (pot) and target species (Crab).
Eel	SA Abalone Fishery (boat associated costs removed)	Catch method involves setting up traps nearshore. Should have a similar cost structure to other harvesting operations which do not use boats.
Rocky Reef	SA Marine Scalefish (Line)	Selected based on gear usage (line) and product type (multi-species).
Spanner Crab	SA Rock Lobster Southern Zone	Selected based on gear usage (pots in deep water).

^a Cost of fishing data sourced from BDO EconSearch (2019c, f, g, i) for SA fisheries and Mobsby et al. (2019) for the Northern Prawn fishery.

Source: BDO EconSearch analysis

Appendix Table 2-6 Queensland aquaculture and database matching schedule

Qld. Aquaculture	Like Sector	Comments
Golden Perch and Silver Perch	SA Fresh Water Finfish ^a	Selected based on species produced (freshwater finfish)
Mud Crab and Red Claw	SA Yabbies ^a	Selected based on species produced (crustaceans)
Aquarium	SA Fresh Water Finfish ^a	Selected based on species produced (freshwater finfish)
Hatchery (Redclaw, Edible Oysters and Other)	SA Oysters ^a	Closest match from available data. Modelled using oysters due to lack of Redclaw data
Barramundi	SA Fresh Water Finfish ^a	Selected based on species produced (freshwater finfish)
Edible Oysters	SA Oysters ^a	Selected based on species produced (Oysters)
Freshwater Fish (ex golden perch & silver perch)	SA Fresh Water Finfish ^a	Selected based on species produced (freshwater finfish)
Other ^b	NSW Other Aquaculture ^c	Closest match from available data
Prawns (includes hatchery)	QLD Prawns ^d	Same sector i.e. no matching required

^a Cost of production data sourced from BDO EconSearch (2019)

^b Includes marine fish, worms, sea cucumbers, algae and ulva, crustaceans and other bivalves

^c Cost of production data sourced from Barclay et al (2016)

^d Cost of production data sourced from QDPIF (2008)

Source: BDO EconSearch analysis

Appendix Table 2-7 South Australian fisheries and database matching schedule

SA Fishery	Like Fishery ^a	Comments
Abalone		Same fishery, i.e. no matching required
Blue Crab		Same fishery, i.e. no matching required
Lakes and Coorong		Same fishery, i.e. no matching required
Marine Scalefish		Same fishery, i.e. no matching required
Northern Zone Rock Lobster		Same fishery, i.e. no matching required
Southern Zone Rock Lobster		Same fishery, i.e. no matching required
Gulf St Vincent Prawns		Same fishery, i.e. no matching required
Spencer Gulf Prawns		Same fishery, i.e. no matching required
Sardine		Same fishery, i.e. no matching required
Miscellaneous	SA Rock Lobster Southern Zone	Selected based on gear usage (pots)

^a Cost of fishing data sourced from BDO EconSearch (2019a-d,f-j)

Source: BDO EconSearch analysis

Appendix Table 2-8 South Australian aquaculture and database matching schedule

SA Aquaculture	Like Fishery ^a	Comments
Tuna		Same sector i.e. no matching required
Marine Finfish		Same sector i.e. no matching required
Oysters		Same sector i.e. no matching required
Mussels		Same sector i.e. no matching required
Abalone		Same sector i.e. no matching required
Freshwater Finfish		Same sector i.e. no matching required
Marron and Yabbies		Same sector i.e. no matching required
Other ^b		Same sector i.e. no matching required

^a Cost of production data sourced from BDO EconSearch (2019I)

^b Comprised of Algae, Silver Perch, Shortfin Eel and Barcoo Grunter

Source: BDO EconSearch analysis

Appendix Table 2-9 WA fisheries and database matching schedule

WA Aggregated Fishery	Like Fishery	Comments
Abalone	SA Abalone ^a	Selected based on gear usage (diver hand collection) and target species (Abalone)
Trawl	SA Spencer Gulf Prawn ^a	Selected based on gear usage (trawl)
Purse Seine	SA Sardine ^a	Selected based on gear usage and vessel characteristics (net fishing and larger boats)
Prawn	Shark Bay Prawn ^b	Selected based on gear usage (trawl) and product type (prawns); Shark Bay Prawn fishery represents approximately 60% of WA state fisheries prawn catch.
Blue Swimmer Crab	Shark Bay Crab ^b	Selected based on gear usage (pots) and target species (Blue Swimmer Crab); Shark Bay Crab fishery represents approximately 70% of Blue Swimmer Crab catch.
Demersal Net	SA Marine Scalefish (Net & Line) ^a	Selected based on gear usage and product type (net fishing and multi species)
Octopus	SA Rock Lobster Northern Zone ^a	Selected based on gear usage (traps) and target species (SANZRL fishery can fish for octopus)
Demersal Line	SA Marine Scalefish (Line) ^a	Selected based on gear usage and product type (line fishing and multi species)
Mud Crab	SA Blue Crab ^a	Selected based on gear usage (pots) and product type (crab)
Gillnet and Barramundi	SA Lakes and Coorong (Net Only) ^a	Selected based on gear usage and vessel characteristics (net fishing and smaller vessels)
Fresh Water	SA Lakes Coorong (Net Only) ^a	Selected based on environment (SA Lakes and Coorong fishery has some similarities to fresh water environments)
Aquarium	SA Abalone Fishery (boat associated costs removed) ^a	Selected based on catch method (hand collection of specimens)
Mackerel	SA Marine Scalefish (Line) ^a	Selected based on gear usage and product type (line fishing and finfish)
Demersal Trap	SA Rock Lobster Northern Zone ^a	Selected based on gear usage (traps) and product type (SANZRL fishery can fish for marine scalefish)
Shark	SA Marine Scalefish (Net & Line) ^a	Selected based on gear usage (gillnets) and product type (finfish including sharks)

Cont.

Appendix Table 2 9 WA fisheries and database matching schedule (cont.)

