THE ECONOMIC CONTRIBUTION OF AQUACULTURE IN THE SOUTH AUSTRALIAN STATE AND REGIONAL ECONOMIES, 2017/18

A Report to PIRSA Fisheries and Aquaculture

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ABBREVIATIONS

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ASBTIA	Australian Southern Bluefin Tuna Industry Association
fte	full-time equivalent
KI	Kangaroo Island
PIRSA	Primary Industries and Regions South Australia
SA	South Australia
SARDI	South Australian Research and Development Institute
GRP	gross regional product
GSP	gross state product
SBT	Southern Bluefin Tuna

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EXECUTIVE SUMMARY

The aim of this study was to estimate the economic contribution of aquaculture activity in South Australia in 2017/18. The results reported here update and expand on those provided in previous studies (EconSearch 2018). This report provides estimates of economic contribution for 2017/18 by aquaculture sector (Tuna, Oysters, Mussels, Abalone, Freshwater Finfish, Marine Finfish, Marron/Yabbies, other aquaculture and aquaculture tourism enterprises) at the state and regional (West Coast, Eyre Peninsula, Yorke Peninsula, Kangaroo Island, Adelaide and Hills and Murraylands and South East) 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.

Reports prior to 2003/04 only included the first level of processing, marketing or handling of aquaculture production in the overall economic contribution. However, for the purpose of this report, all reports since 2003/04 (EconSearch 2018) and future analyses, the following stages in the marketing chain are included in the quantifiable economic contribution:

- the farm gate value of production
- the net value of local (SA) processing
- the net value of local retail and food service trade
- 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.

Value of output and production estimates for South Australian aquaculture for 2017/18 were based on PIRSA Fisheries and Aquaculture's 2017/18 Production Returns as reported by South Australian aquaculture licence holders. The number of licences covered by production returns represented approximately 78 per cent of the total number of aquaculture licences. The consultants coordinated the compilation, analysis and validation of these data. Estimates of SA aquaculture production and value of production for the years 2016/17 and 2017/18 are provided in Table ES-1.

The state's total value of seafood production (landed) in 2017/18 was $469.8 million, of which aquaculture contributed almost 44 per cent ($204.8m) and wild-catch fisheries, making up the balance ($265.0m). In aggregate, Tuna is the largest single sector in the state's aquaculture industry, accounting for almost 62 per cent of the state's gross value of aquaculture production in 2017/18. The other three main sectors in 2017/18 were Marine Finfish (15 per cent), Oysters (10 per cent) and Abalone (7 per cent).

In addition, data were collected for aquaculture tourism ventures offering the opportunity to interact with marine life, resulting in an estimated 4,900 visitors in 2017/18 with a value of $0.39m. No activity was recorded in this sector in 2016/17.

A large proportion of the South Australian aquaculture production, particularly Tuna, is considered a premium high value product, and is exported overseas to high-end markets. Accordingly, the value of the Australian dollar can have a significant impact on the economic performance of the industry. Significant changes in the value of the Australian dollar also have the potential to influence the demand for Australian aquaculture exports. The Australian dollar was fairly steady throughout 2017/18 beginning at US$0.78 in July 2017 and ending at US$0.75 in June 2018, with a low in June 2018 and a high of US$0.80 in September 2017.

Table ES-1 Aquaculture production and value of production, South Australia, 2016/17 and 2017/18

	Weight ('000kg)			Value ($m)		
	2016/17	2017/18	Change	2016/17	2017/18	Change
Southern Bluefin Tuna [a]	8,200	8,000	-2%	116.00	126.00	9%
Marine Finfish	2,294	2,487	8%	27.09	29.87	10%
Oysters						
adult [b]	5,158	2,177	-58%	40.07	20.16	-50%
on-grown [c]	444	330	-26%	0.81	0.70	-13%
spat [d]	-	-	-	1.08	2.20	103%
Mussels	1,777	1,833	3%	3.88	3.98	3%
Abalone	324	399	23%	13.61	14.24	5%
Freshwater Finfish	382	390	2%	4.93	5.27	7%
Marron and Yabbies [e]	4	2	-54%	0.13	0.09	-28%
Other [f]	3,441	697	-80%	25.83	5.24	-80%
Total [g]	**21,580**	**15,986**	**-26%**	**231.52**	**204.84**	**-12%**
Tourism (visitors)	0	4,900	-	0.00	0.39	-

[a] 2016/17 values for SBT were revised with the collection of the 2017/18 data.

[b] The weight for adult Oysters is an approximation on the basis that a dozen Oysters weighs one kilogram.

[c] The volume and value of juvenile Oysters sold for on-growing are excluded from the total volume and value of aquaculture as it is considered an input to production for the final sales of adult Oysters.

[d] The value of spat is also excluded from the total. All spat grown in SA is now sold in SA (i.e. no spat grown in SA is exported to other states) and is considered an input to production for the final sales of adult Oysters.

[e] The volume and value of Marron and Yabby production is potentially underestimated as the number of production returns for this sector is low.

[f] Other aquaculture production in 2016/17 and 2017/18 was comprised of Algae and Silver Perch (including fingerlings and spat) production.

[g] Totals may contain rounding errors.

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

The results of the impact analysis, at the state level, are summarised in Table ES-2. The direct contributions measure on-farm and aquaculture related downstream activities (fish processing, transport, retail and food services). The flow-on contributions measure the economic effects in other sectors of the economy (trade, transport, etc.) generated by the aquaculture industry, that is, the multiplier effects.

The direct output contribution was estimated to be $254.2m ($204.8m on-farm and $49.4m in downstream activities) in 2017/18 (Table ES-2). Total output ($544.7m) needs to be used with care as it includes elements of double counting. Approximately 80 per cent of the output contribution was generated in regional South Australia (Table ES-3).

In 2017/18, aquaculture's total contribution to gross state product (GSP) ($251.5m) (Table ES-2) represented 0.23 per cent of the total GSP for South Australia ($107.4b in 2017/18). As with output, around 82 per cent of the contribution to GSP was generated in regional South Australia (Table ES-3).

Table ES-2 The economic contribution of aquaculture in South Australia, 2017/18

	Tuna	Marine Finfish	Mussels	Oysters	Abalone	Freshwater Finfish	Marron and Yabbies	Other [a]	Total
Output ($m)									
Direct									
On-farm	*126.0*	*29.9*	*4.0*	*20.2*	*14.2*	*5.3*	*0.1*	*5.2*	***204.8***
Downstream	*14.6*	*13.4*	*3.8*	*15.8*	*0.6*	*1.1*	*0.0*	*0.0*	***49.4***
Total Direct	140.6	43.2	7.8	36.0	14.8	6.4	0.1	5.2	**254.2**
Total Flow-on	166.6	42.0	11.6	33.5	27.5	5.8	0.1	3.4	**290.5**
Total [b]	**307.2**	**85.3**	**19.4**	**69.5**	**42.3**	**12.2**	**0.2**	**8.6**	**544.7**
Contribution to GSP ($m)									
Direct									
On-farm	*28.0*	*12.3*	*2.6*	*15.9*	*3.1*	*2.9*	*0.1*	*2.8*	***67.7***
Downstream	*5.0*	*6.3*	*1.8*	*7.6*	*0.2*	*0.6*	*0.0*	*0.0*	***21.5***
Total Direct	33.0	18.6	4.4	23.5	3.3	3.4	0.1	2.8	**89.2**
Total Flow-on	100.5	21.6	6.3	18.0	10.9	3.2	0.0	1.8	**162.4**
Total	**133.5**	**40.2**	**10.7**	**41.5**	**14.2**	**6.6**	**0.1**	**4.7**	**251.5**
Employment (fte)									
Direct									
On-farm	*264*	*101*	*26*	*199*	*42*	*26*	*7*	*5*	***670***
Downstream	*49*	*71*	*20*	*89*	*2*	*6*	*0*	*0*	***236***
Total Direct	313	172	46	288	44	32	7	5	**906**
Total Flow-on	669	151	43	125	92	21	0	12	**1,112**
Total	**981**	**322**	**89**	**413**	**136**	**53**	**8**	**17**	**2,019**
Household income ($m)									
Direct									
On-farm	*12.9*	*5.2*	*2.6*	*5.5*	*2.0*	*1.7*	*0.0*	*1.4*	***31.3***
Downstream	*3.4*	*4.2*	*1.2*	*5.0*	*0.1*	*0.4*	*0.0*	*0.0*	***14.3***
Total Direct	16.4	9.3	3.8	10.5	2.1	2.0	0.0	1.4	**45.6**
Total Flow-on	47.1	11.7	3.6	9.7	6.4	1.7	0.0	1.0	**81.2**
Total [c]	**63.4**	**21.0**	**7.4**	**20.2**	**8.5**	**3.8**	**0.0**	**2.4**	**126.8**

[a] Other aquaculture production in 2017/18 was comprised of Algae and Silver Perch (including fingerlings and spat) production.

[b] Note there is double counting in the total output contribution (see Section 2.2 for an explanation).

[c] Totals may contain rounding errors.

Source: BDO EconSearch analysis

Direct employment was estimated to be 906 fte (670 on-farm and 236 in downstream activities) in 2017/18 with 1,112 flow-on jobs, giving total employment of 2,019 fte (Table ES-2). Around 67 per cent of these jobs were generated in regional South Australia (Table ES-3). Direct household income was estimated to be approximately $45.6m in 2017/18 and flow-on income approximately $81.2m, giving a total household income contribution of around $126.8m (Table ES-2). Around 72 per cent of the household income contribution was generated in regional South Australia (Table ES-3).

In regional areas, the contribution of the aquaculture industry in 2017/18 was concentrated in the Eyre Peninsula region, reflecting the dominance of Tuna and also the majority of production of Other Aquaculture, Oysters, Marine Finfish and Mussel farming (Table ES-3).

Table ES-3 The total regional economic contribution (direct and flow-on) of aquaculture in SA, 2017/18

	Output [a]		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
West Coast	24.4	6%	16.1	8%	123	9%	7.5	8%
Eyre Peninsula	395.4	90%	180.7	88%	1,157	85%	78.9	87%
Yorke Peninsula	0.2	0%	0.2	0%	6	0%	0.1	0%
Kangaroo Island	8.0	2%	3.3	2%	36	3%	1.4	2%
Adelaide and Hills [b]	3.7	1%	2.0	1%	17	1%	1.2	1%
Murraylands and SE	5.3	1%	2.8	1%	23	2%	1.7	2%
Total Regional Contribution [c]	**436.9**	**100%**	**205.0**	**100%**	**1,363**	**100%**	**90.7**	**100%**
Regional Contribution as a Proportion of Total	-	**80%**	-	**82%**	-	**67%**	-	**72%**

[a] Note there is double counting in the total output contribution.

[b] Includes Adelaide metropolitan area.

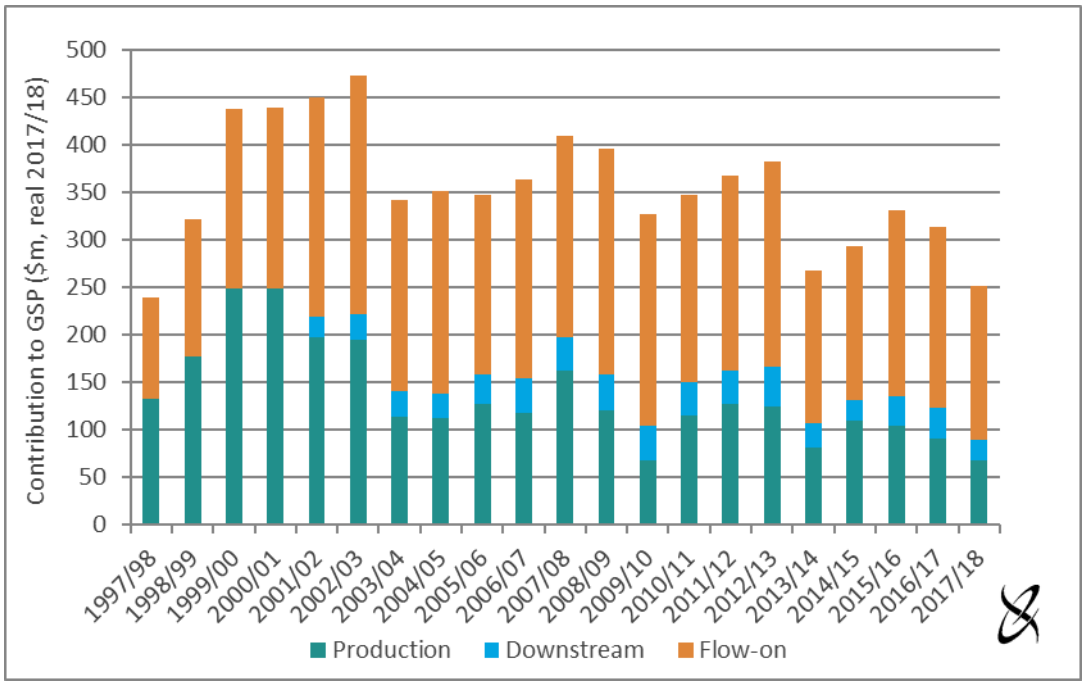
[c] Totals may contain rounding errors.

Source: BDO EconSearch analysis

Total contribution to GSP, in real terms, attributable to aquaculture in SA exhibited a rising trend over the period 1997/98 to 2002/03 and then, despite fluctuations, a declining trend through to 2017/18 (Figure ES-1)[1]. The significant reduction in the GSP contribution 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. Real GSP fell by 30 per cent between 2012/13 and 2013/14 as a result of a fall in value for a number of sectors including Tuna, Marine Finfish, Oysters, Freshwater Finfish and other aquaculture. Real GSP fell by 24 per cent between 2015/16 and 2017/18 resulting from falls in Oyster production related to difficulties sourcing spat after the POMS outbreak in Tasmania, and a lack of microalgae production by a major aquaculture business.

[1] From 1997/98 to 2000/01 only the first level of processing, marketing and handling of aquaculture production (i.e. production impacts) was included in the overall economic contribution. Estimates of the economic contribution of aquaculture presented in this report (i.e. for 2017/18) and all reports since 2003/04 include retail and food service trade and local transport services at all stages of the marketing chain (i.e. downstream contributions).

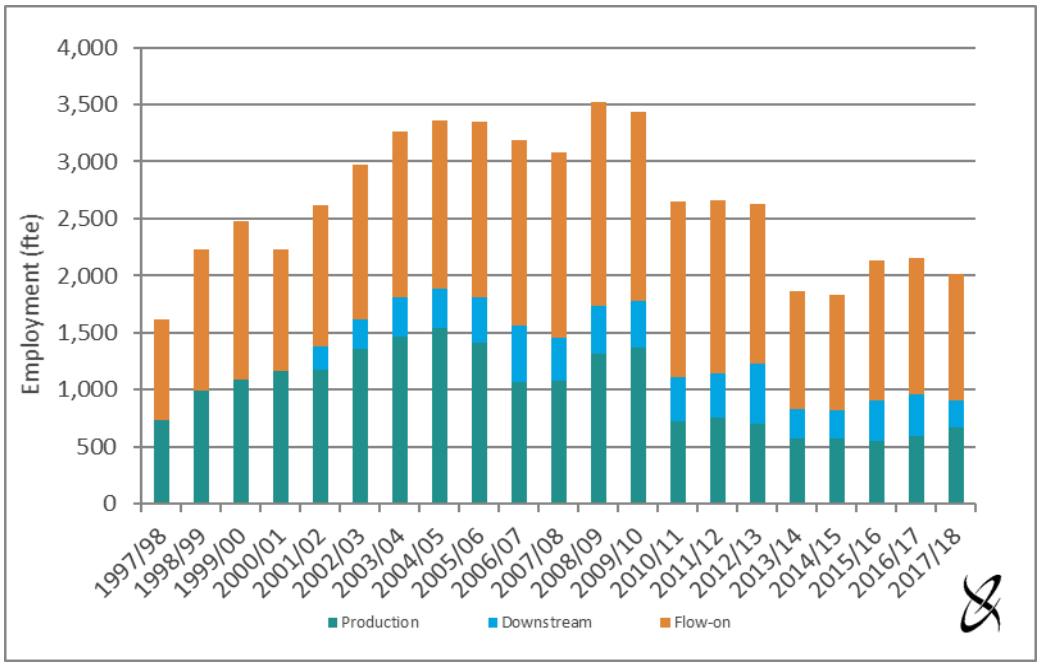
Figure ES-1 Total GSP contribution of aquaculture in SA, 1997/98 to 2017/18 [a]



[a] Total GSP contributions for the period 1997/98 to 2000/01 exclude some downstream activities (including some transport and all retail and food services). Estimates of GSP are expressed in real 2017/18 terms.

Source: Figure 12-1

Figure ES-2 Total employment contribution of aquaculture in SA, 1997/98 to 2017/18 [a]



[a] Total employment contribution for the period 1997/98 to 2000/01 excluding some downstream activities (including some transport and all retail and food services).

Source: Figure 12-1

The total employment contribution attributable to aquaculture in SA exhibited a rising trend over the period 1997/98 to 2008/09, reflecting an expansion in capacity and production growth across most aquaculture sectors over this period (Figure ES-2). The apparent reported fall in employment between 2009/10 and 2010/11 was due to the use of a new refined data collection form which resulted in improvements in the quality and accuracy of the responses from licence holders in the PIRSA Fisheries and Aquaculture Production Returns. The data collected in 2010/11 show that employment was inadvertently overstated in previous years. The fall in employment results in a reduction in household income and, due to the consequences from the modelled economic contributions, there are fewer people being employed in downstream and flow-on activities. This matter has now been resolved through the use of the refined Production Return forms. Total employment was fairly stable between 2010/11 and 2012/13, at around 2,600 fte but fell to around 1,900 in 2013/14 and 2014/15 in line with the fall in total value of production. Total employment rose to over 2,100 fte jobs in 2015/16 and 2016/17 driven by the increase in production but fell slightly in 2017/18 with the fall in Oyster production.

Projections for each sector in terms of production and on-farm employment over the three-year period, 2018/19 to 2020/21, are summarised in Table ES-4 by species and in Table ES-5 by region. These projections were based on PIRSA Fisheries and Aquaculture's 2017/18 Production Return responses submitted by the aquaculture industry. Where possible, these data were validated and improved by industry representatives and with other sources of information.

Table ES-4 Projected growth in South Australian aquaculture production and employment, by species, 2018/19 to 2020/21 [a]

	Estimated cumulative change relative to 2017/18					
	Production			On-farm employment		
	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
Southern Bluefin Tuna	4%	11%	11%	2%	5%	20%
Marine Finfish [b]	29%	46%	51%	5%	5%	5%
Oysters	-3%	2%	10%	1%	2%	6%
Mussels	8%	17%	24%	1%	9%	1%
Abalone	8%	6%	10%	8%	6%	10%
Freshwater Finfish [c]	3%	5%	5%	3%	5%	5%
Marron and Yabbies	10%	10%	11%	1%	1%	1%
Other [d]	0%	0%	0%	0%	0%	0%
Tourism	125%	150%	165%	20%	30%	35%

[a] Based on an analysis of PIRSA Fisheries and Aquaculture's 2017/18 Production Return responses submitted by the aquaculture industry. The plausibility of the projections for Tuna, Marine Finfish, Mussels, Oysters and Abalone have been validated or modified by industry representatives and annual reports (pers. comm. and Clean Seas 2018).

