Report to farmers

Aquaculture production survey—Queensland 2007–08

Ross Lobegeiger and Max Wingfield

Department of Employment, Economic Development and Innovation
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Contents

List of acronyms

AAQ	Aquaculture Association of Queensland
ABFA	Australian Barramundi Farmers' Association
APFA	Australian Prawn Farmers Association
AQIS	Australian Quarantine Inspection Service
BIARC	Bribie Island Aquaculture Research Centre
DA	Development approval
DAFF	Department of Agriculture, Forestry and Fisheries
DEEDI	Department of Employment, Economic Development and Innovation
EMS	Environmental management systems
FCR	Feed conversion ratio
FTE	Full-time equivalent
GIS	Geographical information system
GSRMAP	Great Sandy Regional Marine Aquaculture Plan
PCA	Pearl culture areas
QOGA	Queensland Oyster Growers Association
QSWAMP	Queensland Shellfish Water Assurance Monitoring Program
SAC	Self-assessable code

1. Production summary

The total value of the Queensland aquaculture industry has increased by 4.4% over the last 12 months, with the value of production increasing from $75.5 million in 2006–07 to $78.8 million in 2007–08. This increase was largely due to an increase in the barramundi sector by more than 30% from $18.5 million to $24.3 million.

Although the value of aquaculture production increased by more than 4% over the last 12 months, the wild catch fishery has remained stable. The proportion attributed to aquaculture has increased marginally to 27.8% over the last 12 months (Table 1). In Queensland the total value of fisheries production, including aquaculture, in 2007–08 was $283.8 million, which was 1% higher than the previous year.

Table 1. Queensland fisheries production—gross value (2002–03 to 2007–08)

	ABARE figures		
Year	**Total fisheries ($m)**	**Aquaculture ($m)**	**Aquaculture (%)**
2002–03	290.9	62.9	21.6
2003–04	305.7	67.7	22.1
2004–05	262.8	64.5	24.5
2005–06	256.7	67.7	26.4
2006–07	276.9	71.9	26.0
2007–08	280.5	75.5	26.9
	Queensland figures(1)		
Year	**Total fisheries ($m)**	**Aquaculture ($m)**	**Aquaculture (%)**
2002–03	na*	na*	na*
2003–04	309.3	71.3	23.0
2004–05	265.9	67.9	25.5
2005–06	259.5	70.5	27.2
2006–07	280.5	75.5	26.9
2007–08	283.8	78.8	27.8

* Not available for publication

(1) The Queensland figures include hatchery production for farm stocking and impoundment restocking. Farm stocking details are excluded from the ABARE figures. Details on numbers and values of the species stocked are included in section 8.2 of this report.

Sources: Australian Bureau of Agricultural and Resource Economics (ABARE)
Department of Employment, Economic Development and Innovation (DEEDI)

Table 2. Queensland fisheries production—gross value ($ million) (2003–04 to 2007–08)

	2003–04	2004–05	2005–06	2006–07	2007–08
Marine prawns	$53.3	$45.9	$46.3	$42.5	$41.5
Barramundi	$10.1	$11.9	$14.0	$18.5	$24.3
Redclaw crayfish	$1.3	$1.3	$1.3	$1.4	$1.1
Freshwater fish	$0.7	$0.9	$1.5	$2.2	$2.3
Hatchery and aquarium	$1.4	$1.7	$2.1	$1.9	$1.5
Edible oysters	$0.7	$0.7	$0.6	$0.5	$0.6
Pearl oysters	na*	na*	na*	$1.7	$1.3
Other (1)	$3.6	$5.5	$4.7	$6.8	$6.2
Total	**$71.3**	**$67.9**	**$70.5**	**$75.5**	**$78.8**

* Not available for publication (included in Other)

(1) Includes eels, crabs, marine fish, marine hatchery

The marine prawn industry produces three main species of prawn—black tiger (*Penaeus monodon*), banana (*P. merguiensis*) and kuruma (*P. japonicus*). The kuruma prawn sector is currently represented by one farm where production is minimal.

Production in this sector has decreased by 5% from 3085 tonnes in 2006–07 to 2943 tonnes in 2007–08 while the value has decreased by 2% from $42.5 million in 2006–07 to $41.5 million in 2007–08. The average price of $14.10/kg was marginally above the average price in 2006–07.

The area harvested decreased from 776 hectares in 2006–07 to 717 hectares in 2007–08. The number of producing farms decreased by 14% over the last four years, with only 25 farms in production in 2007–08 compared with 26 the year before.

Barramundi *(Lates calcarifer)* production increased significantly (18%) from 2091 tonnes to 2464 tonnes in 2007–08. This was on top of a 20% increase from the previous year. The value of the industry has increased by 31%, from $18.5 million in 2006–07 to $24.3 million in 2007–08. The average price on a whole-fish basis increased from $8.86/kg to $9.87/kg.

The majority of production came from pond-based and cage-based systems. Over this period the number of producing pond-based farms increased from 26 to 28. The number (six) of tank-based systems remained the same. There was just one sea cage operation.

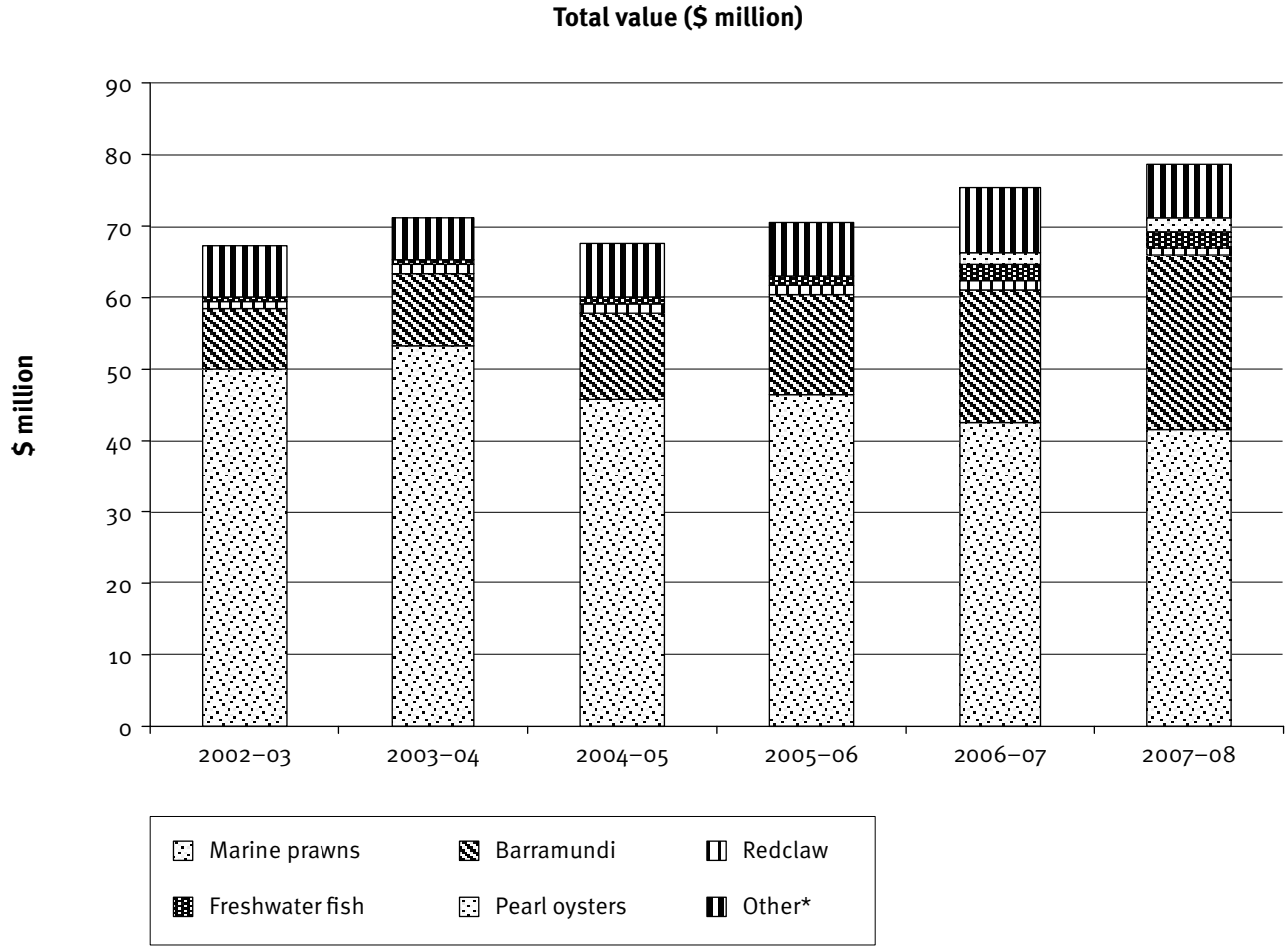
Redclaw crayfish (*Cherax quadricarinatus*) decreased from 100 tonnes in 2006–07 to 67 tonnes in 2007–08. Over the same period the value of redclaw sold as food decreased from $1.45 million in 2006–07 to $1.1 million in 2007–08. The number of producing farms in 2007–08 was 37, which was nine less than in 2006–07. There were 135 farms that reported no production at all for 2007–08. The average prices increased by 13% from $14.45/kg in 2006–07 to $16.39/kg in 2007–08.

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*). Freshwater fish (other than barramundi) production has increased in value from $2.2 million in 2006–07 to over $2.3 million in 2007–08.

