

The Economic Impact of  
Aquaculture on the  
South Australian State  
and Regional  
Economies, 2004/05

A report prepared for  
PIRSA Aquaculture

Prepared by



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## Abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
AFMA	Australian Fisheries Management Authority
fte	full-time equivalent
PIRSA	Primary Industries and Resources South Australia
SA	South Australia
SARDI	South Australian Research and Development Institute
GRP	gross regional product
GSP	gross state product

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## Executive Summary

The aim of this study was to estimate the economic impact of aquaculture activity in South Australia in 2004/05. The results reported here update and expand on those provided in previous studies (EconSearch 1997, 1998, 1999, 2001, 2002a, 2003, 2004 and 2006). This report provides estimates of economic impact for 2004/05 by aquaculture sector (tuna, oysters, abalone, mussels, barramundi and yabby/marron farming and other aquaculture enterprises) at the state and regional (Eyre Peninsula, Limestone Coast and balance of South Australia) levels.

The results of this study illustrate clearly the significance of aquaculture in South Australia in terms of business activity, household income and contribution to the state's growth and employment levels.

Some previous studies have only included the first level of processing, marketing or handling of aquaculture production in the overall economic impact (EconSearch 1997, 1998, 1999, 2001 and 2002a). However, for the purpose of this, the previous three (EconSearch 2003, 2004 and 2006) and future analyses, the following stages in the marketing chain are included in the quantifiable economic impact:

- the farm gate value of production;
- the net value of local (SA) processing;
- the net value of local retail and food service trade; and
- the value of local transport services at all stages of the marketing chain.

In addition, other facets of regional economic development associated with the aquaculture industry are qualitatively assessed.

The results of the analysis, at the state level, are summarised in Table E.1. The **direct impact** measures on-farm and aquaculture related downstream activities (fish processing, transport, retail and food services). The **flow-on impact** measures the economic effects in other sectors of the economy (trade, transport, etc) generated by the aquaculture industry, that is, the ripple or multiplier effects.

**Value of output** is a measure of the business turnover or gross revenue of an activity. **Direct output** equates to the **PIRSA Scorecard** estimate of **net food revenue**, estimated to be \$243m (\$188m on-farm and \$55m in downstream activities) in 2004/05 (Table E.1). **Total output** (\$518m) needs to be used with care as it includes elements of double counting. Over 70 per cent of the output impact was generated in regional South Australia (Table E.2).

**Contribution to gross state or regional product (GSP/GRP)** is measured as value of output less the cost of goods and services (including imports) used in producing the output. As such, it provides an estimate of the net contribution of aquaculture to the state's economy. In 2004/05, aquaculture's **total contribution to GSP** (\$259m) (Table E.1) represented 0.43 per cent of the total GSP for South Australia (\$59,819m)<sup>1</sup>. Approximately 75 per cent of the contribution to GSP was generated in regional South Australia (Table E.2). Contribution to GSP/GRP, as a measure of economic impact, avoids the problem of double counting that arises from using output for this purpose.

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<sup>1</sup> ABS (2005).

Table E.1 The economic impact of aquaculture in South Australia, 2004/05

	Tuna	Oysters	Abalone	Mussels	Barramundi	Yabby/ Marron	Other <sup>a</sup>	Total
<b>Output (\$m)</b>								
Direct								
<i>On-farm</i>	140.0	21.2	5.3	0.7	2.3	0.9	17.6	<b>187.8</b>
<i>Downstream</i>	13.6	34.7	0.3	0.8	0.8	0.4	4.3	<b>54.7</b>
Total Direct	153.5	55.8	5.6	1.4	3.0	1.3	21.8	<b>242.5</b>
Total Flow-on	179.7	62.7	10.0	2.5	3.0	0.8	17.0	<b>275.7</b>
<b>Total</b>	<b>333.3</b>	<b>118.5</b>	<b>15.5</b>	<b>4.0</b>	<b>6.0</b>	<b>2.1</b>	<b>38.8</b>	<b>518.2</b>
<b>Contribution to GSP (\$m)</b>								
Direct								
<i>On-farm</i>	57.4	13.6	1.7	0.5	1.3	0.6	7.6	<b>82.6</b>
<i>Downstream</i>	3.7	13.2	0.1	0.3	0.3	0.2	1.6	<b>19.3</b>
Total Direct	61.1	26.8	1.7	0.7	1.6	0.8	9.2	<b>101.9</b>
Total Flow-on	110.8	29.8	4.8	1.2	1.5	0.4	8.3	<b>156.8</b>
<b>Total</b>	<b>171.9</b>	<b>56.6</b>	<b>6.6</b>	<b>2.0</b>	<b>3.1</b>	<b>1.2</b>	<b>17.4</b>	<b>258.7</b>
<b>Employment (fte)</b>								
Direct								
<i>On-farm</i>	593	397	177	51	32	20	271	<b>1,541</b>
<i>Downstream</i>	48	254	1	6	6	3	28	<b>346</b>
Total Direct	641	652	178	57	38	23	299	<b>1,888</b>
Total Flow-on	894	371	77	15	17	5	98	<b>1,478</b>
<b>Total</b>	<b>1,535</b>	<b>1,023</b>	<b>255</b>	<b>72</b>	<b>55</b>	<b>28</b>	<b>397</b>	<b>3,366</b>
<b>Household income (\$m)</b>								
Direct								
<i>On-farm</i>	19.0	9.5	3.5	1.0	1.2	0.1	5.4	<b>39.8</b>
<i>Downstream</i>	2.4	8.7	0.0	0.2	0.2	0.1	1.1	<b>12.7</b>
Total Direct	21.3	18.2	3.6	1.2	1.4	0.2	6.5	<b>52.5</b>
Total Flow-on	48.2	16.8	2.7	0.7	0.8	0.2	4.6	<b>74.0</b>
<b>Total</b>	<b>69.5</b>	<b>35.0</b>	<b>6.3</b>	<b>1.9</b>	<b>2.2</b>	<b>0.4</b>	<b>11.1</b>	<b>126.5</b>

<sup>a</sup> Other aquaculture production is comprised of yellowtail kingfish, rainbow trout, other marine finfish (e.g. mullet) and other aquaculture enterprises (e.g. algae production).

Source: EconSearch analysis.

**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. Direct employment was estimated to be almost 1,900 fte in 2004/05 with almost 1,500 flow-on jobs, giving **total employment** of 3,366 fte (Table E.1). Over 75 per cent of these jobs were generated in regional South Australia (Table E.2).

**Household income** is a measure of wages and salaries, drawings by owner operators and other payments to labour including overtime payments and income tax, but excluding payroll tax. Direct household income was estimated to be around \$53m in 2004/05 and flow-on income approximately \$74m, giving a **total household income** impact of almost \$127m (Table E.1). Approximately 70 per cent of the household income impact was generated in regional South Australia (Table E.2).

In regional areas, the impact of the aquaculture industry in 2004/05 was concentrated in the Eyre Peninsula region, reflecting the dominance of tuna farming in the total (Table E.2).

Table E.2 The total regional economic impact (direct and flow-on) of aquaculture in South Australia, 2004/05

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Eyre Peninsula	336.2	91%	178.7	92%	2,136	84%	77.9	88%
Limestone Coast	3.3	1%	1.8	1%	38	1%	1.3	1%
Balance of SA	28.0	8%	12.8	7%	384	15%	9.1	10%
<b>Total Regional Impact</b>	<b>367.4</b>	<b>100%</b>	<b>193.3</b>	<b>100%</b>	<b>2,557</b>	<b>100%</b>	<b>88.2</b>	<b>100%</b>
<b>Regional Impact as a Proportion of Total</b>	-	<b>71%</b>	-	<b>75%</b>	-	<b>76%</b>	-	<b>70%</b>

Source: EconSearch analysis.



## 1. Introduction

The aim of this study was to estimate the economic impact of aquaculture activity in South Australia in 2004/05. The results reported here update and expand on those provided in previous studies (EconSearch 1997, 1998, 1999, 2001, 2002a, 2003, 2004 and 2006). Estimates of the economic impact of aquaculture activity in South Australia in 2004/05 are provided for the following aquaculture sectors:

- tuna;
- oysters;
- abalone;
- mussels;
- barramundi;
- yabbies/marron; and
- other aquaculture.

The impacts of these sectors are presented at both the regional and state levels. Regional impacts are based on the following disaggregation:

- Eyre Peninsula<sup>2</sup>;
- Limestone Coast; and
- the balance of SA.

The report is structured as follows.

- Section 2: The general approach to the study is outlined.
- Section 3: A summary of aquaculture production in South Australia.
- Sections 4 to 7: The economic impacts of each aquaculture sector are presented at the state and regional levels.
- Section 8: Other facets of regional economic development associated with aquaculture activity in SA are presented.
- Section 9: Summary of the results.

## 2. Study Approach

### 2.1 Method of Analysis

The presence of a large industry or set of enterprises has considerable effects on the character of the local economy in which it is embedded. In the case of an aquaculture development, the enterprise, to support its own activities, makes purchases of spat or fingerlings, feedstuffs, other material inputs, labour, energy and services. Much of the expenditure goes to persons and companies situated in the local region.

The principle of this expenditure dependence is clearly defined. If aquaculture activity were to cease, there would be consequent reductions in the gross revenues of other sectors in the region. Conversely, if aquaculture activity were to increase, there would be increases in the gross revenues of other sectors. The extent of this type of economic impact can be measured through input-output modelling. This study applies input-output analytical procedures to measure the impact of aquaculture development on the South Australian state and regional economies.

Economic impacts at the state and regional levels were based on input-output models prepared for the Regional Communities Consultative Council, Local Government Association of South Australia and Regional Development SA (EconSearch 2005). For a technical description of the input-output modelling procedure refer to Appendix 1 and for a glossary of input-output terminology refer to Appendix 2.

In terms of scope, some previous studies (EconSearch 1997, 1998, 1999, 2001 and 2002a) have only included the first level of processing, marketing or handling of aquaculture production in the overall economic impact. Estimates of the economic impact of aquaculture presented in this report (i.e. for 2004/05) and for the period 2001/02 to 2003/04 (EconSearch 2003, 2004 and 2006) are consistent with the 'message' and method in<sup>3</sup>:

- South Australian Aquaculture Council (2002), *Final Draft State Aquaculture Action Plan*;
- PIRSA's *Food for the Future* value chain analysis 2004/05 (Seafood Scorecard); and
- the overview of PIRSA Aquaculture's strategic direction for South Australian marine and land based aquaculture industries.

To this end, the following stages in the marketing chain have been included in the quantifiable economic impact:

- the farm gate value of production<sup>4</sup>;
- the net value of local (SA) processing;
- the net value of local retail and food service trade; and
- the value of local transport services at all stages of the marketing chain.

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<sup>3</sup> As discussed at the State Aquaculture Plan Working Group meeting at the Hilton Hotel on 19 November 2002.

<sup>4</sup> For tuna this will include the net value of farm gate production and the gross value of tuna fishing.

In addition, other facets of regional economic development associated with the aquaculture industry were qualitatively assessed. The table below illustrates the change in scope of the economic impact assessment.

Table 2.1 Change in scope of the economic impact assessment

Stage in Market Chain	Scope of Impact Analysis In Previous Studies <sup>a</sup>	Scope of Impact Analysis in Recent and Future Studies <sup>b</sup>
Farm gate production	Yes	Yes
Processing	Yes	Yes
Retail	No	Yes
Food Service	No	Yes
Transport between stages	Part	Yes
Other aspects of the economic impact of aquaculture		
Regional investment	Yes (tuna only)	Yes – qualitative only
Tourism	No	Yes – qualitative only
Education and training	No	Yes – qualitative only

<sup>a</sup> For the years 1996/97, 1997/98, 1998/99, 1999/00 and 2000/01 (EconSearch 1997, 1998, 1999, 2001 and 2002a).

<sup>b</sup> For the years 2001/02, 2002/03 and 2004/05 (EconSearch 2003, 2004 and 2006).

As with previous reports, estimates of direct and flow-on economic impact are presented in terms of the following indicators:

- output;
- contribution to gross state or regional product<sup>5</sup>;
- employment; and
- household income.

**(Value of) Output** is a measure of the gross revenue of goods and services produced by commercial organisations (e.g. farm-gate value of tuna production) and gross expenditure by government agencies. Total output 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).