WA Aggregated Fishery	Like Fishery	Comments
Pearl Oyster	SA Abalone ^a	Selected based on gear usage (hand collection by divers) and product type (high value shellfish)
Sea Cucumber	SA Abalone Fishery (boat associated costs removed) ^a	Selected based on gear usage (hand collection by divers)
Scallop	SA Spencer Gulf Prawn ^a	Closest selection based on gear usage (demersal otter trawl)
Southern Rock Lobster	SA Rock Lobster Southern Zone ^a	Selected based on gear usage (pots) and product type (lobsters)
Crystal Crab	SA Rock Lobster Southern Zone ^a	Selected based on gear usage (pots in deepwater)
Western Rock Lobster	SA Rock Lobster Southern Zone ^{a,c}	Selected based on gear usage (pots) and target species (Lobster)
Trochus	SA Abalone Fishery (boat associated costs removed) ^a	Closest selection based on gear usage (hand collection)

^a Cost of fishing data sourced from BDO EconSearch (2019b,c,d,f,g,h,i,j)

^b Cost of fishing data sourced from Daley & Putten (2018)

^c Fishing cost estimates (fuel, labour, bait & ice, gear and repairs & maintenance) were adjusted in line with prior Western Rock Lobster study by ACIL Allen Consulting (2017)

Source: BDO EconSearch analysis

Appendix Table 2-10 WA aquaculture and database matching schedule

WA Aquaculture	Like Sector ^a	Comments
Barramundi	SA Fresh Water Finfish	Selected based on species produced (freshwater finfish)
Marron	SA Yabbies	Closest match from available data (freshwater crustaceans)
Mussels	SA Mussels	Selected based on species produced (mussels)
Yabbies	SA Yabbies	Selected based on species produced
Silver Perch	SA Fresh Water Finfish	Selected based on species produced (freshwater finfish)
Goldfish & Koi carp	SA Fresh Water Finfish	Selected based on species produced (freshwater finfish)
Ornamental Invertebrates	SA Oysters	Closest match from available data
Ornamental Fish	SA Marine Finfish	Closest match from available data
Rainbow Trout	SA Fresh Water Finfish	Selected based on species produced (freshwater finfish)
Other Species ^b	SA Marine Finfish	Selected based on species produced
Pearl Oyster	SA Oysters	Selected based on species farmed (oysters)

^a Cost of production data sourced from BDO EconSearch (2019)

^b Species in this category produced in the last ten years include artemia, abalone, black bream, groper, Mahi mahi, live rock, mulloway, Murray cod, pink snapper, prawns, rotifers, western rock oysters and yellowtail kingfish (DPIRD 2019)

Source: BDO EconSearch analysis

Appendix Table 2-11 Tasmanian fisheries and database matching schedule

Tas. Fishery	Like Fishery	Comments
Abalone	Tas Abalone ^a	Same fishery, i.e. no matching required
Commercial Dive	Tas Abalone ^a	Selected based on catch method (diver hand collection)
Giant Crab	SA Blue Crab ^b	Selected based on gear usage (pots) and product type (crab)
Octopus	SA Rock Lobster Northern Zone ^b	Selected based on gear usage (traps) and target species (SANZRL fishery can fish for octopus)
Rock Lobster	SA Rock Lobster Southern Zone ^b	Selected based on gear usage (pots) and target species
Scalefish	SA Marine Scalefish (Net & Line) ^b	Selected based on gear usage and target species (net fishing and scalefish)
Scallop	Excluded	Fishery closed in 2017/18
Shellfish	Tas Abalone ^a	Closest selection based on catch method (hand collection/diver hand collection)

^a Based on a previous study undertaken by EconSearch (2013) updated to reflect costs reported in the 2017 review of Tasmanian abalone dive rates (Knuckey and Sen 2017)

^b Cost of fishing data sourced from BDO EconSearch (2019b,c,f,g,h,i)

Source: BDO EconSearch analysis

Appendix Table 2-12 Tasmanian aquaculture and database matching schedule

Tas. Aquaculture	Like Sector	Comments
Abalone	SA Abalone ^a	Selected based on species produced
Mussels	SA Mussel ^a	Selected based on species produced
Oysters	SA Oysters ^a	Selected based on species produced
Salmonids	Tas Salmonids ^a	Same sector, i.e. no matching required

^a Cost of production data sourced from BDO EconSearch (2019I)

^b Cost of production data sourced from KPMG (2015)

Source: BDO EconSearch analysis

Appendix Table 2-13 NT fisheries and database matching schedule

NT Fishery	Like Fishery	Comments
A1 Coastal Line	SA Marine Scalefish Fishery (line only) ^a	Selected based on gear usage and target species (line fishing and multi species)
A2 Coastal Net	SA Marine Scalefish Fishery (net & line) ^a	Selected based on gear usage and target species (net fishing and multi species)
A4 Spanish Mackerel	Southern & Eastern Scalefish & Shark (Gillnet Hook & Trap Sector) ^b	Selected based on gear (moving baited line) and target species (scalefish)
A5 Offshore Net & Line	SA Marine Scalefish Fishery (net & line) ^a	Selected based on gear usage and target species (net fishing and multi species)
A6 Demersal	Southern & Eastern Scalefish & Shark (Trawl Sector) ^b	Selected based on gear usage (trawl) and target species (scalefish)
A7 Barramundi	SA Marine Scalefish Fishery (net & line) ^a	Selected based on gear usage and target species (net fishing and scalefish target)
A8 Mud Crab	SA Blue Crab ^a	Selected based on gear usage and target species
A12 Aquarium	SA Abalone Fishery (boat associated costs removed) ^a	Diving and collection by hand exhibit similarities with Abalone fishing
A13 Trepang	SA Abalone Fishery (boat associated costs removed) ^a	Collection by hand exhibit similarities with Abalone fishing
A18 Timor Reef	SA Rock Lobster Fishery (Northern Zone) ^a	Selected based on gear usage (lobster traps are similar to fish traps) and scalefish endorsement is included in SA fishery

^a Cost of fishing data sourced from BDO EconSearch (2019c,f,g,h)

^b Cost of fishing data sourced from Bath et al. (2018)

Source: BDO EconSearch analysis

Appendix Table 2-14 NT aquaculture and database matching schedule

NT Aquaculture	Like Sector ^a	Comments
Barramundi	SA Fresh Water Finfish	Selected based on species produced (freshwater finfish)
Pearls Oyster	SA Oyster	Closest match from available data (oysters)
Aquarium	SA Marine Finfish	(marine finfish) Selected based on species produced

^a Cost of production data sourced from BDO EconSearch (2019I)

