Southern Zone
Rock Lobster (*Jasus edwardsii*)
Fishery Status Report 2009/10

Status Report to PIRSA Fisheries

A. Linnane, R. McGarvey, J. Feenstra and P. Hawthorne

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2 EXECUTIVE SUMMARY

- In 2009 (i.e. the 2009/10 season), the TACC in the SZRLF was 1,400 tonnes. The total commercial catch from logbook data was 1,243.3 tonnes. This is the third successive season that the TACC has been substantially under-caught. Effort in 2009 was 2,049,961 potlifts, an increase of 6.9% from 2008 (1,916,436 potlifts). Since 2003 (1,042,233 potlifts), when the TACC was first increased to 1,900 tonnes from 1,770 tonnes, effort has increased by 96%.

- In 2009, a total of 99% of catch came from four MFAs in the SZRLF. The highest proportion came from MFA 55 (39%) while the lowest came from MFA 51 (8%) (refer to Figure 28). The majority of the catch (>85%) continues to be taken from inshore grounds (<60 m). The proportion of catch taken in depths of <30 m has been greater in recent years with 38-53% taken within this range between 2006 and 2009.

- For the seventh consecutive season, catch per unit effort (CPUE) decreased in the SZRLF. In 2009, it was 0.60 kg/potlift which represents an 18% decrease from 2008 (0.73 kg/potlift) and a 67% decrease since 2003 (1.82 kg/potlift). The 2009 estimate is the lowest on record since 1970.

- The 2009 zonal decline in CPUE was observed in all of the four major MFAs in the SZRLF. This is the fifth consecutive seasonal decrease in MFAs 51 and 55 and the seventh in MFAs 56 and 58. The 2009 estimates are the lowest on record for all regions except MFA 51.

- Puerulus settlements in 2005 and 2006 were the highest on record at 2.5 and 5.0 puerulus/collector, respectively. Over the next two seasons settlement decreased and in 2009 was 2.0 puerulus/collector which is above the long-term average for the fishery (1.6 puerulus/collector). The estimated period between settlement and recruitment into the fishable biomass is 5 years.

- Pre-recruit index (PRI) from catch sampling decreased from 1.44 in 2006 to 0.69 undersized/potlift in 2007. Since then, PRI has increased and in 2009 was 1.73 undersized/potlift, the highest on record. Note that low levels of participation in the catch sampling program in recent seasons mean that estimates of this index should be viewed with caution.

- Outputs from the qR fishery model show that over the last seven seasons, biomass has decreased and in 2009 was 1,786 tonnes, the lowest estimate on record. This represents a decrease of 62% from 2003 (4,641 tonnes) when the TACC was first increased to 1,900 tonnes from 1,770 tonnes. With a catch of 1,243 tonnes, the 2009 exploitation rate was 69.6%.

- CPUE was below the limit reference point (LRP) zonally and in all regions and has therefore triggered as per the Management Plan for the fishery. PRI did not trigger. It was above the LRP zonally and in MFA 58.

- In summary, there are clear signs that the resource on which the SZRLF is based has declined. CPUE has decreased over the last seven seasons, reflecting a corresponding decline in biomass. This in turn reflects low recruitment over this period. Both pre-recruit and length frequency data indicate that a pulse of recruitment will enter the fishery in 2010 as a result of strong settlement in 2005 and 2006. However, given current fishery trends, there is a clear need to protect this pulse in order to rebuild the currently depleted biomass. As a result, a precautionary TACC for the 2010 season is strongly recommended.