**Contribution to gross state or regional product** (GSP or GRP) is a measure of the net contribution of an activity to the state or regional economy. Contribution to 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 other value added (gross operating surplus and all taxes, less subsidies). It represents payments to the primary inputs of production (labour, capital and land). Using contribution to GRP/GSP as a measure of economic impact avoids

<sup>5</sup> The terminology 'contribution to gross state or regional product' and 'value added' can be used interchangeably. 'Value added' was used in some previous reports (EconSearch 1997 to 2004).

the problem of double counting that may arise from using value of output for this purpose.

**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.

**Household income** is a component of GSP/GRP and is a measure of wages and salaries, drawings by owner operators and other payments to labour including overtime payments and income tax, but excluding payroll tax.

Estimates of economic impact are presented in terms of

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

**Direct impacts** are the initial round of output, employment and household income generated by an economic activity. Estimates of the direct economic impact of aquaculture on the South Australian state and regional economies are consistent with the method employed in PIRSA's *Food for the Future* value-chain analysis, 2004/05, as outlined above<sup>6</sup>.

**Flow-on (or indirect) impacts** are the sum of production-induced effects and consumption-induced effects. Production-induced effects are additional output, 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 effects are additional output, employment and household income resulting from re-spending by households that receive income from employment in direct and indirect activities.

**Total impacts** are the sum of direct and flow-on impacts.

## 2.2 Data

Survey-based value of output estimates for South Australian aquaculture for 2004/05 were prepared by PIRSA Aquaculture and validated by industry representatives before being provided to the consultants for use in this study.

Representative cost structures and other relevant information for enterprises operating in individual sectors of the aquaculture and fishing industries<sup>7</sup> were updated from 2002/03 to 2004/05 using a range of indicators, including data derived from the survey undertaken by PIRSA Aquaculture. These data, included:

- number of employees and unpaid individuals (including owner-operator) - average per enterprise;
- proportion of stock (i.e. spat or fingerlings) sourced from local region, other SA or interstate - average per enterprise; and
- proportion of feed sourced from local region, other SA or interstate - average per enterprise

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<sup>6</sup> Note that direct output equates to the PIRSA Seafood Scorecard estimate of net food revenue.

<sup>7</sup> The original data were obtained from consultation with key industry contacts in 2003 (EconSearch 2003) and from EconSearch (2002b and 2002c).

The representative cost structures were applied to industry value of output estimates to obtain estimates of aggregate expenditures on a regional and state basis.

Estimates of the net value of local (SA and regional) processing margins, the net value of local retail and food service trade margins and the value of local transport margins at all stages of the marketing chain were imputed for each aquaculture sector on the basis of discussions with a range of relevant industry contacts in each sector (EconSearch 2006). For the years 2001/02 and 2002/03, these margins were based on estimates presented in PIRSA's Seafood Scorecard.

### 3. Aquaculture Production in South Australia

Estimates of farm-gate aquaculture production and value of production for South Australia in 2004/05 are summarised in Tables 3.1 to 3.4.

Estimates of tuna catch, tuna farm production and value of production from ABARE, SARDI Aquatic Sciences and PIRSA Aquaculture for the ten-year period, 1995/96 to 2004/05, are provided in Table 3.1.

The farm output values in 1995/96 were significantly affected by the tuna disaster at Port Lincoln in April 1996. Over the period 1996/97 to 2000/01, whole weight of tuna into farms and processed weight out of farms increased at an average rate of 22 per cent per annum while the farm gate value of tuna increased at an average rate of 31 per cent per annum. Between 2000/01 and 2002/03, however, there were only marginal changes in farm output and value.

Although farm output between 2002/03 and 2003/04 increased by 2 per cent, the total farm-gate value of tuna over this period decreased by 43 per cent. The significant decline in the per unit value of farmed tuna (45 per cent) over this period was attributable principally to increased supplies of farmed tuna from Mediterranean countries being sold on the Japanese market and an appreciation of the Australian dollar against the Japanese yen.

Table 3.1 Farmed tuna production, South Australia, 1996/97 to 2004/05

	Into Farms	Farm Output	
	Whole Weight	Processed Weight	Farm Gate Value
	'000kg	'000kg	\$m
1995/96	3,362	1,170	29.3
1996/97	2,498	4,069	91.5
1997/98	3,610	4,927	120.7
1998/99	4,991	6,805	166.7
1999/00	5,133	7,750	240.0
2000/01	5,282	9,051	263.8
2001/02	5,296	9,245	260.5
2002/03	5,409	9,102	266.9
2003/04	5,080	9,290	151.0
2004/05	n.a. <sup>a</sup>	7,458	140.0

<sup>a</sup> Not available until publication of ABARE's *Australian Fisheries Statistics 2005 report* (Stephanie Szakiel, ABARE, pers. comm.).

Source: SARDI Aquatic Sciences, PIRSA Aquaculture and ABARE (2005).

Although there was an increase the per unit value of farmed tuna over the period 2003/04 to 2004/05 (15 per cent), the significant decline in tuna farm output over this period (almost 20 per cent) contributed to the 7 per cent reduction in the total farm-gate value of tuna between 2003/04 and 2004/05.

Estimates of oyster production and value of production from SARDI Aquatic Sciences and PIRSA Aquaculture for the period 1994/95 to 2004/05 are provided in Table 3.2. The gross value of (adult oyster and spat) production has increased at an average rate of 21 per cent per annum over this eleven-year period, although there was only a very small increase over the period 2003/04 to 2004/05.

Estimates of other aquaculture production and value of production from SARDI Aquatic Sciences and PIRSA Aquaculture for the eleven-year period, 1994/95 to 2004/05, are provided in Table 3.3. Both production and value of production increased significantly between 1994/95 and 2004/05, production by an average of 30 per cent per annum and gross value of production by 29 per cent per annum. The significant increase in production and value of production between 2003/04 and 2004/05 is primarily attributable to an increase in marine finfish (principally Yellowtail Kingfish) production.

In aggregate, tuna is the largest single sector in the state's aquaculture industry, accounting for approximately 75 per cent of the state's gross value of aquaculture production in 2004/05 (Table 3.4). The state's total value of seafood production (landed) in 2004/05 was over \$377 million. Of this, tuna farming contributed approximately 37 per cent (Table 3.4).

Table 3.2 Oyster production, South Australia, 1994/95 to 2004/05 <sup>a</sup>

	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Production (adult only):											
Weight ('000 kg)	855	976	1,359	na	na	na	na	na	na	na	na
Number ('000 doz.)	na	na	1,336	1,298	1,441	2,516	2,936	3,464	3,865	4,644	4,650
Value:											
Adult oysters (\$'000)	3,535	3,950	5,205	4,908	5,489	9,389	11,011	13,303	15,116	19,959	19,995
Spat (\$'000)	na	na	610	1,168	997	800	579	856	1,002	1,193	1,195
Total (\$'000)	3,535	3,950	5,815	6,076	6,486	10,189	11,590	14,159	16,118	21,152	21,190

<sup>a</sup> All figures have been rounded to the nearest thousand. Individual figures provided in the columns may not sum to the 'Total' for this reason.

<sup>b</sup> An estimate the value of spat production in 2004/05 was imputed on the basis of the change in adult oyster production between 2003/04 and 2004/05.

Source: SARDI Aquatic Sciences and PIRSA Aquaculture.

Table 3.3 Other aquaculture production, South Australia, 1994/95 to 2004/05 <sup>a</sup>

	1994/95		1995/96		1996/97		1997/98		1998/99		1999/00		2000/01		2001/02		2002/03		2003/04		2004/05	
	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)	Whole Weight ('000kg)	Value (\$'000)
Barramundi	na	na	na	na	138	1,642	193	2,681	249	3,192	279	3,330	264	2,743	255	2,653	471	6,166	216	2,255	217	2,265
Marron	5	99	6	141	5	116	6	131	7	160	12	304	8	196	11	282	22	533	18	480	22	587
Blue Mussels	na	na	na	na	na	na	na	na	84	183	81	173	111	260	171	371	254	466	400	697	377	657
Abalone	na	na	na	na	na	na	na	na	21	856	40	2,000	53	2,677	34	1,901	59	3,080	105	3,155	177	5,318
Yabbies	9	86	17	175	10	111	11	115	27	231	16	156	17	172	8	95	7	93	10	153	20	306
Rainbow Trout	32	188	21	158	25	191	23	118	14	101	8	49	13	176	26	192	18	156	40	330	66	545
Other <sup>b</sup>	296	2,629	323	3,158	280	2,012	379	3,041	412	3,259	337	2,828	480	4,322	334	3,375	1,077	8,769	894	7,533	2,019	17,015
<b>Total</b>	<b>342</b>	<b>3,002</b>	<b>367</b>	<b>3,632</b>	<b>458</b>	<b>4,072</b>	<b>612</b>	<b>6,086</b>	<b>814</b>	<b>7,982</b>	<b>773</b>	<b>8,840</b>	<b>946</b>	<b>10,546</b>	<b>839</b>	<b>8,869</b>	<b>1,908</b>	<b>19,263</b>	<b>1,683</b>	<b>14,603</b>	<b>2,898</b>	<b>26,693</b>

<sup>a</sup> All figures have been rounded to the nearest thousand. Individual figures provided in the columns may not sum to the 'Total' for this reason.

<sup>b</sup> Other aquaculture production is comprised of yellowtail kingfish, Atlantic salmon, rainbow trout, other marine finfish (e.g. mulloway) and other aquaculture enterprises (e.g. algae production).

Source: SARDI Aquatic Sciences and PIRSA Aquaculture.

Table 3.4 Value of aquaculture production and wild fisheries catch, South Australia, 2004/05

	Value of production or catch (\$m)	Contribution to aquaculture production	Contribution to total seafood production or catch
<b>Aquaculture</b>			
Tuna	139.955	74.5%	37.1%
Oysters	21.190	11.3%	5.6%
Barramundi	2.265	1.2%	0.6%
Marron	0.587	0.3%	0.2%
Blue Mussels	0.657	0.3%	0.2%
Abalone	5.318	2.8%	1.4%
Yabbies	0.306	0.2%	0.1%
Rainbow Trout	0.545	0.3%	0.1%
Other	17.015	9.1%	4.5%
<b>Total Aquaculture</b>	<b>187.838</b>	<b>100.0%</b>	<b>49.8%</b>
<b>Wild Catch Fisheries <sup>a</sup></b>			
Rock Lobster	66.040	-	17.5%
Abalone	33.821	-	9.0%
Prawns	35.804	-	9.5%
Pilchards	28.476	-	7.5%
Other Marine Fisheries	21.704	-	5.8%
Inland Water Fisheries	3.703	-	1.0%
<b>Total Wild Catch</b>	<b>189.548</b>	-	<b>50.2%</b>
<b>Total Seafood</b>	<b>377.386</b>	-	<b>100.0%</b>

<sup>a</sup> Excludes catch from the Commonwealth managed fisheries.

Source: SARDI Aquatic Sciences and PIRSA Aquaculture.

## 4. The Economic Impact of Aquaculture in South Australia, 2004/05

Estimates of the direct economic impact of aquaculture production, aquaculture processing, the transport of aquaculture products and the sale of aquaculture products to the retail and food service sectors in South Australia in 2004/05 are provided in this section of the report. Complementary estimates of the flow-on effects generated by these activities through the purchase of materials, services and labour are also provided.

### 4.1 The Economic Impact of Tuna Farming in South Australia, 2004/05

Estimates of the economic impact generated by the tuna farming industry in SA on a sector-by-sector basis for 2004/05 are provided in Table 4.1 and Figures 4.1 to 4.4. Impacts are measured in terms of value of output, contribution to gross state product (GSP), employment and household income.

Table 4.1 The economic impact of tuna farming in South Australia, 2004/05

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Tuna farming <sup>a</sup>	140.0	42%	57.4	33%	593	39%	19.0	27%
Processing	11.5	3%	2.7	2%	38	2%	1.7	2%
Transport	2.0	1%	1.0	1%	10	1%	0.7	1%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.0	0%	0.0	0%	0	0%	0.0	0%
<b>Total Direct</b>	<b>153.5</b>	<b>46%</b>	<b>61.1</b>	<b>36%</b>	<b>641</b>	<b>42%</b>	<b>21.3</b>	<b>31%</b>
Flow-on effects								
Tuna fishing	43.8	13%	37.1	22%	232	15%	7.9	11%
Property and business serv.	24.0	7%	14.2	8%	79	5%	4.6	7%
Manufacturing	21.7	7%	5.1	3%	72	5%	3.2	5%
Trade	16.8	5%	7.7	4%	175	11%	6.1	9%
Pilchards	27.1	8%	21.0	12%	49	3%	11.5	16%
Transport	6.4	2%	3.1	2%	31	2%	2.1	3%
Finance	8.5	3%	5.5	3%	36	2%	2.0	3%
Other Sectors	31.4	9%	17.1	10%	219	14%	10.8	16%
<b>Total Flow-on</b>	<b>179.7</b>	<b>54%</b>	<b>110.8</b>	<b>64%</b>	<b>894</b>	<b>58%</b>	<b>48.2</b>	<b>69%</b>
<b>Total</b>	<b>333.3</b>	<b>100%</b>	<b>171.9</b>	<b>100%</b>	<b>1,535</b>	<b>100%</b>	<b>69.5</b>	<b>100%</b>
Total/Direct	2.17		2.81		2.39		3.26	

<sup>a</sup> Note the double counting in the output impact which also includes the value of tuna fishing.

