Status Report for PIRSA Fisheries

South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery

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April 2008

SARDI Aquatic Sciences Publication No. F2008/000067-1

SARDI Research Report Series No. 268

This publication may be cited as:
Currie, D.R. (2008). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery. Status Report for PIRSA Fisheries. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2008/000067-1.

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SARDI Research Report Series No. 268

Printed in Adelaide April 2008

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Signed:
Date: 4 April 2008
Distribution: PIRSA Fisheries, SARDI Aquatic Sciences Library
Circulation: Public Domain

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EXECUTIVE SUMMARY

1. During 2006/07, 18.4 tonnes of giant crab were harvested from South Australian waters. Most of this catch (89%) was harvested by two miscellaneous licence holders. Rock lobster fishers with giant crab quota entitlements accounted for 8% of the total, while the remainder (3%) was taken as by-product by commercial rock lobster fishermen not holding giant crab quota.
2. The majority of the catch in 2006/07 (9.9 tonnes; 54%) was harvested from ten offshore Marine Fishing Areas (MFAs) in the Northern Zone (NZ), while the remainder (8.5 tonnes; 46%) was harvested from five MFAs in the Southern Zone (SZ).
3. Total catch declined annually following the introduction of quotas in 1999, but has remained relatively stable (18 to 19 tonnes) since 2002/03.
4. In most recent seasons the TACC (22.1 tonnes) has not been harvested due to under-catch in the rock lobster quota sector. There is no evidence to suggest that the under-catch of giant crabs by rock lobster licence holders is a result of reduced abundance or availability of giant crabs. An economic assessment of the fishery may help to reveal the reasons why rock lobster licence holders have not landed their giant crab quota. During 2006/07, the targeted quota was largely taken in the SZ. By comparison, giant crab catches were approximately 30% less than the total allocated for the NZ.
5. Total fishing effort has declined annually since the introduction of quotas in 1999. Fishing effort decreased by 25% between 2005/06 and 2006/07 (20,936 to 15,636 potlifts).
6. Overall catch rates have progressively increased since the commercialisation of the fishery. During 2006/07, average CPUE was highest in the miscellaneous licensed sector (2.94 kg.pot lift^{-1}), and substantially lower in the rock lobster quota and rock lobster by-product sectors (0.60 and 0.09 kg.pot lift^{-1}, respectively).
7. The mean weights of landed giant crabs over the last six-year period have declined in both the NZ and SZ (9% and 1% respectively).
8. The proportion of females comprising the landed catch has progressively declined over the last six seasons in both the NZ and SZ (61% and 69% respectively).
9. Data were available to assess fishery performance against six of the seven interim performance indicators (PI) in each zone. Data was not available to assess the abundance of spawning females. Four of the PI (NZ targeted catch, NZ effort, SZ effort and SZ mean weight) were below the interim lower reference points.

1 INTRODUCTION

This *Status Report* updates previous *Stock Assessment Reports* for the South Australian Giant Crab Fishery (Currie and Ward, 2005; Currie *et al*., 2006), and is part of SARDI Aquatic Sciences ongoing assessment program for this fishery. The document summarises information collected in commercial logbook returns over the period 1 January 1986 to 31 May 2007.

2 FISHERY STATISTICS

2.1 Catch

The total annual catch of giant crab landed by the commercial sector (i.e. dedicated "miscellaneous" licence holders + rock lobster licence holders with giant crab quota + rock lobster licence holders with crab by-product entitlement) has varied markedly since 1986/87 (Figure 1a). In the earliest years of the fishery less than 500 kg of crab were collected annually, but landings increased sharply to 7.4 tonnes in 1992/93. Catches continued to rise over the next two seasons and reached 28 tonnes in 1994/95. This decreased over the next two seasons but reached a historical high of 34.6 tonnes during 1998/99. Catches declined annually following the introduction of quotas in 1999, but have remained relatively stable (18 -19 tonnes) over the last five seasons (2002/03 - 2006/07) (Table 1).