[b] Predominantly Yellowtail Kingfish production.

[c] Predominantly Barramundi production.

[d] Other aquaculture production in 2017/18 was comprised of Algae and Silver Perch (including fingerlings and spat) production.

The projections for each sector through to 2020/21, relative to 2017/18, can be summarised as follows.

- Tuna production – production will increase by 4 per cent in 2018/19 and by 11 per cent in 2019/20 and 2020/21 (Brian Jeffriess, pers. comm.).
    - The Australian wild catch Southern Bluefin Tuna (SBT) quota for the triennium 2018-2020 is 6,165t of which the Government will require the Australian Southern Bluefin Tuna Industry Association (ASBTIA) to set aside 250t pa to cover the recreational and charter catch and 800t is required for longlining. This means 5,115t of SBT catch will be made available for Tuna farms.
    - Demand for SBT in Japan is very strong and the Yen price for all Bluefin Tuna is increasing.
    - Exports to countries other than Japan (mainly Korea and China) are increasing.
    - A higher share of Australia's SBT quota will go to farming because it is very difficult to increase East Coast longline tonnage due to a short catching season.
- Tuna employment – employment will increase by 2 per cent in 2018/19, by 5 per cent in 2019/20 and by 20 per cent in 2020/21 (Brian Jeffriess, pers. comm.).
    - The expected price increases will reduce the cost pressures and lead to more investment and jobs.
    - As exports to destinations other than Japan increase, onshore jobs increase. The reason for this is that these smaller volume shipments go by container after onshore packing, rather than exports to Japan where around 60 per cent go by freezer boat after processing at the farm pontoon and placed directly on the at-sea freezer boat.
    - The industry is gradually moving a greater distance from the shore, meaning more boats and jobs are required. This will particularly be the case from 2021 onwards as the higher SBT quota exceeds the current farming tonnage and area allowed.
    - The industry is investing more in upstream jobs, including marketing.
    - The significant increase in employment in 2020/21 will result from the increase in SBT quota in 2020.
    - Further increases in the Sardine quota are expected in 2020. The Tuna industry now owns 12 of the 14 Sardine licences. However, a large part of the increase in feed requirements will come from imports which are labour intensive.
- Marine Finfish – Clean Seas Seafood increased their production by 8 per cent between 2016/17 and 2017/18. They expect production to increase by another 29 per cent in 2018/19 and then increase to 51 per cent by 2020/21. After a period of consolidation, employment is projected to increase slightly (5 per cent) in 2018/19 and be maintained through to 2020/21. Clean Seas Seafood hatchery infrastructure and farm leases have the potential to more than triple production from the current level. Clean Seas has been granted a lease over the 73ha of additional available area in the upper Spencer Gulf, (corresponding licences are currently under assessment). This will allow the company to increase their farming capacity. The Royal Park processing plant is now processing all Kingfish for the Australian and International markets with fresh and liquid nitrogen rapid frozen product. The state-of-the-art facility provides quality control across the supply chain from hatchery to customer. The facility has a significant capacity for future expansion, including production of new value-added products planned from 2018/19 (Clean Seas Seafood Limited 2018).

- Oysters – Typically, Oysters take 18 months to mature. Some producers will return to full production in 2018/19 with the remaining producers to return to full production in 2019/20. Overall, sale of mature Oysters will decline by 3 per cent in 2018/19 but then increase by 2 per cent in 2019/20 and by 10 per cent in 2020/21. Depending on when producers were impacted by the spat shortage will impact the timing of their return to full production (i.e. farms fully stocked). The establishment of two new land-based hatcheries are now in full production and are able to fully supply spat to the SA Oyster industry. Mortality events with small spat has varied across the growing areas, so industry have maintained a conservative approach to projections (South Australian Oyster Growers Association, pers. comm.).
- Mussels – Moderate growth in production is expected, 8 per cent in 2018/19 increasing to 24 per cent by 2020/21. The two major Mussel farming operations have merged and will now be able to achieve growth through economies of scale and the introduction of new product lines. Employment is also expected to increase but at a lower level (1 per cent in 2018/19 increasing to 9 per cent by 2019/20 but returning to 2018/19 levels in 2020/21) (Andy Dyer, SA Mussel Growers Association, pers. comm.).
- Abalone – moderate growth in production and employment is expected in 2018/19 (8 per cent) increasing to 10 per cent by 2020/21 should current environmental conditions be maintained.
- Freshwater Finfish – low growth in production and employment is expected (3 per cent) in 2018/19 and slightly higher (5 per cent) in 2019/20 and 2020/21.
- Marron and Yabbies – moderate growth in production (10 per cent in 2018/19 and 2019/20 and 11 per cent in 2020/21) but low growth in employment (1 per cent through to 2020/21).
- Other aquaculture – no change in production or employment is expected in 2018/19 through to 2020/21.
- Tourism – high growth in revenue (125 per cent in 2018/19 increasing to 165 per cent by 2020/21) and moderate growth in employment (20 per cent increase in 2018/19 increasing to 35 per cent by 2020/21).

Table ES-5 Projected growth in South Australian aquaculture production and employment, by region, 2018/19 to 2020/21 [a]

	Estimated cumulative change relative to 2017/18					
	Production			On-farm employment		
	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
Adelaide and Hills	6%	4%	4%	2%	2%	2%
Eyre Peninsula	5%	4%	4%	3%	5%	12%
Kangaroo Island	-5%	3%	18%	3%	11%	22%
Murraylands and South East	1%	6%	6%	3%	10%	10%
West Coast	-3%	-2%	8%	-1%	0%	7%
Yorke Peninsula	0%	0%	0%	0%	0%	0%

[a] See notes to Table ES-4. Changes are assumed to occur within the same region as current operations as plans to expand into other regions are not collected in the Production Returns.

Based on two sets of price assumptions, namely a 'no price' response and a 'generic small but negative price' effect, high and low projections of gross value of aquaculture production (GVP) for the period 2018/19 to 2020/21 have been imputed from the production projections. These GVP projections are presented in Table ES-6.

Table ES-6 Projected growth in South Australian aquaculture value of production, 2018/19 to 2020/21 [a]

	Actual GVP ($m)	Low GVP Forecast ($m) [b]			High GVP Forecast ($m) [c]		
	2017/18	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
Southern Bluefin Tuna	126.0	141.0	156.0	166.0	141.0	156.0	166.0
Marine Finfish	29.9	37.1	41.1	42.2	38.5	43.6	45.1
Oysters	20.2	19.7	20.5	22.0	19.6	20.6	22.3
Mussels	4.0	4.3	4.5	4.8	4.3	4.6	4.9
Abalone	14.2	15.4	15.1	15.6	15.4	15.1	15.6
Freshwater Finfish	5.3	5.4	5.5	5.5	5.4	5.5	5.5
Marron and Yabbies	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	5.2	5.2	5.2	5.2	5.2	5.2	5.2
Total [d]	**204.8**	**228.2**	**248.1**	**261.5**	**229.6**	**250.8**	**264.8**
Tourism	0.39	0.87	0.97	1.03	0.88	0.98	1.03

[a] All estimates of gross value of production (GVP) are in 2019 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 75 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 projection period (i.e. prices remain at 2017/18 levels).

[d] Totals may contain rounding errors.

1. INTRODUCTION

The aim of this study was to estimate the economic contribution of aquaculture activity in South Australia in 2017/18. The results reported here update and expand on those provided in previous studies (EconSearch 2018). Estimates of the economic contribution of aquaculture activity in South Australia in 2017/18 are provided for the following aquaculture sectors:

- Tuna (Southern Bluefin Tuna, *Thunnus maccoyii*)
- Marine Finfish (predominantly Yellowtail Kingfish, *Seriola lalandi*)
- Oysters (predominantly Pacific Oyster, *Crassostrea gigas*)
- Mussels (Blue Mussel, *Mytilus galloprovincialis*)
- Abalone (predominantly Greenlip Abalone, *Haliotis laevigata*)
- Freshwater Finfish (predominantly Barramundi, *Lates calcarifer* and Rainbow Trout, *Oncorhynchus mykiss*)
- Marron (*Cherax tenuimanus*) and Yabbies (*Cherax destructor*)
- Other aquaculture (comprised of Algae, *Dunaliella salina*; Silver Perch, *Bidyanus bidyanus*; Shortfin Eel, *Anguilla australis*; and Barcoo Grunter, *Scortum barcoo*)
- Tourism (aquaculture tourism operators offer the opportunity to swim with tuna and interact with other marine organisms).

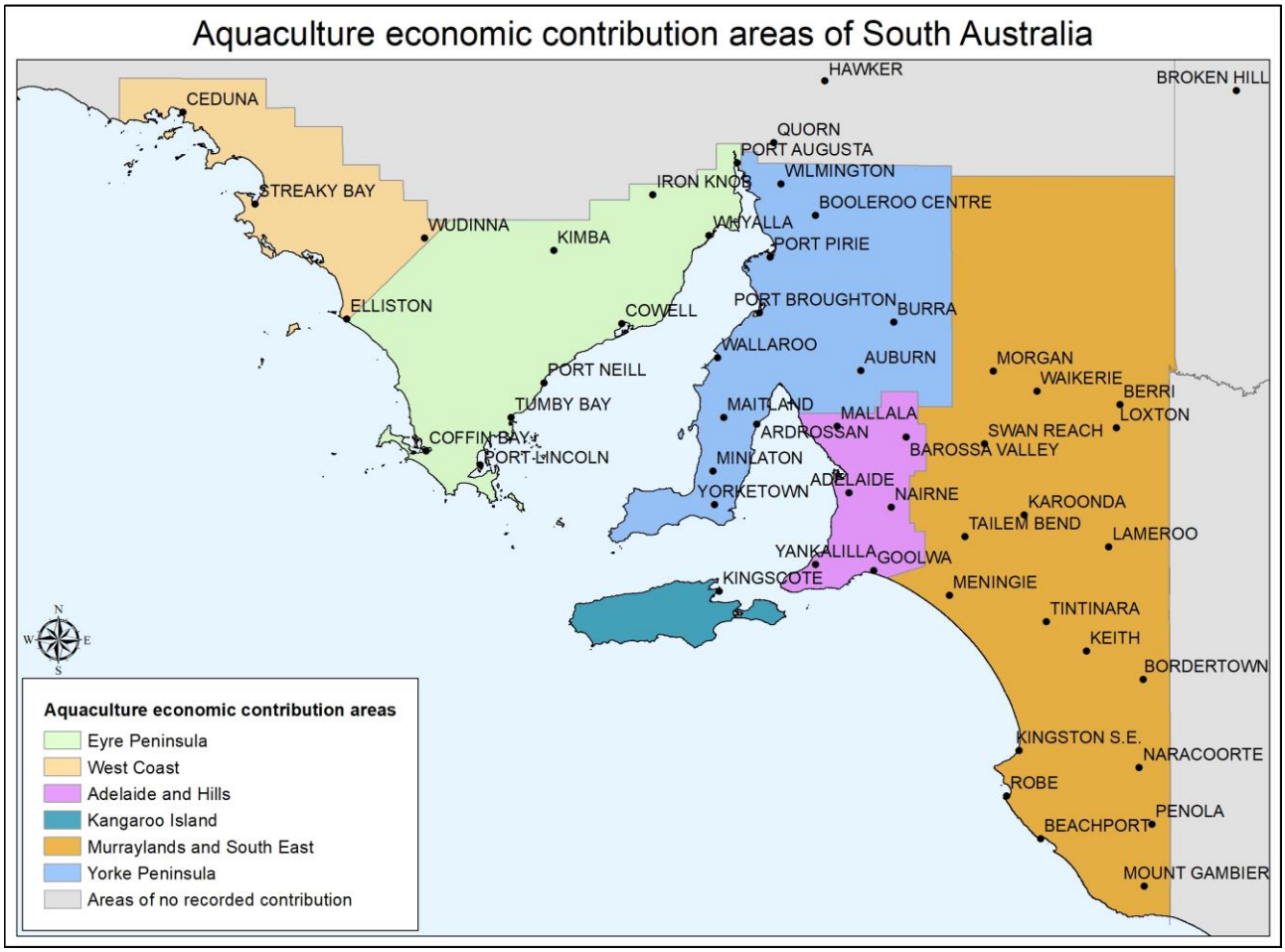
The contributions of these sectors are presented at both the regional and state levels. Regional contributions are based on the following disaggregation and illustrated in Figure 1-1:

- West Coast (WA border to Elliston including Wudinna)
- Eyre Peninsula (Lower Eyre Peninsula to Port Augusta, including Kimba)
- Yorke Peninsula (covers Yorke Peninsula, Mid North and Barossa)
- Kangaroo Island
- Adelaide and Adelaide Hills (including Fleurieu peninsula)
- Murraylands (Riverland and Murraylands) and the South East (Limestone Coast).

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 10:	The economic contributions of each aquaculture sector are presented at the state and regional levels.
Section 11:	Other facets of regional economic development associated with aquaculture activity in SA are presented.
Section 12:	Economic contributions of aquaculture over time.

Figure 1-1 Aquaculture economic contribution regions



Source: PIRSA Fisheries and Aquaculture

2. METHOD

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, farming equipment, 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 contribution can be measured through input-output modelling. This study applies input-output analytical procedures to measure the contribution of aquaculture development on the South Australian state and regional economies.

Economic contributions at the state and regional levels were based on input-output models prepared for the Department of the Premier and Cabinet (EconSearch 2017). For a technical description of the input-output modelling procedure, see EconSearch (2017).

In terms of scope, some previous studies have only included the first level of processing, marketing or handling of aquaculture production in the overall economic contribution. Estimates of the economic contribution of aquaculture presented in this report and all reports since 2003/04 (EconSearch 2018) are consistent with the 'message' and method in:

- PIRSA's Food for the Future value chain analysis 2017/18 (Seafood Scorecard)
- South Australian Seafood Industry Federation Inc. (2009) South Australian Seafood Industry Food Plan 2010-2015.

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

- the farm gate value of production
- the net value of local (SA) processing
- the net value of local retail and food service trade
- 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 were qualitatively assessed. The table below illustrates the change in scope of the economic contribution assessment.

Table 2-1 Change in scope of the economic contribution assessment

Stage in Market Chain	Scope of Contribution Analysis In Earlier Studies [a]	Scope of Contribution 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 contribution 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 to 2000/01.

[b] For the years 2001/02 to 2017/18 (EconSearch 2018).

2.2. Indicators of Economic Contribution

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

- output
- contribution to gross state or regional product
- employment
- 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 contribution avoids 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 contribution are presented in terms of

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

Direct contributions are the initial round of output, employment and household income generated by an economic activity. Estimates of the direct economic contribution of aquaculture in the South Australian state and regional economies are consistent with the method employed in PIRSA's Food for the Future value-chain analysis, 2009/10, as outlined above.

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

2.3. Data

Value of output and production estimates for South Australian aquaculture for 2017/18 were based on PIRSA Fisheries and Aquaculture's 2017/18 Production Returns submitted by the aquaculture industry. The number of licences covered by production returns represented approximately 78 per cent of the total number of aquaculture licences.

Representative cost structures and other relevant information for enterprises operating in individual sectors of the aquaculture and fishing industries were updated from 2002/03 to 2017/18 using a range of indicators, including data derived from the Production Returns. 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
- 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.

3. AQUACULTURE PRODUCTION AND EMPLOYMENT IN SA

3.1. Production and Value of Production

Estimates of South Australian aquaculture production and value of production for the years 2016/17 and 2017/18 are presented in Table 3-1. Some description of these data is provided below. Similar data for the period 1995/96 to 2017/18 are provided in Appendix 1 of the report. Overall, total production decreased by 26 per cent between 2016/17 (21,580t) and 2017/18 (15,986t) and total value declined by 12 per cent (from $231.5m to $204.8m) (Table 3-1).

Table 3-1 Aquaculture production and value of production, SA, 2016/17 and 2017/18

	Weight ('000kg)			Value ($m)		
	2016/17	2017/18	Change	2016/17	2017/18	Change
Southern Bluefin Tuna [a]	8,200	8,000	-2%	116.00	126.00	9%
Marine Finfish	2,294	2,487	8%	27.09	29.87	10%
Oysters						
adult [b]	5,158	2,177	-58%	40.07	20.16	-50%
on-grown [c]	444	330	-26%	0.81	0.70	-13%
spat [d]	-	-	-	1.08	2.20	103%
Mussels	1,777	1,833	3%	3.88	3.98	3%
Abalone	324	399	23%	13.61	14.24	5%
Freshwater Finfish	382	390	2%	4.93	5.27	7%
Marron and Yabbies [e]	4	2	-54%	0.13	0.09	-28%
Other [f]	3,441	697	-80%	25.83	5.24	-80%
Total [g]	**21,580**	**15,986**	**-26%**	**231.52**	**204.84**	**-12%**
Tourism (visitors)	0	4,900	-	0.00	0.39	-

[a] 2016/17 values for SBT were revised with the collection of the 2017/18 data.

[b] The weight for adult Oysters is an approximation on the basis that a dozen Oysters weighs one kilogram.

[c] The volume and value of juvenile Oysters sold for on-growing are excluded from the total volume and value of aquaculture as it is considered an input to production for the final sales of adult Oysters.

[d] The value of spat is also excluded from the total. All spat grown in SA is now sold in SA (i.e. no spat grown in SA is exported to other states) and is considered an input to production for the final sales of adult Oysters.

[e] The volume and value of Marron and Yabby production is potentially underestimated as the number of production returns for this sector is low.

[f] Other aquaculture production in 2016/17 and 2017/18 was comprised of Algae and Silver Perch (including fingerlings and spat) production.

[g] Totals may contain rounding errors.

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

Between 2016/17 and 2017/18 the following changes in production and value of production are apparent.

- The value of Tuna farm output increased by 9 per cent as a result of an 11 per cent increase in price and despite a 2 per cent decline volume of farmed Tuna (ABARES data modified and verified by Brian Jeffriess, Australian Southern Bluefin Tuna Industry Association (ASBTIA), pers. comm.). The ABARES data were modified to reconcile the data from calendar year to financial year and to include domestic sales.

- The value of Marine Finfish production increased by 10 per cent as a result of a 2 per cent rise in price and an 8 per cent increase in the volume of Marine Finfish. Sales growth was achieved in Australian, European and North American markets (Clean Seas Seafood Limited 2018).
- The value of Oyster production decreased by 50 per cent as a result of a 58 per cent decline in volume and despite a 19 per cent increase in price for adult Oysters. The spat supply shortage caused by POMS impacting Tasmanian Oyster hatcheries in 2016/17 resulted in a major fall in production in 2017/18 (South Australian Oyster Growers Association, pers. comm.).
- The value of Mussel production increased by 3 per cent due to a 3 per cent rise in production and despite a 1 per cent fall in the per unit price of Mussels, a result of a merger of the two main mussel farming entities (validated by Andy Dyer, SA Mussel Growers Association, pers. comm.).
- The value of Abalone production increased by 5 per cent as a result of a 23 per cent rise in the volume of Abalone production and despite a 15 per cent fall in the per unit price (David Connell, General Manager, Yumbah Aquaculture, pers. comm.).
- The value of Freshwater Finfish production increased by 7 per cent as a result of a 2 per cent rise in the volume of Freshwater Finfish production and a 5 per cent increase in the per unit price.
- The value of Marron/Yabbies production decreased by 28 per cent as a result of the volume of Marron/Yabbies production more than halving (54 per cent) and despite a 57 per cent increase in the per unit price of Marron/Yabbies. However, this sector had a low number of production returns submitted.
- The value of Other aquaculture production decreased by 80 per cent as a result of an 80 per cent decline in production. Other aquaculture is dominated by algae production. In 2017/18 the major algae producer halted production for a major upgrade to their processing plant.
- Aquaculture tourism operators offer the opportunity to interact with marine organisms. There was no reported activity by tourism operators in 2016/17. However, in 2017/18 there were 4,900 visitors for a value of $0.39m.

