

Ross Lobegeiger **Report to farmers**

Aquaculture production survey Queensland 2010–11

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Department of Agriculture, Fisheries and Forestry

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Dedication

In 2011 there was widespread support for the renaming of this report to the *Ross Lobegeiger Report to farmers*. This change was to help acknowledge and honour the pivotal role that Ross played in developing and supporting the Queensland aquaculture industry. As Supervising Extension Officer, Ross provided the aquaculture industry with almost 20 years of dedicated service. Ross was responsible, as co-author, for producing the very first annual edition of this report in 1991. He then went on to produce a total of 19 issues. As such, Ross Lobegeiger's name has become intrinsically linked with the report and it seems only fitting for the publication to continue to carry his name.

Tragically, Ross Lobegeiger passed away on Saturday 9 October 2010. Ross was such a well-known and enormously liked individual that his loss has been felt deeply by a great many people from all facets of Ross' extensive social and professional network, including the aquaculture industry.



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List of acronyms

ABARES	Australian Bureau of Agricultural and Resource Economics
DAFF	Department of Agriculture, Fisheries and Forestry
FCR	Feed conversion ratio
FTE	Full-time equivalent

1. Production summary

In 2010–11, the Queensland aquaculture industry was severely impacted by adverse climatic events, most notably cyclone Yasi in the north of the state and the Brisbane floods in the south (additional information about the effects of the flood and cyclone can be sourced from Austasia Aquaculture’s Winter 2011 edition at www.austasiaaquaculture.com.au). As such, production was substantially lower than that achieved in the previous year (2009–10). The total value of the Queensland aquaculture industry decreased by 16.2%, with the value of production decreasing from \$103 million in 2009–10 to \$86.3 million in 2010–11. Although this was a substantial decrease, it must be stressed that the industry performed remarkably well under such challenging circumstances and still achieved a production outcome that ranks 2010–11 as the second most productive year ever.

Although the value of aquaculture production decreased in 2010–11, the value of the wild harvest fishery (\$189.6 million in 2010–11) also decreased at a proportionally similar rate. Therefore, the relative importance of aquaculture to Queensland’s total fisheries production decreased only marginally, dropping from 31.6% in 2009–10 to 31.3% in 2010–11 (Table 1). In 2010–11, the total value of fisheries production in Queensland, including aquaculture, was \$275.9 million. The total value of fisheries production was 15.3% lower than in the previous year. Similar trends in Queensland’s fisheries and aquaculture production can be seen in the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) figures (which differ slightly from the Queensland figures as they exclude hatchery production that is sold to supply aquaculture growout operations).

Table 1: Queensland fisheries production—gross value (2006–07 to 2010–11)

Queensland figures ⁽¹⁾			
Year	Total fisheries (\$m)	Aquaculture (\$m)	Aquaculture (%)
2006–07	282.4	77.4	27.4
2007–08	288.5	80.3	27.8
2008–09	308.5	85.5	27.7
2009–10	325.7	103.0	31.6
2010–11	275.9	86.3	31.3
ABARES figures ⁽¹⁾			
Year	Total fisheries (\$m)	Aquaculture (\$m)	Aquaculture (%)
2006–07	276.9	71.9	25.9
2007–08	283.5	75.3	26.6
2008–09	306.6	83.6	27.3
2009–10	323.3	100.6	31.1
2009–10	273.5	83.9	30.6

(1) The Queensland figures include hatchery production for farm stocking and impoundment stocking. Farm stocking details are excluded from the figures used by ABARES.

Sources: ABARES and Fisheries Queensland, part of the Department of Agriculture Fisheries and Forestry

The trend of aquaculture industry growth in Queensland over recent years can be seen in Figure 1, with the most valuable sectors of the industry consistently being prawns and barramundi. Actual dollar value of each sector is given in Table 2. Acknowledging that there will always be some degree of fluctuation between years (due to climatic issues etc.), there is still a clear trend of increasing overall industry value. A very similar incremental trend can be seen in industry production (Figure 2). Actual production figures (tonnes) are given in Table 3.

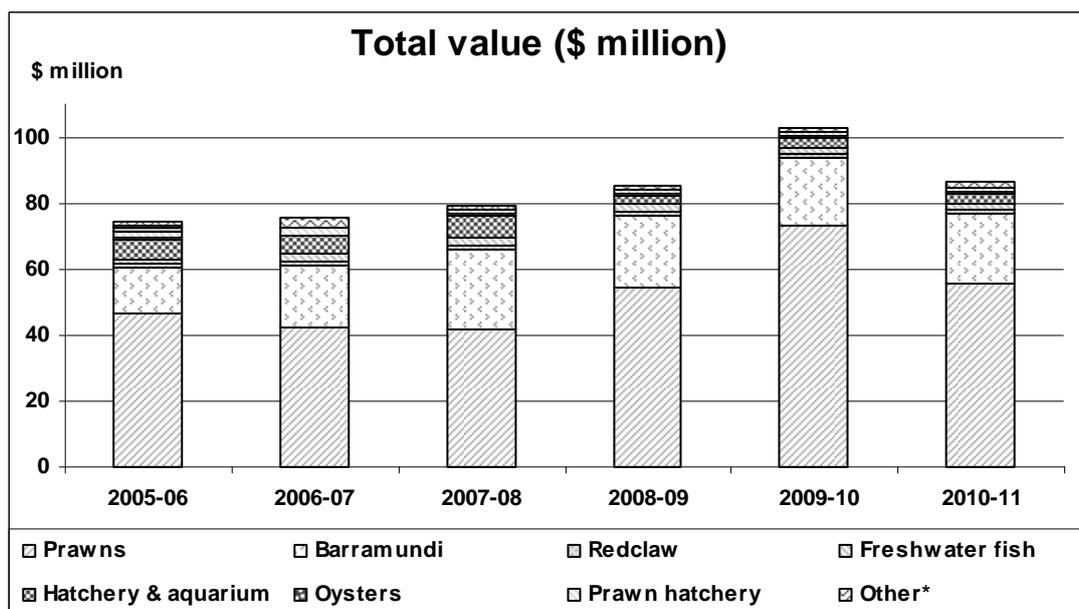


Figure 1: Trend in value (\$ million) of Queensland aquaculture production

* 'Other' includes crabs, sea scallops, marine fish and eels.

Table 2: Queensland aquaculture production—gross value by sector (\$ million)

	2006-07	2007-08	2008-09	2009-10	2010-11
Prawns (includes prawn hatchery)	\$44.4	\$43.0	\$55.8	\$74.3	\$56.9
Barramundi	\$18.5	\$24.3	\$21.4	\$20.7	\$21.2
Redclaw crayfish	\$1.4	\$1.1	\$1.1	\$1.0	\$0.9
Freshwater fish	\$2.2	\$2.3	\$2.6	\$2.2	\$2.2
Hatchery and aquarium	\$3.5	\$6.6	\$2.7	\$3.2	\$2.9
Edible oysters	\$0.5	\$0.6	\$0.5	\$0.5	\$0.5
Pearl oysters	\$1.7	\$1.3	na*	na*	na*
Other ⁽¹⁾	\$5.2	\$1.1	\$1.5	\$1.2	\$1.7
Total	\$77.4	\$80.3	\$85.5	\$103.0	\$86.3

* Not available for publication (included in 'Other')

(1) Includes marine fish, eels, crabs and pearls in some years.

Prior to 2010-11, the prawn industry experienced two seasons of strong annual production increases (in excess of 30% per annum). However, in 2010-11 prawn production decreased by 25%. Queensland farms produce three species of prawns—black tiger (*Penaeus monodon*), banana (*P. merguensis*) and kuruma (*P. japonicus*). The kuruma prawn sector is currently represented by just two small farms.

Prawn production decreased by 25.3% (from 5115 tonnes in 2009-10 to 3822 tonnes in 2010-11), while the value decreased by 23.8% (from \$73 million in 2009-10 to \$55.6 million in 2010-11). The average price increased slightly from \$14.27/kg in 2009-10 to \$14.54/kg in 2010-11. Hatchery sales for the year were \$1.3 million, which was unchanged from the previous year.

The area harvested decreased by 20%, from 827 hectares in 2009-10 to 659 hectares in 2010-11. The number of producing farms decreased from 23 farms in 2009-10 to 20 farms in 2010-11.