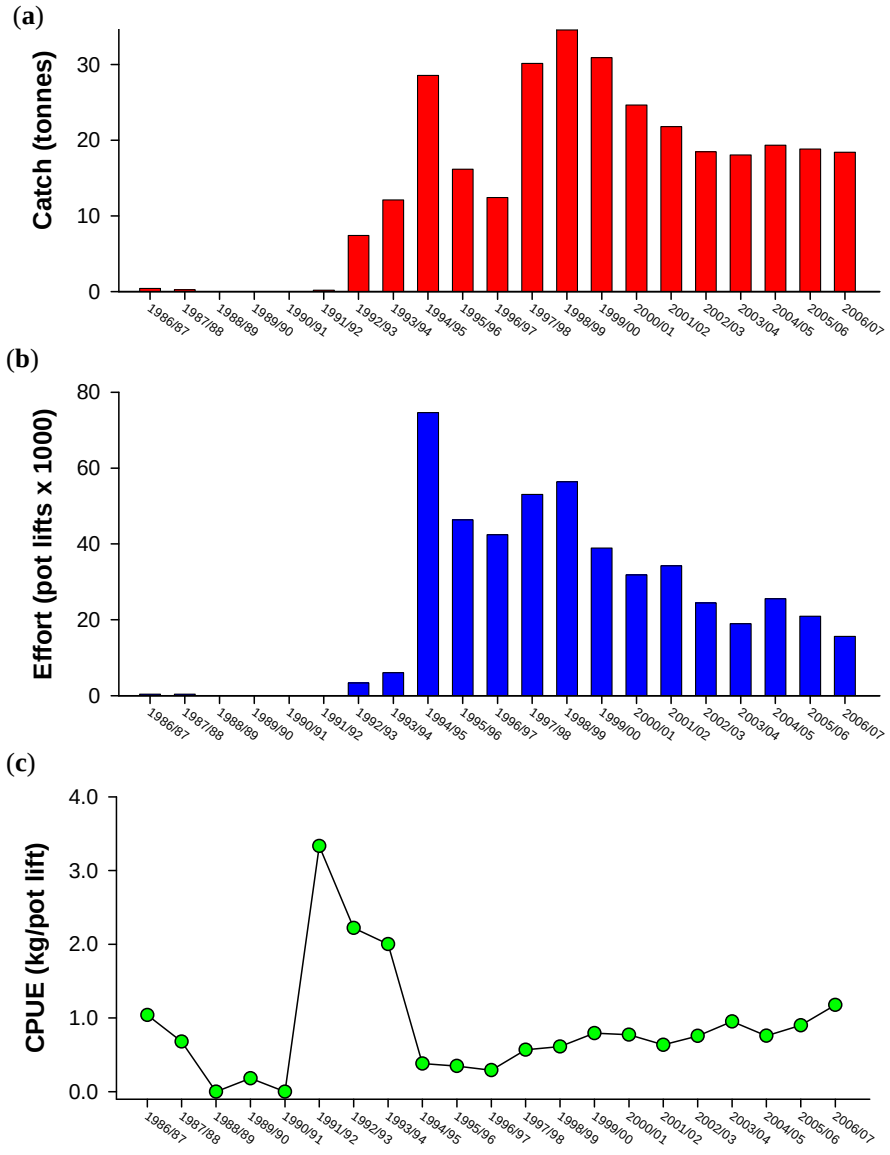

Figure 1. Inter-annual variation in a) total catch, b) fishing effort, and c) catch per unit effort (CPUE) for giant crab *Pseudocarcinus gigas* in South Australian waters.

Table 1. Total catch (kg) of giant crab taken in South Australian waters in each fishing zone since the establishment of TACC's in 1999. Note that no sectoral quotas are allocated prior to 2002/03, as the fishery was operated under a fully competitive TACC.