A breakdown of aquaculture value of production in 2017/18 by region is detailed in Table 3-2 and Table 3-3. Similar data for aquaculture production in 2017/18 are detailed in Table 3-4 and Table 3-5. Activity in the Tuna, Marine Finfish, Oysters, Mussels, Abalone and Other aquaculture is concentrated in the Eyre Peninsula region. The production of remaining aquaculture species (i.e. Freshwater Finfish and Marron/Yabbies) is more widely distributed across SA.

Table 3-2 Aquaculture value of production by sector and region, South Australia, 2017/18 ($'000)

	West Coast	Eyre Peninsula	Yorke Peninsula	Kangaroo Island	Adelaide and Hills	Murraylands and South East	All regions
Southern Bluefin Tuna	0	126,000	0	0	0	0	126,000
Marine Finfish	0	29,865	0	0	0	0	29,865
Oysters [a]	8,071	11,749	57	284	0	0	20,161
Mussels	0	3,977	0	0	0	0	3,977
Abalone	0	7,533	0	6,708	0	0	14,241
Freshwater Finfish [a]	0	3	1	14	1,926	3,325	5,269
Marron and Yabbies [a]	0	0	1	93	1	0	95
Other [a]	0	5,228	8	0	0	0	5,237
Total	**8,071**	**184,356**	**68**	**7,098**	**1,927**	**3,325**	**204,844**
Tourism	0	0	0	0	390	0	390

[a] Includes the value of fingerling sales but excludes local spat and on-grown sales for Oysters.

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

Table 3-3 Proportion of aquaculture value of production by sector and region, South Australia, 2017/18

	West Coast	Eyre Peninsula	Yorke Peninsula	Kangaroo Island	Adelaide and Hills	Murraylands and South East	All regions
Southern Bluefin Tuna	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Marine Finfish	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Oysters [a]	40.0%	58.3%	0.3%	1.4%	0.0%	0.0%	100.0%
Mussels	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Abalone	0.0%	52.9%	0.0%	47.1%	0.0%	0.0%	100.0%
Freshwater Finfish [a]	0.0%	0.1%	0.0%	0.3%	36.6%	63.1%	100.0%
Marron and Yabbies [a]	0.0%	0.0%	1.4%	97.6%	1.0%	0.0%	100.0%
Other [a]	0.0%	99.8%	0.2%	0.0%	0.0%	0.0%	100.0%
Total	**3.9%**	**90.0%**	**0.0%**	**3.5%**	**0.9%**	**1.6%**	**100.0%**
Tourism	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%

Source: Table 3-2

Table 3-4 Aquaculture production by sector and region, South Australia, 2017/18 (kg)

	West Coast	Eyre Peninsula	Yorke Peninsula	Kangaroo Island	Adelaide and Hills	Murraylands and South East	All regions
Southern Bluefin Tuna	0	8,000,000	0	0	0	0	8,000,000
Marine Finfish	0	2,487,011	0	0	0	0	2,487,011
Oysters	852,114	1,289,441	8,780	27,000	0	0	2,177,335
Mussels	0	1,833,243	0	0	0	0	1,833,243
Abalone	0	243,000	0	156,000	0	0	399,000
Freshwater Finfish	0	250	112	1,000	165,870	222,714	389,946
Marron and Yabbies	0	0	50	1,934	39	0	2,022
Other	0	697,085	300	0	0	0	697,385
Total	**852,114**	**14,550,030**	**9,242**	**185,934**	**165,909**	**222,714**	**15,985,942**
Tourism (visitors)	0	0	0	0	4,900	0	4,900

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

Table 3-5 Proportion of aquaculture production by sector and region, South Australia, 2017/18

	West Coast	Eyre Peninsula	Yorke Peninsula	Kangaroo Island	Adelaide and Hills	Murraylands and South East	All regions
Southern Bluefin Tuna	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Marine Finfish	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Oysters	39.1%	59.2%	0.4%	1.2%	0.0%	0.0%	100.0%
Mussels	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Abalone	0.0%	60.9%	0.0%	39.1%	0.0%	0.0%	100.0%
Freshwater Finfish	0.0%	0.1%	0.0%	0.3%	42.5%	57.1%	100.0%
Marron and Yabbies	0.0%	0.0%	2.4%	95.6%	1.9%	0.0%	100.0%
Other	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total	**5.3%**	**91.0%**	**0.1%**	**1.2%**	**1.0%**	**1.4%**	**100.0%**
Tourism (visitors)	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%

Source: Table 3-4

3.2. Employment in SA Aquaculture

Estimates of direct employment in South Australian aquaculture for the years 2016/17 and 2017/18 are provided in Table 3-6. Consistent with previous analyses undertaken by BDO EconSearch, these estimates include employment on inactive, undeveloped and underdeveloped leases. As for the production data, these employment estimates have been derived from PIRSA Fisheries and Aquaculture's 2017/18 Production Returns submitted by the aquaculture industry. Overall, direct employment in aquaculture operations reported by industry, increased by 13 per cent between 2016/17 (594 fte) and 2017/18 (670 fte). In 2017/18 there were 6 jobs associated with aquaculture tourism operations, an increase from 3 jobs in 2016/17.

Table 3-6 Direct employment by aquaculture sector, South Australia, 2016/17 and 2017/18

	Employment (fte)		
	2016/17	2017/18	Change from 2016/17
Southern Bluefin Tuna	223	264	18%
Marine Finfish	69	101	47%
Oysters	206	199	-3%
Mussels	20	26	27%
Abalone	38	42	11%
Freshwater Finfish	26	26	0%
Marron and Yabbies	5	7	38%
Other [a]	7	5	-30%
Total	**594**	**670**	**13%**
Tourism [b]	3	6	79%

[a] 'Other aquaculture' also includes land-based and miscellaneous licences which cannot be allocated to specific sectors.

[b] Note employment totals include rounding.

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

Some notable differences in direct employment between 2016/17 and 2017/18 by species are:

- 47 per cent increase in Marine Finfish due to the significant increase in production over the past few years.
- 18 per cent increase in Tuna. Onshore jobs increase as exports to non-Japan destinations increase due to smaller volume shipments requiring onshore packing for containers. In addition, the industry is generally moving a greater distance from shore, which requires more boats and jobs (Brian Jeffriess, ASBTIA, pers. comm.)
- 27 per cent increase for Mussels, a result of the increase in Mussels production in 2017/18 (Andy Dyer, SA Mussel Growers Association, pers. comm.)
- 11 per cent increase for Abalone, a result of the increase in production
- 79 per cent increase for aquaculture tourism enterprises, in line with the recommencement of visitors to tourism leases in 2017/18.

A breakdown of direct employment in 2017/18 in SA aquaculture by region is detailed in Table 3-7 and Table 3-8. There are some notable differences in the recorded regional distribution of production and employment. For example, the West Coast region was estimated to produce 39 per cent of Oysters by volume but was responsible for only 33 per cent of Oyster employment (Table 3-5 and Table 3-8). These differences may reflect the total number of leases in the West Coast region are operated by a smaller number of owners and the workers cover more leases compared to Eyre Peninsula where leases may be spread over more individual owners and therefore more workers.

Table 3-7 Direct employment by aquaculture sector and region, South Australia, 2017/18 (fte)

	West Coast	Eyre Peninsula	Yorke Peninsula	Kangaroo Island	Adelaide and Hills	Murraylands and South East	All regions
Southern Bluefin Tuna	0	264	0	0	0	0	264
Marine Finfish	0	101	0	0	0	0	101
Oysters	67	121	5	1	5	0	199
Mussels	0	26	0	0	0	0	26
Abalone	0	22	0	20	0	0	42
Freshwater Finfish	0	3	0	0	13	11	26
Marron and Yabbies	0	0	0	4	4	0	7
Other	0	5	0	0	0	0	5
Total	**67**	**542**	**5**	**25**	**21**	**11**	**670**
Tourism	0	0	0	0	6	0	6

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

Table 3-8 Proportion of direct employment by region, South Australia, 2017/18

	West Coast	Eyre Peninsula	Yorke Peninsula	Kangaroo Island	Adelaide and Hills	Murraylands and South East	All regions
Southern Bluefin Tuna	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Marine Finfish	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Oysters	33.4%	60.8%	2.7%	0.6%	2.6%	0.0%	100.0%
Mussels	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Abalone	0.0%	53.0%	0.0%	47.0%	0.0%	0.0%	100.0%
Freshwater Finfish	0.0%	9.7%	0.0%	0.0%	49.2%	41.1%	100.0%
Marron and Yabbies	0.0%	0.0%	0.0%	50.7%	49.3%	0.0%	100.0%
Other	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total	**9.9%**	**80.8%**	**0.8%**	**3.7%**	**3.2%**	**1.6%**	**100.0%**
Tourism	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%

Source: Table 3-8

3.3. Projected Growth in Production and Employment

Aquaculture licence holders were required to provide projections of their production and on-farm employment over the three-year period, 2018/19 to 2020/21. The projections from the PIRSA Fisheries and Aquaculture 2017/18 Production Returns are summarised in Table 3-9 by species and in Table 3-10 by region. Where possible, these data were validated and improved by industry representatives and with other sources of information. The implied production (tonnes or '000 doz.) and on-farm employment (full-time equivalents) levels by species are provided in Table 3-11 and Table 3-12, respectively.

Table 3-9 Projected growth in South Australian aquaculture production and on-farm employment, by species, 2018/19 to 2020/21 (percentage change on 2017/18) [a]

	Estimated cumulative change relative to 2017/18					
	Production			On-farm employment		
	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
Southern Bluefin Tuna	4%	11%	11%	2%	5%	20%
Marine Finfish [b]	29%	46%	51%	5%	5%	5%
Oysters	-3%	2%	10%	1%	2%	6%
Mussels	8%	17%	24%	1%	9%	1%
Abalone	8%	6%	10%	8%	6%	10%
Freshwater Finfish [c]	3%	5%	5%	3%	5%	5%
Marron and Yabbies	10%	10%	11%	1%	1%	1%
Other [d]	0%	0%	0%	0%	0%	0%
Tourism	125%	150%	165%	20%	30%	35%

[a] Based on an analysis of PIRSA Fisheries and Aquaculture's 2017/18 Production Return responses. The plausibility of the projections for Tuna, Marine Finfish, Mussels, Oysters and Abalone have been validated or modified by industry representatives and annual reports (pers. comm., Clean Seas 2018).

[b] Predominantly Yellowtail Kingfish production.

[c] Predominantly Barramundi production.

[d] Other aquaculture production in 2017/18 was comprised of Algae and Silver Perch (including fingerlings and spat).

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns, Brian Jeffriess pers. comm. and SA Oyster Growers Association

Table 3-10 Projected growth in South Australian aquaculture production and on-farm employment, by region, 2018/19 to 2020/21 (percentage change on 2017/18)[a]

	Estimated cumulative change relative to 2017/18					
	Production			On-farm employment		
	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
Adelaide and Hills	6%	4%	4%	2%	2%	2%
Eyre Peninsula	5%	4%	4%	3%	5%	12%
Kangaroo Island	-5%	3%	18%	3%	11%	22%
Murraylands and South East	1%	6%	6%	3%	10%	10%
West Coast	-3%	-2%	8%	-1%	0%	7%
Yorke Peninsula	0%	0%	0%	0%	0%	0%

[a] See notes to Table 3-9. Changes are assumed to occur within the same region as current operations as plans to expand into other regions are not collected in the Production Returns.

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns and Brian Jeffriess pers. comm.

The projections for each sector through to 2020/21, relative to 2017/18, can be summarised as follows.

- Tuna production – production will increase by 4 per cent in 2018/19 and by 11 per cent in 2019/20 and 2020/21 (Brian Jeffriess, pers. comm.).
    - The Australian wild catch Southern Bluefin Tuna (SBT) quota for the triennium 2018-2020 is 6,165t of which the Government will require the Australian Southern Bluefin Tuna Industry Association (ASBTIA) to set aside 250t pa to cover the recreational and charter catch and 800t is required for longlining. This means 5,115t of SBT catch will be made available for Tuna farms.
    - Demand for SBT in Japan is very strong and the Yen price for all Bluefin Tuna is increasing.
    - Exports to countries other than Japan (mainly Korea and China) are increasing.
    - A higher share of Australia's SBT quota will go to farming because it is very difficult to increase East Coast longline tonnage due to a short catching season.
- Tuna employment – employment will increase by 2 per cent in 2018/19, by 5 per cent in 2019/20 and by 20 per cent in 2020/21 (Brian Jeffriess, pers. comm.).
    - The expected price increases will reduce the cost pressures and lead to more investment and jobs.
    - As exports to destinations other than Japan increase, onshore jobs increase. The reason for this is that these smaller volume shipments go by container after onshore packing, rather than exports to Japan where around 60 per cent go by freezer boat after processing at the farm pontoon and placed directly on the at-sea freezer boat.
    - The industry is gradually moving a greater distance from the shore, meaning more boats and jobs are required. This will particularly be the case from 2021 onwards as the higher SBT quota exceeds the current farming tonnage and area allowed.
    - The industry is investing more in upstream jobs, including marketing.
    - The significant increase in employment in 2020/21 will result from the increase in SBT quota in 2020.
    - Further increases in the Sardine quota are expected in 2020. The Tuna industry now owns 12 of the 14 Sardine licences. However, a large part of the increase in feed requirements will come from imports which are labour intensive.
- Marine Finfish – Clean Seas Seafood increased their production by 8 per cent between 2016/17 and 2017/18. They expect production to increase by another 29 per cent in 2018/19 and then increase to 51 per cent by 2020/21. After a period of consolidation, employment is projected to increase slightly (5 per cent) in 2018/19 and be maintained through to 2020/21. Clean Seas Seafood hatchery infrastructure and farm leases have the potential to more than triple production from the current level. Clean Seas has been granted a lease over 73ha of additional available area in the upper Spencer Gulf (corresponding licences is currently being assessed). This will allow the company to increase their farming capacity. The Royal Park processing plant is now processing all fish for the Australian and International markets with fresh and liquid nitrogen rapid frozen product. The state of the art facility provides quality control across the supply chain from hatchery to customer. The facility has a significant capacity for future expansion, including production of new value added products planned from 2018/19 (Clean Seas Seafood Limited 2018).

- Oysters – Typically, Oysters take 18 months to mature. Some producers will return to full production in 2018/19 with the remaining producers to return to full production in 2019/20. Overall, sale of mature Oysters will decline by 3 per cent in 2018/19 but then increase by 2 per cent in 2019/20 and by 10 per cent in 2020/21. Depending on when producers were impacted by the spat shortage will impact the timing of their return to full production (i.e. farms fully stocked). The establishment of two new land-based hatcheries are now in full production and are able to fully supply spat to SA Oyster farms. Mortality events with spat has varied across the growing areas, with industry maintaining a conservative approach to production projections (South Australian Oyster Growers Association, pers. comm.).
- Mussels – Moderate growth in production is expected, 8 per cent in 2018/19 increasing to 24 per cent by 2020/21. The two major Mussel farming operations have merged and will now be able to achieve growth through economies of scale and the introduction of new product lines. Employment is also expected to increase but at a lower level (1 per cent in 2018/19 increasing to 9 per cent by 2019/20 but returning to 2018/19 levels in 2020/21) (Andy Dyer, SA Mussel Growers Association, pers. comm.).
- Abalone – moderate growth in production and employment is expected in 2018/19 (8 per cent) increasing to 10 per cent by 2020/21 should current environmental conditions be maintained.
- Freshwater Finfish – low growth in production and employment is expected (3 per cent) in 2018/19 and slightly higher (5 per cent) in 2019/20 and 2020/21.
- Marron and Yabbies – moderate growth in production (10 per cent in 2018/19 and 2019/20 and 11 per cent in 2020/21) but low growth in employment (1 per cent through to 2020/21).
- Other aquaculture – no change in production or employment is expected in 2018/19 through to 2020/21.
- Tourism – high growth in revenue (125 per cent in 2018/19 increasing to 165 per cent by 2020/21) and moderate growth in employment (20 per cent increase in 2018/19 increasing to 35 per cent by 2020/21).

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 projected production changes (Table 3-9) 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 projected production increases summarised in Table 3-9 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 per cent change in the quantity supplied. This can, in turn, be approximated using the reciprocal of the price elasticity of demand.

Table 3-11 Projected growth in South Australian aquaculture production, 2018/19 to 2020/21 (t or '000 doz.)

	Actual Production [a]	Forecast Production [b]			Av. annual growth rate
	2017/18	2018/19	2019/20	2020/21	
Southern Bluefin Tuna (t)	8,000	8,350	8,900	8,900	3.6%
Marine Finfish (t)	2,487	3,208	3,631	3,755	14.7%
Oysters ('000 doz.)	2,177	2,119	2,222	2,403	3.3%
Mussels (t)	1,833	1,982	2,136	2,278	7.5%
Abalone (t)	399	431	422	438	3.2%
Freshwater Finfish (t)	390	403	409	410	1.7%
Marron and Yabbies (t)	2	2	2	2	3.5%
Other (t)	697	697	697	697	0.0%
Total	**15,986**	**17,192**	**18,421**	**18,885**	**5.7%**
Tourism (visitors)	4,900	11,025	12,250	12,985	38.4%

[a] See Table 3-1.

[b] Based on the projections summarised in Table 3-9. Figures rounded to the nearest thousand so small percentage changes are not reflected in the absolute values.

Source: Table 3-1, PIRSA Fisheries and Aquaculture and BDO EconSearch analysis

Table 3-12 Projected growth in South Australian aquaculture on-farm employment, 2018/19 to 2020/21 (full-time equivalents)

	Actual Employment (fte) [a]	Forecast Employment (fte) [b]			Av. annual growth rate
	2017/18	2018/19	2019/20	2020/21	
Southern Bluefin Tuna	264	269	279	317	6.3%
Marine Finfish	101	106	106	106	1.6%
Oysters	199	202	204	211	2.1%
Mussels	26	26	28	26	0.3%
Abalone	42	45	45	46	3.2%
Freshwater Finfish	26	27	27	27	1.7%
Marron and Yabbies	7	7	7	7	0.2%
Other	5	5	5	5	0.0%
Total	**670**	**687**	**701**	**746**	**3.7%**
Tourism	6	7	8	8	10.5%

[a] Derived from PIRSA Fisheries and Aquaculture's 2017/18 Production Returns responses. Includes employment on inactive, undeveloped and underdeveloped leases.

[b] Based on the projections summarised in Table 3.9.

Source: PIRSA Fisheries and Aquaculture and BDO EconSearch analysis

Short-run elasticities of demand for primary products are generally relatively price inelastic. In the longer run, however, with opportunities for exports and substitution 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 aquaculture products is –2.0 and the reciprocal, the price flexibility coefficient, is -0.5.

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 75 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 projections of gross value of aquaculture production for the period 2018/19 to 2020/21. These projections are presented in Table 3-13.