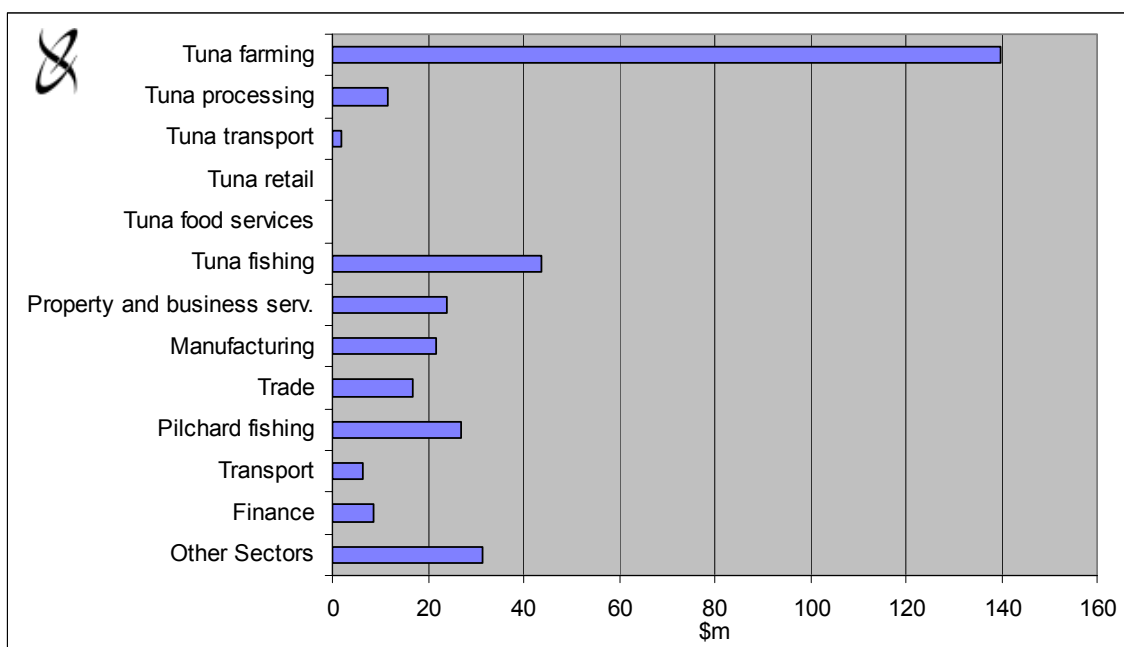
Source: EconSearch analysis.

**Output impacts...**

There are substantial economic impacts from the tuna farming industry in South Australia. Direct output (business turnover) generated in South Australia by tuna farms summed to \$140 million and in other sectors (processing and transport), almost \$14 million in 2004/05. Flow-on output in other sectors of the state economy summed to almost \$180 million (Table 4.1). The sectors most affected were the tuna fishing (tuna capture<sup>8</sup>), pilchard fishing, manufacturing, trade, business and property services, transport and finance sectors (Figure 4.1).

The bottom row of Table 4.1 gives the total impact/direct impact ratio for each economic indicator. For output, the ratio of 2.17 indicates that for each dollar of sales generated by the tuna industry (farming and downstream) there was a total of \$2.17 of in output generated by businesses throughout the state, \$1.00 in the tuna industry (farming and downstream) and \$1.17 in other sectors of the economy.

Figure 4.1 Tuna farming in South Australia, output impacts by sector, 2004/05



Source: EconSearch analysis.

**Contribution to gross state product...**

Contribution to gross state product (GSP) is calculated as the value of output less the cost of goods and services used in producing the output. GSP provides an assessment of the net contribution to state economic growth of a particular enterprise or activity<sup>9</sup>.

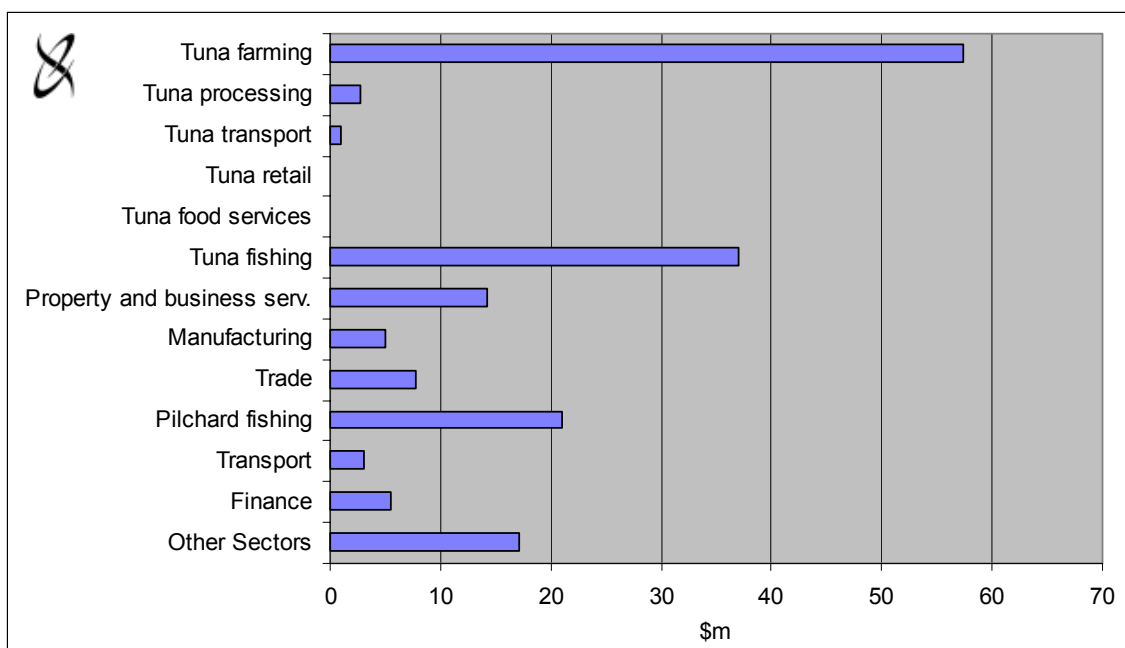
<sup>8</sup> Note that the value of tuna fishing is also included in the direct impact of tuna farming.

<sup>9</sup> The use of 'contribution to GSP' (or GRP) as a measure of economic impact overcomes the problem of double counting that arises from using 'value of output' for this purpose.

The direct contribution to GSP by the tuna industry (i.e. farming, processing and transport) was approximately \$61 million in 2004/05. Associated with this was flow-on GSP in the other sectors of the state economy of \$111 million (Table 4.1).

The flow-ons were greatest in the tuna fishing (\$37m), pilchard fishing (\$21 million), property and business services (\$14m), manufacturing (\$5m), trade (\$8m) and finance (\$6m) sectors (Figure 4.2). The bottom row in Table 4.1 shows that for each one dollar contribution to GSP by the tuna industry there was an additional \$1.81 (\$2.81 total) contribution to GSP in other sectors of the state economy.

Figure 4.2 Tuna farming in South Australia, contribution to GSP by sector, 2004/05



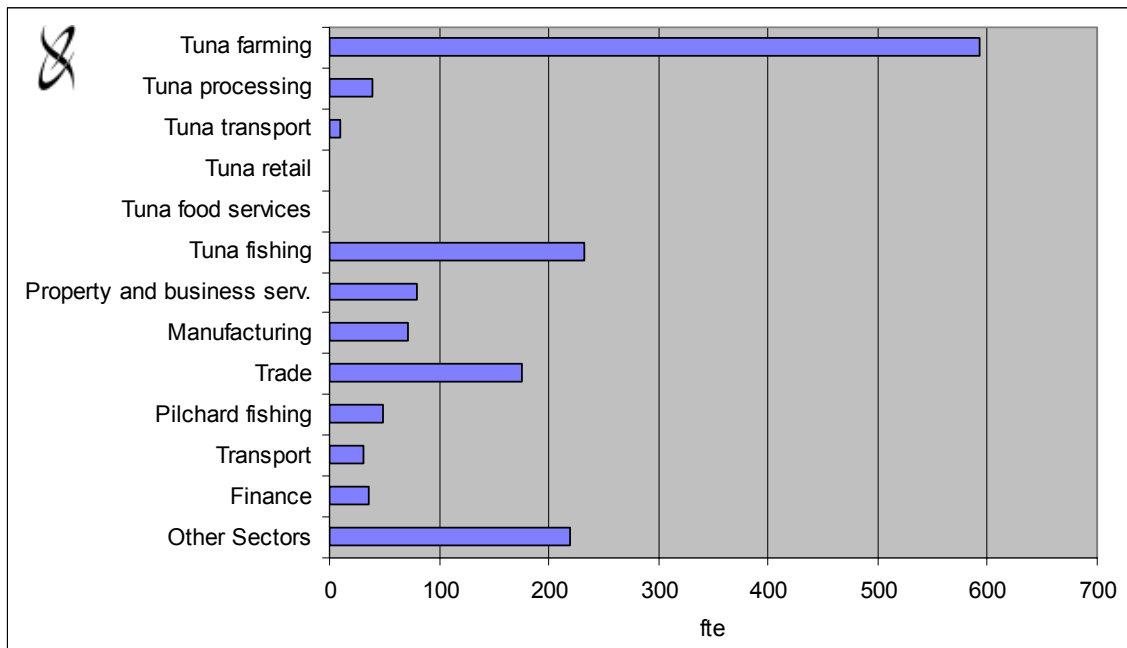
Source: EconSearch analysis.

**Employment and household income...**

A significant number of jobs were created as a result of the flow-on business activity associated with tuna farming, processing and transport. The tuna farms were responsible for the direct employment of approximately 590 full-time equivalents (fte) and, through associated processing and transport activities, another 48 fte in 2004/05 (Table 4.1). Flow-on business activity was estimated to generate a further 894 fte to give total employment of approximately 1,535 fte in the state. The sectors of the economy with employment flow-ons from tuna farming, processing and transport include the tuna fishing (232 fte), trade (175), manufacturing (72), property and business services (79), pilchard fishing (49) and transport (31) sectors (Figure 4.3).

The bottom row in Table 4.1 shows that for each fte job generated directly in tuna farming, processing and transport there were an additional 1.39 jobs (2.39 jobs total) in the rest of the state.

Figure 4.3 Tuna farming in South Australia, employment impacts by sector, 2004/05

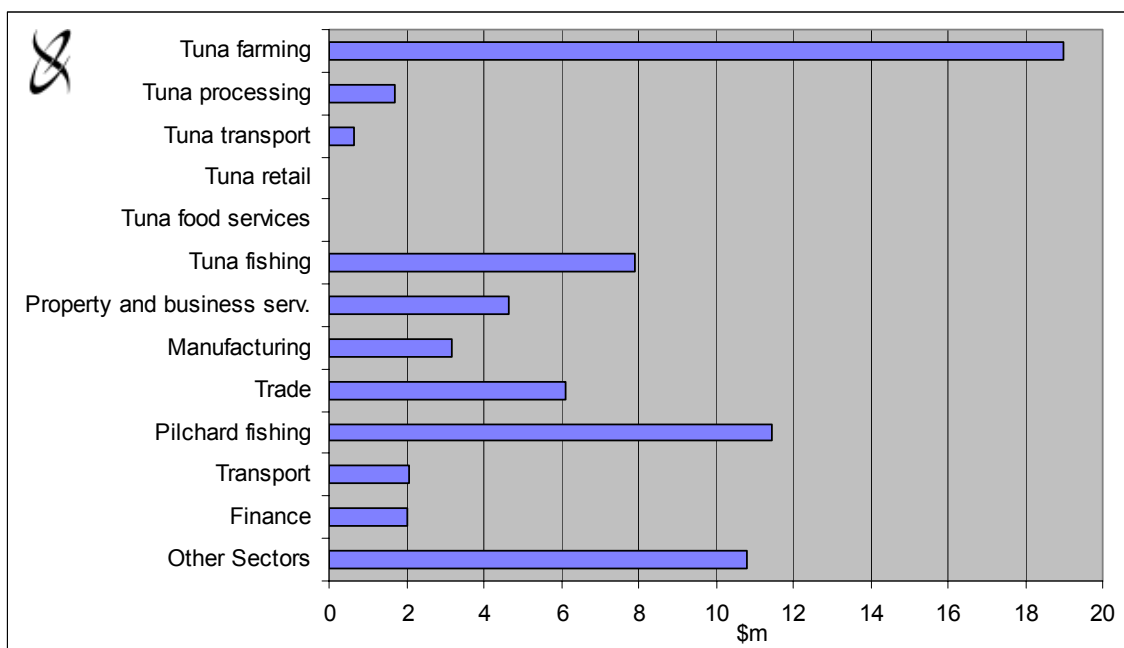


Source: EconSearch analysis.