Source: BDO EconSearch analysis

Appendix Table 2-15 Commonwealth fisheries and database matching schedule

Commonwealth Fishery	Like Fishery ^a	Comments
Bass Strait Central Zone Scallop	Bass Strait Central Zone Scallop ^a	Same fishery, i.e. no matching required
Coral Seas	Southern & Eastern Scalefish & Shark (Gillnet Hook & Trap Sector)	Selected based on gear (8 of 16 fishing permits were for line and trap sectors)
Eastern Tuna & Billfish	Eastern Tuna & Billfish	Same fishery, i.e. no matching required
Heard Island & McDonald Island	Excluded	Primary landing ports are outside of Australia
Macquarie Island Toothfish	Excluded	Negligible catch attributable to jurisdictions within Australia
North West Slope Trawl	Northern Prawn	Selected based on gear usage (bottom trawl) and product type (prawns)
Northern Prawn	Northern Prawn	Same fishery, i.e. no matching required
Small Pelagic	Southern & Eastern Scalefish & Shark (Trawl Sector)	Selected based on gear type (trawl, seine) and target species (scalefish)
Southern Bluefin Tuna - longline	Eastern Tuna & Billfish	Selected based on gear (lines) and target species (tuna)
Southern Bluefin Tuna - purse seine	Southern & Eastern Scalefish & Shark (Gillnet Hook & Trap Sector)	Selected based on gear usage (nets)
Southern & Eastern Scalefish & Shark (Trawl Sector)	Southern & Eastern Scalefish & Shark (Trawl Sector)	Same fishery, i.e. no matching required
Southern & Eastern Scalefish & Shark (Great Australian Bight Trawl Sector)	Southern & Eastern Scalefish & Shark (Trawl Sector)	Selected based on gear usage (trawl) and target species (scalefish)
Southern & Eastern Scalefish & Shark (Gillnet Hook & Trap Sector)	Southern & Eastern Scalefish & Shark (Gillnet Hook & Trap Sector)	Same fishery, i.e. no matching required
Southern Squid Jig	Southern & Eastern Scalefish & Shark (Gillnet Hook & Trap Sector)	Selected based on gear usage (hooks)
South Tasman Rise Trawl	Excluded	Fishery closed in 2017/18

Cont.

Appendix Table 2-16 Commonwealth fisheries and database matching schedule (cont.)

Commonwealth Fishery	Like Fishery ^a	Comments
Torres Strait Finfish	Southern & Eastern Scalefish & Shark (Gillnet Hook & Trap Sector)	Selected based on gear (hooked lines) and target species (scalefish)
Torres Strait Prawn	Torres Strait Prawn	Same fishery, i.e. no matching required
Torres Strait Rock Lobster	SA Abalone	Selected based on gear usage (diver hand collection)
Torres Strait Spanish Mackerel	Southern & Eastern Scalefish & Shark (Gillnet Hook & Trap Sector)	Selected based on gear (moving baited line) and target species (scalefish)
Western Deepwater Trawl	Southern & Eastern Scalefish & Shark (Trawl Sector)	Selected based on gear usage (trawl)
Western Tuna & Billfish	Eastern Tuna & Billfish	Selected based on gear (lines) and similar target species (tuna & billfish)

^a Cost of fishing data sourced from Mobsby and Bath (2018, Eastern Tuna and Billfish), Mobsby et al. 2019, Northern Prawn), Bath et al. 2018, Southern and Eastern Scalefish and Shark), Skirtun et al. 2015, Torres Strait Prawn), George et al. (2012, Bass Strait Central Scallop) and BDO EconSearch (2019c)

Source: BDO EconSearch analysis

APPENDIX 3 Seafood Export Category Definitions

Appendix Table 3-1 Seafood Category and ABS Australian Harmonised Export Commodity Classification (AHECC) correspondence

Seafood Category	AHECC Code	AHECC Labels
Abalone	03078100	Live, fresh or chilled abalone (<i>Haliotis</i> spp.), whether in shell or not
	03078300	Frozen abalone (<i>Haliotis</i> spp.), whether in shell or not
	03078700	Abalone (<i>Haliotis</i> spp.), whether in shell or not, frozen, dried, salted, in brine or smoked, whether or not cooked before or during the smoking process
	16055700	Prepared or preserved abalone (excl. abalone of Chapter 03)
Atlantic & pacific salmon	03021301	Fresh or chilled Pacific salmon (<i>Oncorhynchus nerka</i> , <i>O. gorboscha</i> , <i>O. keta</i> , <i>O. tschawytscha</i> , <i>O. kisutch</i> , <i>O. masou</i> & <i>O. rhodrus</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03021401	Fresh or chilled Atlantic salmon (<i>Salmo salar</i>) and Danube salmon (<i>Hucho hucho</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03031201	Frozen Pacific salmon (<i>Oncorhynchus gorboscha</i> , <i>O. keta</i> , <i>O. tschawytscha</i> , <i>O. kisutch</i> , <i>O. masou</i> & <i>Oncorhynchus rhodurus</i>) (excl. sockeye salmon (red); fillets and other meat of HS 0304 and edible fish offal of HS 03039)
	03031301	Frozen Atlantic salmon (<i>Salmo salar</i>) and Danube salmon (<i>Hucho hucho</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03039)
	03044100	Fresh or chilled fillets of Pacific salmon (<i>Oncorhynchus nerka</i> , <i>O. gorboscha</i> , <i>O. keta</i> , <i>O. tschawytscha</i> , <i>O. kisutch</i> , <i>O. masou</i> and <i>O. rhodurus</i>), Atlantic salmon (<i>Salmo salar</i>) and Danube salmon (<i>Hucho hucho</i>)
	03048100	Frozen fillets of Pacific salmon (<i>Oncorhynchus nerka</i> , <i>gorboscha</i> , <i>keta</i> , <i>tschawytscha</i> , <i>kisutch</i> , <i>masou</i> and <i>rhodurus</i>), Atlantic salmon (<i>Salmo salar</i>) and Danube salmon (<i>Hucho Hucho</i>)
	03054110	Smoked Pacific salmon, Atlantic salmon (<i>Salmo salar</i>) and Danube salmon (<i>Hucho hucho</i>), whether or not cooked before or during the smoking process (incl. fillets) (excl. livers, roes, milt, edible offal and HS 030510)
Atlantic & pacific bluefin tuna	03019404	Live Atlantic and Pacific bluefin tunas (<i>Thunnus thynnus</i> , <i>Thunnus orientalis</i>)
	03023511	Fresh or chilled Atlantic and Pacific bluefin tunas (<i>Thunnus thynnus</i> , <i>Thunnus orientalis</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
Bigeye tuna	03023401	Fresh or chilled bigeye tunas (<i>Thunnus obesus</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03034401	Frozen bigeye tunas (<i>Thunnus obesus</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03039)
Crabs	03061419	Frozen crabs, whether in shell or not, raw, dried, salted, in brine or smoked, or cooked in shell by steaming or boiling in water
	03063300	Live, fresh or chilled crabs, whether in shell or not
	03069300	Dried, salted, in brine, or smoked crabs (excl. frozen, live, fresh or chilled), whether in shell or not
	16051020	Prepared or preserved crab (excl. crab of Chapter 03)
Eels	03019202	Live eels (<i>Anguilla</i> spp.)
Fish livers, roes & milt	03029100	Fresh or chilled fish livers, roes and milt
	03039101	Frozen fish livers, roes and milt
	03052000	Livers roes and milt of fish, dried, smoked, salted or in brine