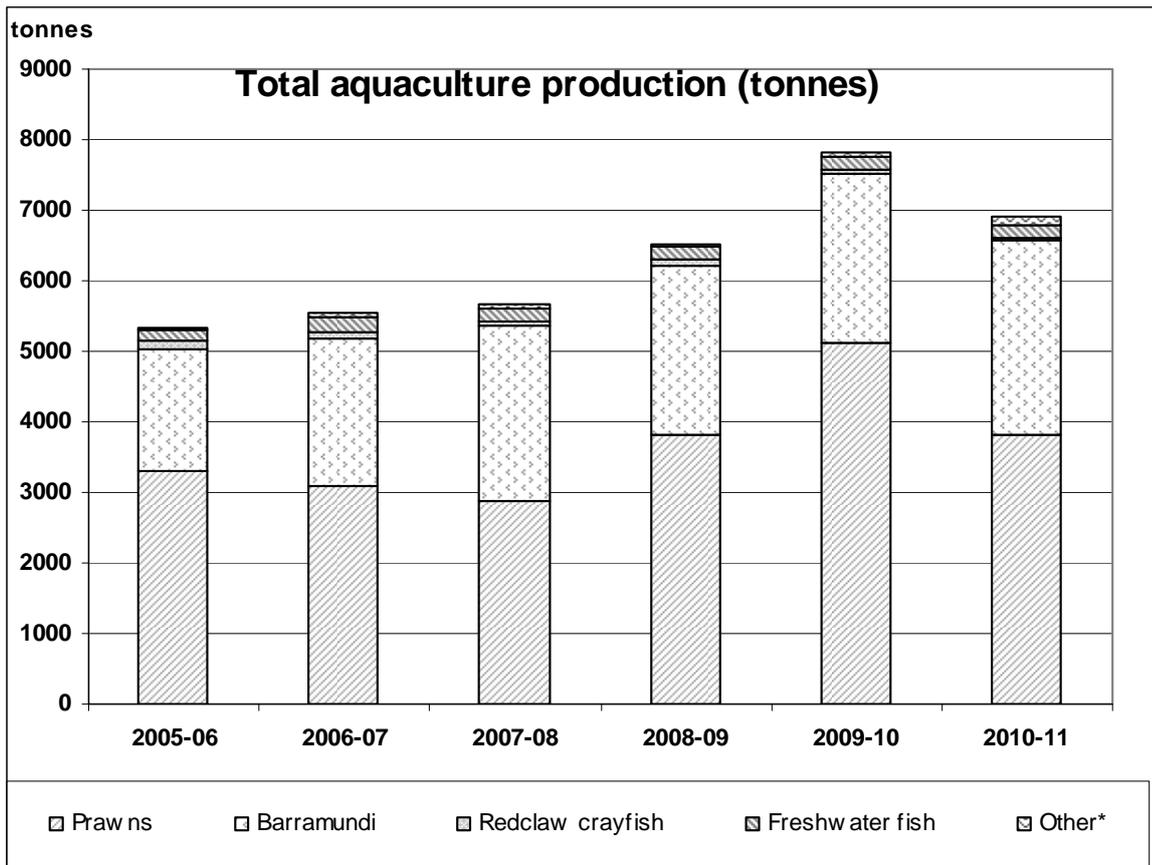


Figure 2: Trend in Queensland aquaculture total production (tonnes)

* 'Other' includes crabs, sea scallops, marine fish and eels.

Table 3: Queensland aquaculture production (tonnes) by sector

	2006-07	2007-08	2008-09	2009-10	2010-11
Marine prawns	3085	2888	3821	5115	3822
Barramundi	2091	2464	2400	2410	2746
Redclaw crayfish	100	65	68	57	52
Freshwater fish	210	198	192	177	177
Other *	64	58	39	63	101
Total	5550	5673	6520	7822	6898

* 'Other' includes marine fish, eels, sea scallops and crabs.

Barramundi (*Lates calcarifer*) production increased by 14%, with 2746 tonnes sold in 2010–11 compared to 2410 tonnes sold in 2009–10. The value of the barramundi sector increased by 3%, from \$20.7 million in 2009–10 to \$21.2 million in 2010–11. Over this period the average price (whole fish basis) decreased by 10.5%, from \$8.60/kg to \$7.70/kg.

The majority of barramundi production came from pond-based systems. Over this period the number of producing pond-based farms rose from 24 to 26. The number of tank-based systems remained at three. There was just one sea cage farm in operation for the first half of this reporting period, but it ceased production following damage caused by Cyclone Yasi.

Redclaw crayfish (*Cherax quadricarinatus*) production peaked during the period 2004–07, where annual harvests totalled around 100 tonnes. Since that time there has been a sharp decline in production, with harvests falling to 52 tonnes in the current reporting period (the lowest since the

mid 1990s). Value of the redclaw sector slipped to \$908 000 (down from \$956 000 in 2009–10). The number of producing farms in 2010–11 was 27; two less than in 2009–10. Average prices increased from \$16.76/kg in 2009–10 to \$17.58/kg.

The freshwater fish growout sector currently produces silver perch (*Bidyanus bidyanus*), jade perch (*Scortum barcoo*), golden perch (*Macquaria ambigua*), Murray cod (*Maccullochella peelii peelii*) and sleepy cod (*Oxyeleotris lineolatus*). The total production of freshwater fish (species other than barramundi) was 176.6 tonnes, which was virtually unchanged from the 176.5 tonnes produced in 2009–10. Over the same period, the value of the sector increased marginally from \$2.18 million to \$2.23 million.

Silver perch production has continued to increase over recent years, with a yield of 113.5 tonnes for 2010–11. Silver perch sales totalled \$1.36 million, with an average price of \$11.98/kg. Jade perch production increased from 17 tonnes to 18.7 tonnes in 2010–11. The value of jade perch sales totalled at \$245 000, with an average price of \$13.09/kg. While Murray cod remains a significant contributor to the freshwater fish sector, in 2010–11 only a few growers produced Murray cod and detailed production data cannot be published as it would compromise client confidentiality.

The eel farming sector grew substantially in terms of both production and industry participation in 2010–11. In recent years there have been too few eel producers to publish detailed production information; however, in 2010–11 there were seven farmers producing 63.3 tonnes of eels valued at \$839 000. The average price was \$13.82/kg. The long-finned eel (*Anguilla reinhardtii*) accounted for the majority of eel production, with much smaller quantities of short-finned eel (*A. australis*) also grown.

The hatchery sector, producing native fish fingerlings and ornamental aquarium species, sold 9.85 million fish during 2010–11; this was slightly less than the 10.1 million fish sold during 2009–10. The value of the hatchery sector also decreased slightly, from \$3.18 million in 2009–10 to \$3.07 million in 2010–11.

Total edible oyster production decreased by nearly 8%, from 97 500 dozen in 2009–10 to 90 000 dozen in 2010–11. The value of the edible oyster industry also decreased from \$513 000 in 2009–10 to \$473 000. The average price per dozen oysters remained stable at \$5.25. This production came from 26 oyster areas.

The combined Queensland aquaculture industry employed 579 full-time equivalents (FTEs)—calculated by combining numbers of permanent and casual labour. This equates to 14 more FTEs than in 2009–10. The prawn farming sector was the largest employer at 334 FTE workers or 58% of the industry's total labour force.

2. Survey methods

Production statistics for the 2010–11 financial year were collected from all sectors of the Queensland aquaculture industry. The requirement to complete the production survey is a mandatory condition imposed on all holders of a current aquaculture development authority.

In 2008–09, a web-based electronic version of the production survey was offered, along with the regular paper-based statistical return. Although the online version was generally well regarded by those producers who accessed the web page, uptake was less than half of all producers across the industry and saw a lower than average response rate to the production survey. In addition, some limitations were revealed in the processing of electronically collected statistical returns, particularly in relation to farms producing multiple crops across different species sectors. Subsequently, the survey has only used the paper-based format.

When interpreting the results presented in this report, it is important to note that each year approximately half of authority holders do not produce and sell any product. These non-producing farms have the option to tick a 'nil return' box on the survey form and are not required to provide any further production data. This means that a substantial amount of potentially relevant data (such as ponded area and labour) from non-producing farms is not captured or reported.

As in 2009–10, aquaculture operators working under the self-assessable code were included in this year's survey. Prior to 2009–10, self-assessable farms were not surveyed.

Of the 521 aquaculture authority holders currently registered in Queensland, 461 producers completed the production survey this year. This response rate of nearly 89% was the best response rate that has been achieved in recent years and is a substantial improvement on the 67% response rate achieved in 2009–10. It is also important to remind authority holders that if an approved aquaculture operation changes ownership, or if the contact details of the owners change, it is the responsibility of the new owner (and a condition of the development approval) that the Department of Agriculture, Fisheries and Forestry (DAFF) is formally notified of such changes.

The results presented in this report reflect the information provided by the industry through the statistical returns. In order to more easily interpret and document the data provided by farmers, this report groups the information into chapters that reflect the major industry sectors or species groups.