Season	Commercial Sector	Northern Zone	Southern Zone	Total Catch	Allocation
1999/00	Miscellaneous	15,104	4,535	19,639	-
	Rock Lobster Quota	3,254	4,082	7,336	-
	Rock Lobster By-product	1,081	2,843	3,924	-
	Total	19,439	11,460	**30,899**	-
	Total Allowable Commercial Catch (TACC)	13,400	12,600	26,000	-
2000/01	Miscellaneous	11,600	7,176	18,776	-
	Rock Lobster Quota	1,862	1,442	3,304	-
	Rock Lobster By-product	1,595	969	2,564	-
	Total	15,683	8,961	**24,644**	-
	Total Allowable Commercial Catch (TACC)	13,400	8,700	22,100	-
2001/02	Miscellaneous	9,016	5,514	14,530	-
	Rock Lobster Quota	2,478	1,329	3,807	-
	Rock Lobster By-product	1,984	1,457	3,441	-
	Total	13,478	8,300	**21,778**	-
	Total Allowable Commercial Catch (TACC)	13,400	8,700	22,100	-
2002/03	Miscellaneous	7,473	6,421	13,894	14,069
	Rock Lobster Quota	1,203	799	2,002	6,926
	Rock Lobster By-product	1,880	710	2,590	1,105
	Total	10,556	7,930	**18,486**	22,100
	Total Allowable Commercial Catch (TACC)	13,400	8,700	22,100	
2003/04	Miscellaneous	7,814	6,407	14,221	14,565
	Rock Lobster Quota	2,033	149	2,182	6,430
	Rock Lobster By-product	1,290	363	1,653	1,105
	Total	11,137	6,919	**18,056**	22,100
	Total Allowable Commercial Catch (TACC)	13,400	8,700	22,100	
2004/05	Miscellaneous	7,056	6,311	13,367	14,565
	Rock Lobster Quota	3,223	9	3,232	6,430
	Rock Lobster By-product	2,521	230	2,751	1,105
	Total	12,800	6,550	**19,350**	22,100
	Total Allowable Commercial Catch (TACC)	13,400	8,700	22,100	
2005/06	Miscellaneous	7,430	8,664	16,084	16,065
	Rock Lobster Quota	1,522	14	1,536	4,930
	Rock Lobster By-product	805	415	1,220	1,105
	Total	9,757	9,093	**18,850**	22,100
	Total Allowable Commercial Catch (TACC)	13,400	8,700	22,100	
2006/07	Miscellaneous	8,016	8,313	16,329	16,151
	Rock Lobster Quota	1,423	12	1,435	4,844
	Rock Lobster By-product	500	156	656	1,105
	Total	9,939	8,481	**18,420**	22,100
	Total Allowable Commercial Catch (TACC)	13,400	8,700	22,100	

2.2 Effort

Total fishing effort by the commercial sector has progressively declined over the last decade (Figure 1b), due mainly to annual reductions in potlifts by the rock lobster by-product sector. In 2006/07, the total effort was 15,636 potlifts, which is 25% less than in 2005/06 (20,936 potlifts).

2.3 CPUE

Catch rates for giant crab have progressively increased over the last decade (Figure 1c), and in 2006/07 the combined CPUE for all commercial sectors was 1.18 kg.pot lift^{-1}.

2.4 Catch, Effort and CPUE by Fishing Sector

Since the introduction of quotas in 1999, the proportion of the total catch landed by each commercial sector has remained relatively stable in the Northern Zone, but has varied considerably in the Southern Zone (Figure 2a). In the Northern Zone, seasonal landings by miscellaneous licence holders have ranged from 55–81% of the total catch, whilst rock lobster quota and rock lobster by-product sectors have taken 12–25% and 5–20% of the catch, respectively. In contrast, the relative catch landed by the miscellaneous sector in the Southern Zone has increased considerably in relation to both the rock lobster quota and rock lobster by-product sectors. During 1999/00, miscellaneous licence holders accounted for less than 40% of the catch, but by 2001/02 landings by this sector had increased to 66%. The proportional catch taken by the miscellaneous sector has subsequently increased in the Southern Zone, and in 2004/05 more than 98% of all giant crab landed were caught by miscellaneous licence holders

Changing levels of catch by each sector in the Southern Zone are consistent with shifts in the level of fishing effort applied by each sector. In 1999/00, the rock lobster by-product fishery accounted for 65% of the total effort in the Southern Zone (Figure 2b). Since then, the number of pots fished each season by this sector has gradually decreased. Between 1999/00 and 2006/07, the number of pots lifted in the Southern Zone rock lobster by-product fishery fell by more than 85%, and during 2006/07 represented just over 40% of the total fishing effort. Similar declines in effort have also occurred in the southern rock lobster quota fishery over the same period, while actual effort has remained relatively stable in the Southern Zone miscellaneous fishery (Figure 2b).