In 2007–08 silver perch (10 farms with 17 ha of ponds) accounted for 39% of freshwater fish production, jade perch (7 farms with 8.4 ha) 30%, Murray cod (4 farms) 29% and other species 2%. Recirculating tank systems accounted for 23% (49 tonnes) of the total freshwater fish production.

Murray cod production was 57 tonnes and was valued at $1.0 million. This represents the most valuable species sector within the freshwater fish group, with silver perch production valued at $701 000 and jade perch at $573 000. The average prices for silver and jade perch were $9.20/kg and $9.70/kg respectively, while Murray cod averaged $17.40kg.

Figure 1. Value of Queensland aquaculture production ($ million)



* Other includes crabs, sea scallops, eels, marine fish

Production from the eel sector (*Anguilla* spp.) has stabilised over the last two years even though there were only four producers operating during this time. Production decreased from 32 tonnes in 2006–07 to 28.7 tonnes in 2007–08. The average price increased marginally to $17.10/kg.

Table 3. Queensland fisheries production—tonnes (2003–04 to 2007–08)

	2003–04	2004–05	2005–06	2006–07	2007–08
Marine prawns	3361	2964	3300	3085	2943
Barramundi	1204	1437	1745	2091	2464
Redclaw crayfish	91	99	105	100	67
Freshwater fish	96	105	152	210	196
Other *	48	48	25	64	58
Total	**4799**	**4654**	**5328**	**5550**	**5728**

* Other includes crabs, sea scallops, eels, marine fish

The hatchery sector, producing native fish fingerlings and ornamental aquarium species, had a 17% increase in the number of sales. The value of the hatchery sector increased by nearly 90%, rising from $3.51 million in 2006–07 to $6.66 million in 2007–08.

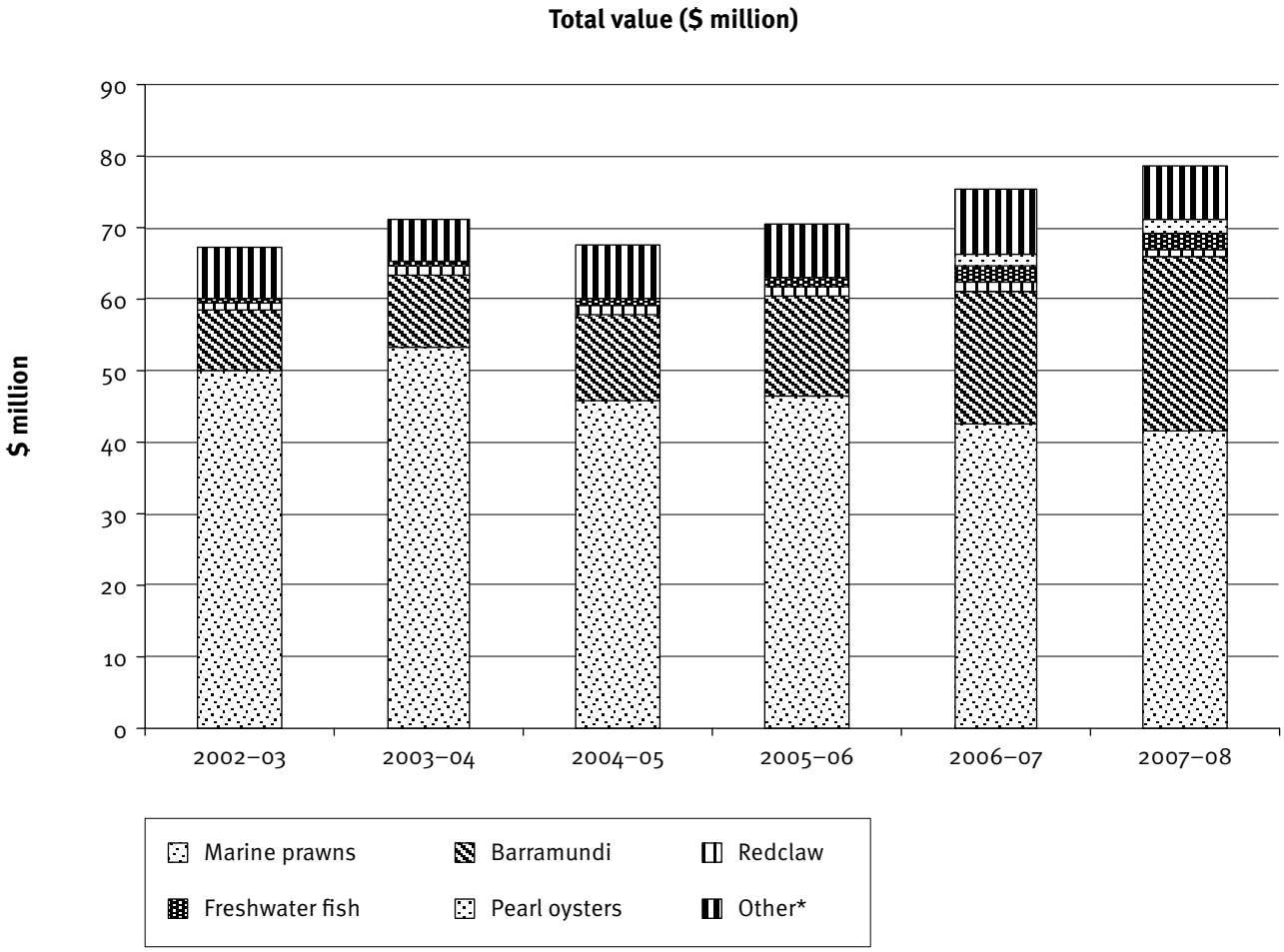
Total edible oyster production decreased from 141 000 dozen in 2006–07 to 136 400 dozen in 2007–08. The value of the industry increased from $534 000 in 2006–07 to $620 500 in 2007–08. The average price per dozen oysters increased by 20% from $3.79 per dozen to $4.55 per dozen. This production came from 32 oyster areas in 2007–08 compared with 36 oyster areas in 2006–07.

The value of the pearl oyster industry in Queensland continues to fluctuate as some of the farms rebuild stocks of nucleated pearls. Four farms reported information this year with production for 2007–08 estimated at $1.3 million compared with $1.7 million in 2006–07.

The total permanent labour force in the aquaculture industry increased from 471 units in 2006–07 to 465 units in 2007–08. The marine prawn sector accounted for 210 units or 45% of the total permanent labour force.

When numbers for permanent and casual labour are combined, employment in the Queensland aquaculture industry has decreased by 8% from 674 full-time equivalents (FTEs) in 2006–07 to 619 FTEs in 2007–08.

Figure 2. Queensland aquaculture total production (tonnes)



* Other includes crabs, sea scallops, eels, marine hatchery and marine aquarium

2. Survey methods

Production statistics for the financial year 2007–08 were collected from farms producing marine prawns, barramundi, redclaw crayfish, freshwater growout fish and eels, as well as hatchery and aquarium producers. Statistics collected from the edible and pearl oyster growers relate to culture areas.

Survey forms were mailed to development permit (aquaculture authority) holders for the species listed below. The number of forms mailed decreased from 793 in 2006–07 to 784 in 2007–08. The results presented in this report reflect the information provided by the industry through the statistical returns. Non-producing farms were able to respond by ticking the 'nil production box' and were not required to provide further details about their operations. In some sectors, non-response by some of the larger growers can provide a result that under-represents the true industry situation.

The total numbers recorded for each species group are based on operations that have these species authorised on their development permit. Most development permits have more than one species on their approval.

The 85% response rate for 2007–08 (Table 4) was lower than the 88% response rate achieved in 2006–07.

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).

Fingerling fish
Fingerling fish are small fish in the 2–10 gram range.

Juvenile crayfish
Juvenile crayfish are immature crayfish in the 1–15 gram range.

Labour conversion
Labour FTEs are calculated by adding the total permanent labour units to the casual labour units converted to FTEs. Forty hours per week casual labour for 48 weeks per year is considered one FTE labour unit. Information collected in hours per week was converted to FTEs by dividing total hours by 40 hours.

Table 4. Response rates to survey questionnaire 2007–08

	Number mailed	Number returned	Per cent returned
Marine prawns	59	53	90%
Barramundi	129	107	83%
Redclaw crayfish	201	172	86%
Freshwater fish	165	143	87%
Eels	29	26	90%
Hatchery and aquarium	79	72	91%
Edible oysters	110	83	75%
Pearl oyster culture areas	12	10	83%
Total	**784**	**666**	**85%**

Note: All holders of development permits in Queensland are required, as a condition of their approval, to complete an annual statistical return. Queensland Primary Industries and Fisheries, part of the Department of Employment, Economic Development and Innovation (DEEDI), will be corresponding with all permit holders who have not completed the 2007–08 returns. Failure to provide an accurate and completed statistical return by the due date constitutes a breach of aquaculture approval conditions and will result in the issuing of a fisheries infringement notice. This may attract a fine of up to $1000 and will be enforced as of 2009.

3. Marine prawns

3.1 General

The value of the Queensland prawn industry decreased marginally from $42.5 million in 2006–07 to $41.5 million in 2007–08. Total production decreased from 3085 tonnes in 2006–07 to 2943 tonnes in 2007–08. Additionally, the hatchery sector sold post-larvae to a value of $1.5 million.

Previous reports have separated kuruma prawn (*Penaeus japonicus*) production from the other two main species—black tiger (*P. monodon*) and banana prawns (*P. merguiensis*). Kuruma prawn production has almost ceased in Queensland with only one farm producing limited quantities for the Australian market. This sector has now been included in the general marine prawn group.