The following are conversion factors and definitions used in the report:

- **Conversion factors**
Fish production is reported on a whole fish basis—for example, gilled and gutted barramundi to whole fish (0.89:1 on weight basis) and filleted barramundi to whole fish (0.48:1 on weight basis).
- **Feed conversion ratio (FCR)**
Estimated average FCRs are published for most species sectors. However, this information is only an estimate as it is reported as a direct ratio of the weight of feed provided versus the weight of product sold. Therefore, a number of other relevant factors, such as the weight of stock remaining in ponds at the end of the reporting period (i.e. fed but not yet harvested), are not considered.
- **Fingerling fish**
Fingerling fish are small fish in the 2–10 g range.
- **Juvenile crayfish**
Juvenile crayfish are immature crayfish in the 1–15 g range.
- **Labour conversion**
Labour FTEs are calculated by adding the total permanent labour units to the casual labour units converted to FTEs—for example, 40 hours per week casual labour for 48 weeks per year is considered one FTE labour unit.

3. Prawns

3.1 General

The value of the Queensland prawn growout industry decreased by nearly 24%, from \$73 million in 2009–10 to \$55.6 million in 2010–11. Total production decreased by 25%, from 5115 tonnes in 2009–10 to 3822 tonnes in 2010–11. In addition, the prawn hatchery sector sold post-larvae to the value of \$1.3 million (also \$1.3 million in 2009–10).

Up until three years ago, this report separated kuruma prawn (*Penaeus japonicus*) production from the other two main prawn species—black tiger (*P. monodon*) and banana (*P. merguensis*). Kuruma prawn production has almost ceased in Queensland, with only two farms (both under a single operator) producing limited quantities for the Australian market. Banana prawns accounted for a substantial portion of the total prawn production; however, nearly all banana prawns are produced by one large operator with multiple farm sites. As such, all production information from the three commercial prawn species is now combined and published under a single, general prawn category.

Of the 71 aquaculture approvals authorising prawn production, 20 farms produced prawns in 2010–11 (24 in 2009–10) and, in addition to the hatcheries that operate as part of a producing farm, one independent hatchery produced post-larvae.

Prawn prices (excluding the small amount of higher valued kuruma prawns) ranged from \$11.75/kg to \$16.50/kg, and the average farmgate price (all prawns) increased slightly from \$14.27/kg in 2009–10 to \$14.54/kg in 2010–11 (Table 4). The proportion of the total harvest being exported appears to be increasing, with 5% being exported in 2010–11, 2% exported 2009–10 and no export at all in the previous year.

Table 4: Summary of prawn production in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Total production (tonnes)	3820	5115	3822
Average price (\$/kg)	\$14.28	\$14.27	\$14.54
Total value (\$ million)	\$54.6	\$73.0	\$55.6
Average yields (kg/ha/crop)	5118	6181	5803

3.2 Prawn production

3.2.1 Growout

Table 5 illustrates prawn production levels from 2008–09 to 2010–11. In the summer of 2010–11, the prawn farming sector was adversely impacted by climatic events (most notably cyclone Yasi in the north of the state and the Brisbane floods in the south). As such, production was substantially lower than that achieved in the previous year (2009–10). However, it must be stressed that the previous year had been an exceptional year, with the total production being 34% higher than the best production previously achieved (2008–09). In fact, given the difficulties experienced in 2010–11, the prawn farming sector has done well to achieve a production outcome that was marginally above that achieved in 2008–09, making 2010–11 the second most productive year for prawn farming.

Although the decrease in production was largely due to adverse weather, the number of producing farms also decreased from 23 to 20. The decrease in production can be further quantified as a 6% decrease in the yield per hectare and a 20% decrease in the area harvested.

In 2010–11, 18 farms (19 in 2009–10) produced over 20 tonnes. In 2010–11, 16 farms (18 in 2009–10) produced over 50 tonnes, while 10 farms (12 in 2009–10) produced over 100 tonnes (Table 5). In 2010–11, six farms (11 in 2009–10) averaged over 6000 kg per hectare per crop.

The total ponded area on prawn farms was 610 hectares at the end of 2010–11. This was a 9% decrease from 669 hectares reported in 2009–10. Over the same period, the area stocked decreased by 22% (dropping from 851 hectares to 660 hectares) and the total harvested area decreased by 20% (from 827 hectares to 659 hectares). The reason the total stocked/harvested area figures are greater than the total ponded area is due to a number of northern farms producing multiple crops per pond per season. In fact, across the sector, the average number of crops per pond in 2010–11 was 1.1.

The average pond size for individual prawn farms ranged from 0.6 to 2.1 hectares, with the industry average being 1.03 hectares. While stocking rates varied from 27 to 58 post-larvae per square metre, the average stocking rate of 44 per square metre was slightly higher than last year's average of 42 per square metre. There were eight farms stocking at 40 or more per square metre (compared with 10 farms the previous season).

Table 5: Number of approved prawn farms and production levels in Queensland (2008–09 to 2010–11)

Production (tonnes)	2008–09	2009–10	2010–11
0.1 to 5.0	1	1	2
5.1 to 10.0	1	3	0
10.1 to 20.0	1	1	1
20.1 to 50.0	4	1	2
50.1 to 100.0	6	5	6
100.1 to 200.0	3	7	4
Over 200	6	5	6
Number of producing farms	22	23	20
Number of producing hatchery-only operations	2	2	1

The quantity of feed used decreased by 34%, from 11 578 tonnes in 2009–10 to 7585 tonnes in 2010–11. Over the same period, the estimated FCR decreased from 2.3:1 to 2.0:1. There was a change in the source of feed, with an increase in the use of Australian-produced feed. In 2010–11, feed sources were 55% from Australia (44% in 2009–10) and 45% from overseas.

3.2.2 Hatchery

In 2010–11, 11 prawn hatcheries (13 in 2009–10) produced an estimated 319 million post-larvae (382 million post-larvae in 2009–10)—see Table 6. Successful domestication programs with banana prawns, and more recently with black tiger prawns, have meant that the industry is no longer entirely reliant on wild-caught spawners and that the majority of spawners are now grown on-farm rather than purchased (as can be seen in the difference between the number of spawners purchased and the number used). There is also some wild broodstock being sourced from the Northern Territory that is not, strictly speaking, being purchased and may not be being reported in these figures.

Table 6: Prawn hatchery production in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Number of spawners purchased	2759	2471	1990
Number of spawners used	6795	9552	10 680
Number of post-larvae produced (million)	336.6	381.7	319.4
Number of post-larvae stocked (million)	305.8	354.8	291.1
Number of post-larvae sold (million)	74.3	76.3	73.8
Value of post-larvae sold (\$ million)	\$1.18	\$1.33	\$1.34
Average value of post-larvae (cents)	1.59c	1.74c	1.81c

Of the 11 operational prawn hatcheries, six (eight in 2009–10) sold post-larvae to supply the rest of the growout sector. Of these hatcheries, only one (two in 2009–10) operated as an independent hatchery that was not part of a business and also engaged in growout production. Queensland prawn hatcheries sold 73.8 million post-larvae in 2010–11, with a value of \$1.34 million. The total amount of post-larvae sold amounted to 25.4% (21.5% in 2009–10) of all the post-larvae stocked, with the remaining 74.6% being produced by hatcheries for their own growout requirements.

3.2.3 Growout labour

The total labour employed on growout prawn farms over the last three years is shown in Table 7. Although there has been some fluctuation in the proportion of permanent and casual labour employed on prawn farms, the total amount of labour utilised has remained remarkably consistent over this period, with a high of 334 FTEs in 2010–11 and a low of 319 FTEs in 2008–09.

With a relatively consistent number of employees and fluctuating production output, it is not surprising that the productivity of the labour force varies substantially. The productivity per labour unit (in terms of both tonnes produced and dollar output) decreased by 25% between 2009–10 and 2010–11.

Table 7: Labour use on prawn farms in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Total permanent (units)	200	221	221
Total casual labour (hours)	227 300	209 100	216 600
FTE labour units	319	330	334
Output per FTE (tonnes)	12.0	15.2	11.4
Output per FTE (\$)	\$171 250	\$221 410	\$166 370

3.3 Hatchery labour

The majority of prawn hatcheries are operated as part of a growout business and the labour component of the hatchery is therefore included with the total prawn farm labour. In 2010–11, there was only one hatchery operating independently of growout farms. Because there was only one operator in this category, no details of the labour component can be published as this would compromise client confidentiality relating to this farm.

3.4 Publications

Biosecurity Australia policy memorandums relating to the importation of prawns and prawn products, Department of Agriculture, Fisheries and Forestry, Canberra, <www.daff.gov.au/ba/ira/final-animal/prawns>.

O'Sullivan, D 2009, 'Gold Coast Prawn fully stocked with domesticated black tiger prawns—a world first', *Austasia Aquaculture*, vol 24(4), pp. 16–19.

Robertson, C (ed.) 2006, *Australian prawn farming manual: health management for profit*, Department of Primary Industries and Fisheries, Queensland, <<http://aciarc.gov.au/publication/CoP01>>.