Although the share of catch taken by each fishing sector in the Northern Zone has remained relatively constant since 1999/00, the level of fishing effort applied annually by each sector has varied inconsistently among years (Figure 2b). In 1999/00, a similar number of pots (~5000) were deployed by all commercial sectors but by 2001/02 fishing effort was dominated by the rock lobster by-product sector (58%). In the Northern Zone during 2006/07, the rock lobster quota, rock lobster by-product and miscellaneous fisheries comprised 54% 23% and 23% of the total effort respectively.

Over the last eight seasons, catch rates in the miscellaneous fishery (i.e. Northern and Southern Zones) have been more than 5 times higher than those of the rock lobster quota fishery, and over 10 times higher than those in the rock lobster by-product fishery (Figure 2c). During 2006/07, catch rates for the miscellaneous fishery were higher in the Northern Zone (3.39 kg.pot lift-1) than in the Southern Zone (2.61 kg.pot lift-1).

2.5 Changes in Quota Holdings

Significant changes in quota holdings have occurred between fishing sectors since 2002/03, with rock lobster quota holders transferring permanently and leasing temporarily progressively larger volumes of their allocated catch to the miscellaneous sector (Table 2). As a result of permanent quota transfers, the total quota held by the miscellaneous sector has increased by 15% (2.1 tonnes) over the last five seasons. Most of this increase has resulted from quota transfers by rock lobster quota holders in the Southern Zone (1.5 tonnes), with transfers by quota holders in the Northern Zone accounting for less than a third of the total increase (0.6 tonnes).

Recent changes in quota holdings between the two principal commercial sectors (miscellaneous and rock lobster quota) appear to have had little direct effect on annual giant crab landings. Such changes may, however, be obscured by coincidental declines in crab landings within the by-product sector. Irrespectively, approximately 16% of the combined TACC has remained un-harvested each season since 2002/03. Most of this shortfall can be attributed to under-catch in the rock lobster quota sector, particularly in the Northern Zone.

Over the last five seasons, 50-70% of the catch allocated to the rock lobster quota sector (4844-6926 tonnes) has not been landed. In 2006/07, 2.7 tonnes of crab in the Northern Zone, and 0.7 tonnes of crab in the Southern Zone were unharvested by the rock lobster quota sector. In comparison, the catch allocated to the miscellaneous sector over the last five seasons has been landed (Table 2).

Changes in the landed catch and CPUE recorded in the miscellaneous sector are likely to be a more reliable indicator of giant crab stock status due to the dedicated and targeted nature of the miscellaneous licence fishing operations. Further analysis will be undertaken in future stock assessments to confirm this assumption.

Table 2. Giant crab quota (tonnes) allocated to each fishing sector and zone since the establishment of TACC's in 1999. No sectoral quotas are allocated prior to 2002/03, as the fishery was operated under a fully competitive TACC.

Season	Quota		Miscellaneous		By-product		Total
	NZ	SZ	NZ	SZ	NZ	SZ	
1999/00	-	-	-	-	-	-	26,000
2000/01	-	-	-	-	-	-	22,100
2001/02	-	-	-	-	-	-	22,100
2002/03	4,690	2,236	8,040	6,029	670	435	22,100
2003/04	4,690	1,740	8,040	6,525	670	435	22,100
2004/05	4,690	1,740	8,040	6,525	670	435	22,100
2005/06	4,190	740	8,540	7,525	670	435	22,100
2006/07	4,104	740	8,626	7,525	670	435	22,100