3 FISHERY STATISTICS

3.1 Catch, effort and CPUE

3.1.1 Zonal catch and effort

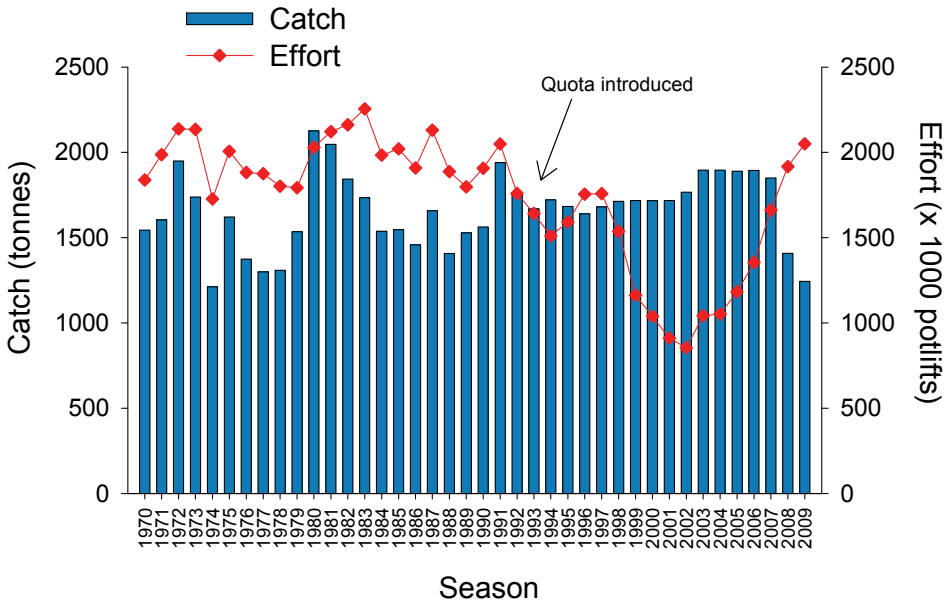

Figure 1 Inter-annual trends in catch and effort in the SZRLF from 1970 to 2009.

In 2009 (i.e. the 2009/10 season), the TACC in the SZRLF was 1,400 tonnes. The total reported commercial catch was 1,243.3 tonnes (Figure 1). This is the third successive season that the TACC has been significantly under-caught. Effort in 2009 was 2,049,961 potlifts, which was an increase of 6.9% from 2008 (1,916,436 potlifts) and the highest level since 1987. Since 2003 (1,042,233 potlifts), when the TACC was first increased to 1,900 tonnes from 1,770 tonnes, effort has increased by 96%.

3.1.2 Within season trends in catch and effort

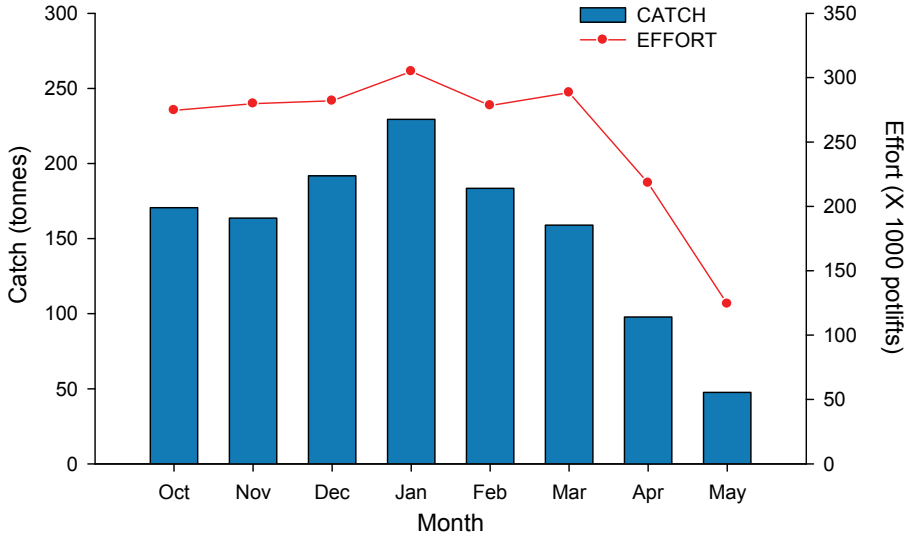

Figure 2 Within season trends in catch and effort in the SZRLF for the 2009 season.

In 2009, the highest catches (>150 tonnes) were taken in the first six months of the season from October to March (Figure 2). The highest catch month was January at 229.4 tonnes while the lowest was May at 47.5 tonnes. The trends in effort reflected catch levels by month.