4. Barramundi

4.1 General

Even with the significant challenges faced in 2010–11 (largely associated with Cyclone Yasi), the barramundi (*Lates calcarifer*) growout sector still managed to achieve its best ever production figures. Total production of 2746 tonnes in 2010–11 was a 14% increase over the 2405 tonnes produced in 2009–10 (Table 8).

The total value of production increased less significantly (3%), from \$20.68 million in 2009–10 to \$21.16 million in 2010–11. The total value of production was actually 1% lower than the \$21.36 million achieved in 2008–09. This decrease in the total value results from the decrease in the average price, which has been steadily decreasing from the \$9.87 achieved in 2007–08 with a sharp (10%) drop over the last year. Over the last two years, all barramundi were sold on the domestic market, whereas in 2008–09 a small portion (1%) was exported.

Hatcheries sold barramundi fingerlings for growout, stocking and the aquarium trade. These figures are reported under sections 8.2 and 8.3 of this report.

4.2 Industry production

Of the 305 aquaculture approvals authorising barramundi production, only 30 farms produced market-ready fish in 2010–11 (eight hatcheries also produced fingerlings). This was a slight increase on the previous year when 28 farms sold barramundi. Most production came from pond-based systems (26 farms), while one farm used sea cages and three farms used recirculating tank-based systems (Table 8).

Table 8: Barramundi production and authorities in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Total production (tonnes whole fish basis)	2400	2405	2746
Average price (\$/kg)	\$8.90	\$8.60	\$7.70
Total value (\$ million)	\$21.36	\$20.68	\$21.16
Pond production (tonnes)	No.	No.	No.
0.01 to 1.0	2	3	5
1.1 to 10.0	2	2	5
10.1 to 50.0	9	10	7
50.1 to 100.0 ⁽¹⁾	4	5	4
Over 100.0	6	5	6
Number of producing farms ⁽¹⁾	23	25	27
Tank production (tonnes)	No.	No.	No.
0.01 to 1.0	1	2	2
1.01 to 5.00	1	0	0
5.1 to 10.0	0	0	0
Over 10.00	1	1	1
Number of producing farms	3	3	3
Pond and tank production	No.	No.	No.
Total number of producing farms	26	28	30

(1) Includes one sea cage farm.

4.3 Pond production

Farm area reported as available for barramundi growout was considerably lower than in the previous year at 140 hectares of ponded area (180 hectares in 2009–10), consisting of 337 ponds averaging 0.4 of a hectare each. Of these, the number of ponds actually stocked was 122 (considerably less than the 209 ponds stocked in 2009–10).

The reported number of fingerlings stocked into ponds was 2.4 million in 2010–11 (22% less than the 3.1 million stocked in the previous year). Fingerlings were stocked at an average rate of 35 500 per hectare.

The total feed used in ponds and cages increased from 4070 tonnes in 2009–10 to 5450 tonnes in 2010–11. Data for this period includes details from Queensland's only sea cage farm that cannot, for confidentiality reasons, be released in its own category. However, sea cage data is not included in the pond volume and density calculations as it not directly comparable and would significantly alter these averages. The estimated average FCR was 2.0:1, which was higher than the FCR of 1.7:1 achieved in the previous year. The proportion of Australian manufactured feed increased from 93% (2009–10) to 99% in 2010–11. See Table 9 for the comparative summary of barramundi pond production.

The lower number of ponds and fingerlings stocked and the higher FCR are all consistent with the information being provided by industry sources, indicating that fish were left longer in the ponds and a significant portion of market-ready product remained on farms at the end of the 2010–11 reporting period. This was partially due to the decreased average market price and partially due to significant and prolonged disruptions to transport and supply chains that occurred during the very wet summer of 2010–11.

Table 9: Barramundi pond production information in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Total production (tonnes whole fish basis) ⁽¹⁾	2400 ⁽²⁾	2405 ⁽²⁾	2746 ⁽²⁾
Average price (\$/kg) ⁽¹⁾	\$8.76	\$8.48	\$7.69
Total value (\$ million) ⁽¹⁾	\$21.36 ⁽²⁾	\$20.68 ⁽²⁾	\$21.16 ⁽²⁾
Market (% sold within Australia) ⁽¹⁾	99%	100%	100%
Number of ponds stocked	202	209	122
Total area stocked (hectares)	99	103	63
Average stocked pond area (hectares)	0.49	0.49	0.52
Total fingerlings stocked (million) ⁽¹⁾	3.83	3.11	2.42
Fingerlings stocked/hectare	39 600	30 100	35 500
Feed used (tonnes) ⁽¹⁾	3580	4070	5450
Feed source (% manufactured in Australia) ⁽¹⁾	91%	93%	99%
Estimated FCR ⁽¹⁾	1.5:1	1.7:1	2.0:1

(1) Includes one sea cage farm.

(2) Includes all barra production so as not to disclose tank-based production details.

4.4 Tank-based production

In 2010–11, only three tank-based farms reported production of barramundi (same as in 2009–10). Because of the low number of producing farms and the fact that most of the reported tank-based production came from a single farm, it is not appropriate (due to confidentiality issues) to release detailed information on this sector of the industry.

In recent years, the tank-based sector of the industry produced just under 100 tonnes of fish. Traditionally, tank-based systems have been able to achieve a higher average price than pond-based systems due to the increased focus on direct sales to niche markets and a higher proportion of live sales. Tank-based systems are generally able to stock more densely and achieve better FCRs due to the more highly controlled culture environment.

4.5 Fingerling production

Barramundi fingerling production increased from 6.5 million in 2009–10 to 8.9 million in 2010–11; however, it is probable that a large proportion of these fingerlings were surplus to industry requirements. This level of fingerling production was very similar to the 8.7 million fingerlings produced in 2008–09. During the year, 10 hatcheries produced barramundi fingerlings (see sections 8.2 and 8.3 of this report for restocking and aquarium sales).

Fingerlings that were retained by the hatchery farm for their own growout are not considered as sales. Fingerlings that were retained by the producer accounted for a substantial proportion (>20%) of the total fingerlings stocked. There were 2.0 million fingerlings sold to other farms for growout (valued at \$606 300), which was less than half of the 4.5 million sold (\$895 000) for this purpose in 2009–10. The average price per fingerling increased from \$0.20 in 2009–10 to \$0.30 in 2010–11.

4.6 Farm labour

Total permanent labour employed in the industry decreased from 84 units in 2009–10 to 72 units in 2010–11. Over the same period, the casual labour employed by the sector increased from 20 200 hours to 39 700 hours.

When permanent and casual labour inputs were combined for the barramundi farming sector, the total number of FTE labour units decreased from 94 in 2009–10 to 92 in 2010–11. Over the same period, the dollar output per labour unit for the sector increased from \$219 000 to \$229 000.

4.7 Publications

Curtis, M & Wingfield, M 2004, *Recirculation aquaculture systems information*, Information Series QI 04047, Department of Primary Industries and Fisheries, Queensland.

Department of Primary Industries and Fisheries 2008, *Queensland barramundi farming status report (2008)*, State of Queensland, <http://www.daff.qld.gov.au/28_15107.htm>.

Schipp, G, Bosmans, J & Humphrey J 2007, *Northern Territory barramundi farming handbook*, Northern Territory Government, <http://www.nt.gov.au/d/Content/File/p/Aquaculture/NT_Barra_Farming_Handbook.pdf>.

5. Redclaw

5.1 General

Production of redclaw crayfish (*Cherax quadricarinatus*) in Queensland peaked during the period from 2004 to 2007, when annual harvests totalled around 100 tonnes. Since that time there has been a sharp decline in production, with a harvest of 52 tonnes in 2010–11 (the lowest since the mid 1990s). Correspondingly, the value of the sector has also declined, with sales of adult redclaw (sold primarily as food, with some broodstock sales) currently amounting to \$908 000.

Of the 199 aquaculture approvals authorising redclaw culture in 2010–11, 28 farms reported production of redclaw, compared with 29 farms in the previous year (Table 10).

5.2 Growout

The number of farms that produced more than 1 tonne decreased from 12 in 2009–10 to 10 in 2010–11 (Table 10). These 10 farms produced 89% of the state's redclaw production, with the top three farms producing 62% of the total production.

In 2010–11, the average price obtained for redclaw crayfish was \$17.58, which was 5% higher than the \$16.76 achieved in 2009–10. Average prices ranged from \$10.00/kg to \$37/kg, although most sold in the \$14/kg to \$20/kg range.

The total available ponded area on farms decreased marginally from 56 hectares in 2009–10 to 53 hectares in 2010–11. The number of growout ponds stocked with redclaw decreased from 394 to 354 in 2010–11, totalling 39 hectares (38 hectares in 2009–10). Over the same period the harvested area increased slightly from 36 hectares of ponds to 39 hectares, while the average pond size remained at 0.11 hectares.