Seafood Category	AHECC Code	AHECC Labels
Mussels	03073100	Live, fresh or chilled mussels (<i>Mytilus</i> spp., <i>Perna</i> spp.), whether in shell or not
	03073200	Frozen mussels (<i>Mytilus</i> spp., <i>Perna</i> spp.), whether in shell or not
	03073951	Mussels (<i>Mytilus</i> spp., <i>Perna</i> spp.), whether in shell or not, dried, salted, in brine or smoked, whether or not cooked before or during the smoking process
Nile perch & snakeheads	03027901	Fresh or chilled Nile perch (<i>Lates niloticus</i>) and snakeheads (<i>Channa</i> spp.) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03032911	Frozen Nile perch (<i>Lates niloticus</i>) and snakeheads (<i>Channa</i> spp.) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03039)
Ornamental fish	03011100	Live ornamental freshwater fish ^a
	03011901	Live Australian species of ornamental syngnathids (incl. seahorses, seadragons, pipefish and pipehorses) (excl. freshwater species) ^a
	03011902	Live Australian species of ornamental fish (excl. syngnathids such as seahorses, seadragons, pipefish and pipehorses; and freshwater fish) ^a
	03011909	Live ornamental fish (excl. Australian species and freshwater fish) ^a
Other fresh fish	03024900	Fresh or chilled fish of the types listed in HS 03032 (excl. herrings; sardines; mackerel; cobia; swordfish; fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03025901	Fresh or chilled fish of the types listed in HS 03032 (excl. cod; haddock; coalfish; hake; Alaska Pollack; blue whiting; fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03028901	Fresh or chilled fish (excl. fish of HS 03021, 03022, 03023, 03024, 03025, 03027 and 03028; fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03044901	Fresh or chilled fillets of fish (excl. of tilapias, catfish, Nile perch, carp, eels, snakeheads, Pacific & Atlantic & Danube salmon, trout, flat fish, swordfish, toothfish, dogfish & other sharks, rays & skates & fish listed in HS 030444)
Other frozen fish	03036901	Frozen fish of the types listed in HS 03036 (excl. cod; haddock; coalfish; hake; Alaska Pollack; blue whiting; fillets and other meat of HS 0304 and edible fish offal of HS 03039)
	03038951	Frozen fish (excl. fish of HS 03031, 03032, 03033, 03034, 03035, 03036 and 03038; fillets and other meat of HS 0304 and edible fish offal of HS 03039)
	03048901	Frozen fillets of fish (excl. fish of HS 03046 and 03047, Pacific salmon, Atlantic salmon, Danube salmon, trout, flat fish, swordfish, toothfish, herrings, tunas, skipjack or stripe-bellied bonito, dogfish and other sharks, rays and skates)
Other live fish	03019910	Live fish (excl. ornamental fish, trout, eels, carp, Atlantic bluefin tunas, Pacific bluefin tunas and Southern bluefin tunas)
Other molluscs	03079101	Live, fresh or chilled molluscs (excl. oysters, scallops, mussels, cuttlefish, squid, octopus, snails other than sea snails, clams, cockles, ark shells, abalone and stromboid conchs), whether in shell or not
	03079200	Frozen molluscs (excl. oysters, scallops, mussels, cuttlefish, squid, octopus, snails other than sea snails, clams, cockles, ark shells, abalone and stromboid conchs), whether in shell or not
	03079901	Molluscs and flours, meals and pellets of molluscs, fit for human consumption (excl. HS 030711 to 030788 and also excl. frozen, live, fresh or chilled)
	16055901	Prepared or preserved molluscs (excl. oysters, scallops, mussels, cuttle fish, squid, octopus, clams, cockles, arkshells, abalone and snails; and molluscs of Chapter 03)
Other salmonidae	03021902	Fresh or chilled salmonidae (excl. trout; Pacific salmon; Atlantic salmon; Danube salmon; fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03031101	Frozen sockeye salmon (red salmon) (<i>Oncorhynchus nerka</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03039)
	03031911	Frozen salmonidae (excl. Sockeye salmon (red salmon); Pacific salmon; Atlantic salmon; Danube salmon; trout; fillets and other meat of HS 0304 and edible fish offal of HS 03039)
	16041100	Prepared or preserved salmon, whole or in pieces, but not minced (excl. salmon of Chapter 03)

Seafood Category	AHECC Code	AHECC Labels
Other tuna	03023101	Fresh or chilled albacore or longfinned tunas (<i>Thunnus alalunga</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03023906	Fresh or chilled tunas (genus <i>Thunnus</i>) (excl. Atlantic, Pacific and Southern bluefin, albacore or longfinned, yellowfin and bigeye tunas; skipjack or stripe-bellied bonito; fillets and other meat of HS 0304 & edible fish offal of HS 03029)
	03023906	Fresh or chilled tunas (genus <i>Thunnus</i>) (excl. Atlantic, Pacific and Southern bluefin, albacore or longfinned, yellowfin and bigeye tunas; skipjack or stripe-bellied bonito; fillets and other meat of HS 0304 & edible fish offal of HS 03029)
	03034101	Frozen albacore or longfinned tunas (<i>Thunnus alalunga</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03039)
	03034921	Frozen tunas (of the genus <i>Thunnus</i>) (excl. albacore, longfinned, yellowfin and bigeye tunas; Atlantic and Pacific bluefin and Southern bluefin tunas; skipjack or stripe-bellied bonito; fillets and other meat of HS 0304 and edible fish offal of HS 03039)
	03048700	Frozen fillets of tunas (of the genus <i>Thunnus</i>), skipjack or stripe-bellied bonito (<i>Euthynnus (Katsuwonus) pelamis</i>)
Oysters	03071100	Live, fresh or chilled oysters, whether in shell or not
	03071200	Frozen oysters, whether in shell or not
	03071901	Oysters, whether in shell or not, dried, salted, in brine or smoked, whether or not cooked before or during the smoking process
	16055100	Prepared or preserved oysters (excl. oysters of Chapter 03)
Preserved fish	16041200	Prepared or preserved herrings, whole or in pieces, but not minced (excl. herrings of Chapter 03)
	16041300	Prepared or preserved sardines, sardinella and brisling or sprats, whole or in pieces, but not minced (excl. sardines, sardinella and brisling or sprats of Chapter 03)
	16041400	Prepared or preserved tunas, skipjack and bonito (<i>Sarda</i> spp.) whole or in pieces, but not minced (excl. tunas, skipjack and bonito (<i>Sarda</i> spp.) of Chapter 03)
	16041500	Prepared or preserved mackerel, whole or in pieces, but not minced (excl. mackerel of Chapter 03)
	16041600	Prepared or preserved anchovies, whole or in pieces, but not minced (excl. anchovies of Chapter 03)
	16041921	Prepared or preserved fish, whole or in pieces, but not minced (excl. salmon; herrings; sardines, sardinella and brisling or sprats; tunas, skipjack and bonito (<i>Sarda</i> spp.); mackerel; anchovies; shark fins; eels; and fish of Chapter 03)
	16042000	Prepared or preserved fish (incl. minced fish) (excl. whole fish or fish in pieces and goods of Chapter 03)