3.1.3 Regional catch and effort

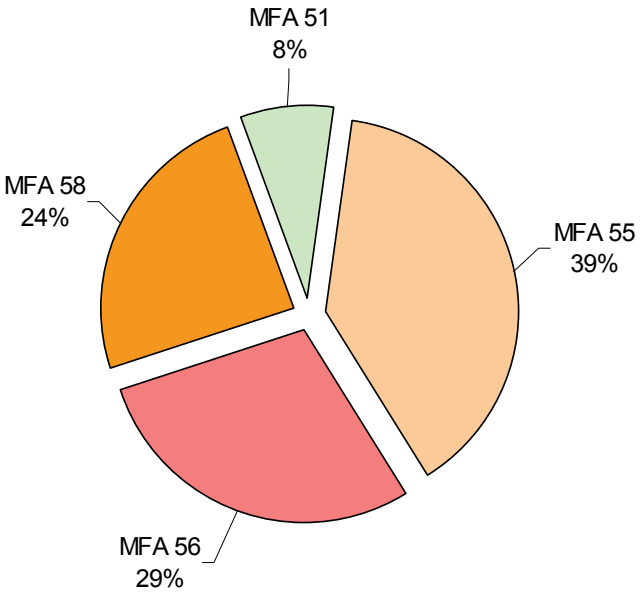

Figure 3 Percentage of total catch taken in the four major MFAs (in terms of tonnage landed) of the SZRLF in 2009.

In 2009, the spatial distribution of catch reflected trends observed in recent seasons. In total, 99% came from four just MFAs, i.e. 51, 55, 56 and 58 (see Figure 28). The highest proportion came from MFA 55 with 39% while only 8% of catch came from MFA 51 (Figure 3).

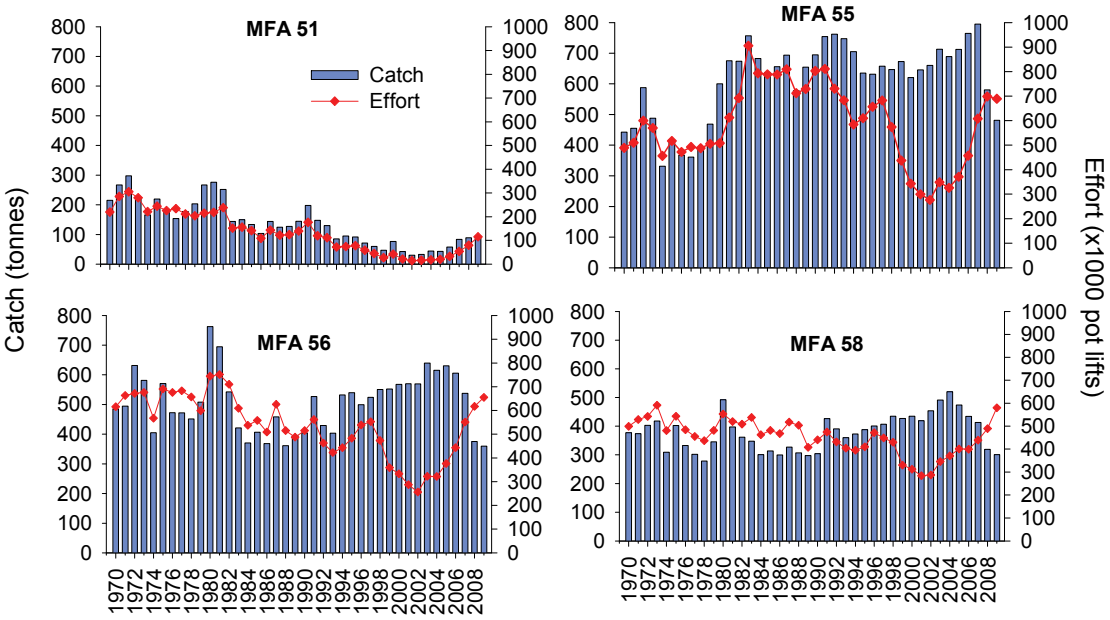

Figure 4 Inter-annual trends in catch and effort in the main Marine Fishing Areas (MFAs) of the SZRLF for the fishing seasons between 1970 and 2009 (note: alternate seasonal ticks on X-axis).

In 2009, catch decreased in all of the major MFAs within the SZRLF with the exception of MFA 51 (Figure 4, refer to Figure 28). This represents the fourth and fifth consecutive annual decreases in MFAs 56 and 58 respectively. In MFA 55, catch has decreased by 39% from 794 tonnes in 2007 to 481 tonnes in 2009. As with zonal trends, effort has increased annually in all MFAs since 2003.