Of the 53 authority holders that responded in 2007–08, 25 were producing growout farms (26 in 2006–07) and three were independent hatcheries (four in 2006–07).

The Queensland industry continued to face a number of production and marketing problems during 2007–08. Post-larvae produced during the early part of the season were of poor quality and many batches had to be discarded before stocking. The cool January period slowed growth on many farms, although the Logan River farms did have a warmer April that extended the harvest.

Prawn prices ranged from $9.50/kg to $17.50/kg and the average farm gate price rose marginally from $13.79/kg in 2006–07 to $14.10/kg in 2007–08 (Table 5). The whole crop was sold in Australia compared with 1% exported in 2006–07.

3.2 Marine prawn production

3.2.1 Growout

The following table (Table 5) illustrates marine prawn production from 2005–06 to 2007–08. Production has continued to decline over the last three years. The number of producing farms has decreased and this has reduced the total area stocked. Some farms have changed some or all of their production to barramundi. However, average yields per hectare increased by 5% over the last 12 months.

Average pond yields vary with the species of prawn grown and the stocking rates of the ponds. Black tiger prawns grow larger than either banana or kuruma prawns. The more intensively operated farms stocked at a much higher rate (above 35 post-larvae per square metre) than the more extensive operations.

In 2007–08 the average stocking rate of the 12 intensive black tiger farms was 44 post-larvae per square metre and their average yield was 5400 kg/ha compared with the 10 less intensive farms where the stocking rate was 24 post-larvae per square metre and the average yield was only 2500 kg/ha.

In 2007–08, 21 farms (24 in 2006–07) produced over 20 tonnes. In 2007–08, 17 farms (18 in 2006–07) produced over 50 tonnes (Table 6) while 10 farms (10 in 2006–07) produced over 100 tonnes. In 2007–08, seven farms (four in 2006–07) averaged over 6000 kg/ha/crop.

The total ponded area of farms has decreased by 4%, from 737 hectares in 2006–07 to 718 hectares at the end of 2007–08. The area stocked decreased by 33% from 1070 to 726 hectares. The total harvested area decreased from 776 hectares in 2006–07 to 713 hectares in 2007–08.

Pond sizes ranged from 0.65 to 1.77 hectares with an average size of 1.03 hectares. The average number of crops per pond per year decreased from 1.1 to 1.0 crop per year. There was only one farm (five in 2007–08) that produced more than one crop per year. The average stocking rate increased from 33 post-larvae per square metre to 37 per square metre. Stocking rates varied from 21 to 56 with 11 farms stocking at 40 or more per square metre (compared with eight farms the previous season).

Table 5. Marine prawn production by aquaculturists in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production (tonnes)	3300	3085	2940
Average price ($/kg)	$14.14	$13.79	$14.10
Total value ($ million)	$46.30	$42.50	$41.50
Average yields (kg/ha/crop)	4118	3974	4170

Table 6. Number of approved marine prawn farms and production levels in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Production (tonnes)	**No.**	**No.**	**No.**
0.1 to 5.0	3	1	10
5.1 to 10.0	1	1	3
10.1 to 20.0	3	0	1
20.1 to 50.0	1	6	4
50.1 to 100.0	9	8	7
100.1 to 200.0	7	4	5
Over 200	5	6	5
Number of producing farms	29	26	25
Number of non-producing farms	19	23	22
Number of hatcheries only	5	6	6
Total number of responses	53	55	53
Number of farms surveyed	59	60	59

The quantity of feed decreased from 6286 tonnes in 2006–07 to 6521 tonnes in 2007–08. Over the same period the estimated feed conversion ratio (FCR) increased from 2.0:1 to 2.2:1. There was a change in the source of feed with an increase in the use of overseas feed. In 2007–08 feed sources were 29% from Australia (50% in 2006–07) and 71% from overseas (50% in 2006–07).

3.2.2 Hatchery

Thirteen prawn hatcheries (14 in 2006–07) in Queensland produced an estimated 310 million post-larvae (320 million post-larvae in 2006–07). The number of post-larvae produced has returned to stable levels of 300–320 million (Table 7). The between-year comparative figures are further complicated by the production of banana prawns where pond-reared spawners are being used for post-larvae production rather than obtaining spawners from the wild.

Table 7. Marine prawn hatchery production in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Number of spawners purchased	3521	4070	2712
Number of spawners used	3505	7928	2213
Number of post-larvae produced (million)	338.5	320.2	310.0
Number of post-larvae stocked (million)	295.7	267.7	264.7
Number of post-larvae sold (million)	97.7	188.6	285.0
Value of post-larvae sold (million)	$1.56	$1.89	$1.48
Average value of post-larvae (cents)	1.60	1.50	1.56

3.2.3 Labour

The total labour employed on marine prawn farms over the last three years is shown in Table 8. The decrease in permanent labour of 8% was offset by the increased use of casual staff. Total casual hours employed has increased by 18% over the last 12 months from 145 676 to 174 282 hours.

The efficiency of permanent labour increased marginally from 13.7 tonnes per unit to 14.0 tonnes in 2007–08. The casual hours per tonne increased from 47 hours to 59 hours per tonne.

The dollar output per labour unit employed in the industry has remained stable at nearly $140 000. In the last 12 months FTEs employed in the industry have also remained stable (around 300 FTEs).

Table 8. Labour use on marine prawn farms in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Permanent labour (tonnes/unit)	18.9	13.7	14.0
Total permanent (units)	175	226	210
Casual labour (hours/tonne)	41	47	59
Total casual labour (hours)	136 302	145 676	174 282
FTE labour units	245	302	301
$ output per labour unit	$188 770	$141 088	$138 105

3.3 Hatchery sector

There were six marine prawn hatcheries in Queensland that did not have growout ponds in the 2007–08 season. These hatcheries supply post-larvae to the growout sector of the industry. Responses were received from five of these hatcheries. Three of the hatcheries produced black tiger post-larvae and supplied 30% of the marine prawn post-larvae sold in 2007–08 (or 10% of the total post-larvae stocked). The total value of production from these hatchery-only operations in 2007–08 was $1.5 million (compared with $1.9 million in 2006–07).

From the returns received, this sector employed eight permanent employees (six in 2006–07) and, together with casual employees, provides employment for nine FTEs (six in 2006–07). Total output per labour unit in 2007–08 was $48 900 (compared with $87 100 in 2006–07).

3.4 Industry development

The prawn sector aquaculture industry development plan 2005–07 has now expired. An assessment was made and this was published in *Australian prawn farming: development plan: implementation report*. The assessment showed that while some of the issues had yet to be resolved, the planning process was useful and an updated version of the industry plan was published in 2008 and remains current until 2011.

Domesticated families of black tiger prawns (*P. monodon*) have been successfully maintained in commercial facilities, and the domestication of prawns is likely to progress; however, there is still a strong reliance on wild-caught broodstock.

3.5 Publications

Robertson, C. (2006). Editor, *Australian prawn farming manual—health management for profit* is available at http://www.aciar.gov.au/web.nsf/doc/ACIA-6XBTR9

Biosecurity Australia policy memorandums relating to the importation of prawns and prawn products at http://www.daff.gov.au/ba/ira/current-animal/prawns

Guidelines for constructing and maintaining aquaculture containment structures is available on the Queensland Primary Industries and Fisheries website at www.dpi.qld.gov.au

The Prawn Industry Development Plan is available on the Queensland Primary Industries and Fisheries website at www.dpi.qld.gov.au

3.6 Further information

Kerrod Beattie (Manager, Aquaculture) on (07) 3224 2247 or kerrod.beattie@dpi.qld.gov.au

4. Barramundi

4.1 General

Barramundi (*Lates calcarifer*) growout production continued to increase strongly over the last 12 months. The product marketed (converted to a whole-fish basis) increased by 18% from 2091 tonnes in 2006–07 to 2464 tonnes in 2007–08.

The majority of production came from pond-based and cage-based systems, while the production from recirculating tank systems decreased 15% from 96 tonnes to 82 tonnes. The total value of production has increased by 31%, from $18.5 million in 2006–07 to $24.3 million in 2007–08. The average price (whole-fish basis) increased by over 11% from $8.86/kg to $9.87/kg.

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

4.2 Industry production

Of the 107 authority holders who responded, 35 produced marketable fish in 2007–08. This compared with 33 from 118 respondents in the previous year. Production came from 28 farms using pond-based systems, one farm using sea cages and six farms using recirculating systems (Table 9).

Table 9. Barramundi production and authorities in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production (tonnes whole-fish basis)	1745	2091	2464
Average price ($/kg)	$8.04	$8.86	$9.87
Total value ($ million)	$14.03	$18.52	$24.31
Pond production (tonnes)	**No.**	**No.**	**No.**
0.01 to 1.0	2	3	4
1.1 to 10.0	8	10	7
10.1 to 50.0	10	7	9
50.1 to 100.0	2	2	4
Over 100.0 (1)	4	5	5
Number of producing farms (1)	26	27	29
Number of non-producing farms	52	54	54
Total pond-based farms responding (1)	78	81	83
Tank production (tonnes)	**No.**	**No.**	**No.**
0.01 to 1.0	3	0	0
1.01 to 5.00	4	4	5
5.1 to 10.0	1	0	0
Over 10.00	3	2	1
Number of producing farms	11	6	6
Number of non-producing farms	26	31	18
Total recirculation farms responding	37	37	24
Pond and tank production (tonnes)	**No.**	**No.**	**No.**
Total number of responses	115	118	107
Number of farms surveyed	134	125	129

(1) Includes one sea cage farm

4.3 Pond production

Total farm ponded area decreased by 4% with 158 hectares available in 2007–08 (compared with 164 hectares in 2006–07); however, the number of available ponds increased to 360 (344 in 2006–07). All of the barramundi produced in pond-based systems were sold domestically over the last three years.

