

The Economic Impact of Aquaculture on the South Australian State and Regional Economies, 2005/06

A report prepared for
PIRSA Aquaculture

Prepared by



24 April 2007

EconSearch Pty Ltd
214 Kensington Rd,
Marryatville SA 5068
Tel: (08) 8431 5533
Fax: (08) 8431 7710
www.econsearch.com.au

Contents

List of Tables	iv
List of Figures	v
Abbreviations	v
Document History and Status	vi
Executive Summary	vii
1. Introduction.....	1
2. Study Approach.....	2
2.1 Method of Analysis.....	2
2.2 Data.....	4
3. Aquaculture Production in South Australia.....	6
3.1 Production and Value of Production.....	6
3.2 Forecast Growth in Production and Employment.....	7
3.3 The Value of Aquaculture and Wild Catch Fisheries in South Australia	10
4. The Economic Impact of Aquaculture in South Australia, 2005/06	12
4.1 The Economic Impact of Tuna Farming in South Australia, 2005/06.....	12
4.2 The Economic Impact of Oyster Farming in South Australia, 2005/06	16
4.3 The Economic Impact of Other Aquaculture in South Australia, 2005/06	18
5. The Economic Impact of Aquaculture in the Eyre Peninsula Region, 2005/06	21
5.1 The Economic Impact of Tuna Farming in the Eyre Peninsula Region, 2005/06	21
5.2 The Economic Impact of Oyster Farming in the Eyre Peninsula Region, 2005/06.....	23
5.3 The Economic Impact of Other Aquaculture in the Eyre Peninsula Region, 2005/06.....	24
6. The Economic Impact of Aquaculture in the Limestone Coast Region, 2005/06	26
7. The Economic Impact of Aquaculture in the Balance of South Australia, 2005/06	28
8. Other Facets of Regional Economic Development Associated with Aquaculture Activity in South Australia.....	30
9. Summary	31
9.1 Economic Impact of Aquaculture in SA, 2005/06.....	31
9.2 Economic Impact of Aquaculture in SA, Time Series, 1997/98 to 2005/06	34
References	37
Appendix 1 Input-Output Methodology.....	39
Appendix 2 Glossary of Input-Output Terminology	42
Appendix 3 Aquaculture Production and Value of Production, South Australia, 1994/95 to 2005/06	44

Appendix 4	The Total Economic Impact of Aquaculture in South Australia, by Aquaculture Sector, 2001/02 to 2004/05.....	46
------------	---	----

List of Tables

Table E1	The economic impact of aquaculture in South Australia, 2005/06	viii
Table E2	The total regional economic impact (direct and flow-on) of aquaculture in South Australia, 2005/06	ix
Table E3	Forecast growth in South Australian aquaculture production and employment, 2006/07 to 2008/09.....	x
Table E4	Forecast growth in South Australian aquaculture value of production, 2006/07 to 2008/09	xi
Table 2.1	Change in scope of the economic impact assessment	3
Table 3.1	Aquaculture production and value of production, South Australia, 2001/02 to 2005/06	6
Table 3.2	Forecast growth in South Australian aquaculture production and employment, 2006/07 to 2008/09 ^a	8
Table 3.3	Forecast growth in South Australian aquaculture value of production, 2006/07 to 2008/09 ^a	10
Table 3.4	Value of aquaculture production and wild fisheries catch, South Australia, 2005/06	11
Table 4.1	The economic impact of tuna farming in South Australia, 2005/06	12
Table 4.2	The economic impact of oyster farming in South Australia, 2005/06 ^a	17
Table 4.3	The economic impact of abalone farming in South Australia, 2005/06	18
Table 4.4	The economic impact of mussel farming in South Australia, 2005/06	19
Table 4.5	The economic impact of barramundi farming in South Australia, 2005/06	19
Table 4.6	The economic impact of yabby/marron farming in South Australia, 2005/06	20
Table 4.7	The economic impact of other aquaculture in South Australia, 2005/06 ^a	20
Table 5.1	The economic impact of tuna farming in the Eyre Peninsula Region, 2005/06.....	21
Table 5.2	The economic impact of oyster farming in the Eyre Peninsula region, 2005/06 ^a	23
Table 5.3	The economic impact of other aquaculture ^a in the Eyre Peninsula region, 2005/06 ^b	25
Table 6.1	The economic impact of aquaculture ^a in the Limestone Coast region, 2005/06 ^b	26
Table 7.1	The economic impact of aquaculture ^a in the balance of SA, 2005/06 ^b	28
Table 9.1	The economic impact of aquaculture in South Australia, 2005/06	31
Table 9.2	The economic impact of aquaculture in the Eyre Peninsula region, 2005/06	32

Table 9.3	The economic impact of aquaculture in the Limestone Coast region, 2005/06	32
Table 9.4	The economic impact of aquaculture in the balance of SA, 2005/06	33
Table 9.5	The total economic impact (direct and flow-on) of aquaculture in South Australia, by aquaculture sector, 2005/06	34

List of Figures

Figure 4.1	Tuna farming in South Australia, output impacts by sector, 2005/06	13
Figure 4.2	Tuna farming in South Australia, contribution to GSP by sector, 2005/06	14
Figure 4.3	Tuna farming in South Australia, employment impacts by sector, 2005/06	15
Figure 4.4	Tuna farming in South Australia, household income impacts by sector, 2005/06	16
Figure 9.1	Total GSP impact of aquaculture in SA, 1997/98 to 2005/06 ^a	35
Figure 9.2	Total employment impact of aquaculture in SA, 1997/98 to 2005/06 ^a	36

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

Document History and Status

Doc Ver	Doc Status	Issued To	Qty elec	Qty hard	Date	Reviewed	Approved
1	Draft	Ian Nightingale	1		16/04/07	JBM	JBM
2	Final	Ian Nightingale, Heather Montgomerie	1		20/04/07	JBM	JBM
3	Final	Ian Nightingale, Heather Montgomerie	1 Word, 1pdf	2	24/04/07	JBM	JBM

Printed: 24/04/2007 3:12:00 PM
 Last Saved: 24/04/2007 3:11:00 PM
 File Name: S:\1_Projects\Current\0525_Aqua
 Impacts\Reports\2006\AquaImpacts06_Final_070424.doc
 Project Manager: Julian Morison
 Principal Author/s: Matthew Ferris and Julian Morison
 Name of Client: PIRSA Aquaculture
 Name of Project: The Economic Impact of Aquaculture on the South Australian
 State and Regional Economies, 2005/06
 Document Version: 3
 Job Number: 0525

Executive Summary

The aim of this study was to estimate the economic impact of aquaculture activity in South Australia in 2005/06. The results reported here update and expand on those provided in previous studies (EconSearch 1997, 1998, 1999, 2001, 2002a, 2003, 2004, 2006a and 2006b). This report provides estimates of economic impact for 2005/06 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 four (EconSearch 2003, 2004, 2006a and 2006b) 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 \$277m (\$211m on-farm and \$66m in downstream activities) in 2005/06 (Table E.1). **Total output** (\$550m) needs to be used with care as it includes elements of double counting. Approximately 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 2005/06, aquaculture's **total contribution to GSP** (\$265m) (Table E.1) represented 0.42 per cent of the total GSP for South Australia (\$62,798m)¹. Approximately 74 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.

¹ ABS (2006).

Table E.1 The economic impact of aquaculture in South Australia, 2005/06

	Tuna	Oysters	Abalone	Mussels	Barramundi	Yabby/ Marron	Other ^a	Total
Output (\$m)								
Direct								
<i>On-farm</i>	155.8	24.8	8.2	1.0	3.4	0.3	17.9	211.4
<i>Downstream</i>	16.0	39.3	0.4	1.0	1.0	0.1	8.1	65.8
Total Direct	171.8	64.1	8.6	1.9	4.3	0.5	26.0	277.3
Total Flow-on	159.8	69.6	10.2	3.0	5.4	0.3	24.4	272.8
Total	331.6	133.7	18.8	4.9	9.8	0.7	50.5	550.1
Contribution to GSP (\$m)								
Direct								
<i>On-farm</i>	68.1	16.5	2.9	0.7	1.5	0.2	7.7	97.6
<i>Downstream</i>	4.3	14.9	0.1	0.4	0.4	0.1	3.1	23.3
Total Direct	72.4	31.4	3.0	1.1	1.9	0.3	10.8	120.8
Total Flow-on	90.6	33.1	4.8	1.5	2.7	0.1	11.6	144.3
Total	163.0	64.4	7.8	2.5	4.6	0.4	22.4	265.1
Employment (fte)								
Direct								
<i>On-farm</i>	502	511	73	57	27	38	199	1,407
<i>Downstream</i>	55	277	1	7	6	1	53	401
Total Direct	557	789	74	64	33	39	252	1,808
Total Flow-on	868	392	77	17	32	2	153	1,540
Total	1,425	1,180	151	81	65	41	406	3,348
Household income (\$m)								
Direct								
<i>On-farm</i>	16.1	10.2	1.5	1.1	2.3	0.0	4.0	35.2
<i>Downstream</i>	2.8	9.8	0.1	0.2	0.3	0.0	2.1	15.3
Total Direct	18.8	20.0	1.5	1.4	2.6	0.1	6.0	50.5
Total Flow-on	42.0	18.6	2.6	0.8	1.4	0.1	6.5	71.9
Total	60.8	38.6	4.1	2.2	4.0	0.1	12.5	122.4

^a 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 over 1,800 fte (1,407 on-farm and 401 in downstream activities) in 2005/06 with over 1,500 flow-on jobs, giving **total employment** of 3,348 fte (Table E.1). Almost 75 per cent of these jobs were generated in regional South Australia (Table E.2).

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 income tax, but excluding payroll tax. Direct household income was estimated to be around \$51m in 2005/06 and flow-on income approximately \$72m, giving a **total household income** impact of over \$122m (Table E.1). Approximately 65 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 2005/06 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, 2005/06

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Eyre Peninsula	351.4	91%	180.0	92%	2,150	87%	70.1	88%
Limestone Coast	2.4	1%	1.1	1%	22	1%	1.0	1%
Balance of SA	30.8	8%	13.9	7%	304	12%	8.3	10%
Total Regional Impact	384.6	100%	195.1	100%	2,476	100%	79.3	100%
Regional Impact as a Proportion of Total	-	70%	-	74%	-	74%	-	65%

Source: EconSearch analysis.