3.1.4 Zonal CPUE

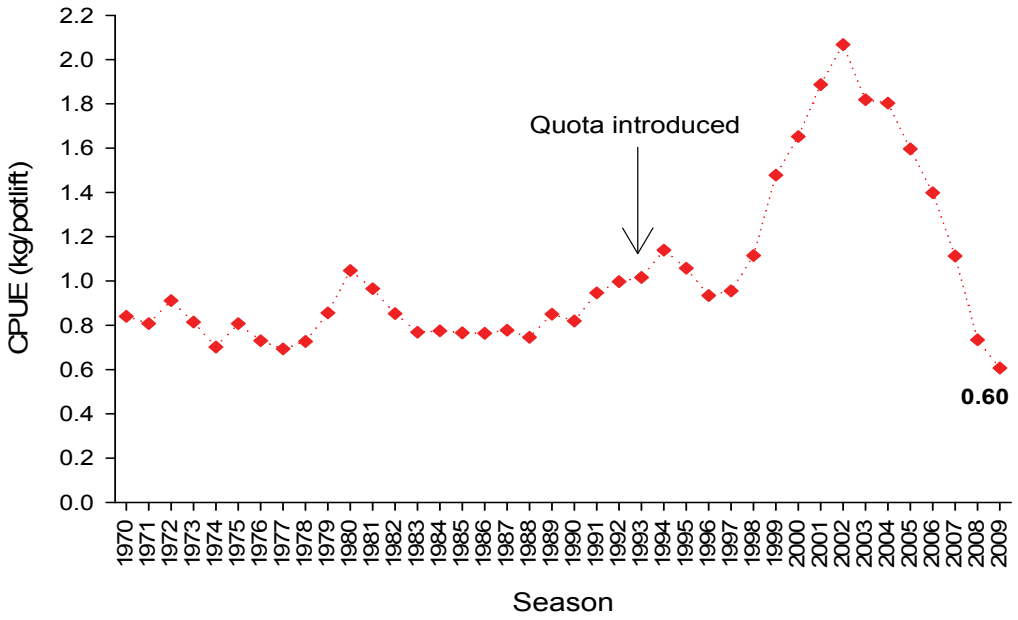

Figure 5 Inter-annual trends in CPUE in the SZRLF between 1970 and 2009.

Over the last seven seasons CPUE in the SZRLF has decreased (Figure 5). In 2009, it was 0.60 kg/potlift which represents an 18% decrease from 2008 (0.73 kg/potlift) and a 67% decrease since 2003 (1.82 kg/potlift). The 2009 estimate is the lowest on record since monitoring began in 1970.

Within season trends in CPUE

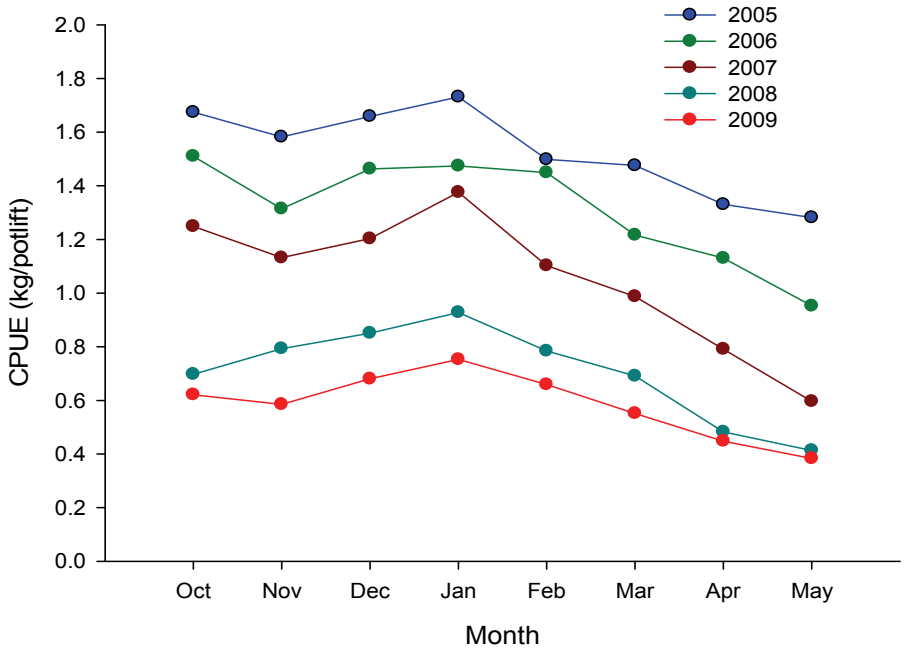

Figure 6 Within season trends in CPUE in the SZRLF over the last five seasons.