It was estimated that personal income of approximately \$19 million was earned in the tuna farming sector in 2004/05, comprising both wages by employees and drawings by owner/operators. An additional \$7.9 million was earned by licence holders and crew in the tuna fishing sector and a further \$43 million by wage and salary earners in all other sectors of the state economy (Figure 4.4).

For each \$1.00 of household income generated directly by tuna farming, processing and transport in 2004/05 there was an additional \$2.26 (\$3.26 total) generated in other sectors of the state economy (Table 4.1).

Figure 4.4 Tuna farming in South Australia, household income impacts by sector, 2004/05



Source: EconSearch analysis.

## 4.2 The Economic Impact of Oyster Farming in South Australia, 2004/05

Table 4.2 provides estimates of the economic impact generated by oyster farming in South Australia on a sector-by-sector basis in 2004/05. As for tuna in the previous section, impacts are measured in terms of output (business turnover), contribution to GSP, employment and household income.

### **Output impacts...**

Direct output (business turnover) generated in SA by oyster farming enterprises summed to over \$21 million in 2004/05 while output generated in SA by associated downstream activities (processing, transport, retail and food service) summed to almost \$35 million. Flow-ons to other sectors of the state economy added another \$63 million in output in 2004/05. The sectors most affected were the trade, manufacturing and property and business services sectors.

### **Contribution to gross state product...**

As noted above, contribution to GSP is calculated as the value of output less the cost of goods and services used in producing the output. In 2004/05, total oyster farming-related contribution to GSP in South Australia was almost \$57 million, \$14 million generated by oyster farming directly, \$13 million generated directly by downstream activities and \$30 million generated in other sectors of the state economy.

Table 4.2 The economic impact of oyster farming in South Australia, 2004/05 <sup>a</sup>

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
<b>Direct effects</b>								
Oyster farming <sup>b</sup>	21.2	18%	13.6	24%	397	39%	9.5	27%
Processing	5.8	5%	1.4	2%	19	2%	0.9	2%
Transport	5.5	5%	2.6	5%	27	3%	1.8	5%
Retail	0.7	1%	0.3	1%	7	1%	0.3	1%
Food services	22.7	19%	8.9	16%	201	20%	5.8	17%
<b>Total Direct</b>	<b>55.8</b>	<b>47%</b>	<b>26.8</b>	<b>47%</b>	<b>652</b>	<b>64%</b>	<b>18.2</b>	<b>52%</b>
<b>Flow-on effects</b>								
Property and business serv	14.5	12%	8.3	15%	55	5%	3.2	9%
Manufacturing	13.1	11%	3.1	5%	44	4%	1.9	5%
Trade	9.4	8%	4.3	8%	98	10%	3.4	10%
Transport	2.8	2%	1.4	2%	14	1%	0.9	3%
Finance	4.1	3%	2.7	5%	18	2%	1.0	3%
Other Sectors	18.6	16%	10.0	18%	143	14%	6.4	18%
<b>Total Flow-on</b>	<b>62.7</b>	<b>53%</b>	<b>29.8</b>	<b>53%</b>	<b>371</b>	<b>36%</b>	<b>16.8</b>	<b>48%</b>
<b>Total Impact</b>	<b>118.5</b>	<b>100%</b>	<b>56.6</b>	<b>100%</b>	<b>1,023</b>	<b>100%</b>	<b>35.0</b>	<b>100%</b>
Total/Direct	3.57		3.16		2.27		2.82	

<sup>a</sup> Constitutes an upper estimate of the flow-on effects given the likelihood of some double counting of consumption induced effects in the retail and food services margins.

<sup>b</sup> Includes sales of spat.

Source: EconSearch analysis.

### ***Employment and household income...***

In 2004/05, SA oyster farming was responsible for the direct employment of around 400 fte and downstream activities created employment for around 250 fte. Flow-on business activity was estimated to generate a further 371 fte. These jobs were concentrated in the trade (98), manufacturing (44) and property and business services (55) sectors.

Personal income of approximately \$10 million was earned in the oyster farming sector and another \$8.7 million in downstream activities. This comprised both wages by employees and estimated drawings by owner/operators. An additional \$16.8 million of household income was earned in other businesses in the state as a result of oyster farming and downstream activities. The total household income impact was approximately \$35 million.

### 4.3 The Economic Impact of Other Aquaculture in South Australia, 2004/05

The economic impacts of other aquaculture sectors in South Australia in 2004/05 (abalone, mussels, barramundi, marron/yabbies and other aquaculture) are reported in Tables to 4.3 to 4.7, respectively.

These results are reported without comment, as the interpretation is identical to that for oysters and tuna farming described in the previous sections.

For most of the other aquaculture sectors, the impacts in terms of flow-on employment and household income are relatively low. As these sectors grow and sales increase, household income and flow-on employment impacts generated by recurrent expenditure are expected to increase as well. The flow-on effects constitute an upper estimate given the likelihood of some double counting of consumption-induced effects in the retail and food services margins.

Table 4.3 The economic impact of abalone farming in South Australia, 2004/05

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
<b>Direct effects</b>								
Abalone farming	5.3	34%	1.7	25%	177	69%	3.5	56%
Processing	0.2	1%	0.1	1%	1	0%	0.0	1%
Transport	0.0	0%	0.0	0%	0	0%	0.0	0%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.0	0%	0.0	0%	0	0%	0.0	0%
<b>Total Direct</b>	<b>5.6</b>	<b>36%</b>	<b>1.7</b>	<b>26%</b>	<b>178</b>	<b>70%</b>	<b>3.6</b>	<b>57%</b>
<b>Flow-on effects</b>								
Property and business serv	1.9	12%	1.1	17%	5	2%	0.3	5%
Manufacturing	1.3	8%	0.3	5%	4	2%	0.2	3%
Trade	1.3	8%	0.6	9%	14	5%	0.5	7%
Transport	0.3	2%	0.1	2%	1	1%	0.1	2%
Finance	0.6	4%	0.4	6%	2	1%	0.1	2%
Other Sectors	4.6	30%	2.3	35%	50	20%	1.5	24%
<b>Total Flow-on</b>	<b>10.0</b>	<b>64%</b>	<b>4.8</b>	<b>74%</b>	<b>77</b>	<b>30%</b>	<b>2.7</b>	<b>43%</b>
<b>Total</b>	<b>15.5</b>	<b>100%</b>	<b>6.6</b>	<b>100%</b>	<b>255</b>	<b>100%</b>	<b>6.3</b>	<b>100%</b>
Total/Direct	2.79		3.82		1.44		1.77	

Source: EconSearch analysis.

Table 4.4 The economic impact of mussel farming in South Australia, 2004/05

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
<b>Direct effects</b>								
Mussel farming	0.7	17%	0.5	23%	51	71%	1.0	54%
Processing	0.2	5%	0.0	2%	1	1%	0.0	2%
Transport	0.1	3%	0.1	3%	1	1%	0.0	2%
Retail	0.1	2%	0.0	2%	1	1%	0.0	2%
Food services	0.4	9%	0.1	7%	3	5%	0.1	5%
<b>Total Direct</b>	<b>1.4</b>	<b>36%</b>	<b>0.7</b>	<b>37%</b>	<b>57</b>	<b>79%</b>	<b>1.2</b>	<b>64%</b>
<b>Flow-on effects</b>								
Property and business serv	0.6	15%	0.4	18%	2	2%	0.1	5%
Manufacturing	0.5	12%	0.1	6%	2	2%	0.1	4%
Trade	0.4	10%	0.2	9%	4	6%	0.1	7%
Transport	0.1	3%	0.1	3%	1	1%	0.0	2%
Finance	0.2	5%	0.1	6%	1	1%	0.0	2%
Other Sectors	0.8	20%	0.4	21%	6	9%	0.3	15%
<b>Total Flow-on</b>	<b>2.5</b>	<b>64%</b>	<b>1.2</b>	<b>63%</b>	<b>15</b>	<b>21%</b>	<b>0.7</b>	<b>36%</b>
<b>Total</b>	<b>4.0</b>	<b>100%</b>	<b>2.0</b>	<b>100%</b>	<b>72</b>	<b>100%</b>	<b>1.9</b>	<b>100%</b>
Total/Direct	2.76		2.67		1.27		1.55	

Source: EconSearch analysis.

Table 4.5 The economic impact of barramundi farming in South Australia, 2004/05

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
<b>Direct effects</b>								
Barramundi farming	2.3	38%	1.3	42%	32	59%	1.2	54%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
Transport	0.3	5%	0.1	5%	1	3%	0.1	4%
Retail	0.1	1%	0.0	1%	1	1%	0.0	1%
Food services	0.4	7%	0.2	5%	3	6%	0.1	4%
<b>Total Direct</b>	<b>3.0</b>	<b>50%</b>	<b>1.6</b>	<b>52%</b>	<b>38</b>	<b>69%</b>	<b>1.4</b>	<b>64%</b>
<b>Flow-on effects</b>								
Property and business serv	0.7	12%	0.4	14%	2	4%	0.1	6%
Manufacturing	0.5	9%	0.1	4%	2	3%	0.1	4%
Trade	0.5	9%	0.2	8%	5	10%	0.2	9%
Transport	0.1	2%	0.1	2%	1	1%	0.0	2%
Finance	0.2	4%	0.1	5%	1	2%	0.1	2%
Other Sectors	0.8	14%	0.5	15%	6	11%	0.3	14%
<b>Total Flow-on</b>	<b>3.0</b>	<b>50%</b>	<b>1.5</b>	<b>48%</b>	<b>17</b>	<b>31%</b>	<b>0.8</b>	<b>36%</b>
<b>Total</b>	<b>6.0</b>	<b>100%</b>	<b>3.1</b>	<b>100%</b>	<b>55</b>	<b>100%</b>	<b>2.2</b>	<b>100%</b>
Total/Direct	1.98		1.92		1.45		1.55	

Source: EconSearch analysis.

Table 4.6 The economic impact of yabby/marron farming in South Australia, 2004/05

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
<b>Direct effects</b>								
Yabby/marron farming	0.9	42%	0.6	52%	20	71%	0.1	25%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
Transport	0.1	3%	0.0	2%	0	1%	0.0	4%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.4	17%	0.1	12%	3	11%	0.1	20%
<b>Total Direct</b>	<b>1.3</b>	<b>61%</b>	<b>0.8</b>	<b>66%</b>	<b>23</b>	<b>83%</b>	<b>0.2</b>	<b>50%</b>
<b>Flow-on effects</b>								
Property and business serv	0.2	9%	0.1	9%	1	3%	0.0	10%
Manufacturing	0.2	8%	0.0	3%	1	2%	0.0	6%
Trade	0.1	7%	0.1	5%	1	5%	0.1	11%
Transport	0.0	2%	0.0	1%	0	1%	0.0	3%
Finance	0.1	3%	0.0	3%	0	1%	0.0	3%
Other Sectors	0.2	11%	0.1	11%	2	6%	0.1	18%
<b>Total Flow-on</b>	<b>0.8</b>	<b>39%</b>	<b>0.4</b>	<b>34%</b>	<b>5</b>	<b>17%</b>	<b>0.2</b>	<b>50%</b>
<b>Total</b>	<b>2.1</b>	<b>100%</b>	<b>1.2</b>	<b>100%</b>	<b>28</b>	<b>100%</b>	<b>0.4</b>	<b>100%</b>
Total/Direct	1.64		1.51		1.20		2.02	

Source: EconSearch analysis.