Average farm productivity across the sector (calculated from harvested growout area) declined slightly this year to 1520 kg/ha, compared to 1550 kg/ha achieved in 2009–10. However, this figure doesn't provide the full picture because yield per hectare tended to improve in the larger, higher producing farms. For instance, the average productivity of farms that produced less than 1000 kg was 1050 kg/ha, while farms that produced over 5000 kg displayed a substantially higher productivity of 3450 kg/ha.

Total feed purchased in 2010–11 was 116 tonnes, which was 11% more than the 106 tonnes used in 2009–10. The estimated average FCR increased from 1.9:1 in 2009–10 to 2.2:1 during the current period.

In 2010–11, the majority of product (99%) was sold on the domestic market. The proportion of domestic sales was the same as the previous year.

Table 10: Redclaw crayfish production and authorities in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Total production (tonnes)	67.8	57.1	51.6
Average price (\$/kg)	\$16.54	\$16.76	\$17.58
Total value (\$'000)	\$1121	\$956	\$908
Pond production (kg)	No.	No.	No.
1 to 100	6	5	7
101 to 500	6	7	3
501 to 1000	6	5	7
1001 to 5000	9	8	7
Over 5000	5	4	3
Number of producing farms	32	29	27

5.3 Tank-based production

No tank-based production was reported in 2010–11.

5.4 Juvenile production

Farmers reported that 43 000 juvenile redclaw were purchased as seedstock during the 2010–11 year. This contributed to the 2.3 million juvenile redclaw reported to be stocked into 25 farms during this period. This was a substantial decrease from the 3 million juveniles stocked in the previous year. The average stocking rate of juveniles into growout ponds was at 6/m², down from 8/m² in 2009–10.

5.5 Labour

Survey returns for the redclaw crayfish sector show that in 2010–11 it had 21 permanent workers (same as 2009–10). The total hours of casual labour employed on farms decreased slightly to 1300 (from 1500 in 2009–10). This equated to 22 FTE workers across the sector, which was unchanged from 2009–10.

Labour efficiency (combining permanent and casual workers) was 2400 kg per FTE (\$41 800). This was a reduction from the 2600 kg per FTE (\$43 500 per labour unit) achieved in 2009–10.

5.6 Publications

Bitomsky, J 2008, *Scoping analysis: redclaw industry development*, Department of Primary Industries and Fisheries, Queensland (available through Kleinhardt Business Consultants or DAFF).

McPhee, C, Jones, C & Shanks, S 2004, 'Selection for increased weight at nine months in redclaw crayfish (*Cherax quadricarinatus*)', *Aquaculture*, vol. 237, pp. 131–40.

Mosig, J 2008, 'Redclaw growers win funds, breed a better product', *Austasia Aquaculture*, vol 22(4), pp. 9–14.

Stevenson, J 2005, *Notes from the 6th annual redclaw conference*, 9 and 10 September 2005, Queensland Crayfish Farmers Association.

Wingfield, M (ed.) 2004, *Proceedings of the 5th annual conference*, Queensland Crayfish Farmers Association, Conference and Workshop Series QC 04001.

6. Freshwater fish

6.1 General

This category includes a range of species from the freshwater fish growout sector (excluding barramundi). The bulk of production came from three species—silver perch (*Bidyanus bidyanus*), jade perch or Barcoo grunter (*Scortum barcoo*) and Murray cod (*Maccullochella peelii*). Other species that also contributed to this sector include sleepy cod (*Oxyeleotris lineolatis*), golden perch (*Macquaria ambigua*) and Australian Bass (*Macquaria novemaculeata*), although production levels for these species remain low by comparison.

The total production from the freshwater fish sector was 176.6 tonnes, which was virtually unchanged from the 176.5 tonnes produced in 2009–10. Over the same period, the value of the sector increased marginally from \$2.18 million to \$2.23 million.

Silver perch production was valued at \$1.36 million with an average price of \$11.98/kg, and jade perch production was valued at \$245 000 with an average price of \$13.09/kg. While Murray cod remained a significant contributor to this sector, in 2010–11 so few growers sold Murray cod that production data could not be published as it could compromise client confidentiality.

Silver perch production has continued to increase over recent years, with a yield of 113.5 tonnes for 2010–11. This represented a 14% increase from the previous year, and accounted for 64% of all freshwater fish production in 2010–11. Jade perch production increased from 17 tonnes to 23.5 tonnes in 2010–11. This season, jade perch production accounted for just over 13% of the freshwater fish harvest.

Of the 273 aquaculture authority holders authorised to grow freshwater fish, 15 growout farms and 14 hatcheries reported production of at least one species in 2010–11—four more growout farms than in the previous year. Eleven of the producing farms primarily used pond-based systems and four primarily used recirculating tank-based systems. All freshwater fish authority holders are approved to grow a number of different freshwater species as well as barramundi. As such, most farms that grow freshwater fish produce and sell a number of different species.

In 2010–11, the vast majority of freshwater fish production came from ponds; however, the information provided below incorporates data from both pond-based and tank-based systems.

6.2 Silver perch

Nine farms produced and sold silver perch in 2010–11. The number of producing farms was unchanged from the previous year. All of these farms used pond-based systems, with no production being reported from tank-based systems.

In 2010–11 silver perch production increased by 14%, from the 99.6 tonnes produced in 2009–10 to 113.6 tonnes. This was the greatest silver perch yield to date in Queensland. Over the same period the average price (whole fish basis) increased by 11%, from \$10.97/kg to \$11.98/kg. With an increase in both price and production, the total value of the sector rose strongly (25%) from \$1.09 million to 1.36 million.

6.2.1 Production details

Silver perch harvested in 2010–11 were produced in 12.6 hectares of ponded area (27 ponds averaging 0.47 hectares). The average yield was 9010 kg per hectare, which was a significant productivity increase from the 7275 kg per hectare achieved in the previous years (Table 11).

Each year the number of fingerlings stocked and the area of ponds stocked provide useful information about industry interest in the species and prospects for the next harvest. The area stocked with silver perch fingerlings decreased from the 27.7 hectares stocked in 2009–10 to 19.2 hectares in 2010–11. However, this decrease in area was more than offset by a strong increase in the average stocking rate (which nearly doubled from 8600 to 16 700 fingerlings per hectare). Over this period the total number of silver perch fingerlings stocked increased significantly (36%), from 236 800 to 322 000.

Table 11: Silver perch production in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Total production (tonnes whole fish basis)	87.8	99.6	113.6
Average price (\$/kg)	\$11.75	\$10.97	\$11.98
Total value (\$'000)	\$1031	\$1092	\$1360
Average yield (kg/ha)	5890	7275	9010
Number of producing farms	10	9	9

Total food used decreased from 317 tonnes in 2009–10 to 250 tonnes in 2010–11. Based on harvest figures, this equated to an FCR of 2.2 kg of feed per kilogram of fish produced. This FCR of 2.2:1 was significantly better than the FCR of 3.2:1 in the previous period. In 2009–10 there was an even split between imported and locally produced feeds, while in the current period, 68% of feed was produced in Australia.

6.3 Jade perch

Production of jade perch in 2010–11 came from four pond-based farms and two tank-based recirculating systems. Consequently, production details reported here are limited due to confidentiality reasons. Combined harvests out of both pond-based and tank-based systems totalled 23.5 tonnes in 2010–11 (Table 12). Jade perch production increased by 38% from the previous year, but was still well below the 41.8 tonnes produced in 2008–09.

The value of the jade perch sector increased strongly (by 55%) from \$195 000 in 2009–10 to \$303 000 in 2010–11. Over the same period, the average price increased (12%) from \$11.53/kg to \$12.89/kg and supports a longer term trend of increasing price with this species.

In terms of future projections, the total area stocked with fingerlings in 2010–11 was 7.9 hectares, which was a major increase from the 3.2 hectares stocked in 2009–10. Correspondingly, total numbers of fingerlings stocked increased to 138 000 (from 49 000 the previous year) at a rate of 17 600 fingerlings per hectare (up from 15 400 fingerlings per hectare). As such, all indicators suggest further increases in jade perch production in the coming season.

Table 12: Jade perch production in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Total production (tonnes whole fish basis)	41.8	17	23.5
Average price (\$/kg)	\$12.28	\$11.53	\$12.89
Total value (\$'000)	\$514	\$195	\$303
Number of producing farms	6	4	6

6.4 Murray cod

While Murray cod remains a significant contributor to this sector, in 2010–11 so few growers sold Murray cod that production data cannot be published as it would compromise client confidentiality. The last time detailed Murray cod information was published was 2008–09.

6.5 Other species

Other species authorised for production in both pond-based and tank-based systems include golden perch (*Macquaria ambigua*), sleepy cod (*Oxyeleotris lineolatis*), Australian bass (*Maquaria novemaculeata*) and sooty grunter (*Hephaestus fuliginosus*). The relatively small quantities produced and the limited number of producers means that detailed information cannot be provided in this report. The combined production of these species in 2010–11 was just over 2 tonnes valued at \$37 000 (compared to 5 tonnes valued at \$90 000 in 2009–10). Out of all the freshwater species of this sector, sleepy cod and golden perch command the highest price per kilogram (at nearly \$18/kg).