Respondents to the survey of aquaculture licence holders undertaken by PIRSA for 2005/06 provided forecasts of their production and employment over the three year period, 2006/07 to 2008/09. The forecasts for each sector are summarised in Table E.3.

Table E.3 Forecast growth in South Australian aquaculture production and employment, 2006/07 to 2008/09 ^a

	Estimated change in production			Estimated change in employment		
	2006/07	2007/08	2008/09	2006/07	2007/08	2008/09
Tuna	-2%	2%	2%	0%	3%	3%
Oysters	14%	9%	9%	3%	6%	7%
Barramundi	1%	1%	0%	0%	0%	0%
Marron	21%	19%	14%	2%	2%	1%
Blue Mussels	55%	24%	20%	11%	16%	18%
Abalone	24%	58%	65%	10%	15%	15%
Yabbies	29%	18%	10%	3%	3%	1%
Rainbow Trout	0%	1%	3%	0%	0%	0%
Marine finfish ^b	49%	55%	76%	30%	18%	14%
Other ^c	13%	13%	13%	12%	11%	7%

^a Based on an analysis of PIRSA Aquaculture's 2005/06 survey responses.

^b Predominantly yellowtail kingfish and mullocky production. Estimates of production growth were based on supplementary information collected by PIRSA Aquaculture (Heather Montgomerie, pers. comm.). Confidentiality requirements prevent the publication of production and value of production estimates for this sector.

^c Other aquaculture includes a diverse range of enterprises including cockle and algae production.

Based on two sets of price assumptions, namely a 'no price' response and a 'generic small but negative price' effect, high and low forecasts of gross value of aquaculture production (GVP) for the period 2006/07 to 2008/09 have been imputed from the production forecasts. These GVP forecasts are presented in Table E.4.

The low estimate of GVP is based on a small but negative price effect for that proportion of the growth that is likely to be supplied to the South Australian domestic market. It was assumed that 100 per cent of the growth in tuna and abalone production would be exported to interstate and overseas markets (i.e. low and high estimates of GVP identical) and 50 per cent of the growth in other sectors would be exported. The high estimate of GVP is based on no price response over the forecast period (i.e. prices remain at 2005/06 levels).

Table E.4 Forecast growth in South Australian aquaculture value of production, 2006/07 to 2008/09 ^a

	Actual GVP (\$m)	Low GVP Forecast (\$m)			High GVP Forecast (\$m)		
	2005/06	2006/07	2007/08	2008/09	2006/07	2007/08	2008/09
Tuna	155.8	152.0	155.1	158.4	152.0	155.1	158.4
Oysters ^b	23.9	26.3	28.1	29.9	27.3	29.8	32.4
Barramundi	3.4	3.4	3.4	3.4	3.4	3.5	3.5
Marron	0.3	0.3	0.4	0.4	0.3	0.4	0.5
Blue Mussels	1.0	1.3	1.5	1.7	1.5	1.8	2.2
Abalone	8.2	10.2	16.1	26.6	10.2	16.1	26.6
Yabbies	0.0	0.0	0.0	0.1	0.0	0.1	0.1
Rainbow Trout	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Other ^c	17.6	22.0	28.7	41.2	24.5	35.8	59.1
Total	210.5	215.8	233.7	262.1	219.6	243.0	283.0

^a All estimates are in 2006 dollars.

^b Adult oysters only (i.e. excludes spat).

^c Other aquaculture is comprised of yellowtail kingfish, Atlantic salmon, other marine finfish (e.g. mulloway) and other aquaculture enterprises (e.g. algae production).

1. Introduction

The aim of this study was to estimate the economic impact of aquaculture activity in South Australia in 2005/06. The results reported here update and expand on those provided in previous studies (EconSearch 1997, 1998, 1999, 2001, 2002a, 2003, 2004, 2006a and 2006b). Estimates of the economic impact of aquaculture activity in South Australia in 2005/06 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;
- 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 2005/06) and for the period 2001/02 to 2004/05 (EconSearch 2003, 2004, 2006a and 2006b) are consistent with the 'message' and method in²:

- South Australian Aquaculture Council (2002), *Final Draft State Aquaculture Action Plan*;
- PIRSA's *Food for the Future* value chain analysis 2005/06 (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 production³;
- 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.

² As discussed at the State Aquaculture Plan Working Group meeting at the Hilton Hotel on 19 November 2002.

³ 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 ^a	Scope of Impact Analysis in Recent and Future Studies ^b
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

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

^b For the years 2001/02, 2002/03, 2004/05 and 2005/06 (EconSearch 2003, 2004, 2006a and 2006b).

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 product⁴;
- 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

⁴ 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 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.

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, 2005/06, as outlined above⁵.

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 2005/06 were prepared by PIRSA Aquaculture and validated by industry representatives before being provided to the consultants for use in this study⁶.

Representative cost structures and other relevant information for enterprises operating in individual sectors of the aquaculture and fishing industries⁷ were updated from 2002/03 to 2005/06 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

⁵ Note that direct output equates to the PIRSA Seafood Scorecard estimate of net food revenue.

⁶ EconSearch coordinated the compilation, analysis and validation of these data.

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

- proportion of feed sourced from local region, other SA or interstate - average per enterprise

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 2006a). 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

3.1 Production and Value of Production

Estimates of tuna, oyster and other aquaculture production and value of production from SARDI Aquatic Sciences and PIRSA Aquaculture for the five-year period, 2001/02 to 2005/06, are provided in Table 3.1. Some description of these data is provided below. Similar data for the period 1994/95 to 2005/06 are provided in Appendix 1 of the report.

Table 3.1 Aquaculture production and value of production, South Australia, 2001/02 to 2005/06

	2001/02		2002/03		2003/04		2004/05		2005/06	
	Weight ('000kg)	Value (\$m)	Weight ('000kg)	Value (\$m)	Weight ('000kg)	Value (\$m)	Weight ('000kg)	Value (\$m)	Weight ('000kg)	Value (\$m)
Tuna	9,245	260.500	9,102	266.907	9,290	151.000	7,458	139.955	8,806	155.795
Oysters										
adult ^a	3,464	13.303	3,865	15.116	4,644	19.959	4,650	19.995	5,397	23.879
spat	-	0.856	-	1.002	-	1.193	-	1.195	-	0.957
Barramundi	255	2.653	471	6.166	216	2.255	217	2.265	400	3.370
Marron	11	0.282	22	0.533	18	0.480	22	0.587	10	0.282
Blue Mussels	171	0.371	254	0.466	400	0.697	377	0.657	469	0.950
Abalone	34	1.901	59	3.080	105	3.155	177	5.318	250	8.222
Yabbies	8	0.095	7	0.093	10	0.153	20	0.306	2	0.036
Rainbow Trout	26	0.192	18	0.156	40	0.330	66	0.545	53	0.356
Other ^b	334	3.375	1,077	8.769	894	7.533	2,019	17.015	2,148	17.591
Total	13,548	283.528	14,875	302.288	15,617	186.755	15,006	187.838	17,535	211.438

^a The weight for adult oysters is an approximation on the basis that a dozen oysters weighs one kilogram.

^b Other aquaculture production is comprised of yellowtail kingfish, Atlantic salmon, other marine finfish (e.g. mullocky) and other aquaculture enterprises (e.g. algae production).

Source: SARDI Aquatic Sciences, PIRSA Aquaculture.

- Tuna farm output increased by 18 per cent between 2004/05 and 2005/06, although the per unit value of farmed tuna over this period declined by 6 per cent. Gross value of production over the period 2003/04 to 2005/06 was well below the values recorded in 2001/02 and 2002/03 due to a combination of 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.
- The gross value of adult oyster production has increased at an average rate of 16 per cent per annum over the five-year period, 2001/02 to 2005/06, with a 19 per cent increase between 2004/05 and 2005/06.

- Of the other aquaculture sectors, the most significant growth in production and value of production has been experienced in the 'other aquaculture' category which includes yellowtail kingfish, Atlantic salmon, rainbow trout, other marine finfish (e.g. mullet) and other aquaculture enterprises (e.g. algae production). Over the period 2001/02 to 2005/06 the value of production of this sector has increased by over 400 per cent, largely as a result of growth in the marine finfish sector.
- Note that confidentiality requirements have prevented the publication of production and value of production estimates for the marine finfish sector in 2005/06 and earlier years. However, given the significant historical and forecast growth in production and employment in this sector, and its increasing relative importance within the aquaculture industry in South Australia, it is likely that production and economic impact estimates will be published for this sector in future reports.

3.2 Forecast Growth in Production and Employment

Respondents to the survey of aquaculture licence holders undertaken by PIRSA for 2005/06 provided forecasts of their production and employment over the three year period, 2006/07 to 2008/09 (Table 3.2). The forecasts for each sector can be summarised as follows:

- Tuna - little or no annual production (-2 to 2 per cent) and employment (0 to 3 per cent) growth;
- Oysters - modest annual production (9 to 14 per cent) and employment (3 to 7 per cent) growth;
- Barramundi - little or no production and employment growth;
- Marron - notable production (14 to 21 per cent) but little employment (1 to 2 per cent) growth;
- Mussels - significant production (20 to 55 per cent) and employment (11 to 18 per cent) growth;
- Abalone – significant production (24 to 65 per cent) and employment (10 to 15 per cent) growth;
- Yabby - notable production (10 to 29 per cent) but little employment (1 to 3 per cent) growth;
- Rainbow trout - low production (0 to 3 per cent) and no employment growth;
- Marine finfish - significant production (49 to 76 per cent) and employment (14 to 30 per cent) growth; and
- Other aquaculture - modest production (13 per cent) and employment (7 to 12 per cent) growth.