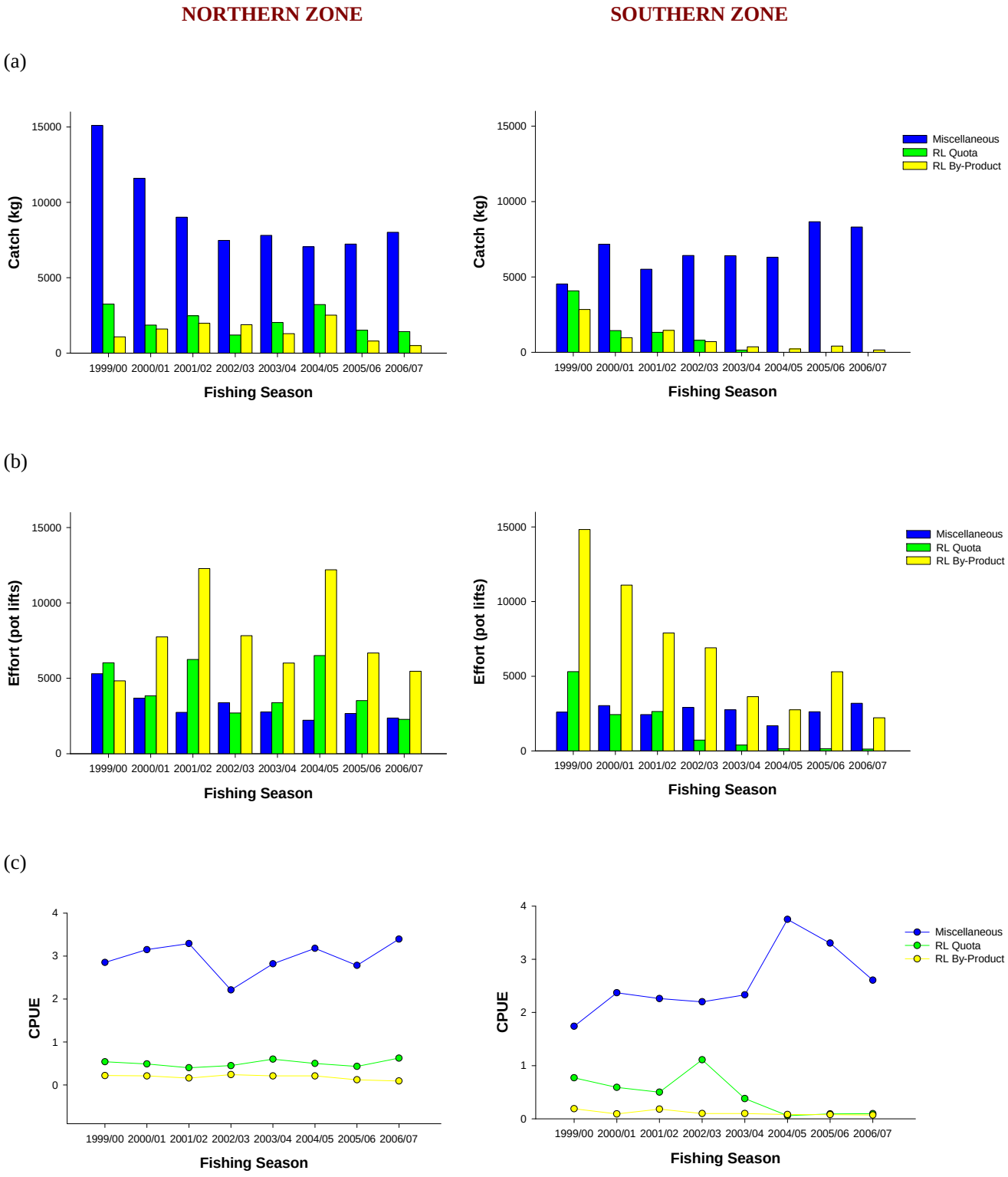

Figure 2. Plots of inter-annual differences in a) total giant crab catch, b) total fishing effort, and c) catch per unit effort between different fishing sectors (Miscellaneous, Rock Lobster Quota, and Rock Lobster By-product) and fishing zones (Northern and Southern) over the period 1999 to 2007.

3 PERFORMANCE INDICATORS

This section provides a report on the performance of the fishery against the interim performance indicators and reference points for the Giant Crab Fishery as defined in Sloan (2003). Insufficient data were available to assess the abundance of spawning females. Further, no upper or lower reference points are defined for sex ratio or spawning female abundance. Values of each PI in 2006/07 were derived from data provided by the miscellaneous and rock-lobster quota licence holders only.

3.1 Northern Zone

There are seven biological PI specified for giant crabs in the NZ. Data are available to assess fishery performance against six PI:

1. The targeted catch in the NZ in 2006/07 was 9.44 tonnes (Table 2; Figure 3). This represented 70.4% of the TACC (13.4 tonnes). This is below the lower reference point (85% of the TACC).