Table 3-13 Projected growth in South Australian aquaculture value of production, 2018/19 to 2020/21[a]

	Actual GVP ($m)	Low GVP Forecast ($m) [b]			High GVP Forecast ($m) [c]		
	2017/18	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
Southern Bluefin Tuna	126.0	141.0	156.0	166.0	141.0	156.0	166.0
Marine Finfish	29.9	37.1	41.1	42.2	38.5	43.6	45.1
Oysters	20.2	19.7	20.5	22.0	19.6	20.6	22.3
Mussels	4.0	4.3	4.5	4.8	4.3	4.6	4.9
Abalone	14.2	15.4	15.1	15.6	15.4	15.1	15.6
Freshwater Finfish	5.3	5.4	5.5	5.5	5.4	5.5	5.5
Marron and Yabbies	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	5.2	5.2	5.2	5.2	5.2	5.2	5.2
Total [d]	**204.8**	**228.2**	**248.1**	**261.5**	**229.6**	**250.8**	**264.8**
Tourism	0.39	0.87	0.97	1.03	0.88	0.98	1.03

[a] All estimates of gross value of production (GVP) are in 2019 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 75 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 projection period (i.e. prices remain at 2017/18 levels).

[d] Totals may contain rounding errors.

Source: PIRSA Fisheries and Aquaculture and BDO EconSearch analysis

3.4. Other Indicators from the Production Returns

It was possible to derive a range of other data from the 2017/18 Production Returns. Estimates are provided below for the following indicators for SA for 2017/18.

- Proportion of aquaculture production, value of production and employment by sector (Table 3-14).
- The number of aquaculture licences reporting activity by sector (Table 3-15).
- Aquaculture spat and fingerling introductions and sales (Table 3-16).
- Reasons provided for nil returns (Table 3-17)
- Total number of aquaculture licences by category (Table 3-18).

Table 3-14 Proportion of aquaculture production, value of production and employment by sector, South Australia, 2017/18

	Production	Value	Direct employment
Southern Bluefin Tuna	50%	62%	39%
Marine Finfish	16%	15%	15%
Oysters	14%	10%	30%
Mussels	11%	2%	4%
Abalone	2%	7%	6%
Freshwater Finfish	2%	3%	4%
Marron and Yabbies [a]	<1%	<1%	1%
Other	4%	3%	1%
Total	**100%**	**100%**	**100%**

[a] 0.01% of total aquaculture production and 0.05% of the total value of aquaculture production.

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

Table 3-15 Number of aquaculture licences reporting activity [a], by sector, South Australia, 2017/18

	Number of licences submitting a Production Return
Southern Bluefin Tuna	16
Marine Finfish	24
Oysters	212
Mussels	26
Abalone	6
Freshwater Finfish	15
Marron and Yabbies	11
Other	2
Tourism	1
Shellfish or Land based Licences with no production reported	86
Total	**399**

[a] This is not the total number of licences in each sector as not every licence holder submitted a production return. Licences are counted twice if they produced in two sectors in 2017/18. Total number of licences by sector are detailed in Table 3-18.

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

Table 3-16 Aquaculture spat and fingerling introductions and sales, South Australia, 2017/18

	All licence holders		Spat/fingerling sales [g]		
	No. spat/fingerlings introduced ('000)	Proportion sourced from SA	No. spat/fingerlings sold ('000)	Value ($'000)	No. of respondents
Southern Bluefin Tuna [a]	14	100%	-	-	0
Marine Finfish [b]	485	100%	n.p.	n.p.	1
Oysters [c]	81,996	100%	111,165	2,200	5
Mussels [d]	0	-	-	-	0
Abalone [e]	2,300	100%	-	-	0
Freshwater Finfish	1,504	44%	n.p.	n.p.	4
Marron and Yabbies	0	-	n.p.	n.p.	1
Other [f]	0	-	-	-	0
Total	**86,298**		**112,359**	**2,242**	**11**

[a] Wild caught juveniles, on-grown product sourced from Commonwealth waters off SA.

[b] Self-produced, on-grown fingerlings.

[c] Excludes stock sourced from other producers in SA for on-growing.

[d] Wild spat caught on-site or sourced from hatcheries.

[e] Includes self-produced at a land-based hatchery, on-grown spat.

[f] Other aquaculture is dominated by algae production for which juvenile introduction is not relevant.

[g] Where the number of respondents is less than 5 the data has not been published (n.p.) to ensure the confidentiality of respondents.

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

Table 3-17 Reasons provided for nil returns, 2017/18

Reason provided for nil returns	Number of licences	
Normal operation does not involve sales [a]	28	16%
None provided / ambiguous / personal	57	33%
Ownership / regulatory [b]	3	2%
Stock levels too low / unable to purchase spat/fingerlings	35	20%
No infrastructure on site	11	6%
Not operating	34	20%
Other	5	3%
Total	**173**	**100%**

[a] For example, the licence may be used for research, holding stock, catching spat, or growing juveniles which are transferred to another licence before selling.

[b] For example, the licence is for sale, currently being transferred, or under another regulatory process.

Source: PIRSA Fisheries and Aquaculture 2017/18 Production Returns

Table 3-18 Aquaculture Licence Holders and category, 2017/18

Aquaculture licence and category	Number of licences
Southern Bluefin Tuna	14
Marine Finfish	23
Oysters[a]	340
Mussels	32
Abalone[b]	5
Landbased Category A	32
Landbased Category B	31
Landbased Category C	12
Landbased Category D	7
Miscellaneous	10
Total	**506**

[a] Oysters includes both marine based intertidal and subtidal licences.

[b] Abalone includes subtidal marine based abalone farms only, with Landbased coastal abalone farms and hatcheries included in the relevant Landbased category.

Source: PIRSA Fisheries and Aquaculture 2017/18

3.5. The Value of Aquaculture and Wild Catch Fisheries in South Australia

The state's total value of seafood production (landed) in 2017/18 was around $469.8 million, of which aquaculture contributed almost 44 per cent ($204.8m) and wild-catch fisheries, the balance ($265.0m) (Table 3-19). In aggregate, Tuna is the largest single sector in the state's aquaculture industry, accounting for almost 62 per cent of the state's gross value of aquaculture production in 2017/18. The other three main sectors in 2017/18 were Marine Finfish (15 per cent), Oysters (10 per cent) and Abalone (7 per cent).

Table 3-19 Value of aquaculture production and wild fisheries catch, South Australia, 2017/18

	Production or catch ('000kg)	Value of production or catch ($m)	Contribution to aquaculture value of production	Contribution to total seafood value of production or catch
Aquaculture				
Southern Bluefin Tuna	8,000	126.0	61.5%	26.8%
Marine Finfish	2,487	29.9	14.6%	6.4%
Oysters	2,177	20.2	9.8%	4.3%
Mussels	1,833	4.0	1.9%	0.8%
Abalone	399	14.2	7.0%	3.0%
Freshwater Finfish	390	5.3	2.6%	1.1%
Marron and Yabbies [a]	2	0.1	0.0%	0.0%
Other [b]	697	5.2	2.6%	1.1%
Total Aquaculture	**15,986**	**204.8**	**100.0%**	**43.6%**
Wild Catch Fisheries [c]				
Rock Lobster	1,575	122.8	-	26.1%
Abalone	700	27.2	-	5.8%
Prawns	2,623	51.8	-	11.0%
Sardines	43,293	26.4	-	5.6%
Other Marine Fisheries	2,929	27.9	-	5.9%
Inland Water Fisheries	1,873	8.9	-	1.9%
Total Wild Catch	**52,993**	**265.0**	**-**	**56.4%**
Total Seafood	**68,979**	**469.8**	**-**	**100.0%**

[a] 0.05% contribution to aquaculture value of production and 0.02% contribution to total seafood value of production or catch.

[b] Other aquaculture production in 2017/18 was comprised of Algae and Silver Perch (including fingerlings and spat).

[c] Excludes catch from the Commonwealth managed fisheries and the SA Charter Boat Fishery. SARDI Aquatic Sciences estimates.

Source: SARDI Aquatic Sciences and PIRSA Fisheries and Aquaculture 2017/18 Production Returns

3.6. Exchange Rates

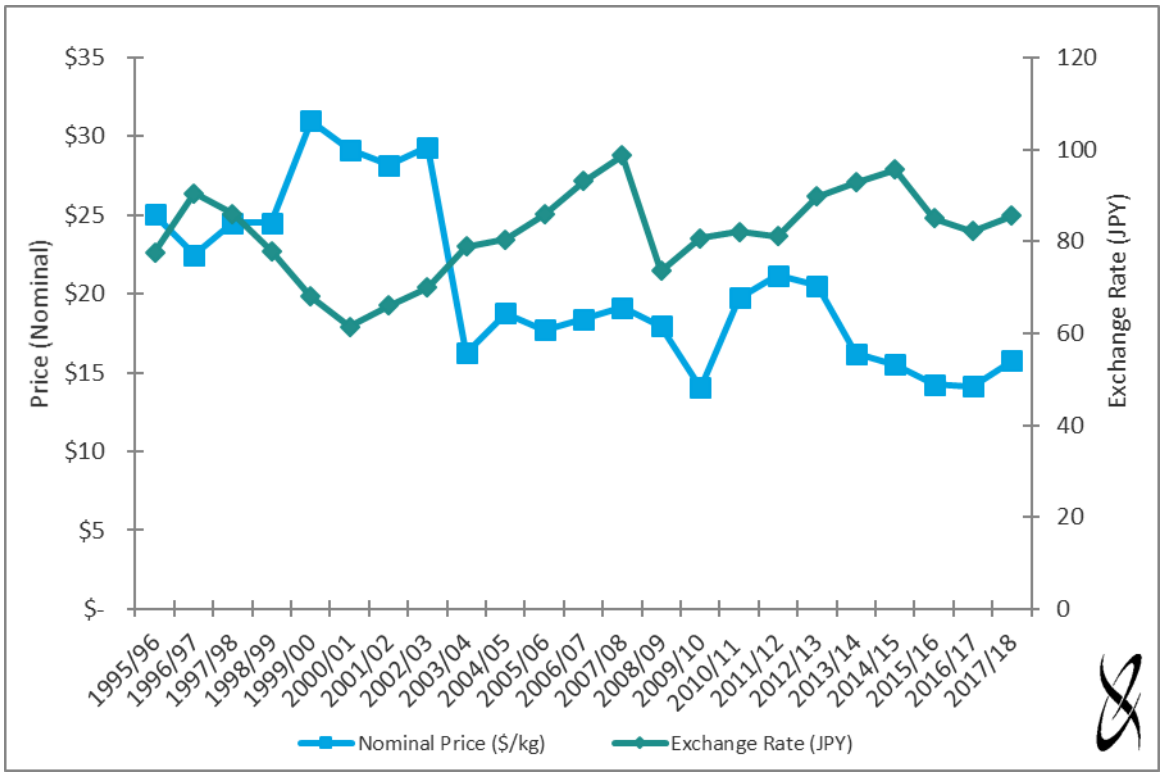
A large proportion of the South Australian aquaculture production, particularly Tuna, is exported overseas. Accordingly, the value of the Australian dollar can have a significant impact on the economic performance of the industry. The value of the Australian dollar influences the price of Australian exports overseas. Significant changes in the value of the Australian dollar have the potential to influence the demand for Australian aquaculture exports. The Australian dollar was fairly steady throughout 2017/18 beginning at US$0.78 in July 2017 and ending at US$0.75 in June 2018, with a low in June 2018 and a high of US$0.80 in September 2017.

The average exchange rate in 2017/18 was US$0.78, a 3 per cent increase compared to the average for the previous year (RBA 2019). Other things held equal, a rise in the value of the currency would have the effect of decreasing the price of aquaculture product received by Australian exporters between 2016/17 and 2017/18.

A significant export destination for South Australian Tuna is Japan. Thus it may be useful to compare the value of the Australian dollar with the Japanese Yen (JPY). The average rate of exchange in 2016/17 was 82.25 JPY increasing to 85.55 (JPY) in 2017/18 (Figure 3-1).

The relationship between the price of Tuna and the exchange rate (JPY) between 1995/96 and 2017/18 can be readily observed in Figure 3-1. A widely used measure of the relationship between two variables, such as price and exchange rate, is the coefficient of correlation. The coefficient of correlation can range in value from +1.0 for a perfect positive correlation to -1.0 for a perfect inverse correlation. The coefficient of correlation between the exchange rate (JPY) and the price for SA farmed Tuna for the period 1995/96 to 2017/18 is -0.65. This indicates that there is a strong inverse relationship between the two variables. Thus, when the Australian dollar appreciates against the JPY there is, generally, a corresponding decline in the average price of SA farmed Tuna. While this relationship is not expected to hold in each individual year, it does hold over the longer periods as evidenced by the relative trends in Figure 3-1.

Figure 3-1 Exchange rate (JPY) and price for Tuna, 1995/96 to 2017/18



Source: RBA (2018)

4. THE ECONOMIC CONTRIBUTION OF AQUACULTURE IN SA, 2017/18

Estimates of the direct economic contribution 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 2017/18 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. These flow-on effects have been estimated using input-output analysis. Input-output analysis is widely used in economic contribution analysis and is a practicable method for measuring economic contributions at regional and state levels. In order to compile a representative cost structure for each sector, costs were derived from data provided by operators in 2002/03 and updated to 2017/18, as described earlier. On an item-by-item basis, the expenditures were allocated between those occurring in South Australia and those goods and services imported from outside the state. These data were then incorporated into the state input-output model to estimate the flow-on or indirect economic contributions.

4.1. The Economic Contribution of Tuna Farming in South Australia, 2017/18

Estimates of the economic contribution generated by the Tuna farming industry in SA on a sector-by-sector basis for 2017/18 are provided in Table 4-1 and Figure 4-1 to Figure 4-4. Contributions are measured in terms of value of output, contribution to gross state product (GSP), employment and household income.

Output contributions...

There are substantial economic contributions from the Tuna farming industry in South Australia. Direct output (business turnover) generated in South Australia by Tuna farms summed to $126.0 million and in other sectors (processing and transport), $14.6 million in 2017/18. Flow-on output in other sectors of the state economy summed to $166.6 million (Table 4-1). The sectors most affected were the Tuna fishing (Tuna capture), property and business services, Sardine fishing, manufacturing, trade, finance and transport sectors (Figure 4-1).

The bottom row of Table 4-1 gives the total contribution/direct contribution ratio for each economic indicator. For output, the ratio of 2.19 indicates that for each dollar of sales generated by the Tuna industry (farming and downstream) there was a total of $2.19 of output generated by businesses throughout the state, $1.00 in the Tuna industry (farming and downstream) and $1.19 in other sectors of the economy (e.g. tuna fishing, property and business services, manufacturing, Sardine fishing, trade, finance and transport sectors).

Table 4-1 The economic contribution of Tuna farming in South Australia, 2017/18

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Tuna farming	126.0	41%	28.0	21%	264	27%	12.9	20%
Processing	12.4	4%	4.0	3%	41	4%	2.8	4%
Transport	2.2	1%	1.0	1%	7	1%	0.6	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	*140.6*	*46%*	*33.0*	*25%*	*313*	*32%*	*16.4*	*26%*
Flow-on effects								
Tuna fishing	31.4	10%	24.0	18%	195	20%	7.7	12%
Property and business serv.	25.6	8%	15.7	12%	60	6%	6.9	11%
Manufacturing	15.8	5%	5.2	4%	53	5%	3.6	6%
Trade	14.3	5%	7.8	6%	77	8%	5.0	8%
Sardines	22.7	7%	16.6	12%	70	7%	5.9	9%
Transport	8.9	3%	4.0	3%	29	3%	2.6	4%
Finance	9.2	3%	6.1	5%	13	1%	2.0	3%
Other Sectors [b]	38.8	13%	21.0	16%	173	18%	13.4	21%
Total Flow-on	*166.6*	*54%*	*100.5*	*75%*	*669*	*68%*	*47.1*	*74%*
Total [a]	**307.2**	**100%**	**133.5**	**100%**	**981**	**100%**	**63.4**	**100%**
Total/Direct	2.19		4.04		3.14		3.88	

[a] Note there is double counting in the total output contribution.

[b] E.g. accommodation, restaurants and cafes, utilities, communications, agriculture, forestry and fishing sectors.

Source: BDO EconSearch analysis

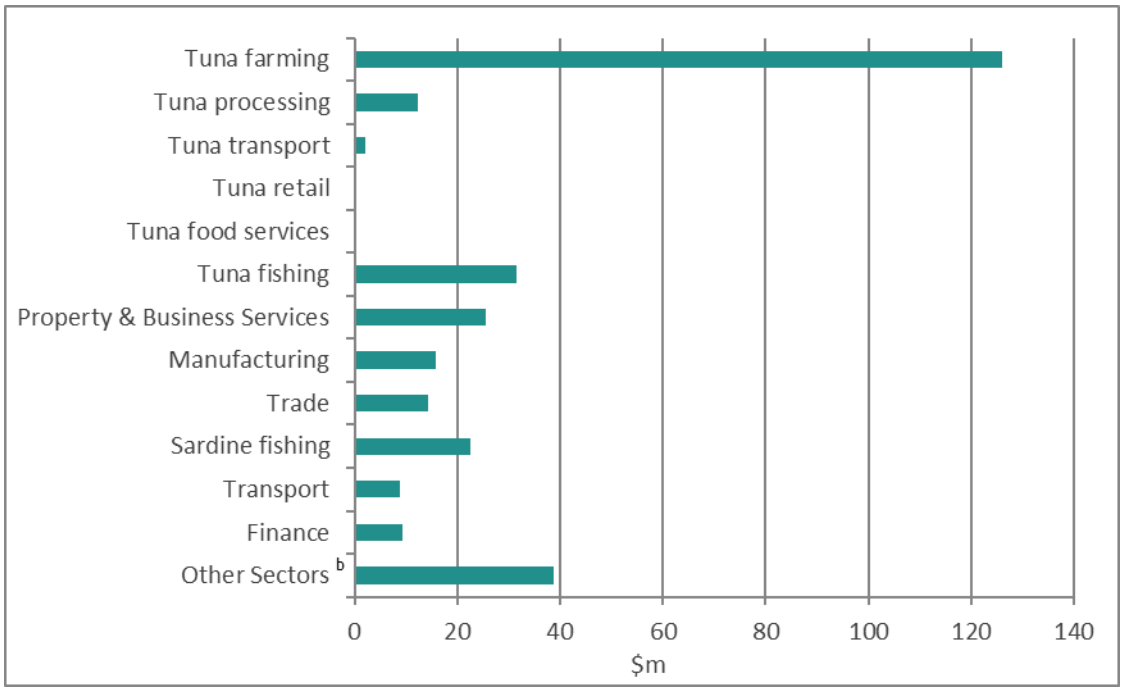
Contribution to gross state product...

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

The direct contribution to GSP by the Tuna industry (i.e. farming, processing and transport) was $33.0 million in 2017/18 ($28.0m from tuna farming and $5.0m from downstream activities). Associated with this was flow-on GSP in the other sectors of the state economy of $100.5m (Table 4-1). The flow-ons were greatest in the Tuna fishing ($24.0m), Sardine fishing ($16.6m), property and business services ($15.7m), trade ($7.8m), finance ($6.1m) and manufacturing ($5.2m) sectors (Figure 4-2). The total contribution to GSP was approximately $133.5m in 2017/18.