Table 3.2 Forecast growth in South Australian aquaculture production and employment, 2006/07 to 2008/09 ^a

	Estimated change in production			Estimated change in employment		
	2006/07	2007/08	2008/09	2006/07	2007/08	2008/09
Tuna	-2%	2%	2%	0%	3%	3%
Oysters	14%	9%	9%	3%	6%	7%
Barramundi	1%	1%	0%	0%	0%	0%
Marron	21%	19%	14%	2%	2%	1%
Blue Mussels	55%	24%	20%	11%	16%	18%
Abalone	24%	58%	65%	10%	15%	15%
Yabbies	29%	18%	10%	3%	3%	1%
Rainbow Trout	0%	1%	3%	0%	0%	0%
Marine finfish ^b	49%	55%	76%	30%	18%	14%
Other ^c	13%	13%	13%	12%	11%	7%

^a Based on an analysis of PIRSA Aquaculture's 2005/06 survey responses.

^b Predominantly yellowtail kingfish and mullet production. Estimates of production growth were based on supplementary information collected by PIRSA Aquaculture (Heather Montgomerie, pers. comm.). Confidentiality requirements prevent the publication of production and value of production estimates for this sector.

^c Other aquaculture includes a diverse range of enterprises including cockle and algae production, for example.

Under the assumption that aquaculture producers in the state are price takers and that changes in industry supply will have little effect on prices received, then the effect of the forecast production changes (Table 3.2) could be translated directly into changes in gross value of production (GVP). Even if a negative price response were to arise from production increases, it could be argued that consumer demand pressures for seafood will have an offsetting, positive impact on price. Indeed, in a comprehensive analysis (Delgado et al. 2003) of the global seafood market it was forecast under baseline (most likely) assumptions that, while global aquaculture production would increase by 84 per cent over the period 1997 to 2020 (19 per cent increase in wild catch), real prices are expected to increase by around 15 per cent for crustaceans and high-value finfish and by 4-6 per cent for molluscs and low value food fish.

Nevertheless, the forecast production increases summarised in Table 3.2 are significant in some sectors and, other things being equal, the prices received would tend to decrease as the quantity supplied increases. This relationship can be measured using a price flexibility coefficient, that is, the percentage change in price given a one percent change in the quantity supplied. This can, in turn, be approximated using the reciprocal of the price elasticity of demand⁸.

Short-run elasticities of demand for primary products are generally relatively price inelastic⁹. In the longer run, however, with opportunities for exports and substitution

⁸ The percentage change in the quantity demanded resulting from a 1 per cent increase in price (Pindyck and Rubinfeld 1995).

⁹ As used in the Monash General Equilibrium Model of the Australian economy, for example (Glyn Wittwer, Centre of Policy Studies, Monash University, pers. comm.).

with other products, elasticities of demand for primary products are generally relatively price elastic (i.e. less than -1.0). In the absence of empirically estimated elasticities for aquaculture products, it was assumed for the purpose of this analysis that the medium-run price elasticity of demand for aquacultural products is -2.0 and the reciprocal, the price flexibility coefficient, is -0.5 ¹⁰.

It is likely that a price response of this magnitude would apply only to that proportion of the growth in aquaculture production that is supplied to the South Australian domestic market. For the purpose of this analysis it was assumed that 100 per cent of the growth in tuna and abalone production would be exported to interstate and overseas markets and 50 per cent of the growth in other sectors would be exported. For that proportion of production growth that is exported from the state to interstate or overseas markets, it was assumed that the producers are price takers and that changes in industry supply will have little effect on prices received.

These two sets of price assumptions, namely a 'no price' response and a 'generic small but negative price' effect, were used as the basis for high and low forecasts of gross value of aquaculture production for the period 2006/07 to 2008/09. These forecasts are presented in Table 3.3.

¹⁰ That is, there would be a 0.5 per cent decrease in price given a one per cent increase in the quantity supplied.

Table 3.3 Forecast growth in South Australian aquaculture value of production, 2006/07 to 2008/09 ^a

	Actual GVP (\$m)	Low GVP Forecast (\$m) ^b			High GVP Forecast (\$m) ^c		
	2005/06	2006/07	2007/08	2008/09	2006/07	2007/08	2008/09
Tuna	155.8	152.0	155.1	158.4	152.0	155.1	158.4
Oysters ^d	23.9	26.3	28.1	29.9	27.3	29.8	32.4
Barramundi	3.4	3.4	3.4	3.4	3.4	3.5	3.5
Marron	0.3	0.3	0.4	0.4	0.3	0.4	0.5
Blue Mussels	1.0	1.3	1.5	1.7	1.5	1.8	2.2
Abalone	8.2	10.2	16.1	26.6	10.2	16.1	26.6
Yabbies	0.0	0.0	0.0	0.1	0.0	0.1	0.1
Rainbow Trout	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Other ^e	17.6	22.0	28.7	41.2	24.5	35.8	59.1
Total	210.5	215.8	233.7	262.1	219.6	243.0	283.0

^a All estimates are in 2006 dollars.

^b The low estimate of gross value of production (GVP) is based on a small but negative price effect for that proportion of the growth that is likely to be supplied to the SA domestic market. It was assumed that 100 per cent of the growth in tuna and abalone production would be exported to interstate and overseas markets (i.e. low and high estimates of GVP identical) and 50 per cent of the growth in other sectors would be exported.

^c The high estimate of GVP is based on no price response over the forecast period (i.e. prices remain at 2005/06 levels).

^d Adult oysters only (i.e. excludes spat).

^e Other aquaculture is comprised of yellowtail kingfish, Atlantic salmon, other marine finfish (e.g. mulloway) and other aquaculture enterprises (e.g. algae production).

3.3 The Value of Aquaculture and Wild Catch Fisheries in South Australia

In aggregate, tuna is the largest single sector in the state's aquaculture industry, accounting for approximately 74 per cent of the state's gross value of aquaculture production in 2005/06 (Table 3.4). The state's total value of seafood production (landed) in 2005/06 was almost \$405 million. Of this, tuna farming contributed approximately 39 per cent and aquaculture as a whole, approximately 52 per cent (Table 3.4).

Table 3.4 Value of aquaculture production and wild fisheries catch, South Australia, 2005/06

	Value of production or catch (\$m)	Contribution to aquaculture production	Contribution to total seafood production or catch
Aquaculture			
Tuna	155.795	73.7%	38.5%
Oysters	24.836	11.7%	6.1%
Barramundi	3.370	1.6%	0.8%
Marron	0.282	0.1%	0.1%
Blue Mussels	0.950	0.4%	0.2%
Abalone	8.222	3.9%	2.0%
Yabbies	0.036	0.0%	0.0%
Rainbow Trout	0.356	0.2%	0.1%
Other ^a	17.591	8.3%	4.3%
Total Aquaculture	211.438	100.0%	52.2%
Wild Catch Fisheries^b			
Rock Lobster	81.170	-	20.0%
Abalone	33.859	-	8.4%
Prawns	36.909	-	9.1%
Sardines	16.031	-	4.0%
Other Marine Fisheries	20.717	-	5.1%
Inland Water Fisheries	4.868	-	1.2%
Total Wild Catch	193.554	-	47.8%
Total Seafood	404.992	-	100.0%

^a Other aquaculture production is comprised of yellowtail kingfish, other marine finfish (e.g. mulloway) and other aquaculture enterprises (e.g. algae production).

^b Excludes catch from the Commonwealth managed fisheries.

Source: SARDI Aquatic Sciences and PIRSA Aquaculture.

4. The Economic Impact of Aquaculture in South Australia, 2005/06

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 2005/06 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, 2005/06

Estimates of the economic impact generated by the tuna farming industry in SA on a sector-by-sector basis for 2005/06 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, 2005/06

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Tuna farming ^a	155.8	47%	68.1	42%	502	35%	16.1	26%
Processing	13.6	4%	3.2	2%	44	3%	2.0	3%
Transport	2.4	1%	1.2	1%	11	1%	0.8	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%
Total Direct	171.8	52%	72.4	44%	557	39%	18.8	31%
Flow-on effects								
Tuna fishing	37.5	11%	30.7	19%	223	16%	7.1	12%
Property and business serv.	23.2	7%	13.5	8%	80	6%	4.8	8%
Manufacturing	21.2	6%	5.0	3%	68	5%	3.1	5%
Trade	16.5	5%	7.5	5%	167	12%	6.0	10%
Sardines	15.2	5%	8.4	5%	60	4%	6.3	10%
Transport	7.1	2%	3.4	2%	34	2%	2.3	4%
Finance	8.2	2%	5.4	3%	34	2%	2.0	3%
Other Sectors	30.8	9%	16.7	10%	202	14%	10.3	17%
Total Flow-on	159.8	48%	90.6	56%	868	61%	42.0	69%
Total	331.6	100%	163.0	100%	1,425	100%	60.8	100%
Total/Direct	1.93		2.25		2.56		3.23	

^a Note the double counting in the output impact which also includes the value of tuna fishing.

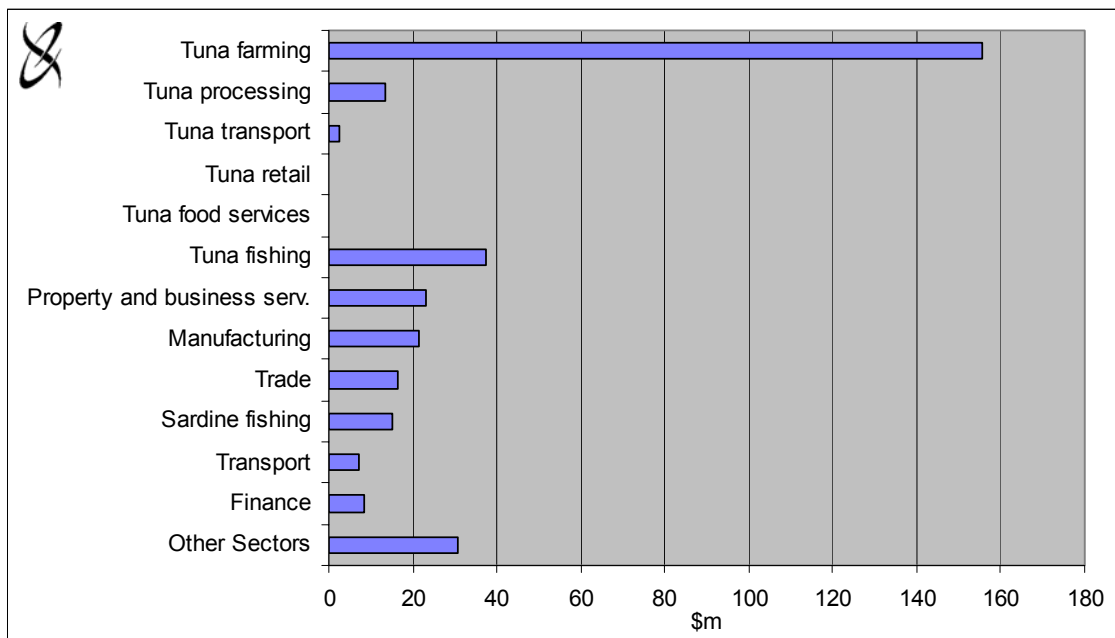
Source: EconSearch analysis.