2. Total effort in the NZ was 4,637 potlifts in 2006/07. This value was outside the reference range (6,076 – 11,331 potlifts), and was more than 23% below the lower reference point.

3. During 2006/07, the catch rate in the NZ was 2.04 kg.potlift^{-1}. This value was within the reference range (1.5 – 3 kg.potlift^{-1}).

4. The mean weight of crabs harvested in the NZ in 2006/07 was 3.05 kg. This value was within the reference range (2.96 – 3.65 kg).

5. During 2006/07, the pre-recruit abundance in the NZ was 2.39 crabs.potlift^{-1}. This value was outside the reference range (1.6 – 1.7 crabs.potlift^{-1}), and more than 15% greater than the upper reference point.

6. The sex ratio (males:females) in the NZ in 2006/07 was 1:0.71.

3.2 Southern Zone

There are seven biological PI specified for giant crabs in the SZ. Data are available to assess fishery performance against six PI:

1. The targeted catch in the SZ in 2006/07 was 8.33 tonnes (Table 2; Figure 3). This represented 95.7% of the TACC (8.70 tonnes). This exceeds the lower reference point (85% of the TACC).

2. Total effort in the SZ was 3,311 potlifts in 2006/07. This value was outside the reference range (3,637 – 7,910 potlifts), and was more than 8% below the lower reference point.

3. During 2006/07, the catch rate in the SZ was 2.51 kg.potlift^{-1}. This value was within the reference range (1.5 – 3 kg.potlift^{-1}).

4. The mean weight of crabs harvested in the SZ in 2006/07 was 2.78 kg. This value was outside the reference range (2.96 – 3.65 kg), but did not exceed the lower reference point by >15%.

5. During 2006/07, the pre-recruit abundance in the SZ was 2.23 crabs.potlift^{-1}. This value was outside the reference range (1.6 – 1.7 crabs.potlift^{-1}), and more than 15% greater than the upper reference point.

6. The sex ratio (males:females) in the SZ in 2006/07 was 1:1.91.

Table 2. Key performance indicator estimates for the South Australian giant crab fishery in 2006/07. Note that all estimates presented here are derived from the miscellaneous and rock lobster quota fisheries only, and do not include information obtained from rock lobster by-product sector. Note also that the reference points for fishing effort have been calculated for the period 1999/00 – 2003/04, as they were not defined in the management plan. Values below the lower reference point are highlighted in red, while values exceeding the upper reference point are highlighted in green.

Location	Indicator	Upper Reference Point	Lower reference Point	Value in 2006/07
NZ	Catch (tonnes)	TACC	85% of TACC	70.4% of TACC
	Effort (pot lifts)	11331	6076	4637
	Catch rate (kg.potlift^{-1})	3	1.5	2.04
	Mean weight (kg)	3.65	2.96	3.05
	Pre-recruit abundance (no.potlift^{-1})	1.7	1.6	2.39
	Sex ratio (M:F)	Not defined	Not defined	0.71
	Spawning female abundance	Not defined	Not defined	No Data
SZ	Catch (tonnes)	TACC	85% of TACC	95.7% of TACC
	Effort (pot lifts)	7910	3637	3311
	Catch rate (kg.potlift^{-1})	3	1.5	2.51
	Mean weight (kg)	3.65	2.96	2.78
	Pre-recruit abundance (no.potlift^{-1})	1.7	1.6	2.23
	Sex ratio (M:F)	Not defined	Not defined	0.91
	Spawning female abundance	Not defined	Not defined	No data