The number of ponds stocked increased from 217 ponds in 2006–07 to 218 in 2007–08. During the same period the stocked area decreased from 101 hectares to 97 hectares. The average pond area was 0.4 hectares.

The number of fingerlings stocked decreased from 2.85 million in 2006–07 to 1.97 million in 2007–08. The density at which fingerlings were stocked in ponds also decreased from 28 300 fingerlings per hectare in 2006–07 to 20 300 fingerlings per hectare in 2007–08.

The total feed used in ponds increased from 2926 tonnes in 2006–07 to 3230 tonnes in 2007–08. The 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, this data has not been included in the pond volume and density calculations as it is not directly comparable and would significantly alter these averages. FCR improved slightly from 1.6:1 to 1.5:1. Ninety-six percent of the feed was manufactured in Australia.

4.4 Tank-based production

In 2007–08, 42 tank-based farms were authorised to grow barramundi. Statistical returns were received from 28 farms. Production from the six farms (six in 2006–07) that produced marketable fish was 82 tonnes, which represents a decrease of 14% from the 96 tonnes produced in 2006–07.

Traditionally, tank systems have been able to achieve a higher average price than pond systems due to the increased focus on direct sales to niche markets and a higher proportion of live sales. This margin has decreased slightly from $1.08/kg in 2006–07 to $1.01/kg in 2007–08.This represents a 10% price premium over pond-raised fish.

Table 10. Pond production information in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production (tonnes whole-fish basis) (1)	1640	1995	2464
Average price ($/kg) (1)	$7.88	$8.81	$9.87
Total value ($ million) (1)	$12.92	$17.57	$24.31
Market (% sold within Australia) (1)	100%	100%	100%
Number of ponds stocked	235	217	218
Total area stocked (hectares)	107	101	97
Average area (hectares)	0.4	0.5	0.4
Total fingerlings stocked (million) (1)	3.40	2.85	1.97
Fingerlings stocked/hectare	29 800	28 300	20 300
Feed used (tonnes) (1)	2 710	2 926	3230
Feed source (% manufactured in Australia) (1)	100%	100%	97%
Estimated FCR (1)	1.7:1	1.6:1	1.5:1

(1) Includes one sea cage farm

4.5 Fingerling production

Barramundi fingerling production increased from 4.5 million in 2006–07 to 8.5 million in 2007–08. Ten farms sold barramundi fingerlings during the year (see sections 8.2 and 8.3 of this report for restocking and aquarium sales).

A total of 4.2 million fingerlings worth $3.0 million were sold for growout (3.4 million worth $1.3 million in 2006–07). The average fingerling price was 73 cents each in 2007–08 (compared with 39 cents in 2006–07).

Table 11. Recirculating farm production information in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production (tonnes whole-fish basis)	105	96	82
Average price ($/kg)	$10.57	$9.89	$10.84
Total value ($ million)	$1.11	$0.95	$0.89
Market (% sold within Australia)	65%	99%	99%
Number of tanks stocked	227	138	115
Total volume stocked (m^3)	1400	1400	950
Average volume (litres)	6100	10 100	14 200
Total fingerlings stocked	533 000	325 250	185 500
Fingerlings stocked per m^3	384	233	114
Feed used (tonnes)	112	111	100
Feed source (% manufactured in Australia)	84%	100%	97%
Estimated FCR	1.1:1	1.2:1	1.2:1

4.6 Farm labour

Permanent labour employed in the pond and cage growout sector of the industry increased from 78 units in 2006–07 to 84 units in 2007–08. Over the same period permanent labour in the recirculating farms increased from seven units to 10 units.

Productivity on the pond and cage farms has increased from 25.5 tonnes of fish per unit in 2006–07 to 29.1 tonnes of fish per unit in 2007–08. Productivity in tank farms nearly doubled from 14 tonnes per unit in 2006–07 to 26 tonnes per unit in 2007–08.

Total casual labour for the pond and cage sector decreased from 49 200 hours in 2006–07 to 40 400 in 2007–08. Casual labour on recirculating farms decreased from 1700 hours in 2006–07 to 950 hours in 2007–08.

When the permanent and casual labour inputs are combined for the total industry the total number of FTE labour units increased from 111 in 2006–07 to 115 in 2007–08.

The dollar output per labour unit for the pond sector increased from $170 000 in 2006–07 to $227 000 in 2007–08, while for the recirculating sector the output decreased from $122 800 to $88 400 per unit.

4.7 Industry development

4.7.1 Barramundi industry development

Barramundi production has continued to grow in Queensland, with significant increases in interstate production (Northern Territory and Western Australia). The strength of this industry sector is that price has also increased with production, demonstrating strong consumer demand and value. In a maturing domestic market this increased production, as well as higher levels of white fish imports, places pressure on growers in the future with regard to product and industry marketing.

In response to market pressures, DEEDI hosted a meeting between members of the Australian Barramundi Farmers Association (ABFA)—the national industry representative body—and several marketing consultants in mid-2008 to bring forward ideas to promote the industry sector and its products. At the Australasian conference, ABFA members were presented with options for TV commercials that targeted different consumers to further develop demand pull. ABFA members are yet to decide how to best promote their industry and products. Although the Aussie dollar has fallen and import prices will rise, the economic slow down will require the industry to focus on promotion to maintain and grow its industry position into the future.

DEEDI continues to work with ABFA on industry development matters, including the introduction of environmental management systems (EMS) for farms. Queensland Primary Industries and Fisheries published the *Queensland barramundi farming status report 2008*, highlighting barramundi's strong industry growth. The report included an estimate of the financial costing of pond-based farming using the economic model, BarraProfit.

4.8 Publications

Curtis, M., and Wingfield, M. (2004) *Recirculation aquaculture systems information*, Information Series QI 04047

Macbeth, M., et al. (2002) *Selective breeding in barramundi: technical report for the Australian Barramundi Farmers Association*, Information Series QI 02067

Queensland Primary Industries and Fisheries (2008) *Queensland barramundi farming status report (2008)* The State of Queensland, DEEDI

4.9 Further information

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5. Redclaw

5.1 General

Production of redclaw crayfish (*Cherax quadricarinatus*) decreased sharply from 100.2 tonnes in 2006–07 to 66.9 tonnes in 2007–08. This decrease was primarily due to a couple of the larger redclaw farms downscaling production while the properties were being offered for sale. Over the same period the total value of the industry decreased from $1.4 million to $1.1 million. In addition to food sales, there was a small quantity of juveniles sold to aquaculture farms and some stock was sold to the aquarium trade (reported under section 8.3.3).

From the 201 returns mailed (204 in 2006–07) there were 172 responses (186 in 2006–07). Thirty-seven farms produced redclaw crayfish in 2007–08, compared with 46 farms in the previous year (Table 12).

5.2 Growout

The number of farms that produced more than one tonne decreased from 17 in 2006–07 to 16 in 2007–08. These 16 farms produced 93% of the state's production with the top six farms producing 66% of the total production. There were 135 farms that reported no production at all for 2007–08 (compared with 140 farms in 2006–07).

In 2007–08 the average price obtained for redclaw crayfish was $16.39. This was a 13.5% increase on the $14.45 achieved in 2006–07. The average prices reported ranged from $7.50/kg to $23.70/kg although most sold in the $14/kg to $18/kg range.

The total available ponded area on farms decreased from 100 hectares in 2006–07 to 84 hectares in 2007–08. There were 500 growout ponds stocked with redclaw in 2007–08, totalling 55 hectares; however, only 416 ponds (47 hectares) were harvested. The average pond size has remained at 0.11 hectares.

Average farm productivity (calculated from harvested growout area) was 1420 kg/ha, which was a decrease from the 1670 kg/ha achieved in 2006–07. The average yield for the 21 farms producing over 500 kg was 1520 kg/ha. For the 16 farms producing over 1000 kg the average was 1610 kg/ha, and for the five farms producing over 5000 kg the average productivity was 1800 kg/ha. Average yields for the 16 farms producing over 1000 kg ranged from 780 kg/ha to 2700 kg/ha, with five of these farms producing over 2000 kg/ha.

Total feed purchased was 122 tonnes in 2007–08 (well down from the 227 tonnes purchased in 2006–07). The estimated average feed conversion ratio improved substantially from 2.3:1 in 2006–07 to 1.8:1 in 2007–08.

In 2007–08 the majority of product (97%) was sold on the domestic market. The proportion of domestic sales increased from the previous year when 88% of product was sold domestically.

Table 12. Redclaw crayfish production and authorities in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production (tonnes)	104.9	100.2	65.5
Average price ($/kg)	$12.43	$14.45	$16.39
Total value ($'000)	$1304	$1448	$1096
Pond production (kg)	**No.**	**No.**	**No.**
1 to 100	18	9	9
101 to 500	20	12	7
501 to 1000	6	8	5
1001 to 5000	11	11	11
Over 5000	4	6	5
Number of producing farms	59	46	37
Number of non-producing farms	128	140	135
Number of responses	187	186	172
Number of farms surveyed	211	203	201

5.3 Tank-based production

No tank-based production was reported in 2007–08.