Table 4.7 The economic impact of other aquaculture in South Australia, 2004/05 <sup>a</sup>

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
<b>Direct effects</b>								
Other aquaculture	17.6	45%	7.6	43%	271	68%	5.4	49%
Processing	1.1	3%	0.2	1%	3	1%	0.2	1%
Transport	1.1	3%	0.5	3%	5	1%	0.4	3%
Retail	0.3	1%	0.1	1%	3	1%	0.1	1%
Food services	1.9	5%	0.7	4%	17	4%	0.5	4%
<b>Total Direct</b>	<b>21.8</b>	<b>56%</b>	<b>9.2</b>	<b>53%</b>	<b>299</b>	<b>75%</b>	<b>6.5</b>	<b>59%</b>
<b>Flow-on effects</b>								
Property and business serv	3.8	10%	2.2	13%	12	3%	0.7	6%
Manufacturing	3.2	8%	0.7	4%	11	3%	0.5	4%
Trade	3.1	8%	1.4	8%	32	8%	1.1	10%
Transport	0.7	2%	0.3	2%	3	1%	0.2	2%
Finance	1.2	3%	0.8	5%	5	1%	0.3	3%
Other Sectors	5.0	13%	2.7	16%	35	9%	1.8	16%
<b>Total Flow-on</b>	<b>17.0</b>	<b>44%</b>	<b>8.3</b>	<b>47%</b>	<b>98</b>	<b>25%</b>	<b>4.6</b>	<b>41%</b>
<b>Total</b>	<b>38.8</b>	<b>100%</b>	<b>17.4</b>	<b>100%</b>	<b>397</b>	<b>100%</b>	<b>11.1</b>	<b>100%</b>
Total/Direct	1.78		1.90		1.33		1.70	

<sup>a</sup> Other aquaculture production is comprised of yellowtail kingfish, rainbow trout, other marine finfish (e.g. mulloway) and other aquaculture enterprises (e.g. algae production).

Source: EconSearch analysis.

## 5. The Economic Impact of Aquaculture in the Eyre Peninsula Region, 2004/05

### 5.1 The Economic Impact of Tuna Farming in the Eyre Peninsula Region, 2004/05

Estimates of the economic impact of tuna farming in the Eyre Peninsula region<sup>10</sup> of South Australia in 2004/05 are reported in Table 5.1. The interpretation of these results is identical to the state-level impacts described in Section 4 of the report.

Table 5.1 The economic impact of tuna farming in the Eyre Peninsula Region, 2004/05

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Tuna farming <sup>a</sup>	140.0	50%	57.4	39%	593	45%	19.0	34%
Processing	11.5	4%	2.7	2%	38	3%	1.7	3%
Transport	2.0	1%	1.0	1%	10	1%	0.7	1%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.0	0%	0.0	0%	0	0%	0.0	0%
<b>Total Direct</b>	<b>153.5</b>	<b>55%</b>	<b>61.1</b>	<b>41%</b>	<b>641</b>	<b>48%</b>	<b>21.3</b>	<b>38%</b>
Flow-on effects								
Tuna fishing	43.8	16%	37.1	25%	232	17%	7.9	14%
Property and business serv.	12.7	5%	8.1	5%	35	3%	1.7	3%
Manufacturing	7.0	3%	2.0	1%	34	3%	1.3	2%
Trade	10.8	4%	5.0	3%	133	10%	3.9	7%
Pilchards	27.1	10%	21.0	14%	49	4%	11.5	20%
Transport	4.0	1%	2.0	1%	24	2%	1.4	2%
Finance	2.8	1%	2.0	1%	15	1%	0.7	1%
Other Sectors	17.7	6%	10.0	7%	164	12%	6.7	12%
<b>Total Flow-on</b>	<b>125.9</b>	<b>45%</b>	<b>86.5</b>	<b>59%</b>	<b>665</b>	<b>52%</b>	<b>34.6</b>	<b>62%</b>
<b>Total</b>	<b>279.5</b>	<b>100%</b>	<b>148.2</b>	<b>100%</b>	<b>1,327</b>	<b>100%</b>	<b>56.4</b>	<b>100%</b>
Total/Direct	1.82		2.43		2.07		2.64	

<sup>a</sup> Note the double counting in the output impact, also includes the value of tuna fishing.

Source: EconSearch analysis.

<sup>10</sup> Defined as the Eyre Statistical Division which is comprised of the following Statistical Local Areas: Ceduna (DC), Cleve (DC), Elliston (DC), Franklin Harbour (DC), Kimba (DC), Le Hunte (DC), Lower Eyre Peninsula (DC), Port Lincoln (C), Streaky Bay (DC), Tumby Bay (DC), Unincorp. Lincoln and Unincorp. West Coast.

### ***Output impacts...***

Direct output (business turnover) generated locally by tuna farms summed to \$140 million and in other sectors (processing and transport), almost \$14 million, in 2004/05. Flow-on output in other sectors summed to \$126 million. The sectors most affected were the tuna fishing (tuna capture<sup>11</sup>), pilchard fishing, manufacturing, trade, property and business services, transport, and finance sectors (Table 5.1).

The bottom row of Table 5.1 gives the total impact/direct impact ratio for each economic indicator. For output, the ratio of 1.82 indicates that for each dollar of sales generated directly by tuna farming, processing and transport there was a total of \$1.82 of output generated by businesses throughout the Eyre Peninsula region, \$1.00 in tuna farming, processing and transport and \$0.82 in other sectors of the regional economy.

### ***Contribution to gross regional product...***

The direct contribution to gross regional product (GRP) in the Eyre Peninsula region by tuna farming, processing and transport was over \$61 million in 2004/05. Flow-on GRP generated in the other sectors of the regional economy was approximately \$87 million in 2004/05. The flow-ons were greatest in the tuna fishing (\$37m), pilchard fishing (\$21m), property and business services (\$8m), trade (\$5m) and transport (\$2m) sectors.

The bottom row in Table 5.1 shows that for each dollar of GRP generated directly in tuna farming, processing and transport there was an additional \$1.43 (\$2.43 total) generated in other sectors of the regional economy.

### ***Employment and household income...***

A significant number of jobs are created as a result of the flow-on business activity. The tuna farms were responsible for the direct employment of around 590 fte and associated processing and transport, approximately 50 fte, in the Eyre Peninsula region in 2004/05. Flow-on business activity was estimated to have generated a further 665 fte jobs locally to give total employment of almost 1,330 fte in the region. The sectors of the local economy with employment flow-ons from tuna farming, processing and transport included the tuna fishing (232 fte), pilchard fishing (49), trade (133), manufacturing (34), property and business services (35) and transport (24) sectors.

The bottom row in Table 5.1 shows that for each job generated directly in tuna farming, processing and transport there was an additional 1.07 jobs (2.07 jobs total) in the rest of the region.

It was estimated that personal income of \$19 million was earned directly in the tuna farming sector in 2004/05, comprising both wages by employees and drawings by owner/operators. An additional \$7.9 million of household income was earned by licence holders and crew in the tuna fishing sector and a further \$29.5 million in other sectors of the regional economy. For each \$1.00 of household income generated directly by tuna farming, processing and transport in 2004/05 there was an additional \$1.64 (\$2.64 total) generated in other sectors of the Eyre Peninsula regional economy.

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<sup>11</sup> Note that the value of tuna fishing is also included in the direct impact of tuna farming.

## 5.2 The Economic Impact of Oyster Farming in the Eyre Peninsula Region, 2004/05

Estimates of the economic impact of oyster farming in the Eyre Peninsula region in 2004/05 are reported in Table 5.2. The interpretation of these results is identical to the state-level impacts described in Section 4 of the report.

### *Output impacts...*

Direct output (business turnover) generated by oyster enterprises in the Eyre Peninsula region summed to over \$20 million in 2004/05 while output generated in the Eyre Peninsula region by associated downstream activities (processing, transport, retail and food service) summed to almost \$8 million. Flow-ons to other sectors of the regional economy added another \$14 million in output in 2004/05. The sectors most affected were the trade, transport, manufacturing and property and business services sectors (Table 5.2).

Table 5.2 The economic impact of oyster farming in the Eyre Peninsula region, 2004/05 <sup>a</sup>

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Oyster farming <sup>b</sup>	20.3	49%	13.0	55%	382	70%	9.1	59%
Processing	1.4	3%	0.4	2%	7	1%	0.3	2%
Transport	5.2	12%	2.6	11%	31	6%	1.8	12%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	1.1	3%	0.4	2%	11	2%	0.3	2%
<b>Total Direct</b>	<b>28.0</b>	<b>67%</b>	<b>16.5</b>	<b>70%</b>	<b>432</b>	<b>80%</b>	<b>11.4</b>	<b>74%</b>
Flow-on effects								
Property and business serv.	3.2	8%	2.1	9%	8	1%	0.4	2%
Manufacturing	1.1	3%	0.3	1%	5	1%	0.2	1%
Trade	2.7	6%	1.2	5%	33	6%	1.0	6%
Transport	0.6	1%	0.3	1%	3	1%	0.2	1%
Finance	0.6	2%	0.4	2%	3	1%	0.2	1%
Other Sectors	5.6	13%	2.9	12%	58	11%	2.0	13%
<b>Total Flow-on</b>	<b>13.7</b>	<b>33%</b>	<b>7.2</b>	<b>30%</b>	<b>111</b>	<b>20%</b>	<b>3.9</b>	<b>26%</b>
<b>Total</b>	<b>41.7</b>	<b>100%</b>	<b>23.7</b>	<b>100%</b>	<b>542</b>	<b>100%</b>	<b>15.4</b>	<b>100%</b>
Total/Direct	1.55		1.47		1.29		1.38	

<sup>a</sup> Constitutes an upper estimate of the flow-on effects given the likelihood of some double counting of consumption-induced effects in the retail and food services margins.

<sup>b</sup> Includes sales of spat.

Source: EconSearch analysis.

***Contribution to gross regional product...***

Total oyster farming-related contribution to GRP in the Eyre Peninsula region was almost \$24 million in 2004/05, \$13.0 million generated by oyster farming directly, \$3.5 million generated by downstream activities and over \$7 million generated in other sectors of the regional economy.

***Employment and household income...***

In 2004/05 in the Eyre Peninsula region, oyster farming was responsible for the direct employment of over 380 fte and associated downstream activities created employment for an additional 50 fte. Flow-on business activity was estimated to generate a further 111 fte.

In 2004/05, personal income of over \$11 million was earned in oyster farming and downstream activities in the Eyre Peninsula region comprising both wages by employees and estimated drawings by owner/operators. An additional \$3.9 million of household income was earned in other local businesses as a result of oyster industry operations. The total household income impact was over \$15 million.

**5.3 The Economic Impact of Other Aquaculture in the Eyre Peninsula Region, 2004/05**

The economic impacts of other aquaculture sectors in the Eyre Peninsula region in 2004/05 (i.e. abalone, mussel, yellowtail kingfish farming and other aquaculture enterprises) are reported in aggregate in Table 5.3. These results are reported without comment, as the interpretation is identical to that for oysters and tuna farming described in the previous sections.

Note that for most of the other aquaculture sectors, the impacts in terms of flow-on employment and household income are relatively low. As these sectors grow and sales increase, household income and flow-on employment impacts generated by recurrent expenditure are expected to increase as well. The flow-on effects constitute an upper estimate given the likelihood of some double counting of consumption-induced effects in the retail and food services margins.

Table 5.3 The economic impact of other aquaculture <sup>a</sup> in the Eyre Peninsula region, 2004/05 <sup>b</sup>

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Other aquaculture	8.2	55%	3.4	50%	211	79%	4.2	69%
Processing	0.6	4%	0.2	2%	3	1%	0.1	2%
Transport	0.4	3%	0.2	3%	3	1%	0.1	2%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.0	0%	0.0	0%	0	0%	0.0	0%
<i>Total Direct</i>	<b>9.3</b>	<b>62%</b>	<b>3.8</b>	<b>56%</b>	<b>217</b>	<b>81%</b>	<b>4.5</b>	<b>73%</b>
Flow-on effects								
Property and business serv.	1.2	8%	0.8	12%	2	1%	0.1	2%
Manufacturing	0.4	3%	0.1	2%	2	1%	0.1	1%
Trade	1.1	8%	0.5	8%	14	5%	0.4	7%
Transport	0.2	1%	0.1	2%	1	0%	0.1	1%
Finance	0.2	2%	0.2	2%	1	0%	0.1	1%
Other Sectors	2.6	17%	1.3	19%	29	11%	0.9	15%
<i>Total Flow-on</i>	<b>5.7</b>	<b>38%</b>	<b>3.0</b>	<b>44%</b>	<b>50</b>	<b>19%</b>	<b>1.6</b>	<b>27%</b>
<b>Total</b>	<b>15.0</b>	<b>100%</b>	<b>6.7</b>	<b>100%</b>	<b>267</b>	<b>100%</b>	<b>6.1</b>	<b>100%</b>
Total/Direct	1.62		1.80		1.23		1.37	

<sup>a</sup> Includes abalone, mussel, yellowtail kingfish farming and other aquaculture enterprises.