The bottom row in Table 4-1 shows that for each one dollar contribution to GSP by the Tuna industry there was an additional $3.04 ($4.04 in total) contribution to GSP in other sectors of the state economy (e.g. tuna fishing, property and business services, Sardine fishing, trade, manufacturing and finance sectors).

Figure 4-1 Tuna farming in South Australia, output contributions by sector, 2017/18 [a]

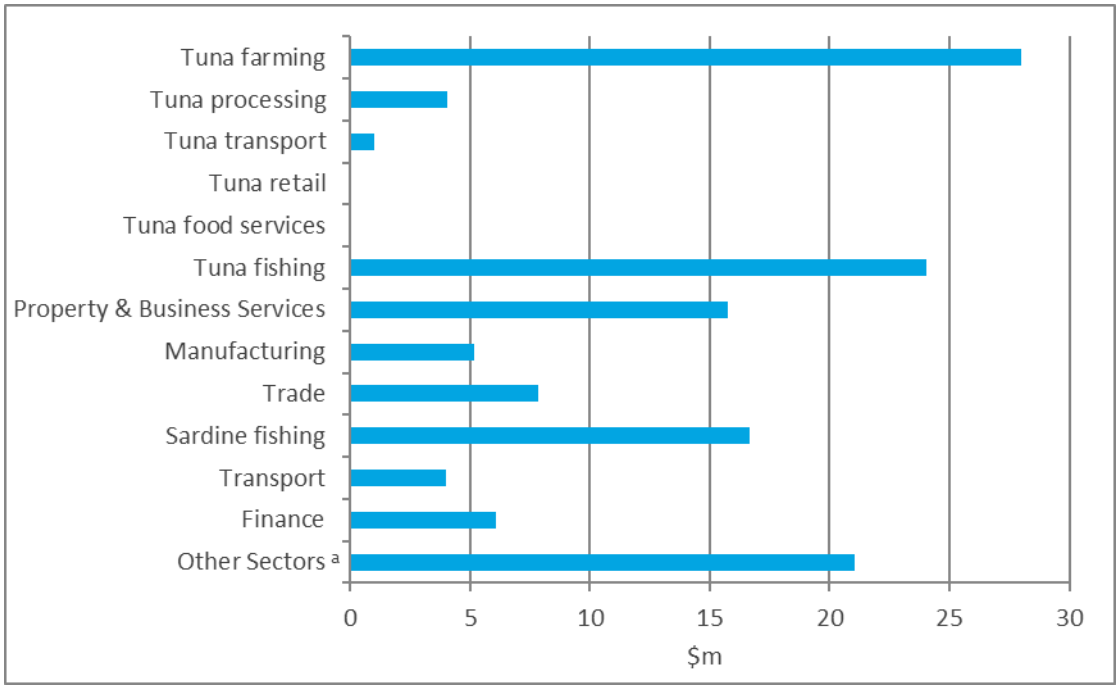


[a] Note there is double counting in the total output contribution.

[b] E.g. accommodation, restaurants and cafes, utilities, communications, agriculture, forestry and fishing sectors.

Source: BDO EconSearch analysis

Figure 4-2 Tuna farming in South Australia, contribution to GSP by sector, 2017/18



[a] E.g. accommodation, restaurants and cafes, utilities, communications, agriculture, forestry and fishing sectors.

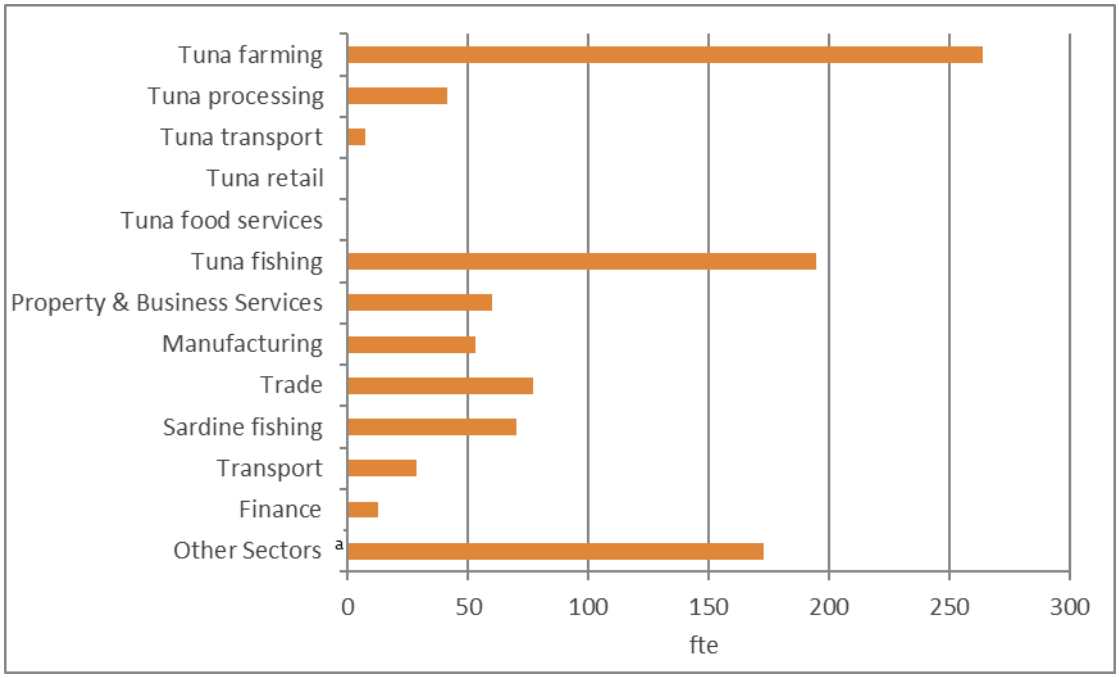
Source: BDO EconSearch analysis

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 264 full-time equivalents (fte) and, through associated processing and transport activities, another 49 fte in 2017/18 (Table 4-1). Flow-on business activity was estimated to generate a further 669 fte to give total employment of 981 fte in the state. The sectors of the economy with employment flow-ons from Tuna farming, processing and transport include the Tuna fishing (195 fte), trade (77), Sardine fishing (70), property and business services (60) and manufacturing (53) (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 2.14 jobs (3.14 jobs in total) in the rest of the state.

Figure 4-3 Tuna farming in South Australia, employment contributions by sector, 2017/18



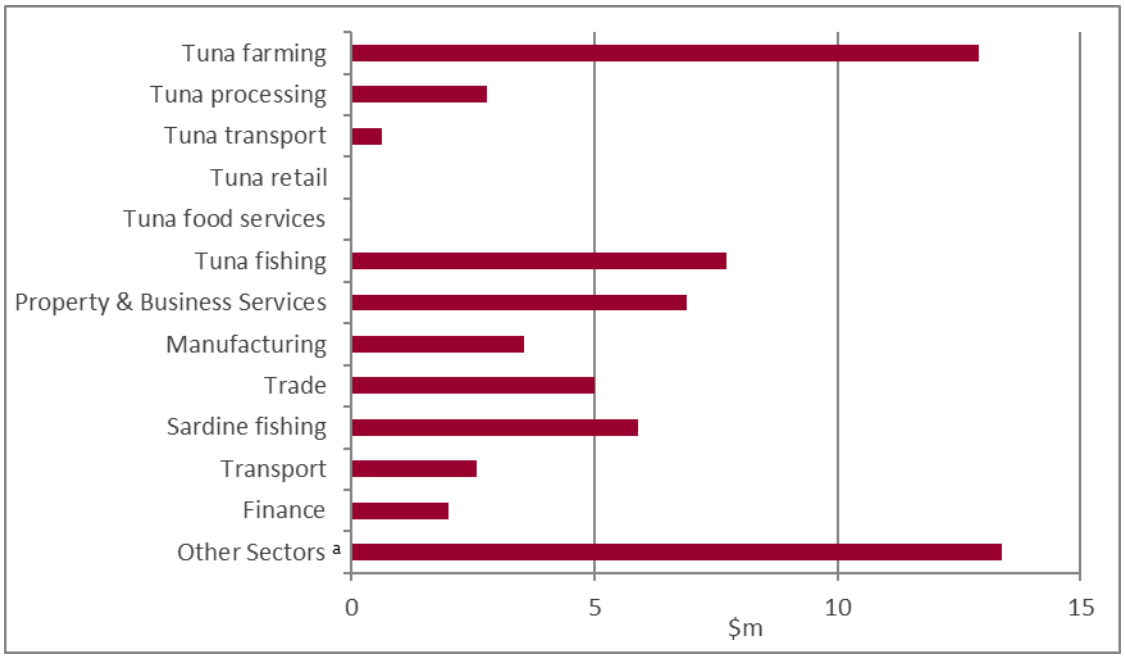
[a] E.g. accommodation, restaurants and cafes, utilities, communications, agriculture, forestry and fishing sectors.

Source: BDO EconSearch analysis

Personal income of $12.9 million was earned in the Tuna farming sector and another $3.4 million in downstream activities. This comprised both wages by employees and estimated drawings by owner/operators. An additional $47.1 million of household income was earned in other businesses in the state as a result of Tuna farming and downstream activities. The total household income contribution was around $63.4 million (Figure 4-4).

For each $1.00 of household income generated directly by Tuna farming, processing and transport in 2017/18 there was an additional $2.88 ($3.88 in total) generated in other sectors of the state economy (Table 4-1).

Figure 4-4 Tuna farming in South Australia, household income contributions by sector, 2017/18



[a] E.g. accommodation, restaurants and cafes, utilities, communications, agriculture, forestry and fishing sectors.
Source: BDO EconSearch analysis

4.2. The Economic Contribution of Oyster Farming in South Australia, 2017/18

Table 4-2 provides estimates of the economic contribution generated by Oyster farming in South Australia on a sector-by-sector basis in 2017/18. As for Tuna in the previous section, contributions are measured in terms of output (business turnover), contribution to GSP, employment and household income.

It should be noted that the gross value of production includes the value of adult Oyster sales only. Approximately $2.2 million of spat sales and $700,000 of sales from on-grown Oysters have been excluded as they are considered an input to production for the final sales of adult Oysters. In previous reports (EconSearch 2018) the value of spat sales was included as some spat was exported interstate. However, all spat grown in SA are now supplied to SA Oyster farms and are, as stated above, now considered an input to production for the final sales of adult Oysters.

Output contributions...

Direct output (business turnover) generated in SA by Oyster farming enterprises summed to $20.2 million in 2017/18 while output generated in SA by associated downstream activities (processing, transport, retail and food service) summed to $15.8 million. Flow-ons to other sectors of the state economy added another $33.5 million in output in 2017/18. The sectors most affected were the property and business services, manufacturing, trade and finance sectors.

Table 4-2 The economic contribution of Oyster farming in South Australia, 2017/18 [a]

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Oyster farming [b]	20.2	29%	15.9	38%	199	48%	5.5	27%
Processing	2.7	4%	0.9	2%	9	2%	0.6	3%
Transport	2.6	4%	1.1	3%	8	2%	0.7	4%
Retail	0.2	0%	0.1	0%	1	0%	0.1	0%
Food services	10.4	15%	5.5	13%	71	17%	3.6	18%
Total Direct	*36.0*	*52%*	*23.5*	*57%*	*288*	*70%*	*10.5*	*52%*
Flow-on effects								
Property and business serv	7.4	11%	4.7	11%	15	4%	1.8	9%
Manufacturing	5.1	7%	1.7	4%	17	4%	1.2	6%
Trade	4.0	6%	2.2	5%	21	5%	1.4	7%
Transport	2.2	3%	1.0	2%	7	2%	0.7	3%
Finance	2.5	4%	1.7	4%	3	1%	0.5	3%
Other Sectors	12.2	18%	6.8	16%	60	15%	4.2	21%
Total Flow-on	*33.5*	*48%*	*18.0*	*43%*	*125*	*30%*	*9.7*	*48%*
Total [c]	**69.5**	**100%**	**41.5**	**100%**	**413**	**100%**	**20.2**	**100%**
Total/Direct	1.93		1.77		1.43		1.92	

[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 adults but excludes sales of spat and on-grown oysters.

[c] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

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 2017/18, total Oyster farming-related contribution to GSP in South Australia was approximately $41.5 million, $15.9 million generated by Oyster farming directly, $7.6 million generated directly by downstream activities and $18.0 million generated in other sectors of the state economy.

Employment and household income...

In 2017/18, SA Oyster farming was responsible for the direct employment of around 199 fte and downstream activities created employment for around 89 fte. Flow-on business activity was estimated to generate a further 125 fte to give total employment of 413 fte in the state. The flow-on jobs were concentrated in the trade (21 fte), manufacturing (17 fte) and property and business services (15 fte).

Personal income of around $5.5 million was earned in the Oyster farming sector and another $5.0 million in downstream activities. This comprised both wages by employees and estimated drawings by owner/operators. An additional $9.7 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 contribution was $20.2 million.

4.3. The Economic Contribution of the Remaining Aquaculture Sectors in South Australia, 2017/18

The economic contributions of the remaining individual aquaculture sectors in South Australia in 2017/18 are reported in Table 4-3 to Table 4-8, 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 following aquaculture sectors, the contributions 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 contributions 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 contribution of Marine Finfish farming in South Australia, 2017/18 [a]

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Marine finfish farming	29.9	35%	12.3	31%	101	31%	5.2	25%
Processing	2.7	3%	0.9	2%	9	3%	0.6	3%
Transport	2.7	3%	1.2	3%	9	3%	0.8	4%
Retail	1.0	1%	0.5	1%	5	2%	0.3	2%
Food services	6.9	8%	3.6	9%	47	15%	2.4	11%
Total Direct	*43.2*	*51%*	*18.6*	*46%*	*172*	*53%*	*9.3*	*44%*
Flow-on effects								
Property and business serv	7.8	9%	4.9	12%	16	5%	1.9	9%
Manufacturing	5.4	6%	1.7	4%	18	6%	1.2	6%
Trade	5.4	6%	2.9	7%	29	9%	1.9	9%
Transport	2.3	3%	1.0	3%	8	2%	0.7	3%
Finance	2.7	3%	1.8	4%	4	1%	0.6	3%
Other Sectors	18.4	22%	9.2	23%	76	24%	5.4	26%
Total Flow-on	*42.0*	*49%*	*21.6*	*54%*	*151*	*47%*	*11.7*	*56%*
Total [a]	**85.3**	**100%**	**40.2**	**100%**	**322**	**100%**	**21.0**	**100%**
Total/Direct	1.97		2.16		1.88		2.25	

[a] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

Table 4-4 The economic contribution of Mussel farming in South Australia, 2017/18 [a]

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Mussel farming	4.0	21%	2.6	25%	26	29%	2.6	36%
Processing	1.0	5%	0.3	3%	3	4%	0.2	3%
Transport	0.6	3%	0.3	3%	2	2%	0.2	2%
Retail	0.5	2%	0.3	2%	3	3%	0.2	2%
Food services	1.8	9%	0.9	9%	12	14%	0.6	8%
Total Direct	*7.8*	*40%*	*4.4*	*41%*	*46*	*52%*	*3.8*	*52%*
Flow-on effects								
Property and business serv	2.5	13%	1.6	15%	5	6%	0.6	8%
Manufacturing	1.6	8%	0.5	5%	5	6%	0.4	5%
Trade	1.4	7%	0.7	7%	7	8%	0.5	6%
Transport	0.7	4%	0.3	3%	2	3%	0.2	3%
Finance	0.9	5%	0.6	5%	1	1%	0.2	3%
Other Sectors	4.4	23%	2.5	23%	22	24%	1.8	24%
Total Flow-on	*11.6*	*60%*	*6.3*	*59%*	*43*	*48%*	*3.6*	*48%*
Total [a]	**19.4**	**100%**	**10.7**	**100%**	**89**	**100%**	**7.4**	**100%**
Total/Direct	2.48		2.42		1.93		1.94	

[a] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

Table 4-5 The economic contribution of Abalone farming in South Australia, 2017/18 [a]

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Abalone farming	14.2	34%	3.1	22%	42	31%	2.0	23%
Processing	0.5	1%	0.2	1%	2	1%	0.1	1%
Transport	0.1	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	*14.8*	*35%*	*3.3*	*23%*	*44*	*32%*	*2.1*	*25%*
Flow-on effects								
Property and business serv	3.7	9%	2.2	16%	9	7%	1.1	13%
Manufacturing	1.8	4%	0.6	4%	6	5%	0.4	5%
Trade	2.0	5%	1.1	8%	11	8%	0.7	8%
Transport	0.8	2%	0.3	2%	3	2%	0.2	3%
Finance	1.0	2%	0.7	5%	1	1%	0.2	3%
Other Sectors	18.2	43%	5.9	42%	62	46%	3.8	45%
Total Flow-on	*27.5*	*65%*	*10.9*	*77%*	*92*	*68%*	*6.4*	*75%*
Total [a]	**42.3**	**100%**	**14.2**	**100%**	**136**	**100%**	**8.5**	**100%**
Total/Direct	2.86		4.32		3.09		4.07	

[a] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

Table 4-6 The economic contribution of Freshwater Finfish farming in South Australia, 2017/18 [a]

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Freshwater finfish farming	5.3	43%	2.9	44%	26	49%	1.7	44%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
Transport	0.6	5%	0.2	4%	2	3%	0.2	4%
Retail	0.1	1%	0.0	1%	0	1%	0.0	1%
Food services	0.5	4%	0.3	4%	3	7%	0.2	5%
Total Direct	*6.4*	*52%*	*3.4*	*52%*	*32*	*60%*	*2.0*	*54%*
Flow-on effects								
Property and business serv	1.3	10%	0.8	12%	2	5%	0.3	8%
Manufacturing	0.8	6%	0.2	4%	3	5%	0.2	5%
Trade	0.9	7%	0.5	7%	5	9%	0.3	8%
Transport	0.3	3%	0.2	2%	1	2%	0.1	3%
Finance	0.5	4%	0.3	5%	1	1%	0.1	3%
Other Sectors	2.2	18%	1.2	18%	10	19%	0.8	21%
Total Flow-on	*5.8*	*48%*	*3.2*	*48%*	*21*	*40%*	*1.7*	*46%*
Total [a]	**12.2**	**100%**	**6.6**	**100%**	**53**	**100%**	**3.8**	**100%**
Total/Direct	1.91		1.92		1.68		1.85	

[a] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

Table 4-7 The economic contribution of Marron/Yabby farming in South Australia, 2017/18 [a]

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Marron/yabbies farming	0.1	49%	0.1	62%	7	94%	0.0	11%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
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	19%	0.0	14%	0	3%	0.0	37%
Total Direct	*0.1*	*68%*	*0.1*	*77%*	*7*	*97%*	*0.0*	*49%*
Flow-on effects								
Property and business serv	0.0	7%	0.0	7%	0	0%	0.0	11%
Manufacturing	0.0	6%	0.0	3%	0	1%	0.0	9%
Trade	0.0	4%	0.0	3%	0	1%	0.0	9%
Transport	0.0	2%	0.0	1%	0	0%	0.0	3%
Finance	0.0	2%	0.0	2%	0	0%	0.0	3%
Other Sectors	0.0	10%	0.0	7%	0	1%	0.0	17%
Total Flow-on	*0.1*	*32%*	*0.0*	*23%*	*0*	*3%*	*0.0*	*51%*
Total [a]	**0.2**	**100%**	**0.1**	**100%**	**8**	**100%**	**0.0**	**100%**
Total/Direct	1.47		1.30		1.03		2.06	

[a] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

Table 4-8 The economic contribution of other aquaculture farming in South Australia, 2017/18 [a]

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Other aquaculture	5.2	61%	2.8	61%	5	29%	1.4	58%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
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	*5.2*	*61%*	*2.8*	*61%*	*5*	*29%*	*1.4*	*58%*
Flow-on effects								
Property and business serv	0.8	9%	0.5	10%	2	9%	0.2	7%
Manufacturing	0.4	5%	0.1	3%	1	8%	0.1	4%
Trade	0.5	6%	0.3	6%	3	16%	0.2	8%
Transport	0.2	2%	0.1	2%	1	3%	0.1	2%
Finance	0.3	3%	0.2	4%	0	2%	0.1	2%
Other Sectors	1.2	14%	0.7	14%	6	32%	0.4	19%
Total Flow-on	*3.4*	*39%*	*1.8*	*39%*	*12*	*71%*	*1.0*	*42%*
Total [b]	**8.6**	**100%**	**4.7**	**100%**	**17**	**100%**	**2.4**	**100%**
Total/Direct	1.65		1.65		3.46		1.72	

[a] Other aquaculture production in 2017/18 was comprised of Algae and Silver Perch (including fingerlings and spat) production. The downstream contributions of other aquaculture production are unknown and have been excluded from the analysis.