5.4 Juvenile production

The reported juvenile production decreased from 3.4 million in 2006–07 to 3.1 million in 2007–08. Sales decreased from 5000 in 2006–07 to 3000 in 2007–08 while the value of sales increased from $850 to $2500. The reported number of juveniles stocked decreased from 4.2 million (30 farms) in 2006–07 to 2.6 million (26 farms) in 2007–08. The average stocking rate of juveniles into growout ponds decreased from 5.3/m^2 to 4.7/m^2.

5.5 Labour

Total permanent labour employed decreased from 38 units in 2006–07 to 31 units in 2007–08. The total hours of casual labour used on farms increased from 2170 hours to 2410 hours.

In terms of labour efficiency the number of permanent labour units used to produce one tonne of crayfish increased from 0.4 units in 2006–07 to 0.5 units in 2007–08. The number of casual hours also increased from 22 hours per tonne in 2006–07 to 37 hours per tonne in 2007–08.

When the permanent and casual labour inputs are combined, the sector employed 32 FTE labour units in 2007–08 (compared with 39 FTE labour units in 2006–07). The product output per labour unit decreased from 2570 kg ($37 200) in 2006–07 to 2090 kg ($34 200) in 2007–08.

5.6 Publications

Bitomsky J. (2008) *Scoping analysis: redclaw industry development*. Available through Kleinhardt Business Consultants or Primary Industries and Fisheries

McPhee C., Jones C., Shanks S. (2004) 'Selection for increased weight at nine months in redclaw crayfish (*Cherax quadricarinatus*)', *Aquaculture* 237:131–140

Stevenson, J. (2005) Notes from the 6th annual redclaw conference—9 and 10 September 2005. Publication of the Queensland Crayfish Farmers Association

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

5.7 Further information

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6. Freshwater fish

6.1 General

The total production from the freshwater fish sector (species other than barramundi) decreased slightly from 210 tonnes in 2006–07 to 198 tonnes in 2007–08. Over the same period the value of the sector still managed to increase very slightly, rising from $2.2 million to $2.35 million. This contrasts with the previous year when both production and value increased by nearly 50%.

The three main species produced are silver perch (*Bidyanus bidyanus*), jade perch, or Barcoo grunter, (*Scortum barcoo*) and Murray cod (*Maccullochella peelii peelii*). There was only minor production of sleepy cod (*Oxyeleotris lineolatis*) and golden perch (*Macquaria ambigua*). Silver perch production was valued at $700 600 with an average price of $9.20/kg; jade perch production was valued at $573 500 with an average price of $9.74/kg; and Murray cod production was valued at $1 million with an average price of $17.42/kg.

Jade perch production increased by 18% (from 2006–07) to 58.9 tonnes, whereas silver perch production fell by 15% to 76.2 tonnes and Murray cod production fell by 11% to 57.5 tonnes. In 2007–08 silver perch accounted for 39% of freshwater fish production (43% in 2006–07), jade perch 30% (24% in 2006–07), Murray cod 29% (31% in 2006–07) and all other species 2%. Recirculating tank systems accounted for nearly 26% (52 tonnes) of the total freshwater fish production (compared with 23% or 49 tonnes in 2006–07).

Statistical returns were mailed to 153 licensed freshwater fish producers and 130 were returned. One hundred and two respondents primarily used pond-based systems and 28 primarily used recirculating tank systems. Many of the authority holders have a number of different species on their approval and produce these species in ponds, tanks or a combination of both systems.

6.2 Silver perch

Statistical returns were mailed to 128 authorised silver perch producers and 119 were returned. Ten authority holders produced and sold silver perch in 2007–08. All of the producing farms used pond-based systems. In 2007–08 13 farms produced fish, including one producer using a tank-based system.

In the previous year (2006–07) the silver perch industry experienced a strong increase in production; however, in 2007–08 production decreased by 15%. In 2007–08 production totalled 76.2 tonnes (89.9 tonnes in 2006–07) and the total value of the industry was $700 600 ($791 600 in 2006–07). The average price (whole-fish basis) increased by 4% from $8.81/kg to $9.20/kg.

6.2.1 Pond systems

The total ponded area of producing farms increased from 24.5 hectares in 2006–07 to 30 hectares in 2007–08. However, over the same period, the total area stocked with silver perch decreased from 24 hectares to 17 hectares and the area harvested increased from 21.1 hectares to 21.8 hectares. The number of fingerlings stocked decreased from 515 000 to 275 000. The average stocking rate decreased from 21 500 per hectare to 15 900 per hectare.

Total food used increased from 170 tonnes in 2006–07 to 177 tonnes in 2007–08. Over this same period the FCR increased from 1.9:1 to 2.3:1.

Table 13. Silver perch production by aquaculturists in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production (tonnes whole-fish basis)	61.2	89.9	76.2
Average price ($/kg)	$8.37	$8.81	$9.20
Total value ($'000)	$512	$792	$701
Average yield (kg/ha)	3550	4162	3500
Number of survey responses	106	115	119
Number of producing farms	16	13	10

6.2.2 Recirculation systems

In 2007–08, 25 farms using tank-based recirculation systems were registered for silver perch production. None of these operations reported any production in 2007–08.

6.3 Jade perch

Statistical returns were mailed to 71 licensed jade perch producers and 63 were returned. Jade perch production in 2007–08 totalled 58.9 tonnes, which was a 15% increase from the 51.2 tonnes produced in 2006–07. In 2007–08 production came from six pond-based systems and one tank-based operation. Table 14 combines production from both pond and tank systems.

From the responses received the number of authority holders that produced and sold jade perch has remained relatively stable over the last two years. The total value of sales increased by more than 26% to $573 400, while the average price increased by 10% to $9.74/kg.

6.3.1 Pond systems

The total ponded area of farms decreased marginally from 9.1 hectares in 2006–07 to 8.8 hectares in 2007–08. Over the same period the total area stocked to jade perch increased from 7.6 hectares to 8.0 hectares. The area harvested increased from 5.4 hectares to 8.4 hectares and the average yield decreased from 8.7 t/ha to 6.5 t/ha. In 2007–08 the number of fingerlings stocked in ponds was 88 000, compared with 143 700 the previous year. Over the same period the average stocking rate decreased from 19 000 per hectare to 11 100 per hectare.

Total food used increased from 101 tonnes in 2006–07 to 120 tonnes in 2007–08, while the FCR increased marginally from 2.1:1 to an estimated 2.2:1.

6.3.2 Recirculation systems

In 2007–08, 21 farms using tank-based recirculation systems were authorised for jade perch production. Only one of these operations reported any production and therefore (for confidentiality reasons) the production details cannot be released.

Table 14. Jade perch production by aquaculturists in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production (tonnes whole-fish basis)	41.9	51.2	58.9
Average price ($/kg)	$8.25	$8.86	$9.74
Total value ($'000)	$346	$454	$573
Average pond-based yield (kg/ha)	6550	8740	6470
Number of survey responses	50	66	63
Number of producing farms	8	8	7

6.4 Murray cod

The 2007–08 year is the third year that Murray cod production could be reported in detail. This was due to significant increases in both the quantity of Murray cod being produced and the number of aquaculturists that are now producing this species. Statistical returns were mailed to 45 authorised Murray cod producers in 2007–08 and 40 were returned.

Murray cod production in 2007–08 totalled 57.5 tonnes, which was a 12% decrease from the 65.1 tonnes produced in 2006–07. However, the total value of the industry still increased by 7%, rising to just over $1 million (from $937 500 in 2006–07). This increase was the result of a 21% increase in the average farm gate price for Murray cod (prices increased from $14.40/kg in 2006–07 to $17.40/kg in 2007–08). In 2007–08 four farms produced Murray cod (same as 2006–07).

6.4.1 Murray cod production details

Because all Murray cod production came from only four farms, all published information must combine production from both pond-based and tank-based systems so as not to breach client confidentiality. There were a total of 170 000 Murray cod fingerlings stocked in 2007–08 (compared with 370 000 in 2006–07). The total food used increased from 81 tonnes in 2006–07 to 89 tonnes in 2007–08. The FCR increased from 1.2:1 to 1.5:1. These results are consistent with reports that some growers are holding on to a significant number of fish to achieve an additional season's growth.

Table 15. Murray cod production by aquaculturists in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production (tonnes whole-fish basis)	42.2	65.1	57.5
Average price ($/kg)	$12.60	$14.40	$17.40
Total value ($'000)	$531	$937	$1002
Average pond-based yield (kg/ha)	6780	5160	na*
Number of survey responses	33	38	40
Number of producing farms	5	4	4

* Not available for publication

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 in 2007–08 was 4.0 tonnes valued at $74 500 (compared with 3.5 tonnes valued at $60 000 in 2006–07). Because both golden perch and sleepy cod are well regarded in the market place, the average price was relatively high at $18.60/kg.

6.6 Labour (freshwater fish)

The total number of permanent labour units in the freshwater fish growout sector decreased from 22.9 in 2006–07 to 18 in 2007–08. For silver perch the output has increased from 8.3 tonnes per unit in 2006–07 to 8.6 tonnes per unit in 2007–08. Over the same period jade perch production increased from 9.5 tonnes per labour unit to 10.8 tonnes per labour unit. The output for Murray cod increased from 9.3 tonnes per labour unit to 15 tonnes per labour unit.

Combined casual labour for all freshwater species was 480 hours (compared with 1800 hours in 2006–06). The total FTEs for the freshwater sector were 18 units in 2007–08 (compared with 24 units in 2006–07).