CPUE generally increases from November to January within the SZRLF before decreasing thereafter (Figure 6). Over the last five seasons, CPUE has decreased consistently across all months of the fishery. In 2009, CPUE was highest in January at 0.75 kg/potlift and lowest in May at 0.38 kg/potlift.

3.1.5 Regional CPUE

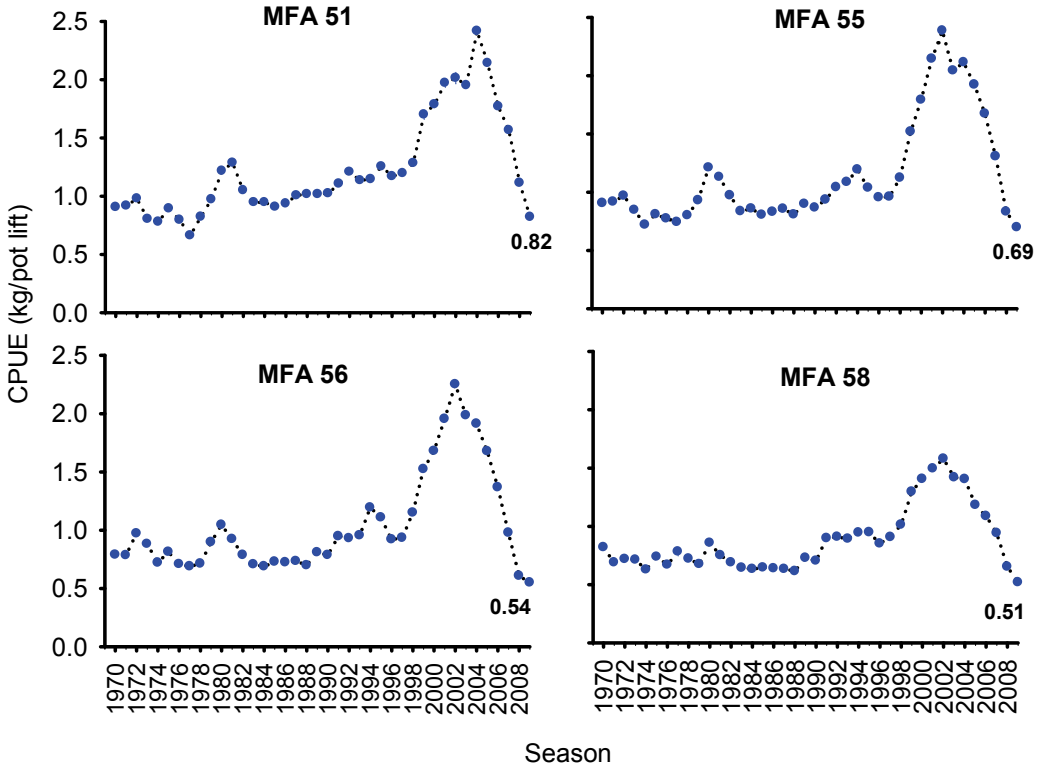

Figure 7 Inter-annual trends in CPUE in the four main MFAs of the SZRLF between 1970 and 2009 (note: alternate annual ticks on X-axis).

Catch rates in each main MFA generally reflect zonal estimates (Figure 7). Highest catch rates were observed in MFA 51 but only 8% of the total catch came from this MFA (Figures 3 and 4). In 2009, catch rates decreased in all four MFAs. This is the fifth consecutive seasonal decrease in MFAs 51 and 55 and the seventh in MFAs 56 and 58. The 2009 estimates are the lowest on record for all regions except MFA 51.