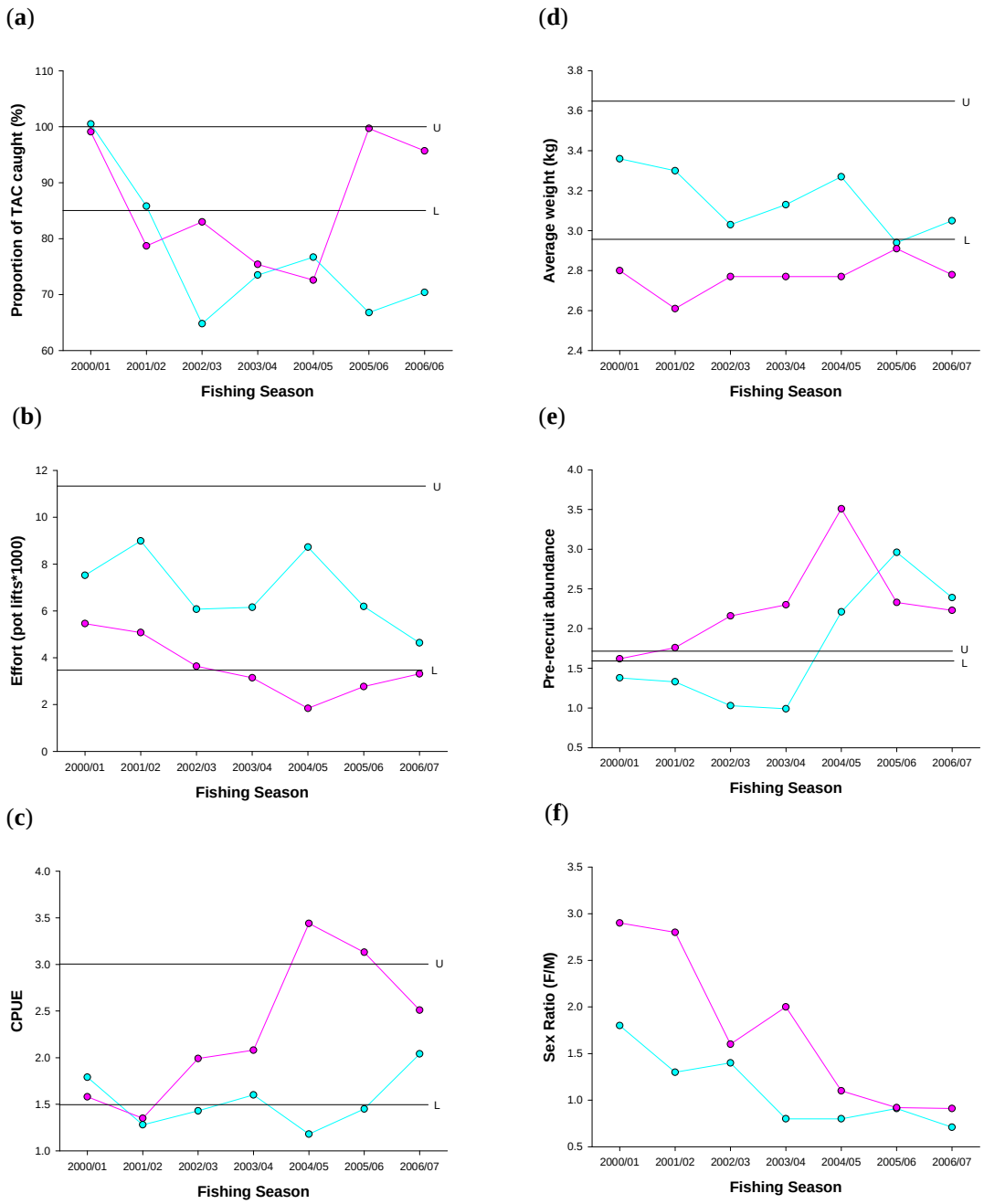

Figure 3. Plots of inter-seasonal differences in key performance indicators for the Northern Zone fishery (solid blue lines) and Southern Zone fishery (solid purple lines). Plots include a) catch as percentage of the TACC, b) fishing effort, c) catch per unit effort (kg.pot lift^{-1}), d) mean crab weight ± s.e., e) abundance of undersized (<150mm) crabs per pot lift, and f) the sex ratio. Horizontal lines in each graph indicate the upper (U) and lower (L) performance reference points. Note that all estimates presented here are derived from combined miscellaneous and rock lobster quota data only (i.e. they do not include information obtained from the rock lobster by-product sector).

4 SUMMARY

Based on the performance indicators for the fishery from the 2006/07 season, the outlook for the South Australian Giant Crab Fishery is positive. A more detailed analysis of the status of the Giant Crab Fishery will be presented in an Assessment Report due for completion in February 2009.

5 REFERENCES

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