The dollar output per labour unit for the sector increased strongly for the second consecutive year, rising to $130 000 (compared with $48 000 in 2005–06 and $94 000 in 2006–07). For silver perch the output increased from $73 500 in 2006–07 to $78 900 in 2007–08. Jade perch increased from $84 00 to $105 600. Murray cod increased from $134 200 to $261 300.

6.7 Industry development

Freshwater fish production continues to demonstrate strong growth. The growth is even more significant given that it has been achieved in well-publicised drought conditions.

The sector continues to be well represented by the Aquaculture Association of Queensland (AAQ) through quarterly workshops and its annual conference. As these systems operate as closed systems, the continuation of bioremediation research at the DEEDI Walkamin Research Station to mitigate nutrient build-up is most important.

A joint meeting in November between Queensland and New South Wales departmental research managers and AAQ agreed to establish whole-of-industry support across Queensland and New South Wales for a national industry development plan that identified key research priorities.

6.8 Publications

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

Rowland S.J., 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

6.9 Further information

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7. Eel culture

7.1 General

Production from the eel aquaculture industry in Queensland was 28.7 tonnes and constitutes a small decrease in production from the 32.4 tonnes produced in 2006–07.

In 2007–08 there were three operations selling eels (comprising four farms). The producing farms were contacted and agreed to release the current and previous year's production data for publication.

The primary species of eel grown by aquaculturists is the long-finned eel (*Anguilla reinhardtii*), with much smaller quantities of short-finned eel (*A. australis*) also grown.

Over the last three years all eels produced were exported and marketed live. Table 16 summarises the farm pond and tank stocking and production details for the period 2005–06 to 2007–08.

In addition to the sale of adult eels, new management arrangements introduced in 2005 allow for the sale of juvenile eels. This has resulted in the sale of a significant quantity of weaned juvenile eels. The details relating to the sale of juvenile eels cannot be released due to confidentiality issues but the value is included in the sundry category of this report.

Total feed purchased was 38.3 tonnes in 2007–08 compared with 53.5 tonnes in 2006–07. The estimated average FCR decreased from 1.6:1 in 2006–07 to 1.3:1 in 2007–08.

Table 16. Eel production by aquaculturists in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production (t)	21.0	32.4	28.7
Total value ($)	$355 100	$544 800	$491 960
Average price ($/kg)	$16.92	$16.80	$17.10
Number of producing farms (1)	4	4	4
Ponds—total area (ha)	2.1	2.6	3.0
Ponds—average area (m^2)	1930	2000	2700
Tanks—total volume (m^3)	95	58	134
Tanks—average volume (L)	3960	1810	3810
Stocking—glass eels and elvers (no.)	1 019 000	423 000	656 200

(1) Two of the farms work closely and effectively sell as a single entity

7.2 Labour

The industry has six permanent staff (six in 2006–07) and employed 170 hours of casual labour. This equates to seven FTEs, which is one more than the previous year. The dollar output per labour unit decreased significantly from $91 500 in 2006–07 to $74 000 in 2007–08. The output per labour unit would be significantly higher if the juvenile eel sales were also included.

7.3 Industry development

Eel culture declined slightly in 2007–08, although interest in the potential of this industry remains strong, especially with declines in wild stocks in other countries and low production in other southern states. A number of glass eel collection permits changed hands with a high market value reported.

Discussion within industry of re-establishing its peak body and developing an industry development plan has occurred. This is seen as an important step in industry development. Some industry restructure is occurring with the development of a cooperative growout operation in North Queensland and some specialisation in the catching of glass eels elsewhere.

Industry consultation has identified research that provides management of gender ratios in immature eels as a way to stimulate increased aquaculture production.

7.4 Publication

Policy for the management arrangements for the commercial harvesting and use of juvenile eels (February 2006) is available on the Queensland Primary Industries and Fisheries website at www.dpi.qld.gov.au

7.5 Further information

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8. Hatchery and aquarium

8.1 General

A total of 79 hatchery and aquarium operations were surveyed and responses were received from 72. The hatcheries produced a wide range of fish for use in aquaria, commercial growout and stocking in public impoundments. Table 17 summarises statistics for the major species produced in 2006–07 and 2007–08.

The total value of this sector rose significantly from $3.51 million in 2006–07 to $6.66 million in 2007–08. Over the same period sales for the sector increased from 8.2 million to 9.6 million. The major impact on the value of the sector was due to barramundi fingerling production. Barramundi fingerling sales increased over 40% and the value of the individual fish increased by 85% as hatcheries sold larger size fingerlings.

For the second consecutive year, the number of fingerlings species sold for farm stocking decreased slightly from previous year's figures. This down-turn is largely due to reduced stocking activity associated with drought conditions.

Exotic ornamental sales increased by 17% from the previous year; however, native ornamental sales decreased by more than 60%.

The hatchery sector has been expanding over the last few years to include a number of hatcheries producing a range of marine species for the aquarium trade, commercial growout and for stocking. They are reported collectively in Table 17 as 'marine hatchery and aquarium'.

Table 17. Hatchery production of native fingerlings and ornamental aquarium species in Queensland (2006–07 and 2007–08)

Species	2006–07			2007–08		
	Sales (no.)	Value ($)	Avg ($)	Sales (no.)	Value ($)	Avg ($)
Barramundi (farm and stocking)	3 429 410	1 271 050	0.39	4 847 190	3 489 420	0.72
Golden perch (farm and stocking)	724 600	161 200	0.22	463 840	83 450	0.18
Australian bass (farm and stocking)	1 192 020	228 040	0.19	1 780 400	266 710	0.15
Silver perch (farm and stocking)	446 560	100 050	0.22	363 270	74 320	0.20
Jade perch (farm)	238 540	52 680	0.22	84 590	15 820	0.19
Murray cod, Mary River cod and sleepy cod (farm and stocking) (1)	61 900	43 715	0.39	107 110	74 070	0.69
Ornamental fish (exotics) (2)	1 320 480	725 450	0.55	1 547 360	659 560	0.43
Ornamental fish (natives) (2) (3)	1 186 790	475 150	0.40	420 323	277 210	0.66
Ornamental invertebrates	(5)	44 720		(5)	109 060	0.54
Marine hatchery and aquarium (1) (4)	(5)	402 960		(5)	1 606 000	
Total (returns received)	**8.20 m**	**$3.51 m**		**9.61 m**	**$6.66 m**	

Notes:
(1) Species combined as insufficient producers to maintain individual confidentiality.

(2) Species grouped as individual species data was not obtained.

(3) All native freshwater fin fish sold to aquarium trade (e.g. rainbows, native ornamentals, saratoga and lungfish, as well as barramundi, golden perch etc.).

(4) Includes oyster and pearl oyster spat, barramundi cod, cobia, mangrove jack, mullet, aquarium fish, seahorses, corals and sandfish production.

(5) Combines different phyla and developmental stages and therefore not appropriate to include numbers.

8.2 Stocking and growout species

The hatchery operations that produced the stocking and growout species listed below used 217 ponds in 2007–08 compared with 222 ponds in 2006–07. Over this period the total ponded area decreased from 43 hectares to 32 hectares. The average pond area decreased from 1950 m^2 in 2006–07 to 1500 m^2 in 2006–07. The sector also used 93 tanks totalling 550 m^3 in 2007–08 (down from 187 tanks totalling 955 m^3 in 2006–07).

8.2.1 Barramundi

Barramundi (*Lates calcarifer*) fingerlings were produced in 13 hatcheries (up from 10 in 2006–07). Total production for 2007–08 was 9 million fingerlings, which was double the 4.5 million produced in 2006–07. The majority of fingerlings were sold to growout farms, with 4.2 million sold for $3.1 million. Although the number of fingerlings sold to farms in 2007–08 increased by 30% from the 3.2 million sold in 2006–07, the value of these sales increased by 130% to $3 million from $1.3 million sold in 2006–07. The increased value was largely a result the average price per fingerling rising from $0.39 in 2006–07 to $0.72 in 2007–08.

The number of fingerlings sold for stocking increased by over 400% from 127 000 ($148 000) in 2006–07 to 653 000 ($438 000) in 2007–08. Over this period the average price for fingerlings sold for stocking increased from $0.55 to $0.67. The price increase for fingerlings sold to both farms and stocking primarily resulted from an increasing demand for larger fingerlings. In addition to fingerling sales, one farm sold a significant quantity of fry. Details relating to the sale of barramundi fry have not been included in this section of the report as they are not directly comparable to fingerling sales; however, the value is included in the sundry category of this report. A substantial portion of fingerlings produced were not sold as they were required to stock the farm that produced them.

8.2.2 Golden perch

Golden perch (*Macquaria ambigua*) fingerling production was undertaken by five hatcheries (five also in 2006–07). The total value of fingerling sales in 2007–08 was $83 450. Production continued to decline from the 1.81 million sold in 2005–06, 725 000 in 2006–07, to just 464 000 in 2007–08. Stocking accounted for the vast majority of sales (446 000) valued at $80 000. The farming sector purchased only 18 000 fish.

For the first time in four years the hatchery sector has achieved some production of Lake Eyre strain golden perch; however, available supplies were still well below industry demand for this highly regarded strain of golden perch.

8.2.3 Australian bass

Australian bass (*Macquaria novemaculeata*) were produced primarily for impoundment stocking. Production occurred in four hatcheries in 2007–08 (four also in 2006–07). Production increased from 1.28 million in 2006–07 to 2.11 million in 2007–08. Sales also increased from 1.19 million ($228 040) in 2006–07 to 1.78 million ($266 710) in 2007–08. The farming sector purchased 50 000 fingerlings.