3.1.6 Spatial trends in catch by depth

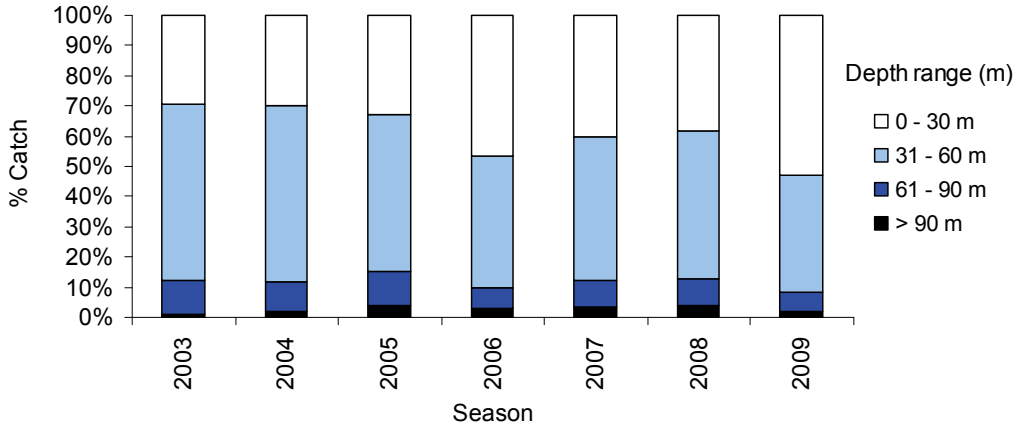

Figure 8 Catch by depth in the SZRLF over the last seven seasons.

Over the last seven seasons >85% of the catch has been taken from depths of <60 m (Figure 8). The proportion of catch taken in depths of <30 m has been greater in recent years with 38-53% taken within this range between 2006 and 2009. Less than 5% of catch is currently taken in depths >90 m.

3.1.7 Spatial trends in CPUE by depth

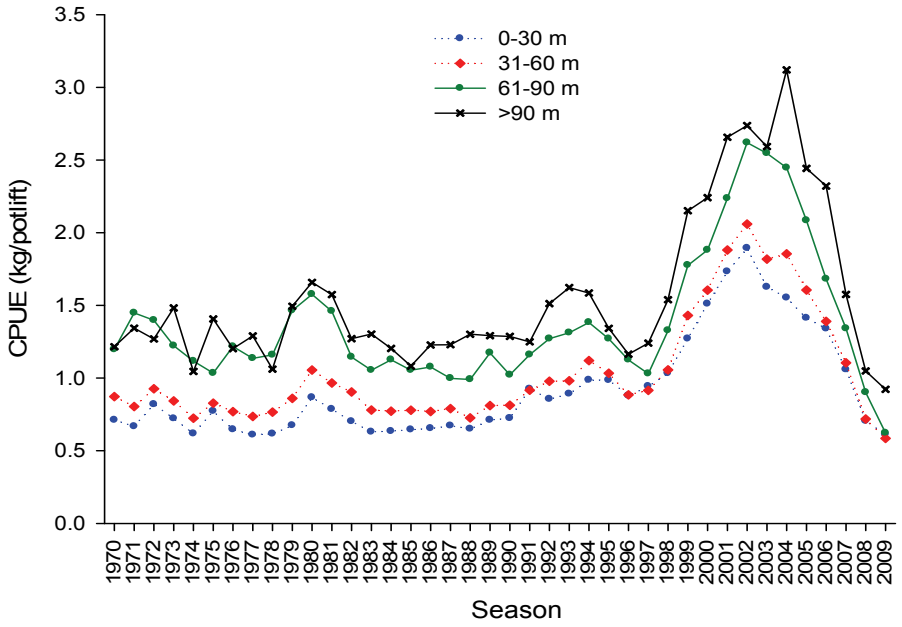

Figure 9 CPUE by depth in the SZRLF from 1970 to 2009.

While >85% of catch is taken from <60 m (Figure 8), catch rates in depths of 0-30 and 31-60 m are consistently lower than those in deeper waters (Figure 9). Over the last 5-7 seasons however, CPUE has generally decreased across all depth ranges and in 2009 ranged from 0.58 kg/potlift (31-60 m) to 0.92 kg/potlift (>90 m).