<sup>b</sup> Constitutes an upper estimate of the flow-on effects given the likelihood of some double counting of consumption-induced effects in the retail and food services margins.

Source: EconSearch analysis.

## 6. The Economic Impact of Aquaculture in the Limestone Coast Region, 2004/05

Estimates of the economic impact of aquaculture in the Limestone Coast region<sup>12</sup> in 2004/05 (i.e. barramundi, yabby/marron farming and other aquaculture enterprises) are reported in aggregate in Table 6.1. The interpretation of these results is identical to the state and regional level impacts described in Sections 4 and 5 of the report.

Note that for most of the aquaculture sectors in the Limestone Coast region the impacts in terms of flow-on employment and household income are relatively low. As these sectors grow and sales increase, household income and flow-on employment impacts generated by recurrent expenditure are expected to increase as well. The flow-on effects constitute an upper estimate given the likelihood of some double counting of consumption-induced effects in the retail and food services margins.

Table 6.1 The economic impact of aquaculture<sup>a</sup> in the Limestone Coast region, 2004/05<sup>b</sup>

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
<b>Direct effects</b>								
Other aquaculture	1.9	59%	1.1	61%	29	77%	0.9	71%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
Transport	0.2	7%	0.1	6%	2	5%	0.1	7%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.0	1%	0.0	0%	0	0%	0.0	0%
<b>Total Direct</b>	<b>2.2</b>	<b>66%</b>	<b>1.2</b>	<b>68%</b>	<b>31</b>	<b>82%</b>	<b>1.0</b>	<b>79%</b>
<b>Flow-on effects</b>								
Property and business serv.	0.3	8%	0.2	10%	0	1%	0.0	2%
Manufacturing	0.1	4%	0.0	2%	1	2%	0.0	2%
Trade	0.2	6%	0.1	5%	2	6%	0.1	5%
Transport	0.0	1%	0.0	1%	0	1%	0.0	1%
Finance	0.0	1%	0.0	2%	0	1%	0.0	1%
Other Sectors	0.4	13%	0.2	12%	3	8%	0.1	11%
<b>Total Flow-on</b>	<b>1.1</b>	<b>34%</b>	<b>0.6</b>	<b>32%</b>	<b>7</b>	<b>18%</b>	<b>0.3</b>	<b>21%</b>
<b>Total</b>	<b>3.3</b>	<b>100%</b>	<b>1.8</b>	<b>100%</b>	<b>38</b>	<b>100%</b>	<b>1.3</b>	<b>100%</b>
Total/Direct	1.52		1.48		1.22		1.28	

<sup>a</sup> Includes barramundi, yabby/marron farming and other aquaculture enterprises.

<sup>b</sup> Constitutes an upper estimate of the flow-on effects given the likelihood of some double counting of consumption-induced effects in the retail and food services margins.

Source: EconSearch analysis.

<sup>12</sup> Defined as the South East South Australia Statistical Division which is comprised of the following Statistical Local Areas: Grant (DC), Lacepede (DC), Mount Gambier (C), Naracoorte and Lucindale (DC), Robe (DC), Tatiara (DC), Wattle Range (DC)-East and Wattle Range (DC)-West.

***Output impacts...***

Direct output (business turnover) generated by aquaculture summed to \$1.9 million and associated downstream activities, \$0.3 million, in the Limestone Coast region in 2004/05. Flow-on output in other sectors of the regional economy summed to \$1.1 million in 2004/05. The sectors most affected were the manufacturing, trade and property and business services sectors (Table 6.1).

***Contribution to gross regional product...***

Total aquaculture-related contribution to GRP in the Limestone Coast region was \$1.8 million in 2004/05, \$1.1 million generated by aquaculture directly, \$0.1 million generated in associated downstream activities and \$0.6 million generated in other sectors of the regional economy.

***Employment and household income...***

Aquaculture and downstream activities were responsible for the direct employment of 31 fte in 2004/05 in the Limestone Coast region. Flow-on business activity was estimated to generate a further 7 fte.

In 2004/05, personal income of \$1.0 million was earned in aquaculture and downstream activities in the Limestone Coast region comprising both wages by employees and estimated drawings by owner/operators. An additional \$0.3 million of household income was earned in other local businesses as a result of aquaculture industry operations.

## 7. The Economic Impact of Aquaculture in the Balance of South Australia, 2004/05

Estimates of the economic impact of aquaculture in the balance of SA<sup>13</sup> in 2004/05 (i.e. oysters, abalone, mussels, barramundi, yellowtail kingfish, yabby/marron farming and other aquaculture enterprises) are reported in aggregate in Table 7.1.

Note that for some of the aquaculture sectors in the balance of SA, the impacts in terms of flow-on employment and household income are relatively low. As these sectors grow and sales increase, household income and flow-on employment impacts generated by recurrent expenditure are expected to increase as well. The flow-on effects constitute an upper estimate given the likelihood of some double counting of consumption-induced effects in the retail and food services margins.

Table 7.1 The economic impact of aquaculture <sup>a</sup> in the balance of SA, 2004/05 <sup>b</sup>

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
Direct effects								
Other aquaculture	17.5	63%	7.7	60%	327	85%	6.6	72%
Processing	1.0	3%	0.3	2%	3	1%	0.1	1%
Transport	1.2	4%	0.5	4%	7	2%	0.4	4%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.1	0%	0.1	0%	1	0%	0.0	0%
<b>Total Direct</b>	<b>19.8</b>	<b>71%</b>	<b>8.5</b>	<b>67%</b>	<b>338</b>	<b>88%</b>	<b>7.1</b>	<b>78%</b>
Flow-on effects								
Property and business serv.	2.5	9%	1.6	12%	5	1%	0.3	3%
Manufacturing	1.0	4%	0.3	2%	3	1%	0.1	1%
Trade	1.0	3%	0.4	3%	11	3%	0.4	4%
Transport	0.2	1%	0.1	1%	1	0%	0.1	1%
Finance	0.2	1%	0.1	1%	1	0%	0.0	0%
Other Sectors	3.3	12%	1.8	14%	24	6%	1.0	11%
<b>Total Flow-on</b>	<b>8.2</b>	<b>29%</b>	<b>4.3</b>	<b>33%</b>	<b>46</b>	<b>12%</b>	<b>2.0</b>	<b>22%</b>
<b>Total</b>	<b>28.0</b>	<b>100%</b>	<b>12.8</b>	<b>100%</b>	<b>384</b>	<b>100%</b>	<b>9.1</b>	<b>100%</b>
Total/Direct	1.43		1.51		1.14		1.28	

<sup>a</sup> Includes oysters, abalone, mussels, barramundi, yellowtail kingfish, yabby/marron farming and other aquaculture enterprises.

<sup>b</sup> Constitutes an upper estimate of the flow-on effects given the likelihood of some double counting of consumption-induced effects in the retail and food services margins.

Source: EconSearch analysis.

<sup>13</sup> Defined as South Australia net of the Eyre and Limestone Coast regions and the Adelaide Statistical Division (or broader metropolitan area).

***Output impacts...***

Direct output (business turnover) generated by aquaculture summed to \$17.5 million and associated downstream activities, \$2.3 million<sup>14</sup>, in the balance of SA in 2004/05. Flow-on output in other sectors of the regional economy summed to \$8.2 million in 2004/05. The sectors most affected were the manufacturing, trade and property and business services sectors (Table 6.1).

***Contribution to gross regional product...***

Total aquaculture-related contribution to gross regional product in the balance of SA was \$12.8 million in 2004/05, \$7.7 million generated by aquaculture directly, \$0.8 million generated in associated downstream activities and \$4.3 million generated in other sectors of the regional economy.

***Employment and household income...***

Aquaculture and downstream activities were responsible for the direct employment of 338 fte in 2004/05 in the balance of SA. Flow-on business activity was estimated to generate a further 46 fte.

In 2004/05, personal income of \$7.1 million was earned in aquaculture and downstream activities in the balance of SA comprising both wages by employees and estimated drawings by owner/operators. An additional \$2.0 million of household income was earned in other local businesses as a result of aquaculture industry operations.

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<sup>14</sup> Based on an analysis of the 2004/05 survey data, it would appear that a significant proportion of other aquaculture value of production is attributable to beta-carotene from the metropolitan area. Given that the downstream impacts of this activity are unknown, they have been excluded from the analysis.

## **8. Other Facets of Regional Economic Development Associated with Aquaculture Activity in South Australia**

In addition to the quantifiable economic impacts outlined above there are a number of other facets of regional economic development associated with aquaculture activity in South Australia.

### **Increasing the diversity and complexity of regional economies**

Many of the small regional towns in South Australia are characterised by a heavy reliance on one or a small number of major industries, combined with a set of other "fundamental" activities that provide basic services and infrastructure to those industries. They lack the diversity and complexity of larger economic units.

The aquaculture industry has developed rapidly in recent years. Through its relatively large requirement for labour and material inputs, the industry has shown the potential to increase the complexity and diversity of local economies. The demand for local labour, goods and services assists in offsetting the contraction of other local industry and may help avoid a range of other economic and social pressures associated with declining regional economies.

### **Re-investment of profits in local enterprises**

In addition to the regional impacts generated by recurrent expenditures in the aquaculture sector, further economic impacts are generated by the investment of profits in new or under-resourced local ventures by aquaculture operators.

For example, the current profitability in the tuna farming sector underpins the very substantial local investment by tuna farmers in the local cannery, shipyard, marinas, property (e.g. hotels) and other industries (e.g. yellowtail kingfish aquaculture and viticulture) (Brian Jeffries, pers. comm.)

### **Tourism**

Tourism activities associated with the aquaculture sector (e.g. recreational fishing and farm tours) provide a further source of income and employment for regional economies with a well-developed aquaculture sector (e.g. the Eyre Peninsula region).

### **Education and Research**

The aquaculture sector, particularly the tuna industry, is characterised by a high level of innovation. These innovative ideas have been directed towards value adding opportunities in the tuna industry itself (e.g. fresh fish direct marketed to Japan) and to the development of new aquaculture industries (e.g. yellowtail kingfish farming).

The success of the tuna industry, in particular, has been a catalyst for the development of significant research (e.g. CRC for Sustainable Aquaculture of Finfish) and education resources (e.g. the Marine Science Centre at Port Lincoln) within South Australia.

## 9. Summary

### 9.1 Economic Impact of Aquaculture in SA, 2004/05

The results of the economic impact analysis are summarised in Tables 9.1 to 9.5. For the state as a whole, the aquaculture industry in 2004/05 was estimated to have had a farm gate value of \$188 million with associated direct output impacts in the processing, transport, retail and food service sectors of \$55 million (Table 9.1). In total, the direct value of aquaculture industry output was estimated to have been approximately \$243 million. This activity generated flow-on output of \$276 million in other South Australian industries. In terms of employment, there were over 1,540 fte jobs generated directly in aquaculture, 346 fte generated in downstream activities (total direct of 1,888 fte) and approximately 1,480 flow-on fte generated in other sectors of the state's economy in 2004/05.

Table 9.1 The economic impact of aquaculture in South Australia, 2004/05

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
<b>Direct effects</b>								
Aquaculture production	187.8	36%	82.6	32%	1,541	46%	39.8	31%
Aquaculture downstream <sup>a</sup>	54.7	11%	19.3	7%	346	10%	12.7	10%
<b>Total Direct</b>	<b>242.5</b>	<b>47%</b>	<b>101.9</b>	<b>39%</b>	<b>1,888</b>	<b>56%</b>	<b>52.5</b>	<b>42%</b>
<b>Flow-on effects</b>								
Tuna Fishing	43.8	8%	37.1	14%	232	7%	7.9	6%
Other Sectors	231.9	45%	119.7	46%	1,246	37%	66.1	52%
<b>Total Flow-on</b>	<b>275.7</b>	<b>53%</b>	<b>156.8</b>	<b>61%</b>	<b>1,478</b>	<b>44%</b>	<b>74.0</b>	<b>58%</b>
<b>Total</b>	<b>518.2</b>	<b>100%</b>	<b>258.7</b>	<b>100%</b>	<b>3,366</b>	<b>100%</b>	<b>126.5</b>	<b>100%</b>

<sup>a</sup> Processing, transport, retail and food services.