[b] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

5. THE ECONOMIC CONTRIBUTION OF AQUACULTURE IN THE EYRE PENINSULA REGION, 2017/18

This region covers the Eyre Peninsula from Lower Eyre Peninsula to Port Augusta, including Kimba (see Figure 1-1).

Production and value by aquaculture sector for the Eyre Peninsula is summarised in Table 5-1.

Table 5-1 Production and value of production in the Eyre Peninsula Region, 2017/18

	Production (t)	Value of Production ($'000)
Southern Bluefin Tuna	8,000	126,000
Marine Finfish	2,487	29,865
Oysters	1,289	11,749
Mussels	1,833	3,977
Abalone	243	7,533
Freshwater Finfish	0	3
Marron and Yabbies	0	0
Other	697	5,228
Total	**14,550**	**184,356**

Source: Table 3-2 and Table 3-4

Estimates of the economic contribution of all aquaculture in the Eyre Peninsula region of South Australia in 2017/18 are reported in Table 5-2. The interpretation of these results is identical to the state-level contributions described in Section 4 of the report.

Table 5-2 The economic contribution of all aquaculture in the Eyre Peninsula Region, 2017/18

Sector	Output [b]		Contribution to GRP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Aquaculture production	184.4	51%	56.7	36%	542	43%	26.3	35%
Aquaculture downstream [a]	24.6	7%	7.6	5%	80	6%	5.6	7%
Total Direct	209.0	57%	64.2	41%	622	49%	31.9	42%
Flow-on effects								
Tuna Fishing	31.4	9%	24.0	15%	195	15%	7.7	10%
Other Sectors	123.7	34%	70.1	44%	453	36%	35.5	47%
Total Flow-on	155.1	43%	94.1	59%	648	51%	43.3	58%
Total	364.0	100%	158.4	100%	1,270	100%	75.1	100%

[a] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

5.1. The Economic Contribution of Tuna Farming in the Eyre Peninsula Region, 2017/18

Estimates of the economic contribution of Tuna farming in the Eyre Peninsula region of South Australia in 2017/18 are reported in Table 5-3.

Table 5-3 The economic contribution of Tuna farming in the Eyre Peninsula Region, 2017/18

Sector	Output		Contribution to GRP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Tuna farming	126.0	49%	28.0	26%	264	32%	12.9	26%
Processing	12.4	5%	2.9	3%	39	5%	2.4	5%
Transport	2.2	1%	1.0	1%	7	1%	0.6	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	*140.6*	*54%*	*31.9*	*30%*	*310*	*38%*	*16.0*	*32%*
Flow-on effects								
Tuna fishing	31.4	12%	24.0	22%	195	24%	7.7	16%
Property and business serv.	16.4	6%	10.0	9%	39	5%	4.3	9%
Manufacturing	8.0	3%	1.9	2%	25	3%	1.6	3%
Trade	10.5	4%	5.7	5%	56	7%	3.7	8%
Sardines	20.0	8%	14.7	14%	62	8%	5.2	11%
Transport	7.0	3%	3.3	3%	23	3%	2.0	4%
Finance	4.1	2%	2.9	3%	5	1%	0.8	2%
Other Sectors	21.7	8%	13.1	12%	104	13%	7.8	16%
Total Flow-on	*119.1*	*46%*	*75.5*	*70%*	*509*	*62%*	*33.2*	*68%*
Total [a]	**259.7**	**100%**	**107.4**	**100%**	**818**	**100%**	**49.2**	**100%**
Total/Direct	1.85		3.37		2.64		3.08	

[a] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

Output contributions...

Direct output (business turnover) generated locally by Tuna farms summed to $126.0 million and in other sectors (processing and transport), $14.6 million in 2017/18. Flow-on output in other sectors summed to $119.1 million. The sectors most affected were the Tuna fishing (Tuna capture), Sardine fishing, property and business services, trade and manufacturing sectors (Table 5-3).

The bottom row of Table 5-3 gives the total contribution/direct contribution ratio for each economic indicator. For output, the ratio of 1.85 indicates that for each dollar of sales generated directly by Tuna farming, processing and transport there was a total of $1.85 of output generated by businesses throughout the Eyre Peninsula region, $1.00 in Tuna farming, processing and transport and $0.85 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 $31.9 million in 2017/18 ($28.0m directly by Tuna farming and $3.9m by downstream businesses). Flow-on GRP generated in the other sectors of the regional economy was $75.5 million in 2017/18. The flow-ons were greatest in the Tuna fishing ($24.0m), Sardine fishing ($14.7m),

property and business services ($10.0m) and trade ($5.7m) sectors. The total contribution to GSP was approximately $107.4m in 2017/18.

The bottom row in Table 5-3 shows that for each dollar of GRP generated directly in Tuna farming, processing and transport there was an additional $2.37 ($3.37 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 264 fte and associated processing and transport, approximately 46 fte in the Eyre Peninsula region in 2017/18. Flow-on business activity was estimated to have generated a further 509 fte jobs locally to give total employment of approximately 818 fte in the region. The sectors of the local economy with employment flow-ons from Tuna farming, processing and transport included the Tuna fishing (195 fte), Sardine fishing (62), trade (56), property and business services (39) and manufacturing (25) sectors.

The bottom row in Table 5-3 shows that for each job generated directly in Tuna farming, processing and transport there was an additional 1.64 jobs (2.64 jobs in total) in the rest of the region.

Personal income of $12.9 million was earned in the Tuna farming sector and another $3.1 million in downstream activities. This comprised both wages by employees and estimated drawings by owner/operators. An additional $33.2 million of household income was earned in other businesses in the region as a result of Tuna farming and downstream activities. The total household income contribution was $49.2 million. For each $1.00 of household income generated directly by Tuna farming, processing and transport in 2017/18 there was an additional $2.08 ($3.08 in total) generated in other sectors of the Eyre Peninsula regional economy.

5.2. The Economic Contribution of Oyster Farming in the Eyre Peninsula Region, 2017/18

Estimates of the economic contribution of Oyster farming in the Eyre Peninsula region in 2017/18 are reported in Table 5-4. The interpretation of these results is identical to the state-level contributions described in Section 4 of the report.

Output contributions...

Direct output (business turnover) generated by Oyster enterprises in the Eyre Peninsula region summed to approximately $11.7 million in 2017/18 while output generated in the Eyre Peninsula region by associated downstream activities (processing, transport, retail and food service) summed to $2.2 million. Flow-ons to other sectors of the regional economy added another $6.0 million in output in 2017/18. The sectors most affected were the property and business services, trade and manufacturing sectors (Table 5-4).

Contribution to gross regional product...

Total Oyster farming-related contribution to GRP in the Eyre Peninsula region was $13.8 million in 2017/18, $9.3 million generated by Oyster farming directly, $0.9 million generated by downstream activities and $3.5 million generated in other sectors of the regional economy.

Employment and household income...

In 2017/18 in the Eyre Peninsula region, Oyster farming was responsible for the direct employment of approximately 121 fte and associated downstream activities created employment for an additional 8 fte.

Flow-on business activity was estimated to generate a further 28 fte. The total employment contribution was 157 fte.

In 2017/18, personal income of $3.8 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 $1.8 million of household income was earned in other local businesses as a result of Oyster industry operations. The total household income contribution was around $5.6 million.

Table 5-4 The economic contribution of Oyster farming in the Eyre Peninsula region, 2017/18 [a]

Sector	Output		Contribution to GRP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Oyster farming [b]	11.7	59%	9.3	67%	121	77%	3.2	58%
Processing	0.4	2%	0.1	1%	1	1%	0.1	1%
Transport	1.5	7%	0.7	5%	5	3%	0.4	8%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.3	2%	0.2	1%	2	1%	0.1	2%
Total Direct	*13.9*	*70%*	*10.2*	*74%*	*129*	*82%*	*3.8*	*68%*
Flow-on effects								
Property and business serv.	1.4	7%	0.9	6%	2	2%	0.3	5%
Manufacturing	0.5	2%	0.1	1%	1	1%	0.1	2%
Trade	0.9	5%	0.5	4%	5	3%	0.3	6%
Transport	0.4	2%	0.2	1%	1	1%	0.1	2%
Finance	0.3	1%	0.2	1%	0	0%	0.1	1%
Other Sectors	2.5	12%	1.7	12%	18	11%	0.9	16%
Total Flow-on	*6.0*	*30%*	*3.5*	*26%*	*28*	*18%*	*1.8*	*32%*
Total [c]	**19.9**	**100%**	**13.8**	**100%**	**157**	**100%**	**5.6**	**100%**
Total/Direct	1.5		1.4		1		1.5	

[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 adults but excludes sales of spat and on-grown oysters.

[c] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

5.3. The Economic Contribution of the Remaining Aquaculture Sectors in the Eyre Peninsula Region, 2017/18

The economic contributions of other aquaculture sectors in the Eyre Peninsula region in 2017/18 (i.e. Marine Finfish, Mussels, Abalone, Freshwater Finfish and other aquaculture enterprises) are reported in aggregate in Table 5-5. 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 some of these other aquaculture sectors, the contributions 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 contributions 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 5-5 The economic contribution of the remaining aquaculture sectors [a] in the Eyre Peninsula region, 2017/18 [b]

Sector	Output		Contribution to GRP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Remaining aquaculture	46.6	55%	19.4	52%	157	53%	10.1	50%
Processing	4.0	5%	0.9	2%	12	4%	0.8	4%
Transport	3.4	4%	1.6	4%	11	4%	1.0	5%
Retail	0.1	0%	0.0	0%	0	0%	0.0	0%
Food services	0.4	1%	0.2	1%	3	1%	0.1	1%
Total Direct	*54.5*	*64%*	*22.1*	*60%*	*183*	*62%*	*12.1*	*59%*
Flow-on effects								
Property and business serv.	5.1	6%	3.3	9%	9	3%	1.0	5%
Manufacturing	1.9	2%	0.4	1%	6	2%	0.4	2%
Trade	4.8	6%	2.6	7%	26	9%	1.7	8%
Transport	1.6	2%	0.7	2%	5	2%	0.5	2%
Finance	1.0	1%	0.7	2%	1	0%	0.2	1%
Other Sectors	15.6	19%	7.3	20%	64	22%	4.6	22%
Total Flow-on	*30.0*	*36%*	*15.1*	*40%*	*111*	*38%*	*8.3*	*41%*
Total [c]	**84.5**	**100%**	**37.2**	**100%**	**294**	**100%**	**20.3**	**100%**
Total/Direct	1.6		1.7		2		1.7	

[a] Includes Marine Finfish, Mussels, Abalone, Freshwater Finfish 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.

[c] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

6. THE ECONOMIC CONTRIBUTION OF AQUACULTURE IN THE WEST COAST REGION, 2017/18

This region covers the West Coast of SA from the WA border to Elliston including Wudinna (see Figure 1-1).

Production and value by aquaculture sector for the West Coast region is summarised in Table 6-1.

Table 6-1 Production and value of production in the West Coast Region, 2017/18

	Production (t)	Value of Production ($'000)
Southern Bluefin Tuna	0	0
Marine Finfish	0	0
Oysters	852	8,071
Mussels	0	0
Abalone	0	0
Freshwater Finfish	0	0
Marron and Yabbies	0	0
Other	0	0
Total	**852**	**8,071**

Source: Table 3-2 and Table 3-4

Estimates of the economic contribution of aquaculture in the West Coast region of SA in 2017/18 (Oysters only) are reported in aggregate in Table 6-2. Note that for some of the aquaculture sectors in the West Coast region, the contributions 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 contributions 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.

Output contributions...

Direct output (business turnover) generated by aquaculture summed to $8.1 million and associated downstream activities, $1.5 million in the West Coast region in 2017/18. Flow-on output in other sectors of the regional economy summed to $4.1 million in 2017/18. The sectors most affected were the property and business services, trade, and manufacturing sectors (Table 6-2).

Contribution to gross regional product...

Total aquaculture-related contribution to gross regional product in the West Coast region was approximately $9.5 million in 2017/18, $6.4 million generated by aquaculture directly, $0.6 million generated in associated downstream activities and $2.4 million generated in other sectors of the regional economy.

Employment and household income...

Aquaculture and downstream activities were responsible for the direct employment of 72 fte in 2017/18 in the West Coast region. Flow-on business activity was estimated to generate a further 18 fte. The total employment contribution was 91 fte.

In 2017/18, personal income of $2.6 million was earned in aquaculture and downstream activities in the West Coast region comprising both wages by employees and estimated drawings by owner/operators. An

additional $1.2 million of household income was earned in other local businesses as a result of aquaculture industry operations. Total household income contribution was $3.9 million in 2017/18.

Table 6-2 The economic contribution of aquaculture [a] in the West Coast region, 2017/18 [b]

Sector	Output		Contribution to GRP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Aquaculture	8.1	59%	6.4	67%	67	74%	2.2	57%
Processing	0.3	2%	0.1	1%	1	1%	0.1	1%
Transport	1.0	7%	0.5	5%	3	4%	0.3	8%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.2	2%	0.1	1%	1	1%	0.1	2%
Total Direct	*9.6*	*70%*	*7.0*	*74%*	*72*	*80%*	*2.6*	*68%*
Flow-on effects								
Property and business serv.	1.0	7%	0.6	6%	2	2%	0.2	5%
Manufacturing	0.3	2%	0.1	1%	1	1%	0.1	2%
Trade	0.6	5%	0.3	4%	3	4%	0.2	6%
Transport	0.3	2%	0.1	1%	1	1%	0.1	2%
Finance	0.2	1%	0.1	1%	0	0%	0.0	1%
Other Sectors	1.7	13%	1.1	12%	11	12%	0.6	16%
Total Flow-on	*4.1*	*30%*	*2.4*	*26%*	*18*	*20%*	*1.2*	*32%*
Total [c]	**13.7**	**100%**	**9.5**	**100%**	**91**	**100%**	**3.9**	**100%**
Total/Direct	1.5		1.4		1		1.5	

[a] Predominantly Oysters.

[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.

[c] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

7. THE ECONOMIC CONTRIBUTION OF AQUACULTURE IN THE YORKE PENINSULA REGION, 2017/18

This region covers the Yorke Peninsula, Mid North and Barossa (see Figure 1-1).

Production and value by aquaculture sector for the Yorke Peninsula region is summarised in Table 7-1.

Table 7-1 Production and value of production in the Yorke Peninsula Region, 2017/18

	Production (t)	Value of Production ($'000)
Southern Bluefin Tuna	0.00	0.00
Marine Finfish	0.00	0.00
Oysters	8.78	57.06
Mussels	0.00	0.00
Abalone	0.00	0.00
Freshwater Finfish	0.11	1.12
Marron and Yabbies	0.05	1.31
Other	0.30	8.40
Total	**9.24**	**67.89**

Source: Table 3-2 and Table 3-4

Estimates of the economic contribution of aquaculture in the Yorke Peninsula region of SA in 2017/18 (i.e. Oysters, Freshwater Finfish, Marron/Yabby and other aquaculture enterprises) are reported in aggregate in Table 7-2.

Note that for some of the aquaculture sectors in the Yorke Peninsula region, the contributions 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 contributions 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.

Output contributions...

Total aquaculture-related contribution to output in the Yorke Peninsula region was approximately $0.1 million in 2017/18, $0.1 million generated by aquaculture directly and less than $0.1 million generated in associated downstream activities and in other sectors of the regional economy (Table 7-2).

Contribution to gross regional product...

Total aquaculture-related contribution to gross regional product in the Yorke Peninsula region was approximately $0.1 million in 2017/18, $0.1 million generated by aquaculture directly and less than $0.1 million generated in associated downstream activities and in other sectors of the regional economy.

Employment and household income...

Aquaculture and downstream activities were responsible for the direct employment of 5 fte in 2017/18 in the Yorke Peninsula region. Flow-on business activity was estimated to generate 1 fte. The total employment contribution was 6 fte.

In 2017/18, personal income of less than $0.1 million was earned in aquaculture and downstream activities in the Yorke Peninsula region comprising both wages by employees and estimated drawings by

owner/operators. Less than $0.1m of household income was earned in other local businesses as a result of aquaculture industry operations.

Table 7-2 The economic contribution of aquaculture [a] in the Yorke Peninsula region, 2017/18 [b]

Sector	Output		Contribution to GRP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Aquaculture	0.1	60%	0.1	69%	5	90%	0.0	55%
Processing	0.0	2%	0.0	0%	0	0%	0.0	0%
Transport	0.0	6%	0.0	4%	0	1%	0.0	7%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.0	1%	0.0	1%	0	0%	0.0	3%
Total Direct	*0.1*	*69%*	*0.1*	*75%*	*5*	*91%*	*0.0*	*66%*
Flow-on effects								
Property and business serv.	0.0	6%	0.0	7%	0	0%	0.0	3%
Manufacturing	0.0	4%	0.0	1%	0	0%	0.0	3%
Trade	0.0	4%	0.0	4%	0	1%	0.0	7%
Transport	0.0	2%	0.0	1%	0	0%	0.0	3%
Finance	0.0	1%	0.0	1%	0	0%	0.0	0%
Other Sectors	0.0	14%	0.0	11%	0	8%	0.0	17%
Total Flow-on	*0.0*	*31%*	*0.0*	*25%*	*1*	*9%*	*0.0*	*34%*
Total [c]	**0.1**	**100%**	**0.1**	**100%**	**6**	**100%**	**0.0**	**100%**
Total/Direct	1.5		1.4		1		1.6	

[a] Includes Oysters, Freshwater Finfish and Marron/Yabby farming 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.

[c] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

8. THE ECONOMIC CONTRIBUTION OF AQUACULTURE ON KANGAROO ISLAND, 2017/18

This region covers the Island of Kangaroo Island (see Figure 1-1).

Production and value by aquaculture sector for Kangaroo Island is summarised in Table 8-1.

Table 8-1 Production and value of production on Kangaroo Island, 2017/18

	Production (t)	Value of Production ($'000)
Southern Bluefin Tuna	0	0
Marine Finfish	0	0
Oysters	27	284
Mussels	0	0
Abalone	156	6,708
Freshwater Finfish	1	14
Marron and Yabbies	2	93
Other	0	0
Total	**186**	**7,098**

Source: Table 3-2 and Table 3-4

Estimates of the economic contribution of aquaculture on Kangaroo Island (KI) in 2017/18 (i.e. Abalone, Oysters, Freshwater Finfish and Marron/Yabby farming enterprises) are reported in aggregate in Table 8-2.