8.2.4 Silver perch

Silver perch (*Bidyanus bidyanus*) fingerling production was undertaken by six hatcheries in 2007–08 (nine in 2006–07) and decreased from 792 000 in 2006–07 to 402 000 in 2007–08. The number sold decreased from 446 560 in 2006–07 to 363 270 in 2007–08. Sales to growout operations dropped slightly from 196 100 ($49 300) in 2006–07 to 150 000 ($27 200) in 2007–08. Sales to stocking decreased slightly from 250 500 ($50 800) in 2006–07 to 214 000 ($47 000) in 2007–08.

8.2.5 Jade perch

Jade perch, or Barcoo grunter, (*Scortum barcoo*) fingerlings came from four hatcheries (four in 2006–07). All sales were to the farm growout sector with some being sold overseas. Sales decreased sharply from to 238 450 ($52 680) in 2006–07 to 84 590 ($15 820) in 2007–08. This decrease was largely due to production problems encountered by the hatcheries. In addition to fingerling sales one hatchery sold a significant quantity of fry. Details relating to the sale of jade perch fry have not been included in this section of the report as they are not directly comparable to fingerling sales; however, the value is included in the sundry category of this report.

8.2.6 Murray cod, Mary River cod and sleepy cod

Murray and Mary River cod (*Maccullochella* sp.) and sleepy cod (*Oxyeleotris lineolatus*) sales were combined to maintain confidentiality of the information supplied by the four hatcheries that produced any of these fish (six hatcheries produced cod in 2006–07). Sales for these species increased 61 900 ($43 715) in 2006–07 to 107 110 ($74 070) in 2007–08. Growout farms purchased 60% of the fingerlings with the rest going to the stocking program.

8.3 Freshwater aquarium and ornamental species

The producers growing freshwater aquarium and ornamental species (listed below) used 267 ponds in 2007–08 (compared with 328 ponds in 2006–07). Ponds covered an area of 14 hectares in 2007–08 (same as 2006–07). The average pond area increased from 438 m^2 in 2006–07 to 520 m^2 in 2007–08. The sector also used 1240 tanks totalling 690 m^3 in 2007–08 (compared with 714 tanks totalling 1335 m^3 in 2006–07).

8.3.1 Exotic ornamental fish

Exotic freshwater ornamental fish were produced from nine hatcheries in 2007–08 (14 in 2006–07). The number of fish sold increased from 1.32 million fish in 2006–07 to 1.55 million in 2007–08; however, the value decreased from $725 450 in 2006–07 to $659 560 in 2007–08.

8.3.2 Native ornamental fish

Native freshwater ornamental fish (including lungfish and saratoga) were produced on 16 farms in 2007–08 (21 in 2006–07). The number of fish sold decreased from 1.19 million ($475 150) in 2006–07 to 420 323 ($277 210) in 2007–08.

8.3.3 Ornamental invertebrates

Invertebrates (primarily freshwater prawns, redclaw crayfish and tadpole shrimp) were sold into the aquarium trade by six farms in 2007–08 (also six farms in 2006–07). Only the value of sales is reported in this section as the group is very diverse and individual counts were not always reported. The value of invertebrates sold increased by 144% from $44 720 in 2006–07 to $109 060 in 2007–08.

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. There were four hatcheries that sold product in 2007–08 (compared with five in 2006–07). Only the value of sales is reported in this section—the group is so diverse that it is not meaningful to tally and compare numbers of oyster spat with numbers of fish. The value of production has been strongly influenced by sales of reef fish fingerlings and has risen by nearly 300% from 403 000 in 2006–07 to $1.606 million in 2007–08.

8.5 Labour (hatchery and aquarium)

Statistics for the whole sector show that it now has 64 permanent staff (55 in 2006–07) and employed 15 500 hours of casual labour (18 800 hours in 2006–07). This equates to 72 FTEs employed in the sector, which was an increase of eight units from 2006–07. Output per labour unit increased by 71% from $54 300 in 2006–07 to $92 800 in 2007–08.

8.6 Industry development

Drought has affected some individuals within the industry, whereas other farms have maintained strong production. Overall, drought has had some impact on the supply of certain species.

Introduction of logbooks for culture stock collection and development of an AAQ Hatchery Code of Practice are two DEEDI-assisted industry development programs. All holders of general fisheries permits allowing for culture stock collection are now required to complete Culture Stock Collection (BR01) and Species of Conservation Interest (SOCI 01) logbooks. Introduction of the system included updated inland maps identifying Queensland waters by grid and site. This was achieved after extensive industry consultation.

A voluntary Hatchery Code of Practice managed by AAQ and supported by DEEDI was developed by industry to ensure high quality and disease-free fingerling production. This scheme is similar to the Hatchery Quality Assurance Scheme implemented in New South Wales. Future interstate recognition of both schemes is sought to maintain high quality trade of fingerlings between states.

Biosecurity of the ornamental aquaculture sector is managed by DEEDI exotic and translocation policies via development approvals (DAs) and self-assessable codes (SACs). In a recent review of DEEDI policies the transition of ornamental licences to DAs was finalised in late November 2007. The aquaculture production coming from developments approved under a SAC will be quantified in future as SAC conditions have been amended to include an annual reporting requirement.

Biosecurity of the aquarium/ornamental industry in Australia has been under review for some time via a whole-of-government review panel (DAFF, 2006). The recommendations of this national report are being implemented. The aim is to ensure biosecurity measures across the whole industry match the controls of the aquaculture section.

8.7 Publications

DAFF (2006) *A strategic approach to the management of ornamental fish in Australia*.

Lupton C., Cheetham R. (2007) Draft report: *Aquaculture Association of Queensland (AAQ) commercial hatchery code of best practice*.

NSW DPI (2007) Draft report: *Hatchery quality assurance scheme*.

DEEDI (2007) Draft report: *Implementation of the national ornamental strategy in Queensland*.

8.8 Further information

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9. Pearl oyster culture

9.1 General

The value of the pearl oyster industry in Queensland continues to fluctuate as some of the farms rebuild stocks of nucleated pearls. Four farms reported information this year.

Twelve pearl culture areas (PCAs) were surveyed and responses were received for 10 of these areas. Four farms produced marketable pearls. The lack of responses from previous years makes it impossible to provided details on production etc. between years.

The main species cultured are the gold lip oyster (*Pinctada maxima*), black lip oyster (*P. margaritifera*), and penguin oyster (*Pteria penguin*). Three new lease areas are being stocked with the akoya pearls (*Pinctada imbricata* or *P. fucata*). All of the pearls were marketed in Australia.

Table 18. Pearl oyster production by aquaculturists in Queensland (2006–07 and 2007–08)

	2006–07	2007–08
Value of production ($ million)	$1.706	$1.292
Number produced—round and baroque	26 700	21 240
Average price each ($)	$62	$57
Stocks on hand as of 30 June 2007		
Stock after 1st operation	43 700	11 300
Stock after 2nd operation	15 300	3 000
Stock after 3rd operation	300	800
Unseeded	70 600	38 300

9.2 Labour

A total of 14 permanent labour units were involved in the industry in 2007–08 (compared with 12 in 2006–07). Total casual hours employed in the industry was 65 100 in 2007–08 (compared with 663 680 in 2006–07). The total FTEs employed in the industry was 48 and the value of production per FTE was estimated to be $26 900.

9.3 Further information

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10. Edible oyster production

10.1 General

In Queensland all aquacultured oyster 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.

A total of 110 oyster areas authorised for aquaculture were surveyed during 2007–08, with 83 statistical returns received. The total production in Queensland has decreased by 3% from 141 000 dozen in 2006–07 to 136 400 dozen in 2007–08; however, the value of the industry has increased by 8% from $574 200 in 2006–07 to $620 500 in 2007–08. The average price per dozen oysters has increased by 20% from $3.79 per dozen in 2006–07 to $4.55 per dozen in 2007–08.

Oyster sales are one measure of change in an industry. To provide other indicators on industry growth and performance the numbers of shells introduced on to the authorised areas, stock losses and the stock on hand details are provided in Table 20.

Industry has indicated that problems with obtaining QX disease-resistant stock from New South Wales were having an impact on growth of the Queensland industry. This has resulted in introductions declining by 17% when compared with the previous season. The number of shells held on leases has increased by 29% which could result in higher production in the next season. Increased losses of shells from lease areas continue to affect total Queensland oyster production.

Table 19. Edible oyster aquaculturists in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Number of oyster areas surveyed	110	110	110
Number of responses	97	97	83
Number of oyster area not stocked	–	–	42
Production (dozens)	**No. of areas**	**No. of areas**	**No. of areas**
Nil	67	61	51
1 to 500	10	16	13
501 to 1000	5	5	5
1001 to 2000	6	5	6
2001 to 5000	2	4	2
5001 to 10 000	3	2	2
Over 10 000	4	4	4
Total producing oyster areas	**30**	**36**	**32**

Table 20. Edible oyster introductions, losses and stocks on hand in Queensland (2006–07 and 2007–08)

	2006–07	2007–08	Change (%)
Shells introduced (dozen)	263 217	217 261	– 17.5%
Losses (dozen)	104 710	123 276	+ 17.7%
Number on hand (30 June)	335 629	433 538	+ 29.0%

Table 21. Edible oyster production in Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Total production ('000 dozen)	161.5	141.0	136.4
Total value ($)	$574 200	$534 000	$620 500

Oysters are sold in a range of different sizes to meet market requirements. The three main categories used by the industry are bistro, bottlers and plate size. Table 22 summarises the different product types, average prices and the percentage of each product type. Bottlers make up 53% of the product marketed at an average price of $3.58 per dozen (7% higher than 2006–07).