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 \$156 million and in other sectors (processing and transport), \$16 million in 2005/06. Flow-on output in other sectors of the state economy summed to almost \$160 million (Table 4.1). The sectors most affected were the tuna fishing (tuna capture¹¹), sardine 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 1.93 indicates that for each dollar of sales generated by the tuna industry (farming and downstream) there was a total of \$1.93 of in output generated by businesses throughout the state, \$1.00 in the tuna industry (farming and downstream) and \$0.93 in other sectors of the economy.

Figure 4.1 Tuna farming in South Australia, output impacts by sector, 2005/06



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 activity¹².

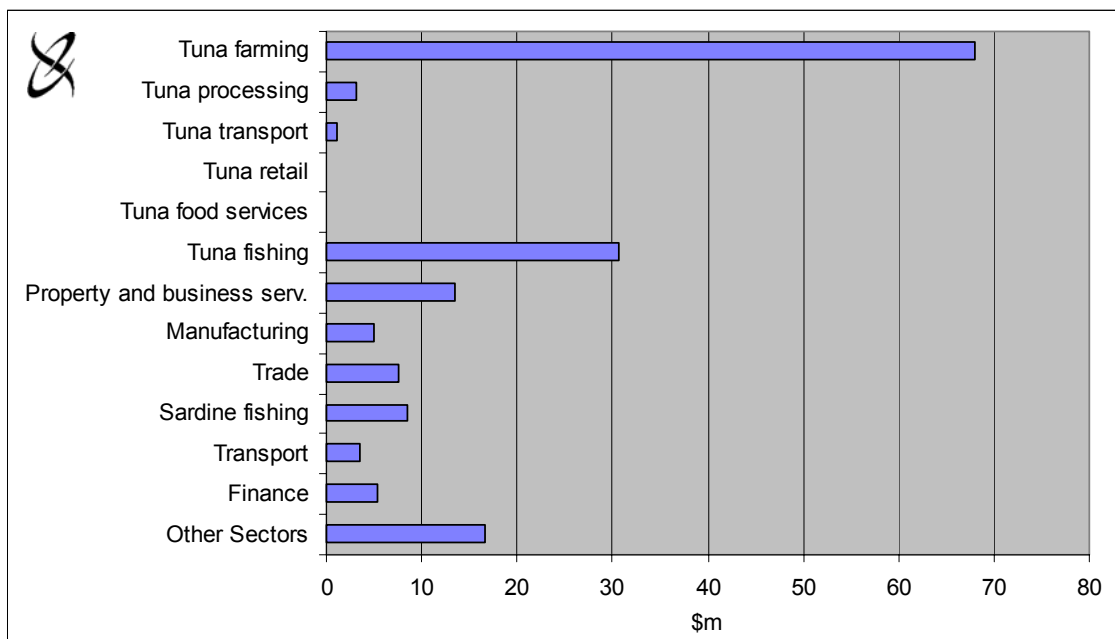
¹¹ Note that the value of tuna fishing is also included in the direct impact of tuna farming.

¹² 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 \$72 million in 2005/06. Associated with this was flow-on GSP in the other sectors of the state economy of \$91 million (Table 4.1).

The flow-ons were greatest in the tuna fishing (\$31m), sardine fishing (\$8 million), property and business services (\$14m), manufacturing (\$5m), trade (\$8m) and finance (\$5m) 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 \$1.25 (\$2.25 in total) contribution to GSP in other sectors of the state economy.

Figure 4.2 Tuna farming in South Australia, contribution to GSP by sector, 2005/06



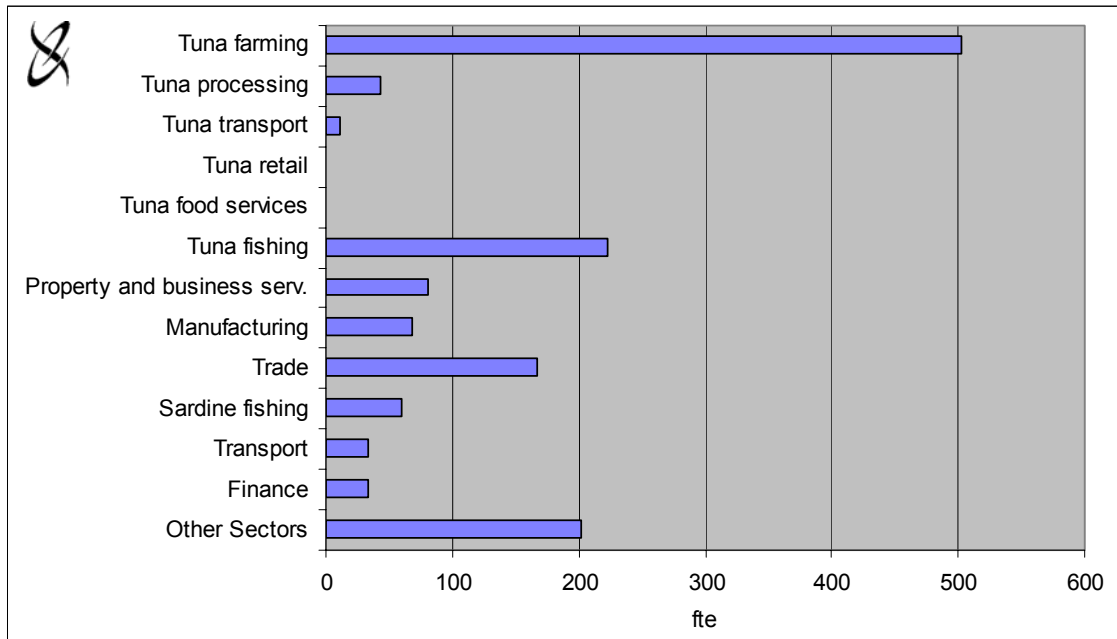
Source: EconSearch analysis.

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 500 full-time equivalents (fte) and, through associated processing and transport activities, another 55 fte in 2005/06 (Table 4.1). Flow-on business activity was estimated to generate a further 868 fte to give total employment of approximately 1,425 fte in the state. The sectors of the economy with employment flow-ons from tuna farming, processing and transport include the tuna fishing (223 fte), trade (167), manufacturing (68), property and business services (80), sardine fishing (60) and transport (34) 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 1.56 jobs (2.56 jobs in total) in the rest of the state.

Figure 4.3 Tuna farming in South Australia, employment impacts by sector, 2005/06

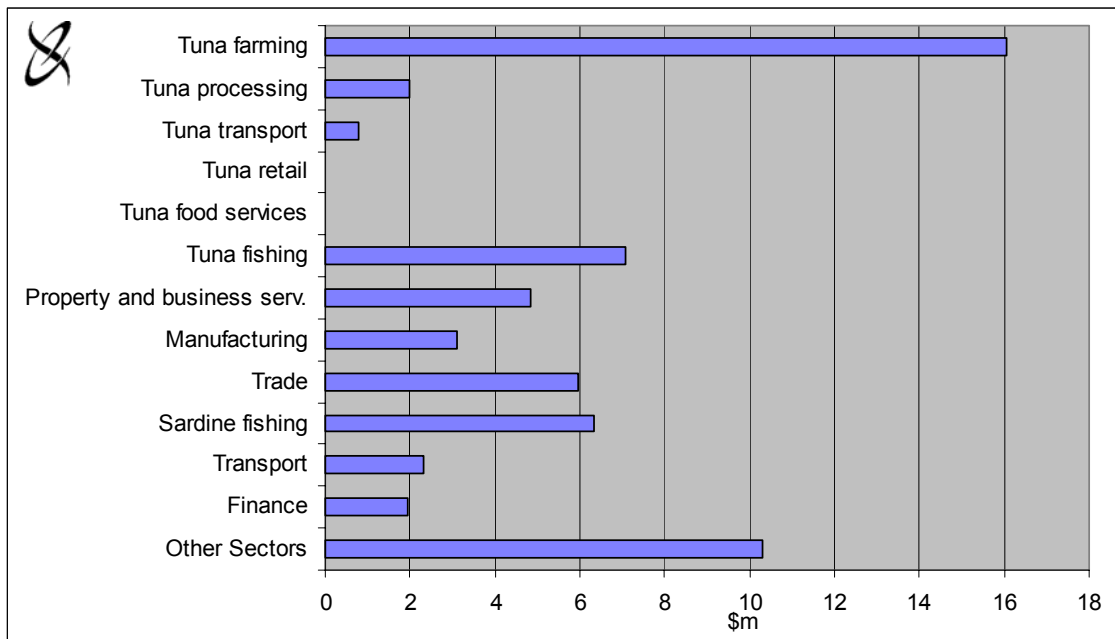


Source: EconSearch analysis.

It was estimated that personal income of approximately \$16 million was earned in the tuna farming sector in 2005/06, comprising both wages by employees and drawings by owner/operators. An additional \$7 million was earned by licence holders and crew in the tuna fishing sector and a further \$38 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 2005/06 there was an additional 2.23 (\$3.23 in 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, 2005/06



Source: EconSearch analysis.