Note that for some of the aquaculture sectors in the KI region, the contributions 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 contributions 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.

Output contributions...

Direct output (business turnover) generated by aquaculture summed to $7.1 million and associated downstream activities, $0.3 million on KI in 2017/18. Flow-on output in other sectors of the regional economy summed to $4.9 million in 2017/18. The sectors most affected were the property and business services, trade and manufacturing sectors (Table 8-2).

Contribution to gross regional product...

Total aquaculture-related contribution to gross regional product on KI was approximately $3.8 million in 2017/18, $1.8 million generated by aquaculture directly, $0.1 million generated in associated downstream activities and $1.9 million generated in other sectors of the regional economy.

Employment and household income...

Aquaculture and downstream activities were responsible for the direct employment of 26 fte in 2017/18 on KI region. Flow-on business activity was estimated to generate a further 18 fte. The total employment contribution was 44 fte.

In 2017/18, personal income of $1.1 million was earned in aquaculture and downstream activities on KI comprising both wages by employees and estimated drawings by owner/operators. An additional $1.1 million

of household income was earned in other local businesses as a result of aquaculture industry operations. The total household income contribution was approximately $2.2 million in 2017/18.

Table 8-2 The economic contribution of aquaculture [a] on KI, 2017/18 [b]

Sector	Output		Contribution to GRP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Aquaculture	7.1	57%	1.8	47%	25	57%	1.0	45%
Processing	0.3	2%	0.1	3%	1	2%	0.1	3%
Transport	0.1	1%	0.0	1%	0	0%	0.0	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	*7.4*	*60%*	*1.9*	*50%*	*26*	*60%*	*1.1*	*49%*
Flow-on effects								
Property and business serv.	0.7	5%	0.4	11%	2	5%	0.2	11%
Manufacturing	0.1	1%	0.0	1%	0	1%	0.0	1%
Trade	0.5	4%	0.3	7%	3	6%	0.2	8%
Transport	0.1	1%	0.1	2%	0	1%	0.0	2%
Finance	0.0	0%	0.0	1%	0	0%	0.0	0%
Other Sectors	3.5	28%	1.1	28%	12	27%	0.7	30%
Total Flow-on	*4.9*	*40%*	*1.9*	*50%*	*18*	*40%*	*1.1*	*51%*
Total [c]	**12.4**	**100%**	**3.8**	**100%**	**44**	**100%**	**2.2**	**100%**
Total/Direct	1.7		2.0		2		2.1	

[a] Includes Abalone, Oysters, Freshwater Finfish and Marron/Yabby farming 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.

[c] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

9. THE ECONOMIC CONTRIBUTION OF AQUACULTURE IN THE ADELAIDE AND HILLS REGION, 2017/18

This region covers Adelaide, the Adelaide Hills and Fleurieu Peninsula.

Production and value by aquaculture sector for the Adelaide and Hills region is summarised in Table 9-1.

Table 9-1 Production and value of production in the Adelaide and Hills Region, 2017/18

	Production (t)	Value of Production ($'000)
Southern Bluefin Tuna	0.00	0.00
Marine Finfish	0.00	0.00
Oysters	0.00	0.00
Mussels	0.00	0.00
Abalone	0.00	0.00
Freshwater Finfish	165.87	1,926.48
Marron and Yabbies	0.04	0.93
Other	0.00	0.00
Total	**165.91**	**1,927.42**

Source: Table 3-2 and Table 3-4

Estimates of the economic contribution of aquaculture in the Adelaide and Hills region of SA in 2017/18 (i.e. Freshwater Finfish and Marron/Yabby farming enterprises) are reported in aggregate in Table 9-2.

Note that for some of the aquaculture sectors in the Adelaide and Hills region, the contributions 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 contributions 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.

Output contributions...

Direct output (business turnover) generated by aquaculture summed to $1.9 million and associated downstream activities, $0.2 million in the Adelaide and Hills region in 2017/18. Flow-on output in other sectors of the regional economy summed to $1.7 million in 2017/18. The sectors most affected were the property and business services, trade and manufacturing sectors (Table 9-2).

Contribution to gross regional product...

Total aquaculture-related contribution to gross regional product in the Adelaide and Hills region was approximately $2.1 million in 2017/18, $1.0 million generated by aquaculture directly, $0.1 million generated in associated downstream activities and $0.9 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 2017/18 in the Adelaide and Hills region. Flow-on business activity was estimated to generate a further 6 fte. The total employment contribution was 24 fte.

In 2017/18, personal income of $0.7 million was earned in aquaculture and downstream activities in the Adelaide and Hills region comprising both wages by employees and estimated drawings by owner/operators. An additional $0.5 million of household income was earned in other local businesses as a result of aquaculture industry operations. The total household income contribution was $1.2 million in 2017/18.

Table 9-2 The economic contribution of aquaculture [a] in the Adelaide and Hills region, 2017/18 [b]

Sector	Output		Contribution to GRP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Aquaculture	1.9	51%	1.0	51%	17	70%	0.6	52%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
Transport	0.2	5%	0.1	4%	1	3%	0.1	5%
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	*2.1*	*56%*	*1.1*	*55%*	*17*	*73%*	*0.7*	*57%*
Flow-on effects								
Property and business serv.	0.4	10%	0.3	12%	1	3%	0.1	8%
Manufacturing	0.2	4%	0.1	3%	1	2%	0.0	3%
Trade	0.3	7%	0.2	7%	1	6%	0.1	8%
Transport	0.1	2%	0.0	2%	0	1%	0.0	2%
Finance	0.1	4%	0.1	4%	0	1%	0.0	3%
Other Sectors	0.6	16%	0.3	16%	3	13%	0.2	19%
Total Flow-on	*1.7*	*44%*	*0.9*	*45%*	*6*	*27%*	*0.5*	*43%*
Total [c]	**3.8**	**100%**	**2.1**	**100%**	**24**	**100%**	**1.2**	**100%**
Total/Direct	1.8		1.8		1		1.8	

[a] Includes Freshwater Finfish and Marron/Yabby farming 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.

[c] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

10. THE ECONOMIC CONTRIBUTION OF AQUACULTURE IN THE MURRAYLANDS AND SOUTH EAST REGION, 2017/18

This region covers the Murraylands (Riverland and Murraylands) and the South East (Limestone Coast).

Production and value by aquaculture sector for the Murraylands and South East region is summarised in Table 10-1.

Table 10-1 Production and value of production in the Murraylands and South East Region, 2017/18

	Production (t)	Value of Production ($'000)
Southern Bluefin Tuna	0	0
Marine Finfish	0	0
Oysters	0	0
Mussels	0	0
Abalone	0	0
Freshwater Finfish	223	3,325
Marron and Yabbies	0	0
Other	0	0
Total	**223**	**3,325**

Source: Table 3-2 and Table 3-4

Estimates of the economic contribution of aquaculture in the Murraylands and South East region of SA in 2017/18 (Freshwater Finfish only) are reported in aggregate in Table 10-2.

Note that for some of the aquaculture sectors in the Murraylands and South East region, the contributions 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 contributions 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.

Output contributions...

Direct output (business turnover) generated by aquaculture summed to $3.3 million and associated downstream activities, $0.4 million in the Murraylands and South East region in 2017/18. Flow-on output in other sectors of the regional economy summed to $1.9 million in 2017/18. The sectors most affected were the trade, property and business services and manufacturing sectors (Table 10-2).

Contribution to gross regional product...

Total aquaculture-related contribution to gross regional product in the Murraylands and South East region was $3.0 million in 2017/18, $1.8 million generated by aquaculture directly, $0.2 million generated in associated downstream activities and $1.0 million generated in other sectors of the regional economy.

Employment and household income...

Aquaculture and downstream activities were responsible for the direct employment of 13 fte in 2017/18 in the Murraylands and South East region. Flow-on business activity was estimated to generate a further 9 fte. The total employment contribution was 21 fte.

In 2017/18, personal income of $1.2 million was earned in aquaculture and downstream activities in the Murraylands and South East region comprising both wages by employees and estimated drawings by owner/operators. An additional $0.6 million of household income was earned in other local businesses as a result of aquaculture industry operations. The total household income contribution was $1.7 million in 2017/18.

Table 10-2 The economic contribution of aquaculture [a] in the Murraylands and South East region, 2017/18 [b]

Sector	Output		Contribution to GRP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Direct effects								
Aquaculture	3.3	60%	1.8	60%	11	52%	1.1	61%
Processing	0.0	0%	0.0	0%	0	0%	0.0	0%
Transport	0.4	6%	0.2	5%	1	7%	0.1	6%
Retail	0.0	0%	0.0	0%	0	0%	0.0	0%
Food services	0.0	0%	0.0	0%	0	1%	0.0	0%
Total Direct	*3.7*	*66%*	*2.0*	*66%*	*13*	*59%*	*1.2*	*68%*
Flow-on effects								
Property and business serv.	0.4	7%	0.2	8%	1	3%	0.1	3%
Manufacturing	0.2	4%	0.1	3%	1	4%	0.1	3%
Trade	0.4	7%	0.2	7%	3	13%	0.1	9%
Transport	0.1	1%	0.0	1%	0	2%	0.0	2%
Finance	0.1	2%	0.1	2%	0	1%	0.0	1%
Other Sectors	0.7	12%	0.4	13%	4	19%	0.3	15%
Total Flow-on	*1.9*	*34%*	*1.0*	*34%*	*9*	*41%*	*0.6*	*32%*
Total [c]	**5.6**	**100%**	**3.0**	**100%**	**21**	**100%**	**1.7**	**100%**
Total/Direct	1.5		1.5		2		1.5	

[a] Freshwater Finfish production.

[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.

[c] Note there is double counting in the total output contribution.

Source: BDO EconSearch analysis

11. OTHER FACETS OF REGIONAL ECONOMIC DEVELOPMENT ASSOCIATED WITH AQUACULTURE ACTIVITY IN SA

In addition to the quantifiable economic contributions 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 (EconSearch 2017). 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 contributions generated by recurrent expenditures in the aquaculture sector, further economic contributions are generated by the investment of profits in new or under-resourced local ventures by aquaculture operators.

For example, the Tuna farming sector underpins the very substantial local investment by Tuna farmers in the local processors, shipyard, marinas, property (e.g. hotels), tourism and other industries (e.g. Yellowtail Kingfish aquaculture and viticulture) (Brian Jeffriess, pers. comm.).

Tourism

Tourism activities associated with the aquaculture sector can provide a further source of income and employment for regional economies. Aquaculture tourism operators offer the opportunity to interact with marine organisms. There was no reported activity by tourism operators in 2016/17. However, in 2017/18 there were 4,900 visitors for a value of $0.39 million. Aquaculture tourism activity is projected to grow further over the next three years.

Education and Research

The aquaculture sector is characterised by a high level of innovation. These innovative ideas have been directed towards value adding opportunities in the Tuna industry (e.g. fresh fish direct marketed to Japan), finfish industry (e.g. creating a new market segment for rapid frozen Yellowtail Kingfish), Oyster industry (e.g. marketing 'King' oysters that are larger in size), the mussel industry (e.g. exploring innovative packaging for product) among other new research and development opportunities.

The success of the Tuna industry, in particular, has been a catalyst for the development of significant research (e.g. Australian Seafood Cooperative Research Centre) and education resources (e.g. the Marine Science Centre at Port Lincoln and the South Australian Research and Development Institute) within South Australia.

There are a number of schools involved in the aquaculture industry which hold land-based or marine based licences for educational purposes of the students. The Eyre Peninsula's Cowell Area School, for example, offers a structured course in aquaculture which is conducted over two years by senior secondary students

on their land-based facility (incorporating aquaponics and Barramundi farming), in addition to a fully operational marine Oyster licence. Education and research opportunities also exist at a higher level where South Australian based universities and vocational education providers offer marine biology and aquaculture related certificates and tertiary awards.

12. ECONOMIC CONTRIBUTION OF AQUACULTURE IN SA, TIME SERIES, 1997/98 TO 2017/18

Estimates of the economic contribution of aquaculture on the South Australian economy for the period 1997/98 to 2017/18, in terms of contribution to GSP and employment, are provided in Figure 12-1 and Figure 12-2, respectively. Further detail is provided by aquaculture sector in Appendix 2.

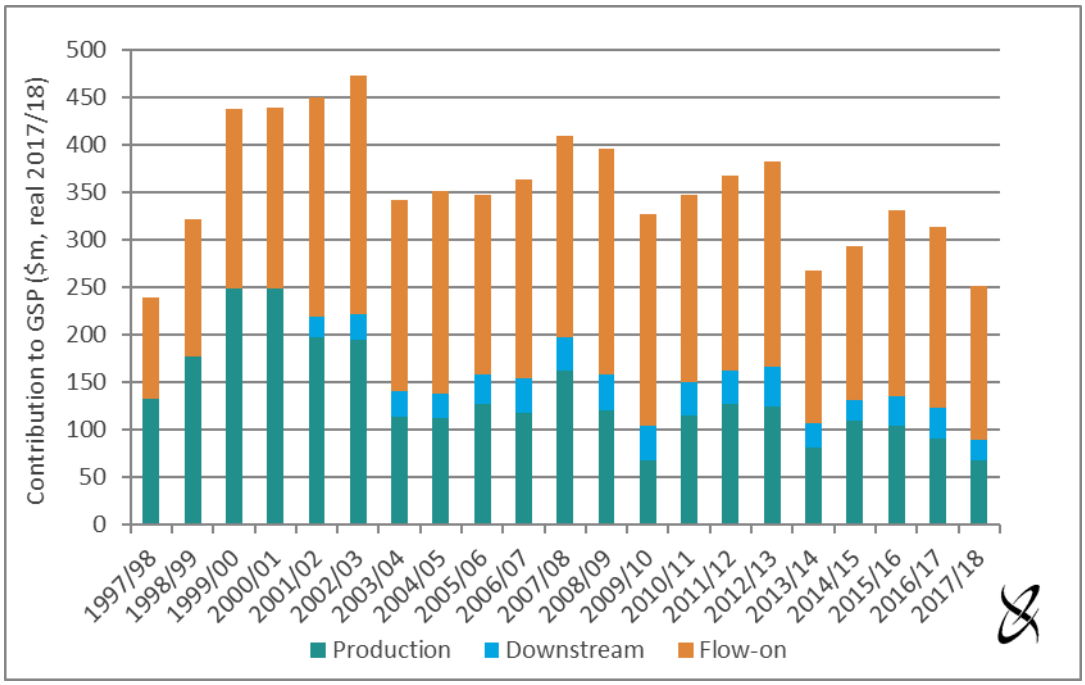
It is important to note that some of the variability in the GSP and employment contributions of SA aquaculture over the period 1997/98 to 2017/18 is a function of changes in methodology. Most significantly, as discussed in Section 2.1 of the report, estimates for the period 1997/98 to 2000/01 exclude some of the downstream contributions associated with aquaculture activity in SA (see Table 2-1 for further details). Other methodological and data-related influences include:

- the use of revised input-output tables
- updates of the representative cost structures for individual aquaculture sectors
- revisions to the processing, transport, retail and food service trade margins used in the analysis
- improvements in the quality of the responses and response rate to the PIRSA Fisheries and Aquaculture Production Returns.

Total contribution to GSP, in real terms, attributable to aquaculture in SA exhibited a rising trend over the period 1997/98 to 2002/03 and then, despite fluctuations, a declining trend through to 2017/18 (Figure 12-1). The significant reduction in the GSP contribution 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. Real GSP fell by 30 per cent between 2012/13 and 2013/14 as a result of a fall in value for several sectors including Tuna, Marine Finfish, Oysters, Freshwater Finfish and other aquaculture. Real GSP fell by 24 per cent between 2015/16 and 2017/18 resulting from falls in Oyster production related to difficulties sourcing spat after the POMS outbreak in Tasmania, and a lack of microalgae production by a major aquaculture business.

The total employment contribution attributable to aquaculture in SA exhibited a rising trend over the period 1997/98 to 2008/09, reflecting an expansion in capacity and production growth across most aquaculture sectors over this period (Figure 12-2). The apparent reported fall in employment between 2009/10 and 2010/11 was due to the use of a refined data collection form which resulted in improvements in the quality and accuracy of the responses from licence holders in the PIRSA Fisheries and Aquaculture Production Returns. The data collected in 2010/11 show that employment was inadvertently overstated in previous years. The fall in employment results in a reduction in household income and, due to the consequences from the modelled economic contributions, there are fewer people being employed in downstream and flow-on activities. This matter has now been resolved using the refined Production Return forms. Total employment was fairly stable between 2010/11 and 2012/13, at around 2,600 fte but fell to around 1,900 in 2013/14 and 2014/15 in line with the fall in total value of production. Total employment rose to over 2,100 fte jobs in 2015/16 and 2016/17 driven by the increase in production but fell slightly in 2017/18 with the fall in Oyster production.

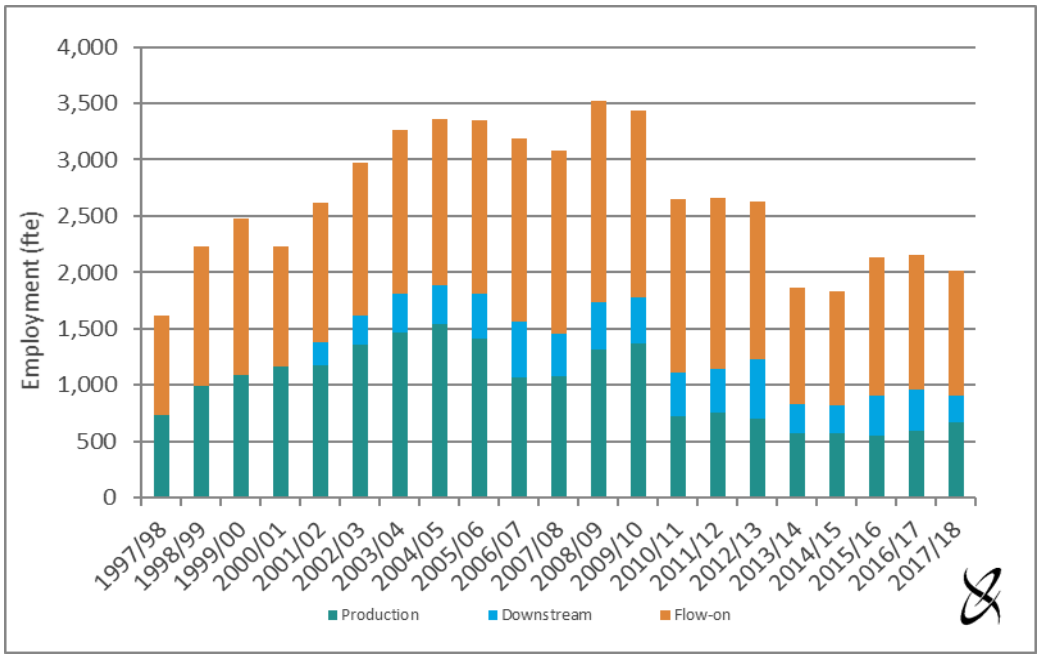
Figure 12-1 Total GSP contribution of aquaculture in SA, 1997/98 to 2017/18 [a]



[a] Total GSP contributions for the period 1997/98 to 2000/01 exclude some downstream activities (including some transport and all retail and food services). Estimates of GSP are expressed in real 2017/18 terms.