3.1.8 Average number of days fished

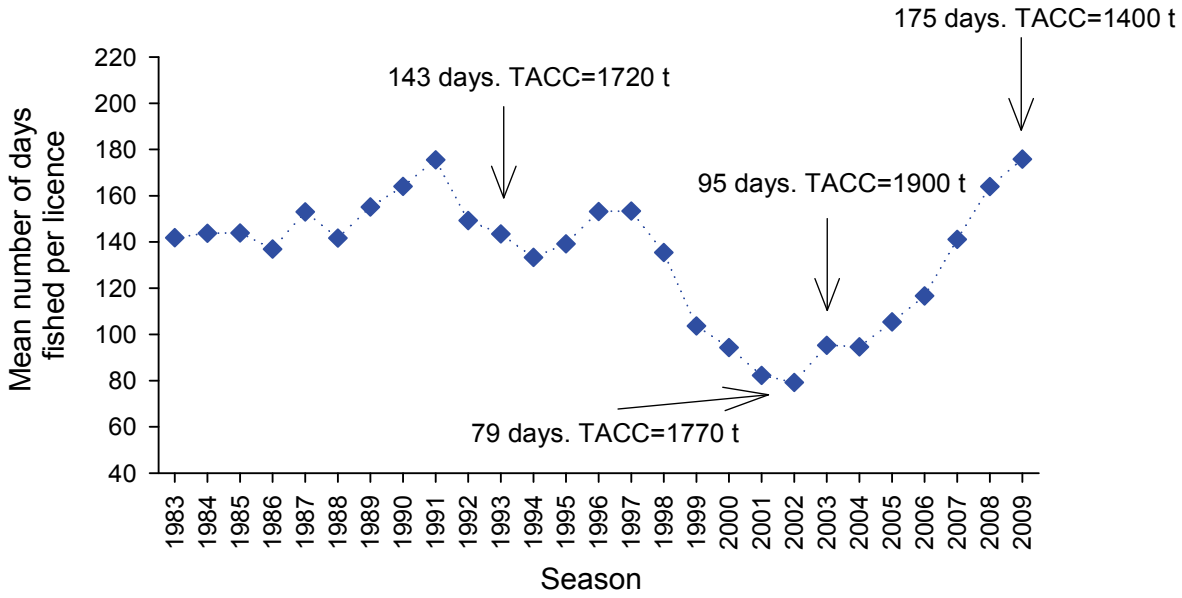

Figure 10 Average numbers of days fished/licence holder from 1983 to 2009 in the SZRLF.

Over the last seven seasons the average numbers of days fished per licence holder has increased (Figure 10). In 2003, when the TACC was increased from 1,770 to 1,900 tonnes, it took licence holders on average 95 days to catch their allocated quota. In 2009, the estimate was 175 days, which represents an increase of 84% from 2003. It should also be highlighted that the 2009 increase was observed despite the fact that only 89% (1,243 tonnes) of the 1,400 tonne TACC was actually taken.

3.1.9 Zonal mean weight

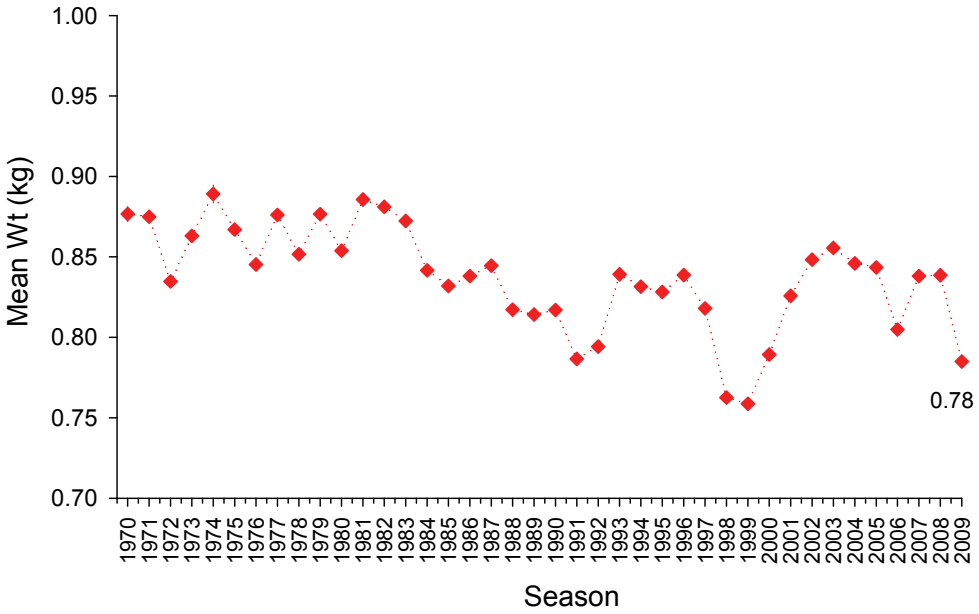

Figure 11 Inter-annual trends in mean lobster weight in the SZRLF from 1970 to 2009.

Mean lobster weight increased over the period 1999 to 2003 before decreasing over the next three seasons (Figure 11). In 2007 and 2008, mean weight increased to 0.83 kg but decreased to 0.78 kg in 2009. As with CPUE, this estimate is affected by high-grading in the zone, when smaller individuals are preferentially selected (see Figure 13).