Seafood Category	AHECC Code	AHECC Labels
Rock lobster	03061131	Frozen whole rock lobster, in shell, cooked by boiling in water
	03061132	Frozen raw whole rock lobster, whether in shell or not
	03061133	Frozen raw rock lobster tails, whether in shell or not
	03061150	Frozen rock lobster, whether in shell or not, raw, dried, salted, in brine or smoked, or cooked in shell by steaming or boiling in water (excl. whole rock lobster, raw or cooked in shell by boiling in water; and raw rock lobster tails)
	03061218	Frozen lobsters (<i>Homarus</i> spp.), whether in shell or not, raw, dried, salted, in brine or smoked, or cooked in shell by steaming or boiling in water (excl. rock lobsters and Norway lobsters (<i>Nephrops norvegicus</i>))
	03063100	Live, fresh or chilled rock lobster and other sea crawfish (<i>Palinurus</i> spp., <i>Panulirus</i> spp., <i>Jasus</i> spp.), whether in shell or not
	03063200	Live, fresh or chilled lobsters (<i>Homarus</i> spp.), whether in shell or not (excl. rock lobsters and Norway lobsters)
	03069100	Dried, salted, in brine, or smoked rock lobster and other sea crawfish (<i>Palinurus</i> spp., <i>Panulirus</i> spp., <i>Jasus</i> spp.) (excl. frozen, live, fresh or chilled), whether in shell or not
Scallops	03072100	Live, fresh or chilled scallops (incl. queen scallops of the genera <i>Pecten</i> , <i>Chamys</i> or <i>Placopecten</i>), whether in shell or not
	03072200	Frozen scallops (incl. queen scallops of the genera <i>Pecten</i> , <i>Chlamys</i> or <i>Placopecten</i>), whether in shell or not
	03072901	Scallops (incl. queen scallops of the genera <i>Pecten</i> , <i>Chlamys</i> or <i>Placopecten</i>), whether in shell or not, dried, salted, in brine or smoked, whether or not cooked before or during the smoking process
	16055200	Prepared or preserved scallops (incl. queen scallops) (excl. scallops of Chapter 03)
Sea cucumbers	03081200	Frozen sea cucumbers (<i>Stichopus japonicus</i> , <i>Holothurioidea</i>)
	03081901	Sea cucumbers (<i>Stichopus japonicus</i> , <i>Holothurioidea</i>), dried, salted, in brine or smoked, whether or not cooked before or during the smoking process
	16056100	Prepared or preserved sea cucumbers (excl. sea cucumbers of Chapter 03)
Shrimp & prawns	03061621	Frozen cold-water shrimps and prawns (<i>Pandalus</i> spp., <i>Crangon crangon</i>), whether in shell or not, raw, dried, salted, in brine or smoked, or cooked in shell by steaming or boiling in water
	03061750	Frozen shrimps and prawns (excl. cold-water shrimps and prawns), whether in shell or not, raw, dried, salted, in brine or smoked, or cooked in shell by steaming or boiling in water
	03063500	Live, fresh or chilled cold-water shrimps and prawns (<i>Pandalus</i> spp., <i>Crangon crangon</i>), whether in shell or not
	03063600	Live, fresh or chilled shrimps and prawns (excl. cold-water shrimps and prawns), whether in shell or not
	03069500	Dried, salted, in brine, or smoked shrimps and prawns (excl. frozen, live, fresh or chilled), whether in shell or not
	16052100	Prepared or preserved shrimps and prawns, not in airtight containers (excl. shrimps and prawns of Chapter 03)
	16052900	Prepared or preserved shrimps and prawns, in airtight containers (excl. shrimps and prawns of Chapter 03)
Southern bluefin tuna	03019507	Live Southern bluefin tunas (<i>Thunnus maccoyii</i>)
	03023601	Fresh or chilled Southern bluefin tunas (<i>Thunnus maccoyii</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03034601	Frozen Southern bluefin tunas (<i>Thunnus maccoyii</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03039)

Seafood Category	AHECC Code	AHECC Labels
Swordfish	03024701	Fresh or chilled swordfish (<i>Xiphias gladius</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03044500	Fresh or chilled fillets of swordfish (<i>Xiphias gladius</i>)
Toothfish	03038301	Frozen toothfish (<i>Dissostichus</i> spp.) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03039)
	03048500	Frozen fillets of toothfish (<i>Dissostichus</i> spp.)
	03049206	Frozen toothfish (<i>Dissostichus</i> spp.) meat, whether or not minced (excl. fillets)
Trout	03019102	Live trout (<i>Salmo trutta</i> , <i>Oncorhynchus mykiss</i> , <i>Oncorhynchus clarki</i> , <i>Oncorhynchus aguabonita</i> , <i>Oncorhynchus gilae</i> , <i>Oncorhynchus apache</i> and <i>Oncorhynchus chrysogaster</i>)
	03021102	Fresh or chilled trout (<i>Salmo trutta</i> , <i>Oncorhynchus mykiss</i> , <i>O. clarki</i> , <i>O. aguabonita</i> , <i>O. gilae</i> , <i>O. apache</i> and <i>O. chrysogaster</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03031401	Frozen trout (<i>Salmo trutta</i> , <i>Oncorhynchus mykiss</i> , <i>Oncorhynchus clarki</i> , <i>Oncorhynchus aguabonita</i> , <i>Oncorhynchus gilae</i> , <i>Oncorhynchus apache</i> and <i>Oncorhynchus chrysogaster</i>) (excl. fillets & other meat of HS 0304 & edible fish offal of HS 03039)
	03054330	Smoked trout (<i>Salmo trutta</i> , <i>Oncorhynchus mykiss</i> , <i>O. clarki</i> , <i>O. aguabonita</i> , <i>O. gilae</i> , <i>O. apache</i> and <i>O. chrysogaster</i>), whether or not cooked before or during smoking process (incl. fillets) (excl. livers, roes, milt, edible offal & HS 030510)
Yellowfin tuna	03023201	Fresh or chilled yellowfin tunas (<i>Thunnus albacares</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03029)
	03034201	Frozen yellowfin tunas (<i>Thunnus albacares</i>) (excl. fillets and other meat of HS 0304 and edible fish offal of HS 03039)

APPENDIX 4 Summary of National Contributions Project Review Working Papers

Discussions between Seafood Industry Australia (SIA) and Fisheries Research and Development Corporation (FRDC) identified the need to gather the information required to support the Australian fisheries and aquaculture industry to “tell its story” of its contributions to the national, State and regional economies and communities. To meet this need the National Contributions Project (NCP), led by FRDC’s Human Dimensions Research (HDR) Subprogram, was established with the initial objective of coordinating a comprehensive technical review of existing contribution studies and data. The aim of the review was to ensure that the NCP avoids duplication by building on previous work and data collection/analysis to also help ensure that best-practice methods are used to estimate contributions, given data requirements and budget.