The highest value product ($7.88 per dozen) is the plate size, which make up 9% of the product sold. Prices for this size increased by more than 13% per dozen. Bistro oysters at $6.58 per dozen accounted for 24% of production. Average prices increased by 20% from the previous year.

Table 22. Edible oyster marketing information for Queensland (2005–06 and 2006–07)

Packaging type	2006–07		2007–08	
	Price per dozen ($)	Market (%)	Price per dozen ($)	Market (%)
Bottlers	$3.35	53%	$3.58	53%
Bistro	$5.49	15%	$6.58	24%
Plate	$6.96	12%	$7.88	9%
Others	$1.90	20%	$2.62	14%
Average return—all oysters	$3.79		$4.55	

10.2 Labour

Total permanent labour employed in the industry was 21 units (17 in 2007–08), while total casual employment has been the same for the last two years at 1300 hours. This converts to 22 FTEs employed in the industry, which represents an increase of four from the previous year.

In terms of labour efficiency, the production per FTE for 2007–08 was 6100 dozen (compared with 8100 dozen in 2006–07). Total industry output decreased from $30 700 per labour unit in 2006–07 to $28 000 per labour unit in 2007–08.

10.3 Industry development

The Queensland Shellfish Water Assurance Monitoring Program (QSWAMP) continued during 2007–08 and industry maintains responsibility for undertaking sampling. DEEDI continue to manage the program and to date this has been a favourable decision with successful sampling undertaken by industry.

An Australian Quarantine and Inspection Service (AQIS) audit was conducted in April 2008. The Moreton Island growing area remains the only AQIS export-approved area.

A new Oyster Industry Development Plan for the Queensland Oyster Industry was completed for 2008–09. Some of the major actions resulting from this development plan included:

- A marketing and communication plan will promote and brand Queensland oysters to increase demand and productivity.
- Nursery operations/spat source will increase quality and viability of Queensland spat.

- A policy was implemented for the reallocation of unused marine aquaculture authorities.
- Improved land facilities will be developed to assist the industry to expand.
- The impact of attrition on oyster farms will be determined to increase the farm production.
- A policy was implemented for maximising rock oyster production through a reduction in latent effort and reallocation of unused oyster areas. This has resulted in the introduction of a productivity condition to all resource allocation authorities for oystering.
- The Oyster Industry Management Plan for Moreton Bay Marine Park was released in August 2008 and details how the oyster industry is to be managed within the Moreton Bay Marine Park. The plan will benefit industry by reducing duplication of licensing and administration and aid with the development of the Queensland rock oyster industry by providing confidence to long-term investment in the industry.

10.4 Publications

Queensland Oyster Industry Development Plan (2005) is available on the Queensland Primary Industries and Fisheries website at www.dpi.qld.gov.au

Queensland Oyster Industry Development Plan: Implementation Report (2007) is available on the Queensland Primary Industries and Fisheries website at www.dpi.qld.gov.au

QSWAMP sampling guideline is available on the Queensland Primary Industries and Fisheries website at www.dpi.qld.gov.au

Policy for maximising oyster production: management of non-productive areas (2007) is available on the Queensland Primary Industries and Fisheries website at www.dpi.qld.gov.au

The Oyster Industry Management Plan for Moreton Bay Marine Park (2008) is available on the Queensland Primary Industries and Fisheries website at www.dpi.qld.gov.au

10.5 Further information

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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 Census and Statistics.

The information presented in Tables 24 to 27 was compiled from the annual statistical returns received from licensed aquaculture producers. The totals include all sectors of the industry described in the earlier part of this report.

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

The number of returns received varies between years (as shown in Table 23). In any one year it may not be the same producers responding and this can affect the trends. Rounding errors can cause minor discrepancies in some of the totals.

Table 23. Response rates—Queensland (2005–06 to 2007–08)

	2005–06	2006–07	2007–08
Number of authorised producers (no.)	617	na*	580
Questionnaires mailed (no.)	784	793	784
Questionnaires received (no.)	684	708	665
Response rate (%)	87%	89%	85%

* Not available for publication

The main sectors (marine, barramundi and freshwater fish have a major influence on value and quantities produced.

The total farm gate value of production is highly dependent on marine prawns, which contributes approximately 54% (prawn growout and hatchery) of the total industry value and 52% of the total quantity of product sold. Barramundi is the next most significant industry sector with steadily increasing production. In 2007–08 barramundi growout and fingerlings contributed 26% of the total industry value and 38% of the total quantity of product sold. Four divisions (Northern, Far Northern, Moreton and Mackay) account for the majority of the production.

The largest increases in industry value occurred in the Northern division (18%) and Wide Bay division (5%). The Moreton division has declined by 9% over the previous year. The value of marine prawn production in Queensland has decreased by 2% while the value of barramundi production increased by 31% over the previous year.

Table 24. Farm gate value ($ million)—Queensland (2005–06 to 2007–08)

Statistical division	2005–06	2006–07	2007–08
Brisbane	$0.00	$0.00	$0.00
Moreton	$14.54	$15.47	$14.11
Wide Bay	$4.69	$5.02	$5.27
Darling Downs	$0.40	$0.72	$0.71
Fitzroy	$0.39	$0.30	$0.46
Central West	$0.00	$0.00	$0.00
Mackay	$9.13	$8.44	$8.57
Northern	$21.13	$24.57	$29.11
Far Northern	$20.21	$21.00	$20.56
Total	**$70.50**	**$75.52**	**$78.79**

Table 25. Total production (tonnes)—Queensland (2005–06 to 2007–08)

Statistical division	2005–06	2006–07	2007–08
Brisbane	0	0	0
Moreton	901	1143	855
Wide Bay	267	293	315
Darling Downs	34	58	48
Fitzroy	23	24	23
Central West	0	0	0
Mackay	646	583	614
Northern	1676	2037	2137
Far Northern	1772	1713	1712
Total	**5319**	**5851**	**5705**

Mackay, Far Northern and Northern divisions have the majority of the ponded areas in Queensland with Wide Bay and Moreton also having significant areas (Table 26).

The largest employment occurs in the Far Northern division, which employed over 30% of the aquaculture workforce in Queensland (Table 27). Total employment has decreased by 8% over the last 12 months.

Table 26. Total ponded area (hectares)—Queensland (2005–06 to 2007–08)

Statistical division	2005–06	2006–07	2007–08
Brisbane	0	0	0
Moreton	171	171	163
Wide Bay	131	127	122
Darling Downs	18	20	16
Fitzroy	13	8	6
Central West	0	0	0
Mackay	225	225	188
Northern	255	248	299
Far Northern	309	313	237
Total	**1122**	**1112**	**1031**

Table 27. Total employment (FTEs)—Queensland (2005–06 to 2007–08)

Statistical division	2005–06	2006–07	2007–08
Brisbane	0	0	0
Moreton	144	122	116
Wide Bay	64	80	61
Darling Downs	8	7	6
Fitzroy	9	6	6
Central West	0	0	0
Mackay	60	47	56
Northern	149	194	186
Far Northern	150	218	188
Total	**584**	**674**	**619**

12. Specialised areas—status report

12.1 Aquaculture planning program

12.1.1 Marine aquaculture planning (Great Sandy Region)

A draft Great Sandy Regional Marine Aquaculture Plan (GSRMAP) has been developed for consultation.

It includes the:

- GSRMAP (full details of proposed aquaculture sites, planning principles and management outcomes to minimise the risk of social and environmental impacts)

- GSRMAP implementation guidelines (specific management controls to achieve the GSRMAP management outcomes)

- *Great Sandy regional marine aquaculture management plan characterisation studies* (technical background information about the site evaluations).

The aim of the plan is to establish guidelines for sustainable marine aquaculture development, and to streamline and standardise assessment processes for future aquaculture applications within the boundaries of Great Sandy Marine Park. Great Sandy Marine Park stretches from Baffle Creek to Double Island Point, and allows non-intensive aquaculture activities (under permit) in certain areas—the zoning plan is administered by the Environmental Protection Agency (EPA). However, up until now there has been no comprehensive planning for aquaculture in the region. The draft GSRMAP will help to ensure clarity for future non-intensive aquaculture development within the marine park boundaries.

The locations of proposed aquaculture sites in the GSRMAP were selected after extensive consultation between industry and government. Local knowledge was sought at an early stage, with key stakeholder organisations providing information about the environment, marine mammals and turtles, fishing and boating activities, commercial use and tourism.

A separate policy is also being developed by DEEDI to establish a flexible and transparent pre-assessment process for future aquaculture development applications in Queensland. Aquaculture applications are currently considered on a non-competitive, 'first come, first serve' basis. The draft *Policy for allocation of marine aquaculture authorities* proposes a formal but flexible process for managing future applications using a combination of non-competitive and competitive processes. Competitive allocation involves an expression of interest process—the merit of each application will be evaluated by a panel using allocation criteria. If applicants are successful at this stage, they will need to submit a standard development approval application form.

Feedback regarding the draft GSRMAP and draft policy will be used to refine and finalise the plan and Policy in consultation with the Queensland Inter-agency Working Group for Aquaculture.

12.1.2 Further information

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Further information on aquaculture planning is available online at www.dpi.qld.gov.au

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