4.2 The Economic Impact of Oyster Farming in South Australia, 2005/06

Table 4.2 provides estimates of the economic impact generated by oyster farming in South Australia on a sector-by-sector basis in 2005/06. 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 almost \$25 million in 2005/06 while output generated in SA by associated downstream activities (processing, transport, retail and food service) summed to almost \$39 million. Flow-ons to other sectors of the state economy added another \$70 million in output in 2005/06. 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 2005/06, total oyster farming-related contribution to GSP in South Australia was over \$64 million, \$17 million generated by oyster farming directly, \$15 million generated directly by downstream activities and \$33 million generated in other sectors of the state economy.

Table 4.2 The economic impact of oyster farming in South Australia, 2005/06 ^a

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Oyster farming ^b	24.8	19%	16.5	26%	511	43%	10.2	27%
Processing	6.7	5%	1.6	2%	22	2%	1.0	3%
Transport	6.3	5%	3.0	5%	30	3%	2.1	5%
Retail	0.4	0%	0.2	0%	4	0%	0.2	0%
Food services	25.8	19%	10.1	16%	221	19%	6.6	17%
Total Direct	64.1	48%	31.4	49%	789	67%	20.0	52%
Flow-on effects								
Property and business serv	16.2	12%	9.3	14%	60	5%	3.6	9%
Manufacturing	14.7	11%	3.4	5%	47	4%	2.2	6%
Trade	10.5	8%	4.8	7%	106	9%	3.8	10%
Transport	3.2	2%	1.5	2%	15	1%	1.0	3%
Finance	4.6	3%	3.0	5%	19	2%	1.1	3%
Other Sectors	20.5	15%	11.0	17%	145	12%	6.9	18%
Total Flow-on	69.6	52%	33.1	51%	392	33%	18.6	48%
Total Impact	133.7	100%	64.4	100%	1,180	100%	38.6	100%
Total/Direct	2.09		2.05		1.50		1.93	

^a 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.

^b Includes sales of spat.

Source: EconSearch analysis.

Employment and household income...

In 2005/06, SA oyster farming was responsible for the direct employment of around 500 fte and downstream activities created employment for around 280 fte. Flow-on business activity was estimated to generate a further 392 fte. These jobs were concentrated in the trade (106), manufacturing (47) and property and business services (60) sectors.

Personal income of approximately \$10 million was earned in the oyster farming sector and another \$9.8 million in downstream activities. This comprised both wages by employees and estimated drawings by owner/operators. An additional \$18.6 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 \$39 million.

4.3 The Economic Impact of Other Aquaculture in South Australia, 2005/06

The economic impacts of other aquaculture sectors in South Australia in 2005/06 (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 some 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, 2005/06

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Abalone farming	8.2	44%	2.9	37%	73	48%	1.5	36%
Processing	0.3	2%	0.1	1%	1	1%	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%
Total Direct	8.6	46%	3.0	38%	74	49%	1.5	37%
Flow-on effects								
Property and business serv	1.5	8%	0.9	11%	5	3%	0.3	7%
Manufacturing	1.1	6%	0.3	3%	4	2%	0.2	4%
Trade	1.1	6%	0.5	7%	11	8%	0.4	10%
Transport	0.3	1%	0.1	2%	1	1%	0.1	2%
Finance	0.4	2%	0.3	4%	2	1%	0.1	2%
Other Sectors	5.8	31%	2.7	35%	54	36%	1.5	37%
Total Flow-on	10.2	54%	4.8	62%	77	51%	2.6	63%
Total	18.8	100%	7.8	100%	151	100%	4.1	100%
Total/Direct	2.19		2.62		2.04		2.71	

Source: EconSearch analysis.

Table 4.4 The economic impact of mussel farming in South Australia, 2005/06

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Mussel farming	1.0	19%	0.7	27%	57	70%	1.1	52%
Processing	0.2	5%	0.1	2%	1	1%	0.0	2%
Transport	0.2	3%	0.1	3%	1	1%	0.0	2%
Retail	0.1	2%	0.1	2%	1	2%	0.0	2%
Food services	0.5	9%	0.2	7%	4	5%	0.1	5%
Total Direct	1.9	39%	1.1	42%	64	79%	1.4	64%
Flow-on effects								
Property and business serv	0.7	14%	0.4	17%	2	3%	0.1	6%
Manufacturing	0.6	11%	0.1	5%	2	2%	0.1	4%
Trade	0.5	9%	0.2	8%	5	6%	0.2	8%
Transport	0.1	3%	0.1	2%	1	1%	0.0	2%
Finance	0.2	4%	0.1	6%	1	1%	0.1	2%
Other Sectors	0.9	19%	0.5	20%	7	9%	0.3	15%
Total Flow-on	3.0	61%	1.5	58%	17	21%	0.8	36%
Total	4.9	100%	2.5	100%	81	100%	2.2	100%
Total/Direct	2.56		2.40		1.27		1.57	

Source: EconSearch analysis.

Table 4.5 The economic impact of barramundi farming in South Australia, 2005/06

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Barramundi farming	3.4	35%	1.5	32%	27	42%	2.3	57%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
Transport	0.6	6%	0.3	6%	3	4%	0.2	5%
Retail	0.1	1%	0.0	1%	1	1%	0.0	1%
Food services	0.3	3%	0.1	3%	3	4%	0.1	2%
Total Direct	4.3	44%	1.9	42%	33	51%	2.6	64%
Flow-on effects								
Property and business serv	1.2	12%	0.7	16%	3	5%	0.2	5%
Manufacturing	0.9	10%	0.2	5%	3	5%	0.1	3%
Trade	0.9	10%	0.4	9%	10	15%	0.3	8%
Transport	0.2	2%	0.1	2%	1	2%	0.1	2%
Finance	0.4	4%	0.3	6%	2	2%	0.1	2%
Other Sectors	1.7	18%	0.9	20%	13	20%	0.6	15%
Total Flow-on	5.4	56%	2.7	58%	32	49%	1.4	36%
Total	9.8	100%	4.6	100%	65	100%	4.0	100%
Total/Direct	2.25		2.40		1.95		1.55	

Source: EconSearch analysis.

Table 4.6 The economic impact of yabby/marron farming in South Australia, 2005/06

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Yabby/marron farming	0.3	43%	0.2	56%	38	93%	0.0	22%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
Transport	0.0	2%	0.0	2%	0	0%	0.0	4%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.1	17%	0.0	12%	1	3%	0.0	23%
Total Direct	0.5	63%	0.3	70%	39	96%	0.1	49%
Flow-on effects								
Property and business serv	0.1	9%	0.0	9%	0	1%	0.0	10%
Manufacturing	0.1	8%	0.0	3%	0	0%	0.0	6%
Trade	0.0	6%	0.0	5%	0	1%	0.0	12%
Transport	0.0	2%	0.0	1%	0	0%	0.0	3%
Finance	0.0	2%	0.0	3%	0	0%	0.0	3%
Other Sectors	0.1	10%	0.0	10%	0	1%	0.0	18%
Total Flow-on	0.3	37%	0.1	30%	2	4%	0.1	51%
Total	0.7	100%	0.4	100%	41	100%	0.1	100%
Total/Direct	1.59		1.43		1.04		2.05	

Source: EconSearch analysis.

Table 4.7 The economic impact of other aquaculture in South Australia, 2005/06 ^a

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Other aquaculture	17.9	36%	7.7	34%	199	49%	4.0	32%
Processing	1.8	4%	0.4	2%	6	1%	0.3	2%
Transport	1.9	4%	0.9	4%	9	2%	0.6	5%
Retail	0.5	1%	0.2	1%	5	1%	0.2	2%
Food services	3.9	8%	1.5	7%	33	8%	1.0	8%
Total Direct	26.0	52%	10.8	48%	252	62%	6.0	48%
Flow-on effects								
Property and business serv	4.7	9%	2.8	12%	16	4%	1.0	8%
Manufacturing	4.2	8%	1.0	4%	14	3%	0.6	5%
Trade	3.8	8%	1.8	8%	39	10%	1.4	11%
Transport	1.0	2%	0.5	2%	5	1%	0.3	2%
Finance	1.5	3%	1.0	4%	6	1%	0.3	3%
Other Sectors	9.2	18%	4.7	21%	74	18%	2.8	22%
Total Flow-on	24.4	48%	11.6	52%	153	38%	6.5	52%
Total	50.5	100%	22.4	100%	406	100%	12.5	100%
Total/Direct	1.94		2.07		1.61		2.07	

^a 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, 2005/06

5.1 The Economic Impact of Tuna Farming in the Eyre Peninsula Region, 2005/06

Estimates of the economic impact of tuna farming in the Eyre Peninsula region¹³ of South Australia in 2005/06 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, 2005/06

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Tuna farming ^a	155.8	56%	68.1	49%	502	41%	16.1	34%
Processing	13.6	5%	3.2	2%	44	4%	2.0	4%
Transport	2.4	1%	1.2	1%	11	1%	0.8	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%
Total Direct	171.8	62%	72.4	52%	557	46%	18.8	40%
Flow-on effects								
Tuna fishing	37.5	13%	30.7	22%	223	18%	7.1	15%
Property and business serv.	12.6	5%	8.3	6%	24	2%	1.3	3%
Manufacturing	6.6	2%	1.8	1%	31	3%	1.2	3%
Trade	11.1	4%	5.1	4%	132	11%	4.0	9%
Sardines	15.2	5%	8.4	6%	60	5%	6.3	14%
Transport	2.6	1%	1.3	1%	15	1%	0.9	2%
Finance	1.9	1%	1.3	1%	10	1%	0.5	1%
Other Sectors	19.0	7%	10.6	8%	168	14%	6.7	14%
Total Flow-on	106.5	38%	66.9	48%	639	54%	27.4	60%
Total	278.3	100%	140.0	100%	1,220	100%	46.8	100%
Total/Direct	1.62		1.93		2.19		2.49	

^a Note the double counting in the output impact, also includes the value of tuna fishing.

Source: EconSearch analysis.