Source: EconSearch (2018), Table ES-2 and ABS (2018)

Figure 12-2 Total employment contribution of aquaculture in SA, 1997/98 to 2017/18 [a]



[a] Total employments contributions for the period 1997/98 to 2000/01 exclude some downstream activities (including some transport and all retail and food services).

Source: EconSearch (2018) and Table ES-2

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DISCLAIMER

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

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

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

APPENDIX 1 Aquaculture Production and Value, 1995/96 to 2017/18

Appendix Table 1-1 Farmed Tuna production, SA, 1995/96 to 2017/18

	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	4,992	6,805	166.7
1999/00	5,131	7,750	240.0
2000/01	5,162	9,051	263.8
2001/02	5,234	9,245	260.5
2002/03	5,375	9,102	266.9
2003/04	5,002	9,290	151.0
2004/05	5,215	7,458	140.0
2005/06	5,189	8,806	155.8
2006/07	5,342	7,486	137.7
2007/08	5,221	9,757	186.7
2008/09	5,017	8,786	157.8
2009/10	4,124	7,284	102.2
2010/11	3,786	5,800	114.5
2011/12	4,570	7,087	150.0
2012/13	4,198	7,486	153.5
2013/14	5,050	7,544	122.4
2014/15	5,447	8,418	130.7
2015/16	4,899	8,895	126.9
2016/17 [a]	4,686	8,200	116.0
2017/18	5,130	8,000	126.0

[a] 2016/17 values for SBT were revised with the collection of the 2017/18 data. Processed weight refers to gill and gutted wet weight

Source: ABARES and Brian Jeffriess (pers. comm. 8/05/19)

Appendix Table 1-2 Oyster production, SA, 1994/95 to 2005/06

	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. Excludes the volume and value of juvenile oysters sold for on-growing.

Source: SARDI Aquatic Sciences and PIRSA Fisheries and Aquaculture.

Appendix Table 1-3 Oyster production, SA, 2006/07 to 2017/18

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Production (adult only):												
Weight ('000 kg)	na	na	na	na	na	na	na	na	na	na	na	na
Number ('000 doz.)	7,720	5,448	5,848	6,123	6,154	5,241	5,710	4,900	3,891	4,589	5,158	2,177
Value:												
Adult oysters ($'000)	37,841	30,132	32,231	35,027	35,205	30,972	35,002	32,077	28,385	30,945	40,066	20,161
Spat ($'000) [b]	1,143	1,469	320	444	1,267	271	298	227	333	611	1,084	2,200
Total ($'000)	38,984	31,601	32,551	35,471	36,472	31,243	35,300	32,303	28,718	30,945	40,066	20,161

[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. Excludes the volume and value of juvenile oysters sold for on-growing.

[b] The value of spat is also excluded from the total from 2015/16 onwards. All spat grown in SA is now sold in SA (i.e. no spat grown in SA is exported to other states) and is considered an input to production for the final sales of adult Oysters.

Source: SARDI Aquatic Sciences and PIRSA Fisheries and Aquaculture.

Appendix Table 1-4 Remaining aquaculture sector production, SA, 1994/94 to 2001/02

	1994/95		1995/96		1996/97		1997/98		1998/99		1999/00		2000/01		2001/02	
	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)
Marine Finfish	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Mussels	na	na	na	na	na	na	na	na	84	183	81	173	111	260	171	371
Abalone	na	na	na	na	na	na	na	na	21	856	40	2,000	53	2,677	34	1,901
Freshwater Finfish	32	188	21	158	163	1,833	216	2,799	263	3,293	287	3,379	277	2,919	281	2,845
Marron and Yabbies	14	185	23	316	15	227	17	246	34	391	28	460	25	368	19	377
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
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**
Tourism (visitors)	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

[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 predominantly of Algae production but varies year to year.

Source: SARDI Aquatic Sciences and PIRSA Fisheries and Aquaculture

Appendix Table 1-5 Remaining aquaculture sector production, SA, 2002/03 to 2009/10

	2002/03		2003/04		2004/05		2005/06		2006/07		2007/08		2008/09		2009/10	
	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)
Marine Finfish	na	na	na	na	na	na	na	na	na	na	2,074	17,674	3,382	29,209	3,757	27,133
Mussels	254	466	400	697	377	657	469	950	1,032	1,914	1,369	2,591	1,340	2,519	1,343	2,530
Abalone	59	3,080	105	3,155	177	5,318	250	8,222	196	7,155	167	5,151	227	8,121	286	10,341
Freshwater Finfish	489	6,322	256	2,585	283	2,810	453	3,726	423	4,019	421	4,513	424	4,501	415	4,897
Marron and Yabbies	29	626	28	633	42	893	12	318	29	721	22	559	23	606	23	645
Other [b]	1,077	8,769	894	7,533	2,019	17,015	2,148	17,591	1,953	18,514	1,707	13,533	1,402	10,892	1,319	10,260
Total	**1,908**	**19,263**	**1,683**	**14,603**	**2,898**	**26,693**	**3,332**	**30,807**	**3,633**	**32,323**	**5,759**	**44,022**	**6,798**	**55,847**	**7,143**	**55,807**
Tourism (visitors)	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

[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 predominantly of Algae production but varies year to year.

Source: SARDI Aquatic Sciences and PIRSA Fisheries and Aquaculture

Appendix Table 1-6 Remaining aquaculture sector production, SA, 2010/11 to 2017/18

	2010/11		2011/12		2012/13		2013/14		2014/15		2015/16		2016/17		2017/18	
	Whole Weight	Value	Whole Weight	Value	Whole Weight	Value	Whole Weight	Value	Whole Weight	Value	Whole Weight	Value	Whole Weight	Value	Whole Weight	Value
	('000kg)	($'000)	('000kg)	($'000)	('000kg)	($'000)	('000kg)	($'000)	('000kg)	($'000)	('000kg)	($'000)	('000kg)	($'000)	('000kg)	($'000)
Marine Finfish	3,620	27,909	1,504	16,121	889	11,262	579	8,013	1,076	18,185	2,018	30,001	2,294	27,088	2,487	29,865
Mussels	1,174	2,425	1,277	2,677	1,480	2,935	1,619	3,446	1,577	3,069	2,088	4,400	1,777	3,877	1,833	3,977
Abalone	317	10,842	178	6,410	236	8,600	330	10,890	334	11,401	350	14,733	324	13,608	399	14,241
Freshwater Finfish	168	2,323	234	2,676	311	5,386	233	2,368	272	4,108	441	6,851	382	4,927	390	5,269
Marron and Yabbies	37	1,032	12	343	11	383	12	434	8	455	5	204	4	132	2	95
Other [b]	2,977	22,471	2,647	19,321	3,407	25,673	230	1,740	4,160	31,212	4,412	37,518	3,441	25,825	697	5,237
Total	**8,293**	**67,003**	**5,852**	**47,549**	**6,335**	**54,240**	**3,004**	**26,892**	**7,426**	**68,430**	**9,314**	**93,707**	**8,222**	**75,457**	**5,809**	**58,684**
Tourism (visitors)	na	na	11,959	623	9,284	511	8,303	511	9,732	-	460	40	0	0	4,900	390

[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 predominantly of Algae production but varies year to year.

Source: SARDI Aquatic Sciences and PIRSA Fisheries and Aquaculture

APPENDIX 2 Total Economic Contribution of Aquaculture in SA, by Sector, 2001/02 to 2016/17

Appendix Table 2-1 The total economic contribution (direct and flow-on) of aquaculture in SA, 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%**

Appendix Table 2-2 The total economic contribution (direct and flow-on) of aquaculture in SA, 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%**

Appendix Table 2-3 The total economic contribution (direct and flow-on) of aquaculture in SA, 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%**

Appendix Table 2-4 The total economic contribution (direct and flow-on) of aquaculture in SA, 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%**

Appendix Table 2-5 The total economic contribution (direct and flow-on) of aquaculture in SA, 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	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%**

Appendix Table 2-6 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2006/07

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	306.3	51.6%	145.0	51.4%	1,149	36.0%	53.8	38.7%
Oyster farming	193.9	32.7%	94.6	33.5%	1,295	40.6%	56.4	40.6%
Abalone farming	18.0	3.0%	7.9	2.8%	136	4.3%	5.7	4.1%
Mussels farming	9.2	1.6%	4.6	1.6%	109	3.4%	3.3	2.3%
Barramundi farming	8.9	1.5%	4.2	1.5%	56	1.8%	2.5	1.8%
Yabby/Marron farming	1.6	0.3%	0.9	0.3%	47	1.5%	0.3	0.2%
Other aquaculture	55.9	9.4%	25.1	8.9%	400	12.5%	16.9	12.2%
Total (SA)	**593.8**	**100.0%**	**282.4**	**100.0%**	**3,192**	**100.0%**	**138.9**	**100.0%**

Appendix Table 2-7 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2007/08

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	383.2	58.3%	198.8	59.7%	1,229	39.9%	70.2	48.9%
Marine finfish farming	57.6	8.8%	24.0	7.2%	287	9.3%	13.8	9.6%
Oyster farming	152.8	23.3%	79.8	23.9%	1,105	35.8%	43.9	30.5%
Mussels farming	13.7	2.1%	7.2	2.2%	148	4.8%	4.9	3.4%
Abalone farming	16.4	2.5%	6.0	1.8%	112	3.6%	4.3	3.0%
Freshwater finfish farming	10.9	1.7%	5.5	1.7%	86	2.8%	3.1	2.2%
Marron and yabbies farming	1.3	0.2%	0.8	0.2%	46	1.5%	0.2	0.2%
Other aquaculture	21.1	3.2%	10.9	3.3%	70	2.3%	3.3	2.3%
Total (SA)	**656.9**	**100.0%**	**333.0**	**100.0%**	**3,083**	**100.0%**	**143.7**	**100.0%**

Appendix Table 2-8 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2008/09

Sector	Output		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	360.4	52.3%	168.6	51.5%	1,291	36.7%	70.5	43.0%
Marine finfish farming	95.6	13.9%	39.8	12.2%	438	12.4%	23.4	14.3%
Oyster farming	162.5	23.6%	84.4	25.8%	1,211	34.4%	47.2	28.8%
Mussels farming	13.4	1.9%	7.0	2.1%	185	5.3%	4.8	2.9%
Abalone farming	24.8	3.6%	10.5	3.2%	161	4.6%	7.7	4.7%
Freshwater finfish farming	12.3	1.8%	6.2	1.9%	114	3.2%	4.4	2.7%
Marron and yabbies farming	1.4	0.2%	0.9	0.3%	38	1.1%	0.3	0.2%
Other aquaculture	18.9	2.7%	10.0	3.1%	84	2.4%	5.6	3.4%
Total (SA)	**689.2**	**100.0%**	**327.6**	**100.0%**	**3,523**	**100.0%**	**163.8**	**100.0%**

Appendix Table 2-9 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2009/10

Sector	Output [b]		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	288.1	45.8%	119.3	42.9%	1,179	34.3%	62.2	40.2%
Marine finfish farming	94.8	15.1%	33.8	12.1%	422	12.3%	21.2	13.7%
Oyster farming	172.4	27.4%	89.9	32.3%	1,259	36.6%	50.1	32.4%
Mussels farming	13.5	2.1%	7.0	2.5%	185	5.4%	4.8	3.1%
Abalone farming	30.7	4.9%	12.8	4.6%	189	5.5%	8.8	5.7%
Freshwater finfish farming	12.4	2.0%	6.5	2.3%	112	3.3%	4.1	2.7%
Marron and yabbies farming	1.5	0.2%	0.9	0.3%	26	0.7%	0.3	0.2%
Other aquaculture	15.7	2.5%	8.0	2.9%	69	2.0%	3.2	2.1%
Total (SA)	**629.2**	**100.0%**	**278.3**	**100.0%**	**3,441**	**100.0%**	**154.8**	**100.0%**

Appendix Table 2-10 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2010/11

Sector	Output [b]		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	283.2	44.2%	140.2	45.8%	868	32.8%	49.7	34.9%
Marine finfish farming	95.9	15.0%	35.0	11.4%	425	16.0%	21.8	15.3%
Oyster farming	176.1	27.5%	91.5	29.9%	966	36.5%	51.8	36.4%
Mussels farming	12.1	1.9%	6.4	2.1%	73	2.8%	4.3	3.0%
Abalone farming	33.7	5.3%	12.6	4.1%	185	7.0%	8.8	6.2%
Freshwater finfish farming	7.2	1.1%	3.8	1.3%	53	2.0%	2.7	1.9%
Marron and yabbies farming	2.4	0.4%	1.5	0.5%	27	1.0%	0.4	0.3%
Other aquaculture	29.7	4.6%	15.1	4.9%	52	2.0%	2.8	1.9%
Total (SA)	**640.3**	**100.0%**	**306.1**	**100.0%**	**2,649**	**100.0%**	**142.4**	**100.0%**

Appendix Table 2-11 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2011/12

Sector	Output [b]		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	328.4	50.0%	162.5	49.6%	964	36.3%	56.4	37.9%
Marine finfish farming	49.9	7.6%	22.5	6.9%	257	9.7%	12.8	8.6%
Oyster farming	210.9	32.1%	109.2	33.3%	1,077	40.5%	63.0	42.3%
Mussels farming	13.3	2.0%	7.0	2.1%	85	3.2%	4.7	3.1%
Abalone farming	20.8	3.2%	8.4	2.6%	139	5.2%	6.6	4.4%
Freshwater finfish farming	8.2	1.2%	4.1	1.3%	74	2.8%	3.1	2.1%
Marron and yabbies farming	0.8	0.1%	0.5	0.2%	19	0.7%	0.1	0.1%
Other aquaculture	25.2	3.8%	13.4	4.1%	42	1.6%	2.2	1.5%
Total (SA)	**657.4**	**100.0%**	**327.6**	**100.0%**	**2,656**	**100.0%**	**149.0**	**100.0%**

Appendix Table 2-12 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2012/13

Sector	Output [b]		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	339.3	48.0%	166.7	47.8%	954	36.3%	56.9	36.4%
Marine finfish farming	30.6	4.3%	14.9	4.3%	112	4.3%	6.0	3.8%
Oyster farming	249.5	35.3%	122.8	35.2%	1,240	47.2%	76.1	48.6%
Mussels farming	15.8	2.2%	8.3	2.4%	77	2.9%	5.5	3.5%
Abalone farming	25.5	3.6%	9.6	2.8%	112	4.3%	5.6	3.6%
Freshwater finfish farming	13.0	1.8%	7.5	2.2%	73	2.8%	4.0	2.6%
Marron and yabbies farming	0.9	0.1%	0.6	0.2%	22	0.8%	0.2	0.1%
Other aquaculture [a]	32.1	4.5%	18.5	5.3%	35	1.3%	2.1	1.3%
Total (SA)	**706.7**	**100.0%**	**348.9**	**100.0%**	**2,625**	**100.0%**	**156.4**	**100.0%**

Appendix Table 2-13 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2013/14

Sector	Output [b]		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	288.4	55.8%	136.0	54.0%	776	41.6%	50.0	42.7%
Marine finfish farming	21.4	4.1%	10.9	4.3%	94	5.1%	4.9	4.2%
Oyster farming	144.5	28.0%	78.7	31.2%	699	37.5%	44.9	38.3%
Mussels farming	17.1	3.3%	9.3	3.7%	99	5.3%	6.3	5.4%
Abalone farming	34.1	6.6%	11.1	4.4%	120	6.4%	7.2	6.2%
Freshwater finfish farming	7.3	1.4%	3.6	1.4%	49	2.6%	2.7	2.3%
Marron and yabbies farming	1.0	0.2%	0.6	0.3%	15	0.8%	0.2	0.2%
Other aquaculture [a]	3.0	0.6%	1.6	0.6%	12	0.6%	0.9	0.8%
Total (SA)	**516.7**	**100.0%**	**251.9**	**100.0%**	**1,865**	**100.0%**	**117.1**	**100.0%**

Appendix Table 2-14 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2014/15

Sector	Output [b]		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	272.6	49.6%	135.8	48.6%	665	36.3%	44.2	35.3%
Marine finfish farming	46.6	8.5%	24.2	8.6%	156	8.5%	10.7	8.5%
Oyster farming	113.9	20.7%	64.3	23.0%	620	33.8%	36.3	29.0%
Mussels farming	15.5	2.8%	8.5	3.1%	100	5.4%	5.8	4.6%
Abalone farming	35.0	6.4%	11.6	4.1%	133	7.2%	7.6	6.0%
Freshwater finfish farming	11.6	2.1%	5.8	2.1%	56	3.0%	4.5	3.6%
Marron and yabbies farming	0.8	0.1%	0.6	0.2%	10	0.5%	0.1	0.1%
Other aquaculture [a]	53.3	9.7%	28.8	10.3%	94	5.1%	16.1	12.9%
Total (SA)	**549.4**	**100.0%**	**279.5**	**100.0%**	**1,833**	**100.0%**	**125.2**	**100.0%**

Appendix Table 2-15 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2015/16

Sector	Output [b]		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	306.1	46.6%	132.0	41.7%	817	38.3%	56.9	36.9%
Marine finfish farming	76.7	11.7%	40.5	12.8%	228	10.7%	17.3	11.2%
Oyster farming	132.3	20.1%	74.1	23.4%	668	31.4%	41.3	26.8%
Mussels farming	21.6	3.3%	11.9	3.8%	110	5.2%	8.2	5.3%
Abalone farming	43.7	6.6%	14.5	4.6%	132	6.2%	8.7	5.7%
Freshwater finfish farming	15.2	2.3%	8.7	2.8%	74	3.5%	4.8	3.1%
Marron and yabbies farming	0.4	0.1%	0.3	0.1%	7	0.3%	0.1	0.1%
Other aquaculture [a]	60.8	9.3%	34.5	10.9%	94	4.4%	16.8	10.9%
Total (SA)	**656.9**	**100.0%**	**316.6**	**100.0%**	**2,131**	**100.0%**	**154.1**	**100.0%**

Appendix Table 2-16 The total economic contribution (direct and flow-on) of aquaculture in SA, by aquaculture sector, 2016/17

Sector	Output [b]		Contribution to GSP		Employment		Household Income	
	($m)		($m)		(fte)		($m)	
Tuna farming	289.1	45.9%	124.1	40.7%	856	39.8%	58.2	37.9%
Marine finfish farming	77.3	12.3%	36.7	12.0%	270	12.6%	19.0	12.4%
Oyster farming	156.5	24.9%	90.5	29.6%	712	33.1%	47.5	30.9%
Mussels farming	18.6	3.0%	10.3	3.4%	81	3.8%	7.0	4.6%
Abalone farming	33.5	5.3%	13.8	4.5%	104	4.9%	6.3	4.1%
Freshwater finfish farming	11.7	1.9%	6.2	2.0%	53	2.5%	3.6	2.4%
Marron and yabbies farming	0.3	0.0%	0.2	0.1%	6	0.3%	0.1	0.0%
Other aquaculture [a]	42.4	6.7%	23.5	7.7%	69	3.2%	11.9	7.7%
Total (SA)	**629.4**	**100.0%**	**305.3**	**100.0%**	**2,151**	**100.0%**	**153.6**	**100.0%**