6.6 Labour

The total number of FTE workers within this sector was 18.5 labour units in 2010–11, which was a 12% decrease from the 21 FTEs operating in the previous year. The majority of these (14) were permanent workers with casual labour supplying 8270 hours.

While many of the contributing growers produced several species, the labour distribution for each species was analysed where possible. For silver perch, the output increased from 7.6 tonnes per labour unit in 2009–10 to 11.7 tonnes in 2010–11. Over the same period, jade perch output increased from 5.7 tonnes per labour unit to 7.7 tonnes.

The dollar output per labour unit can be calculated using the number of workers in the freshwater fish sector and the value of the sector. In 2010–11, each FTE returned \$120 650 in fish sold. This figure was marginally higher than in 2009–10, where each FTE returned \$116 600. Broken down by species, silver perch returned \$140 100 per labour unit (up from \$86 700 in 2009–10), while jade perch returned \$100 200 (up from \$67 300).

6.7 Publications

Rowland, SJ 2009, 'Review of aquaculture research and development of the Australian freshwater fish silver perch, *Bidyanus bidyanus*', *Journal of the World Aquaculture Society*, vol. 40(3), pp. 291–324.

Rowland, SJ et al. 2007, *Development of a health management strategy for the silver perch aquaculture industry*, New South Wales Department of Primary Industries.

Rowland, SJ et al. 2007, *Diagnosis, treatment and prevention of the diseases of the Australian freshwater fish silver perch (*Bidyanus bidyanus*)*, New South Wales Department of Primary Industries.

7. Eel culture

7.1 General

The primary species of eel grown in Queensland aquaculture was the long-finned eel (*Anguilla reinhardtii*), with much smaller quantities of short-finned eel (*A. australis*) also grown.

Production of adult eels from aquaculture in Queensland peaked at 71.8 tonnes in 2001–02. Production levels then progressively decreased for a number of years and detailed production data could not be published over much of this period due to confidentiality issues associated with low industry participation. However, in 2010–11, both eel production and participation increased allowing the publication of more details about this sector.

In 2010–11, Queensland farms sold 63.2 tonnes of eels with a farmgate value of \$839 000. In 2010–11, there were 44 aquaculture approvals authorised for eel production, with seven farms actually producing eels. This was a significant increase in industry participation from 2009–10, when only three farms produced eels (Table 13).

Over the last few years, all eels produced have been exported and marketed live. In addition to the sale of adult eels, management arrangements introduced in 2005 allow for the sale of juvenile eels. In recent years, this has resulted in the sale of a substantial quantity of weaned juvenile eels.

Table 13: Adult eel production in Queensland (2007–08 to 2010–11)

	2007–08	2008–09	2009–10	2010–11
Total production (tonnes whole fish basis)	28.7	na	na	63.2
Average price (\$/kg)	\$17.10	na	na	\$13.28
Total value (\$'000)	\$492	na	na	\$839
Number of producing farms	4	3	3	7

7.1.1 Production details

The eels harvested in 2010–11 were mainly produced from 10.5 hectares of ponded area (66 ponds averaging 0.16 hectares). The average pond yield was 6200 kg per hectare. Only one farm reported production from a tank-based system; consequently, production details from the tank-based system cannot be reported due to confidentiality reasons.

In 2010–2011, there were 11 hectares of ponds stocked with 460 000 weaned juvenile eels. The average stocking rate was 47 600 elvers per hectare.

7.2 Labour

In 2010–11, the eel farming sector had 8.5 permanent staff and employed 980 hours of casual labour. This equates to nine FTEs. The output per FTE labour unit was 7100 kg or \$93 100.

7.3 Publications

Department of Employment, Economic Development and Innovation 2011, *Annual status report 2011: Queensland eel fishery*, Department of Employment, Economic Development and Innovation, Queensland, <http://www.daff.qld.gov.au/28_19526.htm>.

Department of Primary Industries and Fisheries 2006, *Policy for the management arrangements for the commercial harvesting and use of juvenile eels*, Department of Primary Industries and Fisheries, Queensland, <http://www.daff.qld.gov.au/documents/Fisheries_CommercialFisheries/Juv-Eel-Policy-v6.pdf>.

8. Hatchery and aquarium

8.1 General

The hatchery and aquarium sector encompasses growers who produce fish for use in aquariums, commercial growout (aquaculture) and stocking in public impoundments. Table 14 summarises statistics for the major species produced in 2009–10 and 2010–11.

The value of this sector has remained just above the \$3 million mark over recent years (Table 14). During 2010–11, the total value dropped slightly from the \$3.18 million achieved in the previous year to \$3.07 million. Over the same period, the total number of fish sold also decreased slightly from 10.1 million to 9.85 million. Fingerling sales for most of the common species remained

relatively similar to the previous year—the notable exceptions to this being barramundi (where only half as many fingerlings were sold as in the previous year) and jade perch (where twice as many fingerlings were sold as in the previous year).

The number of fingerlings sold to the aquaculture sector for commercial growout dropped from 5.3 million in 2009–10 to 3.6 million in 2010–11. Much of this decrease can be attributed to reduced demand from aquaculture farms (particularly for barramundi) following Cyclone Yasi.

A total of 4.867 million fingerlings were sold for the state fish stocking program in public impoundments, including silver perch, golden perch, barramundi, Australian bass and Murray cod. This represents a 40% increase on the 3.465 million fingerlings sold for the state fish stocking program in 2009–10.

Table 14: Hatchery production of native fingerlings and ornamental aquarium species in Queensland (2009–10 and 2010–11)

Species	2009–10			2010–11		
	Sales (no.)	Value (\$)	Avg (\$)	Sales (no.)	Value (\$)	Avg (\$)
Barramundi (combined aquaculture and stocking)	5 136 200	\$1 296 400	\$0.25	2 581 100	\$1 034 500	\$0.40
Golden perch (combined aquaculture and stocking)	1 173 600	\$250 700	\$0.21	2 564 500	\$537 900	\$0.21
Australian bass (combined aquaculture and stocking)	1 237 900	\$266 700	\$0.22	1 612 000	\$332 200	\$0.21
Silver perch (combined aquaculture and stocking)	488 400	\$115 700	\$0.24	394 700	\$143 100	\$0.36
Jade perch (aquaculture)	517 400	\$138 000	\$0.27	1 094 300	\$190 000	\$0.17
Murray cod, Mary River cod and sleepy cod (combined aquaculture and stocking) ⁽¹⁾	198 300	\$131 000	\$0.66	197 900	\$115 300	\$0.58
Ornamental fish (exotics) ⁽¹⁾	1 163 800	\$510 600	\$0.44	1 191 900	\$436 800	\$0.37
Ornamental fish (natives) ⁽¹⁾⁽²⁾	191 500	\$242 100	\$1.27	212 800	\$137 100	\$0.64
Other ⁽⁵⁾	⁽⁴⁾	\$108 500		⁽⁴⁾	\$119 400	
Marine hatchery and aquarium ⁽¹⁾⁽³⁾	⁽⁴⁾	\$123 400		⁽⁴⁾	na	
Total (returns received)	10.1m	\$3.18m		9.85m	\$3.07m	

- (1) Species grouped as individual species—data was not obtained or there were insufficient producers to maintain individual confidentiality.
- (2) Includes all native freshwater finfish sold to aquarium trade (e.g. rainbows, native ornamentals, saratoga, tandanus, as well as barramundi, golden perch etc.).
- (3) Includes oyster and pearl oyster spat, cobia, marine aquarium fish species, seahorses, corals and sandfish production.
- (4) Combines different phyla and developmental stages and therefore not appropriate to include numbers.
- (5) Includes barramundi sold as larvae, macrobrachium, snails and other invertebrate ornamental species.

8.2 Stocking and commercial growout species

The hatchery operations that produced the species listed below for the stocking program and for commercial growout (aquaculture) used 322 ponds in 2010–11. This was essentially unchanged from the 323 ponds used in 2009–10. Over this period, the total ponded area increased from 47.4 hectares to 53.6 hectares. The average size of ponds used to produce these fingerlings was 1670 m². The sector also used 213 tanks totalling 1700 m³ of capacity (average tank volume: 8000 L), compared with 125 tanks totalling 457 m³ in 2009–10.

8.2.1 Barramundi

Barramundi (*Lates calcarifer*) fingerlings were produced in 10 hatcheries (up from nine in 2009–10). Total production for 2010–11 was 8.9 million fingerlings, which was up from the 6.5 million produced in 2009–10 but similar to the 8.7 million produced in 2008–09. A major portion of the barramundi fingerlings produced was from farms that incorporate both hatchery and growout production. Fingerlings that were retained by the hatchery farm for their own growout are not considered as sales. Such operations account for a substantial proportion (>20%) of the fingerlings produced.