The review comprised three parts, each addressing a key question for the NCP:

1. What fisheries and aquaculture economic contribution/impact studies have been conducted in the past 10 years in Australia and what elements of this body of work can be used (with or without adjustment) in the National Contributions Project? This was the subject of this Working Paper (WP1).
2. What data are needed to support NCP objective 1 and what data are currently available for use in this project? This was the subject of Working Paper 2 (WP2).
3. What are the implications of 1 and 2 for the design of the National Contributions Project? This was the subject of Working Paper 3 (WP3)

The remainder of this Appendix provides a summary of each of these three working papers.

Working Paper 1: Identification and critical assessment of recent contributions reports

The aim of WP1 (BDO EconSearch 2018a) was to identify and critically assess all the recent contributions/impact reports with a focus on fishing and aquaculture in Australia as well as a selection of key overseas studies. A list of criteria against which each study was assessed was developed by BDO EconSearch in consultation with the HDR and the National Contributions Project Technical Advisory Group. The criteria included:

- geography of the fishery and boundaries of economy affected - the primary focus was on Australian studies. For each study, the relevant State/Territory was recorded as well as any sub-State analysis. The report is structured on a State/Territory basis with a section for each and an additional section for Commonwealth studies where the subject fisheries are managed by the Australian Fisheries Management Authority (AFMA). A selection of international studies has also been included.
- parts of the value chain included - the focus of the report is on primary production, i.e. fishing and aquaculture activity. However, many studies include indicators of economic contribution for other segments of the value chain (processing, transport, retail, food service, etc.) and these have been reported as well.
- timeframe of analysis - latest year for which the results and data are reported.
- number of previous studies - some studies are a continuation of a time series of reports or an update of one or more previous studies. In these cases, the number of previous studies is recorded.

- include flow-on/ multiplier/ indirect effects - some studies report direct contribution results only. However, many of the studies referenced also report indirect or flow-on effects.
- analytical method - for those studies reporting indirect effects, the modelling approach used to estimate those effects is reported (e.g. input-output modelling, computable general equilibrium (CGE) modelling)
- use of survey to collect primary data - some studies are based on secondary data only while others also involve collection of primary data through survey of licence holders/ business operators. The conduct of such primary data collection is recorded.
- indicators used - the indicators of economic contribution, such as jobs, GVP, household income and gross regional product, are reported.
- contributions analysis primary (or secondary) purpose of the study - while the primary focus of some studies is to report details of economic contribution, it is a secondary consideration in other studies. This distinction is reported.

Several reports discussed in WP1 stood out as providing recent and relevant data that could be used directly in a comprehensive national contributions study. These reports present data from 2013 or later on catch, GVP, employment or business cost structures. These reports are briefly summarised below.

ABARES - Australian fisheries and aquaculture statistics 2016 (Mobsby and Koduah 2017)¹³

This report presents catch and GVP data for the key species in the wild catch and aquaculture industries in each State. The reports are part of an annual time series with 25 reports, the most recent data being for the 2015/16 financial year. While results are reported by species in this report, it will provide useable direct data for a national contributions study, particularly for single species fisheries. For multi-species fisheries it may provide usable direct data for some States, but further analysis is likely to be required.

ABARES - Australian fisheries economic indicators reports (Bath et al. 2018, Bath and Green 2016, Bath et al. 2016 and Skirtun et al. 2015)

These five reports were published by ABARES in the last five years, presenting data for years between 2013 and 2017 for four commonwealth fisheries (see Section 2.8). Each report forms part of a time series. These fishery specific reports will provide useful direct data for a national contributions study for each of the four fisheries.

Economic and Social Indicators for the South Australian Commercial Fisheries (EconSearch 2019 a-j)

Each of the ten reports provides a recent and comprehensive assessment of the economic contribution of a fishery to South Australia over time. These reports will provide usable direct employment, expenditure, catch and GVP data for a comprehensive economic contribution assessment. The range of indicators, stages of value chain and inclusion of flow-on effects included in these reports demonstrates a useful and realistic method for a comprehensive assessment.

The Economic Impact of Aquaculture on the South Australian State and Regional Economies (EconSearch 2019I)

This report presents employment, expenditure, production and GVP data for several categories of aquaculture in South Australia over time. It also presents indicators of economic contributions to South

¹³ The 2017 report Mobsby (2018) has subsequently been published and was used in the analysis for this report.

Australia and the relevant regions for each category. The report will provide usable production and GVP data for a national contributions study.

Economic Contribution of the Western Rock Lobster Industry 2017 (ACIL Allen Consulting 2017)

This report presents recent and relevant data for the Western Rock Lobster Fishery, including direct employment, expenditure, catch and GVP. The report also describes the associated downstream supply chain. For these two reasons the report will provide usable data and a relevant framework as part of a national contributions study.

Economic Impact Assessment: Tasmanian Aquaculture Industry (KPMG 2015)

The report presents employment, expenditure, production and GVP data for salmonoid aquaculture in Tasmania in 2013/14. While the production and GVP data may no longer be current, the expenditure and employment data are usable starting points for modelling the cost structure of businesses in the industry as part of a national contributions study.

Review of Tasmanian abalone dive rates (Knuckey & Sen 2017)

While this report isn't primarily focused on economic contribution, it provides expenditure, employment, catch and GVP data for wild catch Abalone businesses in Tasmania. These data provide usable catch data and a starting point for modelling the cost structure of businesses in this industry as part of a national contributions study.

Social and Economic Evaluation of NSW Coastal Aquaculture (Barclay et al. 2016)

The report presents employment, expenditure, production and GVP data for Oyster and 'non-Oyster' businesses. While the production and GVP data may no longer be current, the expenditure and employment data are a usable starting point for modelling the cost structure of businesses in the industry as part of a national contributions study.