Source: EconSearch analysis.

For the Eyre Peninsula region the aquaculture industry in 2004/05 was estimated to have had a farm gate value of \$168 million with associated direct output impacts in the processing, transport, retail and food service sectors of \$22 million (Table 9.2). In total, the direct value of aquaculture industry output was estimated to have been approximately \$191 million. This activity generated flow-on output of \$145 million in other regional industries. In terms of employment, there were approximately 1,190 fte jobs generated directly in aquaculture, over 100 fte generated in downstream activities (total direct of 1,290 fte) and almost 850 flow-on fte generated in other sectors of the region's economy in 2004/05.

Table 9.2 The economic impact of aquaculture in the Eyre Peninsula region, 2004/05

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Aquaculture production	168.4	50%	73.8	41%	1,186	56%	32.3	42%
Aquaculture downstream <sup>a</sup>	22.4	7%	7.5	4%	104	5%	4.9	6%
<i>Total Direct</i>	<i>190.8</i>	<i>57%</i>	<i>81.4</i>	<i>46%</i>	<i>1,290</i>	<i>60%</i>	<i>37.3</i>	<i>48%</i>
Flow-on effects								
Tuna Fishing	43.8	13%	37.1	21%	232	11%	7.9	10%
Other Sectors	101.6	30%	60.2	34%	614	29%	32.7	42%
<i>Total Flow-on</i>	<i>145.4</i>	<i>43%</i>	<i>97.3</i>	<i>54%</i>	<i>846</i>	<i>40%</i>	<i>40.6</i>	<i>52%</i>
<b>Total</b>	<b>336.2</b>	<b>100%</b>	<b>178.7</b>	<b>100%</b>	<b>2,136</b>	<b>100%</b>	<b>77.9</b>	<b>100%</b>

<sup>a</sup> Processing, transport, retail and food services.

Source: EconSearch analysis.

For the Limestone Coast region the aquaculture industry in 2004/05 was estimated to have had a farm gate value of \$1.9 million with associated direct output impacts in the processing, transport, retail and food service sectors of \$0.3 million (Table 9.3). This activity generated flow-on output of \$1.1 million in other regional industries. In terms of employment, there were 31 fte jobs generated directly in aquaculture and downstream activities and approximately 7 flow-on fte generated in other sectors of the region's economy in 2004/05.

Table 9.3 The economic impact of aquaculture in the Limestone Coast region, 2004/05

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
Direct effects								
Aquaculture production	1.9	59%	1.1	61%	29	77%	0.9	71%
Aquaculture downstream <sup>a</sup>	0.3	8%	0.1	7%	2	5%	0.1	7%
<i>Total Direct</i>	<i>2.2</i>	<i>66%</i>	<i>1.2</i>	<i>68%</i>	<i>31</i>	<i>82%</i>	<i>1.0</i>	<i>79%</i>
Other Sectors (flow-on)	1.1	34%	0.6	32%	7	18%	0.3	21%
<b>Total</b>	<b>3.3</b>	<b>100%</b>	<b>1.8</b>	<b>100%</b>	<b>38</b>	<b>100%</b>	<b>1.3</b>	<b>100%</b>

<sup>a</sup> Processing, transport, retail and food services.

Source: EconSearch analysis.

For the balance of SA region the aquaculture industry in 2004/05 was estimated to have had a farm gate value of almost \$18 million with associated direct output impacts in the processing, transport, retail and food service sectors of \$2.3 million (Table 9.4). This activity generated flow-on output of over \$8 million in other regional industries. In terms of employment, there were almost 340 fte jobs generated directly in aquaculture and downstream activities and almost 50 flow-on fte generated in other sectors of the region's economy in 2004/05.

Table 9.4 The economic impact of aquaculture in the balance of SA, 2004/05

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
Direct effects								
Aquaculture production	17.5	63%	7.7	60%	327	85%	6.6	72%
Aquaculture downstream <sup>a</sup>	2.3	8%	0.8	7%	11	3%	0.6	6%
<i>Total Direct</i>	<i>19.8</i>	<i>71%</i>	<i>8.5</i>	<i>67%</i>	<i>338</i>	<i>88%</i>	<i>7.1</i>	<i>78%</i>
Other Sectors (flow-on)	8.2	29%	4.3	33%	46	12%	2.0	22%
<b>Total</b>	<b>28.0</b>	<b>100%</b>	<b>12.8</b>	<b>100%</b>	<b>384</b>	<b>100%</b>	<b>9.1</b>	<b>100%</b>

<sup>a</sup> Processing, transport, retail and food services.

Source: EconSearch analysis.

For the state as a whole the aquaculture industry is dominated by the tuna-farming sector (Table 9.5). In 2004/05, it accounted for approximately 65 per cent of total aquaculture industry related (direct and flow-on) output and GSP, almost 47 per cent of aquaculture related employment and approximately 55 per cent of aquaculture related household income<sup>15</sup>.

Table 9.5 The total economic impact (direct and flow-on) of aquaculture in South Australia, by aquaculture sector, 2004/05

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Tuna farming	333.3	64.3%	171.9	66.4%	1,535	45.6%	69.5	54.9%
Oyster farming	118.5	22.9%	56.6	21.9%	1,023	30.4%	35.0	27.7%
Abalone farming	15.5	3.0%	6.6	2.5%	255	7.6%	6.3	5.0%
Mussels farming	4.0	0.8%	2.0	0.8%	72	2.1%	1.9	1.5%
Barramundi farming	6.0	1.2%	3.1	1.2%	55	1.6%	2.2	1.8%
Yabby/Marron farming	2.1	0.4%	1.2	0.5%	28	0.8%	0.4	0.4%
Other aquaculture	38.8	7.5%	17.4	6.7%	397	11.8%	11.1	8.8%
<b>Total (SA)</b>	<b>518.2</b>	<b>100.0%</b>	<b>258.7</b>	<b>100.0%</b>	<b>3,366</b>	<b>100.0%</b>	<b>126.5</b>	<b>100.0%</b>

Source: EconSearch analysis.

<sup>15</sup> Similar estimates to those presented in Table 9.5 are presented in Appendix 3 for the years 2001/02 to 2003/04. When using these time series data it is important to acknowledge the influence of methodological changes in accounting for variability between years (see section 9.2 for further detail).

## 9.2 Economic Impact of Aquaculture in SA, Time Series, 1997/98 to 2004/05

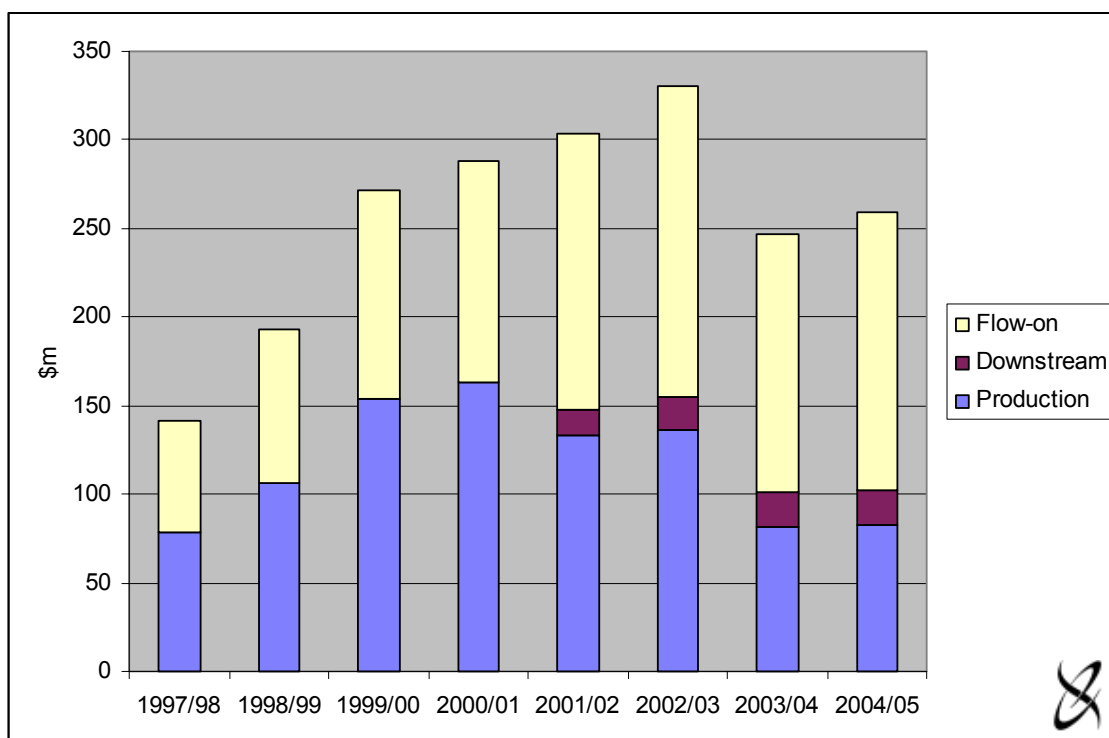
Estimates of the economic impact of aquaculture on the South Australian economy for the period 1997/98 to 2004/05, in terms of contribution to GSP and employment, are provided in Figures 9.1 and 9.2, respectively.

It is important to note that some of the variability in the GSP and employment impacts of SA aquaculture over the period 1997/98 to 2004/05 is a function of changes in methodology. Most significantly, as discussed in Section 2.1 of the report, estimates for the period 1997/98 to 2000/01 exclude some of the downstream impacts associated with aquaculture activity in SA<sup>16</sup>. Other methodological changes include:

- the use of revised input-output tables;
- updates of the representative cost structures for individual aquaculture sectors; and
- revisions to the processing, transport, retail and food service trade margins used in the analysis.

Total contribution to GSP attributable to aquaculture in SA exhibited a rising trend over the period 1997/98 to 2002/03 (Figure 9.1). The significant reduction in the GSP impact between 2002/03 and 2003/04 is primarily a function of the decline in the per unit value of farmed tuna (45 per cent) over this period.

Figure 9.1 Total GSP impact of aquaculture in SA, 1997/98 to 2004/05 <sup>a</sup>



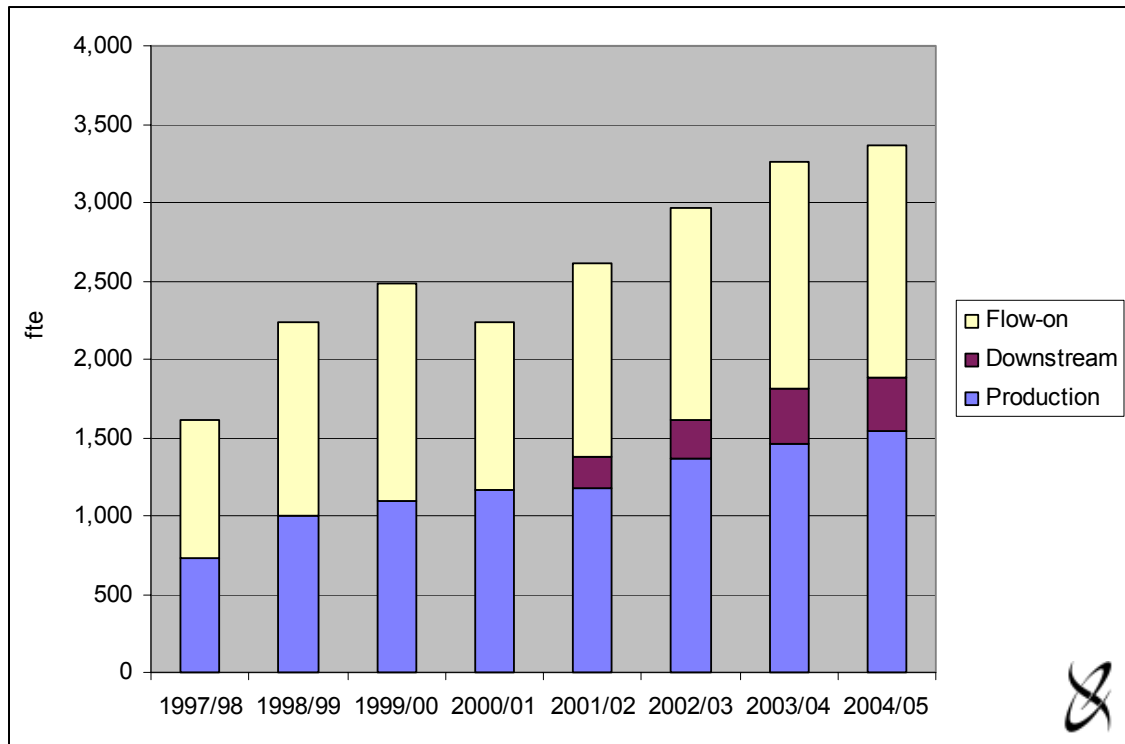
<sup>a</sup> Total GSP impacts for the period 1997/98 to 2000/01 exclude some downstream activities (including some transport and all retail and food services).