Because of the market and supply chain disruptions experienced by the barramundi growout sector in 2010–11 (largely due to extreme weather conditions), demand from this sector for fingerlings was down and a large proportion of the fingerlings produced were likely surplus to industry requirements. In 2010–11, there were 2 million fingerlings sold to other farms for growout (valued at \$606 000) compared with 4.5 million sold for \$897 000 in 2009–10. The average price per fingerling increased substantially, from \$0.20 in 2009–10 to \$0.30 in 2010–11.

Some barramundi hatcheries in this sector also produced larvae for sale. These larvae were not included in barramundi production figures, as numbers and costs of larvae are not comparable with fingerling production and would therefore distort total production figures. For this period, the total value of barramundi larvae sold cannot be reported separately due to client confidentiality, but was included in the overall sector summary (Table 14).

The number of fingerlings sold for the stocking program fell from 606 000 (\$401 000) in 2009–10 to 570 200 (\$428 100) in 2010–11. Over the last three years, the average price for barramundi fingerlings sold for stocking has increased steadily from \$0.44 to \$0.66 to the current price of \$0.75. The higher price for barramundi sold to the stocking program (compared to aquaculture growout) was largely attributed to the larger size of the stocked fingerlings.

8.2.2 Golden perch

Golden perch (*Macquaria ambigua*) fingerling production was undertaken by five hatcheries (seven in 2009–10). The number of fingerlings sold increased from 1.17 million in 2009–10 to 2.57 in 2010–11. Over this period, the total value of fingerling sales increased from \$250 700 to \$537 900. The total number of fingerlings produced increased from 1.6 million in 2009–10 to 2.6 million in 2010–11. Stocking accounted for the vast majority of sales, with only a few thousand fingerlings purchased by the farming sector.

8.2.3 Australian bass

Production of Australian bass (*Macquaria novemaculeata*) occurred in four hatcheries in 2010–11 (five in 2009–10). Bass fingerlings were produced primarily for impoundment stocking, with a few thousand fingerlings purchased by the farming sector. In 2010–11, a total of 1.61 million bass fingerlings were sold for a total value of \$332 200. This was a slight increase on the 1.2 million fingerlings sold in 2009–10 for \$266 700. Over the same period, the average price per fingerling decreased from \$0.22 to \$0.21.

8.2.4 Silver perch

Silver perch (*Bidyanus bidyanus*) fingerlings were produced by eight hatcheries in 2010–11 (six in 2009–10). The number of fingerlings sold decreased from 488 400 in 2009–10 to 394 700 in 2010–11. Although the number of fingerlings sold decreased, the value of the sales increased from \$115 700 in 2009–10 to \$143 100 in the current year. In 2010–11, nearly three-quarters of silver perch fingerlings (287 500) were sold for aquaculture growout, while the remainder (107 250 fingerlings) were sold for impoundment stocking. This ratio of sales to aquaculture and stocking was a complete reversal of the previous year when three-quarters of fingerlings were sold for

stocking. The average price received per fingerling sold to aquaculture was \$0.25 (\$0.23 in 2009–10) and \$0.66 for stocking (\$0.24 in 2009–10). The sharp increase in the average price of fingerlings sold to stocking was due to larger fingerlings. .

8.2.5 Jade perch

Jade perch or Barcoo grunter (*Scortum barcoo*) fingerlings came from three hatcheries in 2010–11 (also three in 2009–10). All sales were to the aquaculture growout sector, with a significant number of fry and fingerlings being sold overseas and interstate. Sales totalled 1.09 million fingerlings (valued at \$190 000), which continued the trend of increasing fingerling production over recent years—for example, 84 590 fingerlings (\$15 800) in 2007–08, 179 000 fingerlings (\$47 500) in 2008–09 and 517 000 fingerlings (\$138 000) in 2009–10. The average price received in 2010–11 was \$0.17, which was substantially lower than the \$0.27 per fingerling achieved in the previous year.

8.2.6 Murray cod, Mary River cod and sleepy cod

Murray cod, Mary River cod (*Maccullochella* sp.) and sleepy cod (*Oxyeleotris lineolatus*) sales were combined to maintain confidentiality of the information supplied by the hatcheries that produced these fish. In 2010–11, five hatcheries produced cod fingerlings, which was a slight increase on the four hatcheries that produced cod over the last few years. Sales for these species have remained remarkably consistent over recent years, with 197 900 (valued at \$115 300) sold in 2010–11 and 198 300 (\$131 000) sold in 2009–10. The average price for fingerlings was \$0.58, with growout farms purchasing 39% of the fingerlings (41% in 2009–10) and the rest having gone to the stocking program.

8.3 Freshwater aquarium and ornamental species

The producers that grew freshwater aquarium and ornamental species (listed below) used 192 ponds in 2010–11 (compared with 132 ponds in 2009–10). Ponds covered an area of 12.9 hectares in 2010–11 (9.1 hectares in 2009–10). The average size of ponds used for growing ornamentals was 670 m². The sector also used 634 tanks totalling 430 m³ in 2010–11 (compared with 603 tanks totalling 490 m³ in 2009–10).

8.3.1 Exotic ornamental fish

Exotic freshwater ornamental fish were produced by nine hatcheries in 2010–11 (down from 11 hatcheries in 2009–10). The number of fish sold increased marginally from 1.164 million fish in 2009–10 to 1.192 million fish in 2010–11. Over the same period, the value of the sector decreased by 16% from \$510 600 to \$436 800. This reduction in value was due to a decrease in the average price of fingerlings from \$0.44 to \$0.37.

8.3.2 Native ornamental fish

Native freshwater ornamental fish (including lungfish and saratoga) were produced by 12 farms in 2010–11 (down from 15 in 2009–10). The number of fish sold increased from 191 500 (valued at \$242 000) in 2009–10 to 212 800 (valued at \$137 100) in the current period. Over this period, the average price per fish halved from \$1.27 to \$0.64. This reduction in value was strongly influenced by the reduced sales of large and highly valued species such as lungfish and saratoga.

8.4 Marine hatchery and aquarium

The marine hatchery and aquarium group covers a diverse range of species including oyster and pearl oyster spat, barramundi cod, cobia, mangrove jack, mullet, aquarium fish, seahorses, corals and sandfish production.

In 2010–11, there were too few hatcheries producing in this category to publish any production details without potentially divulging confidential individual information. This year, the value of

production from this category is only published in the total aquaculture production value under the category of 'Other' (see section 1).

8.5 Labour

Statistics for the whole sector show that in 2010–11 it had 46 permanent staff (up from 41 in 2009–10) and employed 16 100 hours of casual labour (13 500 hours in 2009–10). This equated to 55 FTEs employed in the sector, which was a small decrease from the 58 units in 2009–10. Output per labour unit decreased from \$66 250 in 2009–10 to \$53 600 in the current period.

8.6 Publications

Department of Agriculture, Fisheries and Forestry 2010, *A strategic approach to the management of ornamental fish in Australia*, Department of Agriculture, Fisheries and Forestry, Canberra, <<http://www.daff.gov.au/abares/publications>>.

Lupton, C & Cheetham, R 2009, *Aquaculture Association of Queensland (AAQ) commercial hatchery code of best practice*, Aquaculture Association of Queensland.

New South Wales Department of Primary Industries 2010, *Hatchery quality assurance scheme*, New South Wales Department of Primary Industries, <<http://www.dpi.nsw.gov.au/fisheries/aquaculture>>.

9. Pearl oyster culture

9.1 General

As in the previous two reporting periods, the value of the pearl oyster industry in Queensland is not available for publication in 2010–11. Only three farms reported production and, with so few active producers, the publication of any production details could potentially disclose confidential individual information. As such, the value of the pearling sector is only reported in the 'Other' category of this report (see section 1). The main species cultured are the gold-lipped pearl oyster (*Pinctada maxima*), black-lipped pearl oyster (*P. margaritifera*) and penguin wing oyster (*Pteria penguin*).

10. Edible oyster production

10.1 General

In Queensland, all oyster aquaculture production occurs south of Hervey Bay and is confined to the culture of rock oysters (*Saccostrea glomerata*) on 'furniture' placed on tidal land, predominantly above mean low water.

In 2010–11, the edible oyster industry had a particularly poor year as it was significantly impacted by the heavy rainfall associated with the Brisbane floods and the resulting freshwater inundation and siltation of oyster beds. These exceptional circumstances resulted in stock losses, harvesting restrictions and access and supply chain disruptions. Under these circumstances, it was not surprising that production decreased by nearly 8%, from 97 500 dozen in 2009–10 to 90 000 dozen in 2010–11 (Table 15). Over this period the value of oyster sales decreased by 8%, from \$512 600 to \$472 900.