The value of inshore commercial fisheries to fishers and consumers in regional communities on Queensland's east coast (Pascoe et al. 2016)

The report presents gross regional product¹⁴ estimates (direct and flow-on) for inshore fisheries in Queensland for 2013/14. While the production, GVP and, therefore, GRP data may no longer be current, the modelling approach used in the analysis to estimate flow-on effects (a form of short cut I-O analysis) is an interesting one and may prove to be a useful approach where alternative estimation methods are not possible.

Working Paper 2: Data needs and data availability for a national contributions study

Working Paper 2 (WP2) identified existing data sets (and data gaps) to support NCP objective 1, the estimation of the economic contribution of wildcatch fisheries and aquaculture to the Australian (national) and State/Territory economies. The process of identifying available data drew on the output of WP1, but also involved direct communication with key data managers/custodians in each of the jurisdictions.

WP2 first considered the general data needs for an economic contributions analysis. The data required for such an analysis is often collected and used for other economic analysis purposes, particularly for the

¹⁴ Referred to as gross value added in the report

development and implementation of harvest strategies. The paper details the range of relevant data sets that can be compiled for such purposes and grouped these data sets as follows:

- financial data
- economic efficiency data
- economic contribution data.

Financial Data

Financial data are data that have a direct bearing on the financial performance of vessels in the fishery or businesses in an aquaculture sector. Financial data are used as input into economic contributions models but can also be used as input into bioeconomic or other models used to estimate maximum economic yield (MEY) in commercial fisheries, for example.

Primarily, the financial data will be those that are relevant to operators of fishing vessels and aquaculture enterprises. For these commercial businesses the principal objective will generally be to maximise returns to their investments. For this reason, the costs and returns to the business are of primary importance.

The main financial data considered here are:

- product prices and income
- operating costs
- business profitability.

Economic Indicators

In addition to ensuring that the exploitation of fisheries and aquaculture resources is conducted in a manner consistent with the principles of ecologically sustainable development, the charter for most agencies responsible for fisheries and aquaculture sector management will generally be concerned with:

- maximising economic efficiency in the exploitation of marine resources
- implementing efficient and cost-effective fisheries and aquaculture sector management.

These broader considerations give rise to a number of indicators additional to the financial data referred to above. These include:

- gross value of production
- cost of management
- economic rent or net economic return (NER).

Economic Contributions

A fishery is a common property resource and, as such, can be thought of as being owned by the broader community, not just the fishers who have access to the resource. The management of a fishery (or an aquaculture sector utilising a marine resource) will be on behalf of this broader community and will generally include a range of social and economic objectives that are wider in scope than the financial and economic indicators described above. Indicators reflecting these broader community objectives might include:

- Employment - direct and indirect

- Provision of services to the fishing industry
- Contribution of the fishery to gross domestic product
- Exports.

Details around the above structure of economic data sets comprised the first half of WP2 (Section 2). The second part of the paper (Section 3) summarises the fisheries and aquaculture data currently available to help prepare a contributions assessment in Australia, as well as identifying the data gaps. This information is presented separately for fisheries and aquaculture sectors in each of the States, the Northern Territory and those fisheries managed by the Commonwealth.

Working paper 3: Recommendations on the preferred research design for the NCP

Working Paper 3 (WP3) provides preliminary recommendations about the preferred research design for NCP objective 1. The recommendations around scope, method, data requirements and data collection plan are summarised below.

Economic Contribution Analysis Defined

Economic contribution and impact analyses are often used to inform public policy and by interested parties with a vested interest who are lobbying for a certain outcome. The result can be multiple models with differing results based on the methodology and the quality of the analysis.

It is recommended that an explicit and consistent terminology be adopted in the preparation of the National Contributions Project and that this standard be adopted in subsequent economic activity studies in the fishing and aquaculture industries. Appendix Table 4-1 provides the definition of some key terms for economic activity analysis.

It is further recommended for the National Contributions Project and subsequent studies that this standard terminology be coupled with a thorough description of methodology and assumptions to reduce the confusion and misuse of economic activity analysis.

Appendix Table 4-1 Definition of selected terms for economic activity analysis

Term	Definition
Economic Activity	Dollars spent within region/State/nation that are attributable to a given industry, event, or policy.
Economic Activity Analysis	An analysis that tracks the flow of dollars spent within a region (market values). Both economic impact and economic contribution analysis are types of economic activity analysis.
Economic Contribution	The gross economic activity associated with an industry, event, or policy in an existing regional/State/national economy.
Economic Impact	The net new economic activity associated with an industry, event, or policy in an existing regional/State/national economy.
Economic Benefit	A net increase in total social welfare. Economic benefits can be both market and nonmarket values.
Cost Benefit Analysis	An economic efficiency analysis that measures net changes or levels in social welfare associated with an industry, event or policy. This type of analysis includes both market and non-market values and accounts for opportunity costs.
Input-Output Model	A specific methodological framework that characterises the financial linkages in a regional/State/national economy between industries, households, and institutions.

Input-Output only measures economic activity and does not include any non-market values.

Source: Based on Watson et al. (2014).

Industry of Analysis

An important consideration for the National Contributions Project is the question of which activities to include in the analysis. Some previous contribution studies have included only the primary activity (fishing and aquaculture) while many have included one or more downstream activities¹⁵.

It is recommended that the National Contributions Project include the wildcatch fisheries and aquaculture activity. Ideally this would include Fisheries and Aquaculture Support Services as separately defined activities in industry Class 0529, Other Agriculture and Fishing Support Services. As a practical approach, those support services that are paid for/funded by industry should be included and will be identified as an indirect contribution in the same way other inputs are included in the estimation of indirect contribution. In jurisdictions that have implemented a policy of cost recovery, this approach will also capture fisheries and aquaculture management activity. Most fisheries economic contribution studies reviewed as part of this project have not explicitly included management activity as part of the economic value of the industry. However, in a recent study of the Alaskan Seafood Industry (McDowell Group 2017) the contribution of commercial fisheries management, together with hatcheries and other support services, is reported separately as part of the direct economic contribution of the seafood industry.

It is also recommended that the National Contributions Project include processing of Australian caught/produced seafood. While this will require some assumptions regarding the attribution of aggregate activity to locally caught/produced seafood, production and import data are available to enable this attribution process. Further, aggregate national industry data are available for industry Class 1120, Seafood Processing, which includes wages and salaries, sales and service income, industry value added and employment¹⁶.

Given the nature of the assumptions and estimation methods that would need to be employed, it is likely that there would be a reduced level of confidence in the estimates of processing sector economic contribution, compared to corresponding estimates for the economic contribution of fishing and aquaculture activities. This would be particularly so at the sub-national level.

It is recommended that consideration be given to the estimation of other downstream activities in the seafood value chain. In particular, these activities would include seafood wholesale, retail and food service activities as well as local transport services at all stages of the marketing chain. The trade-off between confidence in the estimates and the resources required to make these estimates will be a factor in such consideration.