Source: EconSearch (1997, 1998, 1999, 2001, 2002a, 2003, 2004 and 2006) and Table 9.1.

<sup>16</sup> See Table 2.1 for further details.

The total employment impact attributable to aquaculture in SA exhibited a rising trend over the period 1997/98 to 2004/05, reflecting an expansion in capacity and production growth across most aquaculture sectors over this period (Figure 9.2).

Figure 9.2 Total employment impact of aquaculture in SA, 1997/98 to 2004/05 <sup>a</sup>



<sup>a</sup> Total employments impacts for the period 1997/98 to 2000/01 exclude some downstream activities (including some transport and all retail and food services).

Source: EconSearch (1997, 1998, 1999, 2001, 2002a, 2003, 2004 and 2006) and Table 9.1.

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## Appendix 1 Input-Output Methodology

### Overview of Input-Output Analysis

Input-output analysis provides a comprehensive economic framework that is extremely useful in the resource planning process. Broadly, there are two ways in which the input-output method can be used.

First, the input-output table provides a numerical picture of the size and shape of the economy and its essential features. The input-output transactions table can be used to describe some of the important features of an economy, the interrelationships between sectors, and the relative importance of the individual sectors.

Second, input-output analysis provides a standard approach for the estimation of the economic impact of a particular activity. The input-output model is used to calculate industry multipliers that can then be applied to various development scenarios.

### Linkages between sectors

The standard approach for the estimation of the regional economic impact of a particular activity, such as wine production, is to employ *input-output analysis*. The input-output model conceives the economy of the region as being divided up into a number of sectors, and this allows the analyst to trace expenditure flows.

To illustrate this, consider the example of a winery that, in the course of its operation, purchases goods and services from other sectors. These goods and services would include grapes, bottles, and corks and, of course, labour. The direct employment created is regarded in the model as an expenditure flow into the household sector, which is one of several non-industrial sectors recognised in the input-output model.

Upon receiving expenditure by the winery, the other sectors in the state economy engage in their own expenditures. For example, as a consequence of winning a contract for work with a winery, a bottle manufacturer buys materials from its suppliers and labour from its own employees. Suppliers and employees in turn engage in further expenditure, and so on. These *indirect effects*, as they are called, are part of the impact of the winery on the regional or state economy. They must be added to the *direct effects* (which are expenditures made in immediate support of the winery itself) in order to arrive at a measure of the total impact of the winery.

It may be thought that these indirect effects go on indefinitely, and that their amount adds up without limit, the presence of *leakages*, however, prevents this from occurring. In the context of the impact on a *regional or state* economy, an important leakage is expenditure on imports, that is, products or services that originate from *outside the region, state or country* (e.g. French oak barrels).

Thus some of the expenditure for imports to the region is lost to the local economy. Consequently, the indirect effects get smaller and smaller in successive expenditure rounds, due to this and other leakages. Hence the total expenditure created in the local economy is limited in amount, and so (in principle) it can be measured.

The performance of the input-output analysis calculations require a great deal of information. The analyst needs to know the magnitude of various expenditures and where they occur. Also needed is information on how the sectors that receiving this expenditure share *their* expenditures among the various sectors from whom they buy, and so on for the further expenditure rounds.

In applying the input-output model, the standard procedure is to determine the direct or first-round expenditures only. No attempt is made to pursue such inquiries on expenditure in subsequent rounds, not even (for example) to trace the effects in the local economy on household expenditures by winery employees on food, clothing, entertainment, and so on, as it is impracticable to measure these effects for an individual case, here the winery.

The input-output model is instead based on a set of assumptions about constant and uniform proportions of expenditure. If households in general in the local economy spend (say) 13.3 per cent of their income on food and non-alcoholic beverages, it is assumed that those working in wineries do likewise. Indeed, the effects of all expenditure rounds after the first are calculated by using such standard proportions (*multiplier* calculations).

## Multipliers

Multipliers are an indication of the strength of the linkages between a particular sector and the rest of the regional economy. As well, they can be used to estimate the impact of a change in that particular sector on the rest of the economy. As noted above, detailed explanations on calculating input-output multipliers (and the underlying assumptions) are provided in any regional economics or input-output analysis textbook (see for example Hewings (1985), Jensen and West (1986), Midmore and Harrison-Mayfield (1996), Powell et al. (1985), and West (1993)). Suffice to note that they are calculated through a routine set of mathematical operations based on coefficients derived from the input-output transactions table.

## Input-output transactions table

The structure and linkages of a local economy can be described with the aid of input-output analysis. Input-output analysis, as an accounting system of inter-industry transactions, is based on the notion that no industry exists in isolation.

This assumes, within any economy, each firm depends on the existence of other firms to purchase inputs from, or sell products to, for further processing. The firms also depend on final consumers of the product and labour inputs to production. An input-output transactions table is a convenient way to illustrate the purchases and sales of goods and services taking place in an economy at a given time.

Input-output tables provide a numerical picture of the size and shape of the economy and its essential features. Products produced in the economy are aggregated into a number of groups of industries and the transactions between them recorded in the transactions table. The rows and columns of the input-output table can be interpreted in the following way:

- The rows of the input-output table illustrate sales for intermediate usage (to other firms) and for final demand (consumers, exports, capital formation).

- The columns show the origin of the inputs and hence the purchases made at that time (labour, capital and intermediate inputs).
- Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

In summary, the input-output transactions table can be used to describe some of the important features of a regional economy, the interrelationships between sectors, and the relative importance of the individual sectors. The table is also used for the calculation of sector multipliers and the estimation of economic impacts arising from some change in the local economy.

## Appendix 2      Glossary of Input-Output Terminology

**Basic value** is the price received for a good or service by the producer. It is also known as *producers' price*. It excludes indirect taxes and transport, trade and other margins.

**Consumption-induced effects** are additional output, employment and income resulting from re-spending by households that receive income from employment in direct and indirect activities. Consumption-induced effects are sometimes referred to as "induced effects".

**Contribution to gross state/regional product** is calculated as the value of output less the cost of goods and services (including imports) used in producing the output. It represents payments to the primary inputs of production (labour, capital and land). Contribution to GSP/GRP is consistent with standard measures of economic activity, such as gross domestic, State or regional product and it provides an assessment of the net contribution to regional economic growth of a particular enterprise or activity.

**Direct effects** are the initial round of output, employment and income generated by an economic activity.

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

**Exports** refers to the sale of goods and services to final consumers outside the region of interest. In a state input-output table, exports refers to the sale of goods and services interstate and overseas. In a regional input-output table exports refers to the sale of goods and services interstate, overseas and to other regions within the state.

**Flow-on effects** are the sum of the production-induced effects and the consumption-induced effects.

**Household income** is wages and salaries, drawings by owner operators and other payments to labour including overtime payments and income tax, but excluding payroll tax.

**Input-output analysis** is an accounting system of inter-industry transactions based on the notion that no industry exists in isolation.

**Input-output table** is a transactions table that illustrates and quantifies the purchases and sales of goods and services taking place in an economy at a given point in time. It provides a numerical picture of the size and shape of the economy and its essential features. Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

**Multiplier** is an index (ratio) indicating the overall change in the level of activity that results from an initial change in economic activity. They are an indication of the strength of the linkages between a particular sector and the rest of the regional economy. They can be used to estimate the impact of a change in that particular sector on the rest of the economy.

**Other Final Demand** includes government expenditure, private and public sector investment (gross fixed capital formation) and change in stocks (inventories).

**Other Value Added** includes gross operating surplus and all taxes, less subsidies.

**Output** is gross revenue of goods and services produced by commercial organisations plus gross expenditure by government agencies.

**Purchasers' price** is the price paid for a good or service paid by the purchaser. It includes indirect taxes and transport, trade and other margins.

**Production-induced effects** are additional output, employment and income resulting from re-spending by firms that receive income from the sale of goods and services to firms undertaking, for example, agricultural activities. Production-induced effects are sometimes referred to as "indirect effects".

**Total impact** is the sum of the direct effects and the flow-on effects.

**Type I multiplier** is calculated as  $(\text{direct effects} + \text{production-induced effects})/\text{direct effects}$ .

**Type II multiplier** is calculated as  $(\text{direct effects} + \text{production-induced effects} + \text{consumption-induced effects})/\text{direct effects}$ .

### Appendix 3 The Total Economic Impact of Aquaculture in South Australia, by Aquaculture Sector, 2001/02 to 2003/04

Appendix Table 3.1 The total economic impact (direct and flow-on) of aquaculture in South Australia, by aquaculture sector, 2001/02

Sector	Output		Value Added		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
Tuna farming	490.8	85.0%	260.1	85.6%	1,806	69.0%	69.8	73.9%
Oyster farming	57.6	10.0%	28.9	9.5%	514	19.7%	15.5	16.4%
Abalone farming	5.6	1.0%	3.0	1.0%	64	2.4%	1.7	1.8%
Mussels farming	1.6	0.3%	0.9	0.3%	31	1.2%	0.7	0.8%
Barramundi farming	8.7	1.5%	4.4	1.4%	74	2.8%	2.6	2.8%
Yabby/Marron farming	1.1	0.2%	0.6	0.2%	13	0.5%	0.2	0.2%
Other aquaculture	12.1	2.1%	6.0	2.0%	115	4.4%	3.9	4.1%
<b>Total (SA)</b>	<b>577.5</b>	<b>100.0%</b>	<b>303.8</b>	<b>100.0%</b>	<b>2,617</b>	<b>100.0%</b>	<b>94.4</b>	<b>100.0%</b>

Source: EconSearch (2003).

Appendix Table 3.2 The total economic impact (direct and flow-on) of aquaculture in South Australia, by aquaculture sector, 2002/03

Sector	Output		Value Added		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
Tuna farming	508.5	79.3%	266.2	80.5%	1,791	60.3%	71.6	66.7%
Oyster farming	64.8	10.1%	32.4	9.8%	582	19.6%	17.4	16.2%
Abalone farming	9.6	1.5%	4.9	1.5%	97	3.3%	2.6	2.4%
Mussels farming	2.3	0.4%	1.2	0.4%	44	1.5%	1.1	1.0%
Barramundi farming	22.7	3.5%	11.1	3.4%	162	5.5%	6.6	6.1%
Yabby/Marron farming	2.0	0.3%	1.0	0.3%	22	0.7%	0.4	0.4%
Other aquaculture	31.6	4.9%	13.9	4.2%	270	9.1%	7.8	7.2%
<b>Total (SA)</b>	<b>641.5</b>	<b>100.0%</b>	<b>330.8</b>	<b>100.0%</b>	<b>2,969</b>	<b>100.0%</b>	<b>107.4</b>	<b>100.0%</b>

Source: EconSearch (2004).

Appendix Table 3.3 The total economic impact (direct and flow-on) of aquaculture in South Australia, by aquaculture sector, 2003/04

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Tuna farming	347.9	69.2%	171.9	69.8%	1,759	53.9%	76.9	62.1%
Oyster farming	117.1	23.3%	56.4	22.9%	1,028	31.5%	34.2	27.6%
Abalone farming	9.0	1.8%	4.0	1.6%	149	4.6%	3.7	3.0%
Mussels farming	4.2	0.8%	2.1	0.9%	76	2.3%	2.0	1.6%
Barramundi farming	5.4	1.1%	3.0	1.2%	52	1.6%	1.7	1.4%
Yabby/Marron farming	1.5	0.3%	0.8	0.3%	19	0.6%	0.3	0.3%
Other aquaculture	17.8	3.5%	8.0	3.2%	182	5.6%	5.1	4.1%
<b>Total (SA)</b>	<b>502.9</b>	<b>100.0%</b>	<b>246.2</b>	<b>100.0%</b>	<b>3,264</b>	<b>100.0%</b>	<b>123.9</b>	<b>100.0%</b>

Source: EconSearch (2006).