¹³ 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 \$156 million and in other sectors (processing and transport), \$16 million in 2005/06. Flow-on output in other sectors summed to \$107 million. The sectors most affected were the tuna fishing (tuna capture¹⁴), sardine 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 1.62 indicates that for each dollar of sales generated directly by tuna farming, processing and transport there was a total of \$1.62 of output generated by businesses throughout the Eyre Peninsula region, \$1.00 in tuna farming, processing and transport and \$0.62 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 \$72 million in 2005/06. Flow-on GRP generated in the other sectors of the regional economy was approximately \$67 million in 2005/06. The flow-ons were greatest in the tuna fishing (\$31m), sardine fishing (\$8m), property and business services (\$8m), trade (\$5m) and manufacturing (\$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 \$0.93 (\$1.93 in 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 500 fte and associated processing and transport, approximately 55 fte in the Eyre Peninsula region in 2005/06. Flow-on business activity was estimated to have generated a further 639 fte jobs locally to give total employment of almost 1,220 fte in the region. The sectors of the local economy with employment flow-ons from tuna farming, processing and transport included the tuna fishing (223 fte), sardine fishing (60), trade (132), manufacturing (31), property and business services (24) and transport (15) 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 1.19 jobs (2.19 jobs in total) in the rest of the region.

It was estimated that personal income of \$16 million was earned directly in the tuna farming sector in 2005/06, comprising both wages by employees and drawings by owner/operators. An additional \$7.1 million of household income was earned by licence holders and crew in the tuna fishing sector and a further \$23.7 million in other sectors of the regional economy. For each \$1.00 of household income generated directly by tuna farming, processing and transport in 2005/06 there was an additional \$1.49 (\$2.49 in total) generated in other sectors of the Eyre Peninsula regional economy.

¹⁴ 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, 2005/06

Estimates of the economic impact of oyster farming in the Eyre Peninsula region in 2005/06 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 almost \$24 million in 2005/06 while output generated in the Eyre Peninsula region by associated downstream activities (processing, transport, retail and food service) summed to almost \$9 million. Flow-ons to other sectors of the regional economy added another \$15 million in output in 2005/06. 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, 2005/06 ^a

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Oyster farming ^b	23.7	50%	15.9	57%	487	75%	9.8	59%
Processing	1.6	3%	0.5	2%	8	1%	0.3	2%
Transport	6.0	13%	3.1	11%	35	5%	2.1	13%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	1.2	3%	0.5	2%	12	2%	0.3	2%
Total Direct	32.6	69%	19.9	72%	543	84%	12.4	76%
Flow-on effects								
Property and business serv.	3.7	8%	2.4	9%	7	1%	0.4	2%
Manufacturing	1.2	3%	0.3	1%	6	1%	0.2	1%
Trade	3.0	6%	1.4	5%	35	5%	1.1	7%
Transport	0.6	1%	0.3	1%	4	1%	0.2	1%
Finance	0.5	1%	0.4	1%	3	0%	0.1	1%
Other Sectors	5.7	12%	3.0	11%	52	8%	1.9	12%
Total Flow-on	14.7	31%	7.8	28%	106	16%	4.0	24%
Total	47.3	100%	27.7	100%	650	100%	16.4	100%
Total/Direct	1.51		1.43		1.22		1.35	

^a 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.

^b 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 \$28 million in 2005/06, \$15.9 million generated by oyster farming directly, \$4.0 million generated by downstream activities and almost \$8 million generated in other sectors of the regional economy.

Employment and household income...

In 2005/06 in the Eyre Peninsula region, oyster farming was responsible for the direct employment of almost 490 fte and associated downstream activities created employment for an additional 56 fte. Flow-on business activity was estimated to generate a further 106 fte.

In 2005/06, personal income of over \$12 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 \$4.0 million of household income was earned in other local businesses as a result of oyster industry operations. The total household income impact was over \$16 million.

5.3 The Economic Impact of Other Aquaculture in the Eyre Peninsula Region, 2005/06

The economic impacts of other aquaculture sectors in the Eyre Peninsula region in 2005/06 (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 ^a in the Eyre Peninsula region, 2005/06 ^b

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Other aquaculture	13.6	53%	6.6	53%	186	66%	3.7	54%
Processing	1.3	5%	0.4	3%	6	2%	0.2	3%
Transport	1.1	4%	0.5	4%	6	2%	0.4	5%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.1	0%	0.0	0%	1	0%	0.0	0%
Total Direct	16.1	62%	7.5	61%	200	71%	4.3	64%
Flow-on effects								
Property and business serv.	1.6	6%	1.0	9%	3	1%	0.2	2%
Manufacturing	0.6	2%	0.2	1%	3	1%	0.1	2%
Trade	1.6	6%	0.8	6%	19	7%	0.6	9%
Transport	0.3	1%	0.1	1%	2	1%	0.1	1%
Finance	0.2	1%	0.2	1%	1	0%	0.1	1%
Other Sectors	5.3	21%	2.5	21%	53	19%	1.5	21%
Total Flow-on	9.7	38%	4.8	39%	81	29%	2.5	36%
Total	25.7	100%	12.3	100%	281	100%	6.8	100%
Total/Direct	1.61		1.65		1.41		1.58	

^a Includes abalone, mussel, yellowtail kingfish farming and other aquaculture enterprises.

^b 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, 2005/06

Estimates of the economic impact of aquaculture in the Limestone Coast region¹⁵ in 2005/06 (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^a in the Limestone Coast region, 2005/06^b

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
Direct effects								
Other aquaculture	1.2	52%	0.6	49%	15	68%	0.7	68%
Processing	0.0	2%	0.0	1%	0	1%	0.0	1%
Transport	0.2	8%	0.1	8%	1	6%	0.1	7%
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>	<i>1.5</i>	<i>62%</i>	<i>0.7</i>	<i>58%</i>	<i>17</i>	<i>75%</i>	<i>0.7</i>	<i>76%</i>
Flow-on effects								
Property and business serv.	0.2	9%	0.1	12%	0	1%	0.0	2%
Manufacturing	0.1	5%	0.0	3%	0	2%	0.0	2%
Trade	0.1	6%	0.1	6%	2	7%	0.1	5%
Transport	0.0	1%	0.0	1%	0	1%	0.0	1%
Finance	0.0	2%	0.0	2%	0	1%	0.0	1%
Other Sectors	0.4	16%	0.2	18%	3	13%	0.1	13%
<i>Total Flow-on</i>	<i>0.9</i>	<i>38%</i>	<i>0.5</i>	<i>42%</i>	<i>6</i>	<i>25%</i>	<i>0.2</i>	<i>24%</i>
Total	2.4	100%	1.1	100%	22	100%	1.0	100%
Total/Direct	1.63		1.73		1.35		1.32	

^a Includes barramundi, yabby/marron farming and other aquaculture enterprises.

^b 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.

¹⁵ Defined as the South East South Australia Statistical Division which is comprised of the following Statistical Local Areas: Grant (DC), Lacedpede (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 \$1.2 million and associated downstream activities, \$0.2 million in the Limestone Coast region in 2005/06. Flow-on output in other sectors of the regional economy summed to \$0.9 million in 2005/06. 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 \$1.1 million in 2005/06, \$0.6 million generated by aquaculture directly, \$0.1 million generated in associated downstream activities and \$0.5 million generated in other sectors of the regional economy.

Employment and household income...

Aquaculture and downstream activities were responsible for the direct employment of 17 fte in 2005/06 in the Limestone Coast region. Flow-on business activity was estimated to generate a further 6 fte.

In 2005/06, personal income of \$0.7 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 \$0.2 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, 2005/06

Estimates of the economic impact of aquaculture in the balance of SA¹⁶ in 2005/06 (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^a in the balance of SA, 2005/06^b

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
Direct effects								
Other aquaculture	17.1	55%	7.4	53%	218	72%	5.0	61%
Processing	1.2	4%	0.3	2%	4	1%	0.1	2%
Transport	1.7	6%	0.8	5%	9	3%	0.6	7%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.2	1%	0.1	0%	2	1%	0.0	1%
Total Direct	20.1	65%	8.6	62%	233	77%	5.8	70%
Flow-on effects								
Property and business serv.	2.4	8%	1.5	11%	5	2%	0.3	4%
Manufacturing	1.1	3%	0.3	2%	3	1%	0.1	2%
Trade	0.9	3%	0.4	3%	10	3%	0.3	4%
Transport	0.2	1%	0.1	1%	1	0%	0.1	1%
Finance	0.1	0%	0.1	1%	1	0%	0.0	0%
Other Sectors	5.9	19%	2.8	20%	50	16%	1.6	19%
Total Flow-on	10.7	35%	5.3	38%	71	23%	2.5	30%
Total	30.8	100%	13.9	100%	304	100%	8.3	100%
Total/Direct	1.54		1.63		1.31		1.44	

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

^b 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.

¹⁶ 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 \$17.1 million and associated downstream activities, \$3.1 million in the balance of SA in 2005/06. Flow-on output in other sectors of the regional economy summed to \$10.7 million in 2005/06. 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 \$13.9 million in 2005/06, \$7.4 million generated by aquaculture directly, \$1.2 million generated in associated downstream activities and \$5.3 million generated in other sectors of the regional economy.

Employment and household income...

Aquaculture and downstream activities were responsible for the direct employment of 233 fte in 2005/06 in the balance of SA. Flow-on business activity was estimated to generate a further 71 fte.

In 2005/06, personal income of \$5.8 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 \$2.5 million of household income was earned in other local businesses as a result of aquaculture industry operations.

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, 2005/06

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 2005/06 was estimated to have had a farm gate value of \$211 million with associated direct output impacts in the processing, transport, retail and food service sectors of \$66 million (Table 9.1). In total, the direct value of aquaculture industry output was estimated to have been approximately \$277 million. This activity generated flow-on output of \$273 million in other South Australian industries. In terms of employment, there were over 1,400 fte jobs generated directly in aquaculture, 401 fte generated in downstream activities (total direct of 1,808 fte) and approximately 1,540 flow-on fte generated in other sectors of the state's economy in 2005/06.