Geography

An important consideration in conducting contribution studies is the size of the study area selected. The size and boundary of the study area will affect the results of an economic contribution or impact analysis in two fundamental ways: by affecting the size of the total contribution relative to the direct contribution,

¹⁵ See Working Paper 1 which details the elements in the value chain post catch/production in each of the cited economic contribution reports.

¹⁶ See ABS (20189b).

i.e. the size of the multiplier, and by affecting the total economic activity associated with the study area, thereby affecting the relative size of the contribution of a given industry.

A systematic, comprehensive sub-State contributions analysis across Australia would seem a poor use of research resources given that commercial fishing and aquaculture in some regions (however defined) in some States would generate very little economic activity. This, together with the concern that the results of a contributions study may be influenced by simply changing the area of analysis, seem good reasons not to prescribe or recommend any sub-State regions for the NCP. There may well be good reasons why funding parties may want to include, as case studies, a contributions study of a particular region, however determining those priorities is outside the scope of this paper.

Given the above discussion, it is recommended that the study areas be limited, in the first instance, to the States, the Northern Territory and Australia as a whole.

It is further recommended that any analysis at a sub-State level be determined by the NCP funding partners together with the Project's Steering Group.

Time for the Analysis

There are two aspects of the time dimension of a contributions analysis that need to be considered: the length of time and the reference dates for the study. From the review of available data, given the possibilities of updating and estimating, and recognising the need for the results to appear as current as possible, it is recommended that 2017/18 be the period for which the analysis is undertaken.

Modelling Framework

It is recommended that the I-O modelling framework be adopted for the National Contributions Project, given the widespread use of the approach for economic contribution analysis, particularly in fishing and aquaculture contribution studies.

However, given the limitations of the model for economic impact analysis, it would be advantageous if the modelling for the National Contributions Project was conducted in a framework that enables relaxation of some of the more restrictive assumptions of the standard input-output model. This would enable the framework to be used for impact analysis at a later date if required.

It is further recommended that the modelling framework used for the National Contributions Project is prepared in a consistent format and with common protocols at national, State and regional levels.

Indicators of Economic Contribution

A number of indicators can be used to describe the direct and flow-on economic contribution of a fishery or aquaculture sector. While some individual economic indicators are directly comparable across sectors (e.g. fulltime equivalent (FTE) employment and value-added by sector), there is no single indicator that provides a meaningful, comprehensive measure upon which to base cross-sectoral comparisons of contribution. A broader, human well-being approach offers the ability to highlight the diverse nature of the contributions made by very different types of activities and reduces the need for comparisons based on a narrow range of traditional indicators.

Nevertheless, it is recommended that those economic indicators that are directly comparable across sectors, particularly GVA and FTE employment, be the primary measures of economic contribution and, at a minimum, be the indicators that are reported in the NCP.

Components of Economic Contribution

Estimates of economic contribution are presented in terms of

- direct contribution
- flow-on (or indirect) contribution
- total contribution.

Direct contribution is the initial round of value added, employment and household income generated by an economic activity.

Flow-on (or indirect) contribution is the sum of production-induced contribution and consumption-induced contribution.

- **Production-induced contribution** is additional value added, employment and household income resulting from re-spending by firms (e.g. transport contractors) that receive payments from the sale of services to firms undertaking, for example, Oyster production.
- **Consumption-induced contribution** is additional value added, employment and household income resulting from re-spending by households that receive income from employment in direct and indirect activities.

Total contributions are the sum of direct and flow-on contributions.

These components of economic contribution are further described in [Appendix Table 4-2](#).

Appendix Table 4-2 Components of economic contribution

Contribution component	Description
Direct (initial) contribution	The stimulus for the economic contribution - normally a measure of sales to final demand
Flow-on (indirect) contribution:	
Production-induced:	
First-round	Refers to the purchases of inputs required from other sectors in the economy in order to produce the output demanded
Industrial-support	Refers to second, third and subsequent-round industrial flow-on contributions triggered by the purchases in the first round
Consumption-induced	Stem from the spending of household income received as payments for labour used in producing the output demanded
Total contribution	Direct contribution + flow-on contribution

It is recommended that, as a minimum, the reporting of the components of economic contribution include the following:

- Direct contribution

- Production-induced contribution
- Consumption-induced contribution
- Total contribution

Proposed Data Collection and Management Plan

The following steps are recommended as the key steps in collecting and managing data for the National Contribution Project.

1. Develop/update the list of key data managers/custodians in each of the jurisdictions.
2. Agree on a list of key fisheries and aquaculture sectors by jurisdiction that will be included in the analysis.
3. Expand contact database (Step 1) to include key industry contacts for each key fishery and key aquaculture sector in each of the jurisdictions.
4. Review existing data and results available in the publications and data sources listed in WP1. Several reports discussed in Section 3 of WP1 stand out as providing recent and relevant data that could be used directly in a comprehensive national contributions project. These reports present data from 2013 or later on catch, GVP, employment or business cost structures and a summary of each is provided in Section 3 of WP1.
5. Review existing fisheries and aquaculture data sources detailed in WP2. Section 2 of WP2 identifies existing data sets that can be used to support the NCP. The paper also identifies data gaps.
6. Develop a database framework on a jurisdictional basis that includes, as a minimum, the following elements for each of the key fisheries and aquaculture sectors:
 - a. Catch/production
 - b. Price
 - c. GVP
 - d. Business costs/operating costs (representative cost structures)
 - e. Management costs
 - f. Data alignment assumptions - data and assumptions that will be used to modify data, particularly cost data, that are not available for the study year. This will include, for example, total days fished, price of fuel, business interest rates, CPI in relevant jurisdiction, wage price index
 - g. Export data
 - h. Employment data
7. Populate the database with best available information.
8. Where there are data gaps estimate using appropriate methods including methods detailed in Section 2.1.3 of WP2 in relation to industry cost data.
9. Validate data, particularly where data gaps have been estimated, with industry representatives in each of the key fisheries and aquaculture sectors.

10. Development/prepare/access set of I-O tables appropriately specified for the agreed spatial definitions for the NCP.
11. Develop industry cost structures from the database for modification/adjustment of the I-O tables prepared under item 10. The following adjustments/assumptions will be required for each item of expenditure
 - a. Proportion imported to the jurisdiction
 - b. Proportion imported to Australia
 - c. Identify any margins (wholesale, retail, transport, insurance, etc.) and allocate appropriately
 - d. Identify any indirect taxes or subsidies and allocate appropriately.
12. Structure the database so that the sum of activity across jurisdictions is consistent with the national data having account of inter-jurisdictional trade and transactions.