Although 2010–11 was an exceptionally difficult year for oyster producers, the industry has been in decline since 2004–05 when annual harvests in the order of 200 000 dozen were achieved.

Table 15: Edible oyster production in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Total production ('000 dozen)	105.6	97.5	90.0
Total value (\$)	\$509 600	\$512 600	\$472 900

Of the 98 oyster areas authorised for aquaculture in 2010–11, there were a total of 26 oyster areas that sold product (25 in 2009–10). There were also six other oyster areas that did not directly sell product but were used to supply stock to the areas that did sell. Production levels varied across these 26 areas, ranging from 50 dozen to almost 21 000 dozen (Table 16).

Table 16: Analysis of edible oyster production (oysters sold) in Queensland (2008–09 to 2010–11)

	2008–09	2009–10	2010–11
Number of oyster areas surveyed	107	106	98
Number of responses	66	74	92
Production (dozens)	No. of areas	No. of areas	No. of areas
Nil	41	49	67
1 to 500	7	8	8
501 to 1000	4	2	4
1001 to 2000	5	4	2
2001 to 5000	4	6	7
5001 to 10 000	3	1	2
Over 10 000	3	4	3
Total producing oyster areas	25	25	26

The average price per dozen oysters has decreased fractionally from \$5.26 per dozen in 2009–10 to \$5.25 in the current reporting period.

Oysters are sold in a range of different product categories (which are largely based on size and presentation) to meet market requirements. The three main product categories (in ascending size) used by the industry are 'bottlers', 'bistro' and 'plate'. Table 17 summarises the different product categories in terms of average price and market percentage for the current and previous reporting period. In 2010–11, bottlers made up the largest product category, accounting for 45% of the product marketed. Bottlers were also the lowest value category, at an average price of \$3.27 per dozen. The price of bottlers has dropped sharply (26%) since 2009–10. The highest value category was the larger plate product (\$8.07 per dozen), which made up 14% of the oysters sold. The price for plate oysters increased by 13% since last year. Bistro oysters at \$6.88 per dozen accounted for 32% of production, with the average price up 8% from the previous year.

Table 17: Edible oyster marketing information for Queensland (2009–10 and 2010–11)

Product category	2009–10		2010–11	
	Price per dozen (\$)	Market (%)	Price per dozen (\$)	Market (%)
Bottlers	\$4.43	38%	\$3.27	45%
Bistro	\$6.08	35%	\$6.88	32%
Plate	\$7.76	17%	\$8.07	14%
Others	\$2.81	10%	\$5.00	9%
Average return—all oysters	\$5.26	100%	\$5.25	100%

Details of other indicators of industry growth and performance (such as the numbers of shells introduced to authorised areas, stock losses and stock on hand) are provided in Table 18. The number of shells introduced to leases decreased by 38%. The reported loss of oyster stock (attributed principally to water quality issues and oyster disease, as well as theft, predation and husbandry issues) increased by an enormous 210% during 2010–11. Much of the stock loss was either directly or possibly linked with the Brisbane floods. On a positive note, even after coping with the exceptionally challenging season, the industry still managed to increase the number of shell being held on leases at the end of the reporting period by 57%.

Table 18: Edible oyster introductions, losses and stocks on hand in Queensland (2009–10 and 2010–11)

	2009–10	2010–11	Change (%)
Shells introduced (dozen)	154 300	95 100	-38%
Losses (dozen)	144 000	302 200	-210%
Number of shell on hand (30 June)	253 300	397 400	+57%

10.2 Labour

Total permanent labour employed in the industry was 20.8 units (19.8 units in 2009–10), while total casual employment increased from 2592 hours in 2009–10 to 3533 hours. This converts to a total of 22.6 FTEs employed in the industry, which represents an increase of 1.6 labour units from the previous year.

In terms of labour efficiency, the production per FTE for 2010–11 was 3980 dozen (compared with 4600 dozen in 2009–10). Total industry output (in terms of dollars returned from sales per labour unit) decreased from \$24 200 per labour unit in 2009–10 to \$20 900 per labour unit in 2010–11.

10.3 Publications

Department of Primary Industries and Fisheries 2007, *Queensland oyster industry development plan: implementation report*, State of Queensland, <http://www.daff.qld.gov.au/28_14744.htm>.

Department of Primary Industries and Fisheries 2008, *Queensland oyster industry development plan 2008–09*, State of Queensland, <http://www.daff.qld.gov.au/28_14628.htm>.

O'Sullivan, D 2009, 'Plan allows for expanded oyster production in Moreton Bay marine park', *Austasia Aquaculture*, vol. 23(3), pp. 12–16.

11. Regional summary

Information has been analysed to provide a regional overview of the aquaculture industry in Queensland. The regions are based on the statistical divisions adopted by the Australian Bureau of Statistics.

The information presented in Tables 19 to 22 was compiled from the annual statistical returns received from registered aquaculture authority holders. The totals include all sectors of the industry described in the earlier parts of this report.

The results presented in these tables need to be interpreted carefully, as they only summarise the information collected from those farms that responded and submitted detailed statistical returns.

The number of returns received varies between years (Table 19), which can significantly affect any trends. Also, rounding errors may cause minor discrepancies in some of the totals. It should also be noted that the data from 2009–10 included, for the first time, statistical data from aquaculture operations that are registered under the self-assessable code for aquaculture.

Table 19: Response rates—Queensland (2007–08 to 2010–11)

	2007–08	2008–09	2009–10	2010–11
Number of authorised producers (no.)	580	476	530	521
Questionnaires received (no.)	665	371	354	461
Response rate (%)	85%	78%	67%	89%

The following tables (Tables 20 to 22) demonstrate how some of the major production parameters such as value, weight of product, ponded area and labour were divided between the respective Queensland statistical divisions. It should be noted that no regional information was available for 2008–09, as that year's production data was collected using an online survey that did not provide data suitable for analysing in terms of statistical regions.

The main sectors (prawns and barramundi) had a major influence on the value and quantity of production. The total farmgate value of production was highly dependent on prawns, which in 2010–11 contributed 66% (prawn growout and hatchery) of the total industry value and 55% by weight of the total production. Barramundi was the next most significant industry sector, which contributed 25% of the total industry value and 40% of the total quantity of product sold. Four divisions (Northern, Far Northern, Moreton and Mackay) accounted for the majority of the industry value and production (Tables 20 and 21).

Table 20: Farmgate value (\$ million)—Queensland (2007–08 to 2010–11)

Statistical division	2007–08	2008–09	2009–10	2010–11
Brisbane and Moreton	\$14.1	na*	\$25.1	\$15.8
Wide Bay	\$5.3	na*	\$6.4	\$7.2
Darling Downs	\$0.7	na*	\$1.2	\$0.9
Fitzroy	\$0.5	na*	\$0.4	\$0.3
Mackay	\$8.6	na*	\$7.2	\$8.0
Northern	\$29.1	na*	\$44.0	\$34.7
Far Northern	\$20.5	na*	\$18.7	\$19.4
Total	\$78.8	85.5	\$103.0	\$86.3

* Not available for publication

Table 21: Total production (tonnes)—Queensland (2007–08 to 2010–11)

Statistical division	2007–08	2008–09	2009–10	2010–11
Brisbane and Moreton	855	na*	1592	910
Wide Bay	315	na*	366	425
Darling Downs	48	na*	80	55
Fitzroy	23	na*	5	2
Mackay	614	na*	505	501
Northern	2137	na*	3504	2890
Far Northern	1712	na*	1769	2115
Total	5705	6520	7821	6898

* Not available for publication

Far Northern and Northern divisions had the majority of the ponded area, with Mackay, Brisbane and Moreton, and Wide Bay also having significant areas (Table 22).

Table 22: Total ponded area (hectares)—Queensland (2007–08 to 2010–11)

Statistical division	2007–08	2008–09	2009–10	2010–11
Brisbane and Moreton	163	na*	170	170
Wide Bay	122	na*	138	152
Darling Downs	16	na*	18	17
Fitzroy	6	na*	5	5
Mackay	188	na*	184	178
Northern	299	na*	265	264
Far Northern	237	na*	229	238
Total	1031	995	1010	1024

* Not available for publication

The greatest employment occurred in the Northern division, which employed over 40% of the Queensland aquaculture workforce in 2010–11 (Table 23).

Table 23: Total employment (FTEs)—Queensland (2007–08 to 2010–11)

Statistical division	2007–08	2008–09	2009–10	2010–11
Brisbane and Moreton	116	na*	99	106
Wide Bay	61	na*	56	56
Darling Downs	6	na*	8	7
Fitzroy	6	na*	8	8
Mackay	56	na*	47	41
Northern	186	na*	229	230
Far Northern	188	na*	117	131
Total	619	562	565	579

* Not available for publication

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