Table 9.1 The economic impact of aquaculture in South Australia, 2005/06

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Aquaculture production	211.4	38%	97.6	37%	1,407	42%	35.2	29%
Aquaculture downstream ^a	65.8	12%	23.3	9%	401	12%	15.3	12%
<i>Total Direct</i>	<i>277.3</i>	<i>50%</i>	<i>120.8</i>	<i>46%</i>	<i>1,808</i>	<i>54%</i>	<i>50.5</i>	<i>41%</i>
Flow-on effects								
Tuna Fishing	37.5	7%	30.7	12%	223	7%	7.1	6%
Other Sectors	235.3	43%	113.6	43%	1,317	39%	64.8	53%
<i>Total Flow-on</i>	<i>272.8</i>	<i>50%</i>	<i>144.3</i>	<i>54%</i>	<i>1,540</i>	<i>46%</i>	<i>71.9</i>	<i>59%</i>
Total	550.1	100%	265.1	100%	3,348	100%	122.4	100%

^a Processing, transport, retail and food services.

Source: EconSearch analysis.

For the Eyre Peninsula region the aquaculture industry in 2005/06 was estimated to have had a farm gate value of \$193 million with associated direct output impacts in the processing, transport, retail and food service sectors of \$27.4 million (Table 9.2). In total, the direct value of aquaculture industry output was estimated to have been approximately \$221 million. This activity generated flow-on output of \$131 million in other regional industries. In terms of employment, there were approximately 1,180 fte jobs generated directly in aquaculture, over 120 fte generated in downstream activities (total direct of 1,300 fte) and 850 flow-on fte generated in other sectors of the region's economy in 2005/06.

Table 9.2 The economic impact of aquaculture in the Eyre Peninsula region, 2005/06

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Direct effects								
Aquaculture production	193.1	55%	90.5	50%	1,176	55%	29.5	42%
Aquaculture downstream ^a	27.4	8%	9.3	5%	124	6%	6.1	9%
<i>Total Direct</i>	<i>220.5</i>	<i>63%</i>	<i>99.8</i>	<i>55%</i>	<i>1,300</i>	<i>60%</i>	<i>35.6</i>	<i>51%</i>
Flow-on effects								
Tuna Fishing	37.5	11%	30.7	17%	223	10%	7.1	10%
Other Sectors	93.4	27%	49.5	28%	627	29%	27.3	39%
<i>Total Flow-on</i>	<i>130.9</i>	<i>37%</i>	<i>80.2</i>	<i>45%</i>	<i>850</i>	<i>40%</i>	<i>34.4</i>	<i>49%</i>
Total	351.4	100%	180.0	100%	2,150	100%	70.1	100%

^a Processing, transport, retail and food services.

Source: EconSearch analysis.

For the Limestone Coast region the aquaculture industry in 2005/06 was estimated to have had a farm gate value of \$1.2 million with associated direct output impacts in the processing, transport, retail and food service sectors of \$0.2 million (Table 9.3). This activity generated flow-on output of \$0.9 million in other regional industries. In terms of employment, there were 17 fte jobs generated directly in aquaculture and downstream activities and approximately 6 flow-on fte generated in other sectors of the region's economy in 2005/06.

Table 9.3 The economic impact of aquaculture in the Limestone Coast region, 2005/06

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
Direct effects								
Aquaculture production	1.2	52%	0.6	49%	15	68%	0.7	68%
Aquaculture downstream ^a	0.2	10%	0.1	9%	2	7%	0.1	8%
<i>Total Direct</i>	<i>1.5</i>	<i>62%</i>	<i>0.7</i>	<i>58%</i>	<i>17</i>	<i>75%</i>	<i>0.7</i>	<i>76%</i>
Other Sectors (flow-on)	0.9	38%	0.5	42%	6	25%	0.2	24%
Total	2.4	100%	1.1	100%	22	100%	1.0	100%

^a Processing, transport, retail and food services.

Source: EconSearch analysis.

For the balance of SA region the aquaculture industry in 2005/06 was estimated to have had a farm gate value of over \$17 million with associated direct output impacts in the processing, transport, retail and food service sectors of \$3.1 million (Table 9.4). This activity generated flow-on output of almost \$11 million in other regional industries. In terms of employment, there were over 230 fte jobs generated directly in aquaculture and downstream activities and over 70 flow-on fte generated in other sectors of the region's economy in 2005/06.

Table 9.4 The economic impact of aquaculture in the balance of SA, 2005/06

Sector	Output		Contribution to GRP		Employment		Household Income	
	(\$m)		(\$m)		(jobs)		(\$m)	
Direct effects								
Aquaculture production	17.1	55%	7.4	53%	218	72%	5.0	61%
Aquaculture downstream ^a	3.1	10%	1.2	8%	15	5%	0.8	9%
<i>Total Direct</i>	<i>20.1</i>	<i>65%</i>	<i>8.6</i>	<i>62%</i>	<i>233</i>	<i>77%</i>	<i>5.8</i>	<i>70%</i>
Other Sectors (flow-on)	10.7	35%	5.3	38%	71	23%	2.5	30%
Total	30.8	100%	13.9	100%	304	100%	8.3	100%

^a 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 2005/06, it accounted for approximately 60 per cent of total aquaculture industry related (direct and flow-on) output and GSP, almost 43 per cent of aquaculture related employment and approximately 50 per cent of aquaculture related household income¹⁷.

¹⁷ Similar estimates to those presented in Table 9.5 are presented in Appendix 4 for the years 2001/02 to 2004/05. 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).

Table 9.5 The total economic impact (direct and flow-on) of aquaculture in South Australia, by aquaculture sector, 2005/06

Sector	Output		Contribution to GSP		Employment		Household Income	
	(\$m)		(\$m)		(fte)		(\$m)	
Tuna farming	331.6	60.3%	163.0	61.5%	1,425	42.6%	60.8	49.7%
Oyster farming	133.7	24.3%	64.4	24.3%	1,180	35.3%	38.6	31.5%
Abalone farming	18.8	3.4%	7.8	2.9%	151	4.5%	4.1	3.4%
Mussels farming	4.9	0.9%	2.5	1.0%	81	2.4%	2.2	1.8%
Barramundi farming	9.8	1.8%	4.6	1.7%	65	1.9%	4.0	3.3%
Yabby/Marron farming	0.7	0.1%	0.4	0.2%	41	1.2%	0.1	0.1%
Other aquaculture ^a	50.5	9.2%	22.4	8.5%	406	12.1%	12.5	10.2%
Total (SA)	550.1	100.0%	265.1	100.0%	3,348	100.0%	122.4	100.0%

^a Other aquaculture production is comprised of yellowtail kingfish, Atlantic salmon, other marine finfish (e.g. mulloway), rainbow trout and other aquaculture enterprises (e.g. algae production).

Source: EconSearch analysis.

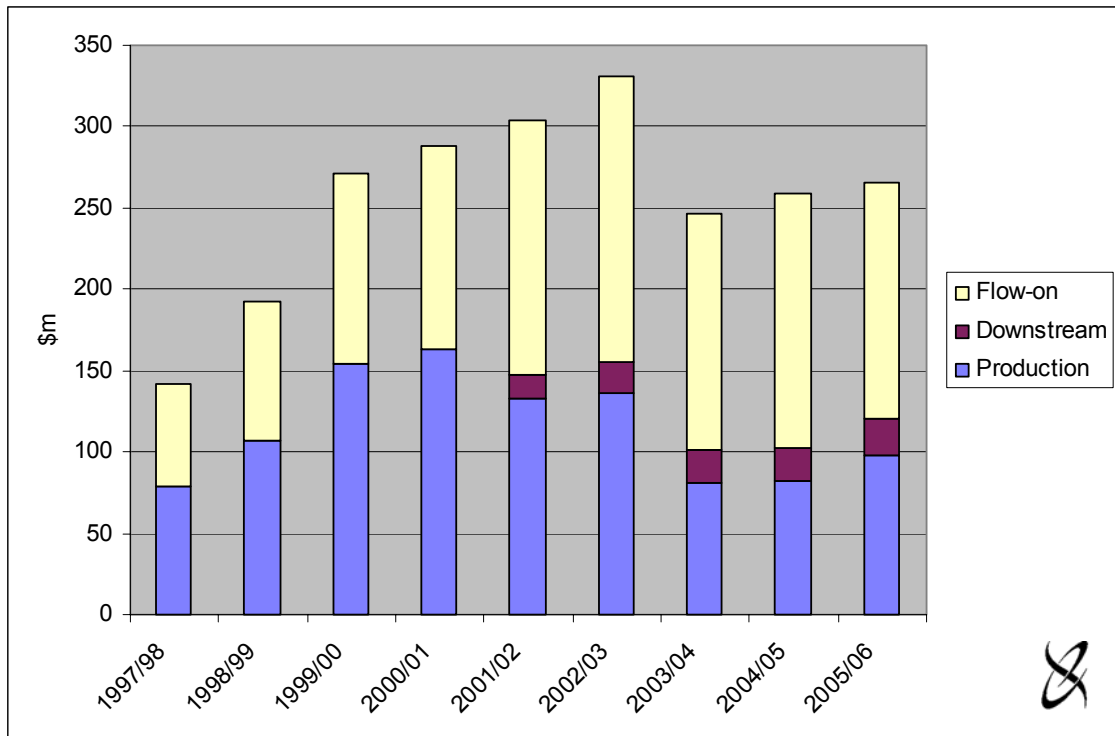
9.2 Economic Impact of Aquaculture in SA, Time Series, 1997/98 to 2005/06

Estimates of the economic impact of aquaculture on the South Australian economy for the period 1997/98 to 2005/06, 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 2005/06 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 SA¹⁸. 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.

¹⁸ See Table 2.1 for further details.

Figure 9.1 Total GSP impact of aquaculture in SA, 1997/98 to 2005/06 ^a

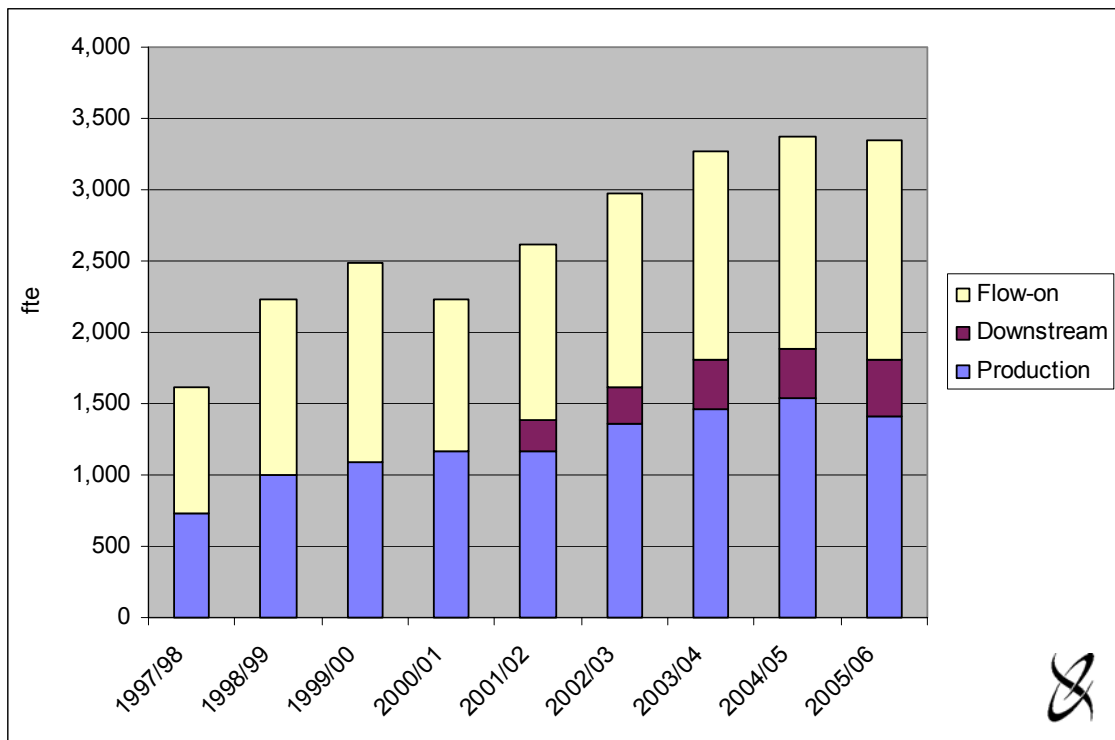
^a Total GSP impacts for the period 1997/98 to 2000/01 exclude some downstream activities (including some transport and all retail and food services).

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

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. Total contribution to GSP since 2003/04 has continued its rising trend.

The total employment impact attributable to aquaculture in SA exhibited a rising trend over the period 1997/98 to 2005/06, 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 2005/06 ^a



^a 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, 2006a and 2006b) and Table 9.1.

References

- ABARE 2005, *Australian Fisheries Statistics 2004*, Canberra.
- ABS 2006, *2005/06 Australian National Accounts: State Accounts*, Cat. No. 5220.0, Canberra.
- Delgado, C.L., Wada, N., Rosegrant, M.W., Meijer, S. and Ahmed, M. 2003, *Fish to 2020: Supply and Demand in Changing Global Markets*, International Food Policy Research Institute, Washington, D.C.
- EconSearch 1997, *The Economic Impact of Aquaculture and Fishing Industry Activity on the Eyre Peninsula Region of South Australia*, report to Aquaculture Group, Primary Industries South Australia.
- EconSearch 1998, *The Economic Impact of Aquaculture in the Eyre Peninsula Region and South Australia, 1996-97*, report to Aquaculture Group, Primary Industries and Resources South Australia.
- EconSearch 1999, *The Economic Impact of Aquaculture in the Eyre Peninsula Region and South Australia, 1998-99*, report to Aquaculture Group, Primary Industries and Resources South Australia.
- EconSearch 2001, *The Economic Impact of Aquaculture in the Eyre Peninsula Region and South Australia, 1999/00*, report to Aquaculture Group, Primary Industries and Resources South Australia.
- EconSearch 2002a, *The Economic Impact of Aquaculture on the South Australian State and Regional Economies, 2000/01*, report to Aquaculture Group, Primary Industries and Resources South Australia.
- EconSearch 2002b, *South Australian Aquaculture Market Analysis Project*, report to the Seafood Industry Development Board.
- EconSearch 2002c, *Accent on Aquaculture in the Limestone Coast*, report to the South East Local Government Association.
- EconSearch 2003, *The Economic Impact of Aquaculture on the South Australian State and Regional Economies, 2001/02*, report to Aquaculture Group, Primary Industries and Resources South Australia.
- EconSearch 2004, *The Economic Impact of Aquaculture on the South Australian State and Regional Economies, 2002/03*, report to Aquaculture Group, Primary Industries and Resources South Australia.
- EconSearch 2005, *Quantifying the Economic Contribution of Regional South Australia*, report prepared for Regional Communities Consultative Council, Local Government Association of SA and Regional Development SA.
- EconSearch 2006a, *The Economic Impact of Aquaculture on the South Australian State and Regional Economies, 2003/04*, report to PIRSA Aquaculture, Primary Industries and Resources South Australia, February.
- EconSearch 2006b, *The Economic Impact of Aquaculture on the South Australian State and Regional Economies, 2004/05*, report to PIRSA Aquaculture, Primary Industries and Resources South Australia, May.
- Hewings, G.J.D. 1985, *Regional Input-Output Analysis*, Sage Publications, Beverly Hills.
- Jensen, R.C., Mandeville, T.D. and Karunaratne, N.D. 1979, *Regional Economic Planning: Generation of Regional Input-Output Analysis*, Croom Helm, London.

- Jensen, R.C. and West, G.R. 1986, *Input-Output for Practitioners: Theory and Applications*, Australian Regional Developments No. 1, AGPS, Canberra.
- Midmore, P. and Harrison-Mayfield, L. 1996, *Rural Economic Modelling: an Input-Output Approach*, CAB International, Wallington, UK.
- Pindyck, R.S. and Rubinfeld, D.L. 1995, *Microeconomics (Third Edition)*, Prentice Hall, New Jersey.
- Powell, R.A., Jensen, R.C. and Gibson, A.L. 1985, *The Economic Impact of Irrigated Agriculture in N.S.W.*, Report to the N.S.W. Irrigators' Council Limited, Department of Agricultural Economics and Business Management, University of New England, Armidale.
- South Australian Aquaculture Council 2002, *Final Draft State Aquaculture Action Plan*
- West, G.R. 1993, *Input-Output Analysis for Practitioners: User's Guide, Version 7.1*, Department of Economics, University of Queensland, St Lucia.

Disclaimer

We have prepared the above report exclusively for the use and benefit of our client. Neither the firm or any employee of the firm undertakes responsibility in any way whatsoever to any person (other than to the above mentioned client) in respect of the report including any errors or omissions therein however caused.

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 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 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 Aquaculture Production and Value of Production, South Australia, 1994/95 to 2005/06

Appendix Table 3.1 Farmed tuna production, South Australia, 1995/96 to 2005/06

	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	5,421	7,458	140.0
2005/06	n.a. ^a	8,806	155.8

^a Not available until publication of ABARE's *Australian Fisheries Statistics 2006* report (David Galeano. ABARE, pers. comm.).

Source: SARDI Aquatic Sciences and PIRSA Aquaculture.

Appendix Table 3.2 Oyster production, South Australia, 1994/95 to 2005/06 ^a

	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Production (adult only):												
Weight ('000 kg)	855	976	1,359	na	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	5,397
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	23,879
Spat (\$'000) ^b	na	na	610	1,168	997	800	579	856	1,002	1,193	1,195	957
Total (\$'000)	3,535	3,950	5,815	6,076	6,486	10,189	11,590	14,159	16,118	21,152	21,190	24,836

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

^b An estimate the value of spat production in 2005/06 was imputed on the basis of the change in adult oyster production between 2003/04 and 2005/06.

Source: SARDI Aquatic Sciences and PIRSA Aquaculture.

Appendix Table 3.3 Other aquaculture production, South Australia, 1994/95 to 2005/06 ^a

	1994/95		1995/96		1996/97		1997/98		1998/99		1999/00		2000/01		2001/02		2002/03		2003/04		2004/05		2005/06	
	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)	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	400	3,370
Marron	5	99	6	141	5	116	6	131	7	160	12	304	8	196	11	282	22	533	18	480	22	587	10	282
Blue Mussels	na	na	na	na	na	na	na	na	84	183	81	173	111	260	171	371	254	466	400	697	377	657	469	950
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	250	8,222
Yabbies	9	86	17	175	10	111	11	115	27	231	16	156	17	172	8	95	7	93	10	153	20	306	2	36
Rainbow Trout	32	188	21	158	25	191	23	118	14	101	8	49	13	176	26	192	18	156	40	330	66	545	53	356
Other ^b	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	2,148	17,591
Total	342	3,002	367	3,632	458	4,072	612	6,086	814	7,982	773	8,840	946	10,546	839	8,869	1,908	19,263	1,683	14,603	2,898	26,693	3,332	30,808

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

^b Other aquaculture production is comprised of yellowtail kingfish, Atlantic salmon, other marine finfish (e.g. mulloway) and other aquaculture enterprises (e.g. algae production).

Source: SARDI Aquatic Sciences and PIRSA Aquaculture.

Appendix 4 The Total Economic Impact of Aquaculture in South Australia, by Aquaculture Sector, 2001/02 to 2004/05¹⁹

Appendix Table 4.1 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%
Total (SA)	577.5	100.0%	303.8	100.0%	2,617	100.0%	94.4	100.0%

Source: EconSearch (2003).

Appendix Table 4.2 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%
Total (SA)	641.5	100.0%	330.8	100.0%	2,969	100.0%	107.4	100.0%

Source: EconSearch (2004).

¹⁹ Other aquaculture production is comprised of yellowtail kingfish, Atlantic salmon, other marine finfish (e.g. mullocky), rainbow trout and other aquaculture enterprises (e.g. algae production).

Appendix Table 4.3 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%
Total (SA)	502.9	100.0%	246.2	100.0%	3,264	100.0%	123.9	100.0%

Source: EconSearch (2006a).

Appendix Table 4.4 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%
Total (SA)	518.2	100.0%	258.7	100.0%	3,366	100.0%	126.5	100.0%

Source: EconSearch (2006b).