3.1.10 Within season trends in mean weight

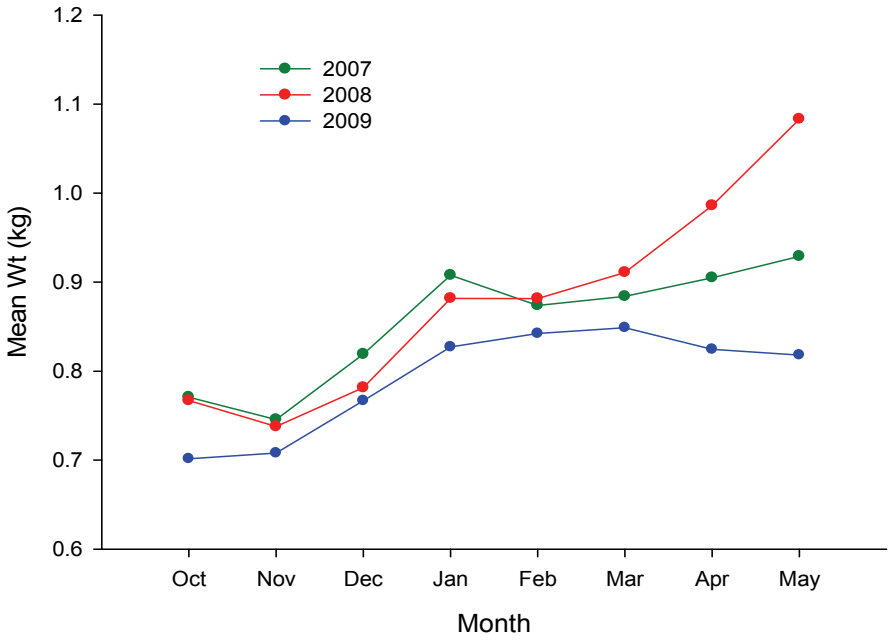

Figure 12 Within season trends in mean weight in the SZRLF over the last three seasons.

In the SZRLF, mean weight tends to generally increase as the season progresses (Figure 12). In 2009, trends in mean weight were similar to those from previous seasons. Mean weight was lowest in October at 0.70 kg and highest in March at 0.84 kg.

3.1.11 High-grading

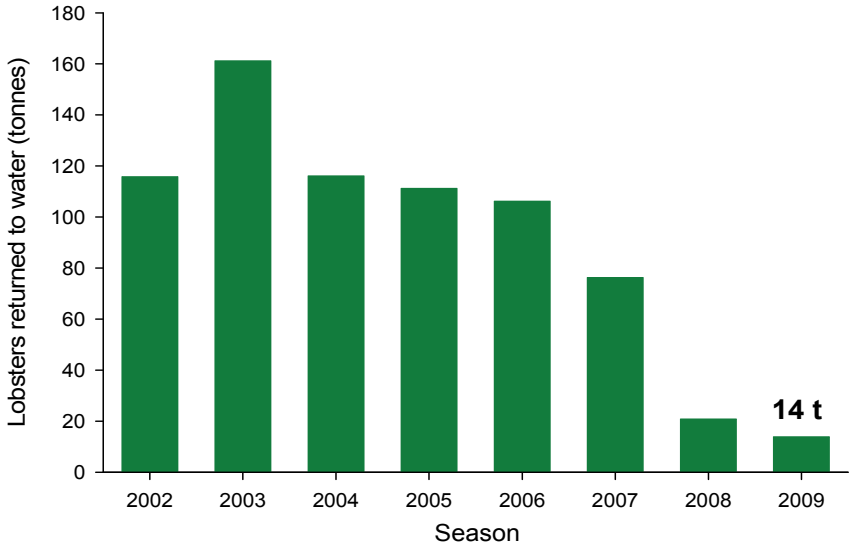

Figure 13 Estimates of tonnage returned to the water due to high-grading in the SZRLF over the last eight seasons (2002-2009).

Estimates of high-grading (i.e. tonnage of lobsters returned to the water due to unsuitable size, colour or physical damage) exceeded 100 tonnes consecutively over the period 2002 to 2006 (Figure 13). Since then, estimates have steadily decreased and in 2009 only 14 tonnes were recorded as being high-graded. Decreases in levels of high-grading are likely to reflect declining catch rates in recent seasons. As the recording of high-grades in logbooks is undertaken on a voluntary basis, values are likely to be underestimated.

3.2 Puerulus Settlement Index

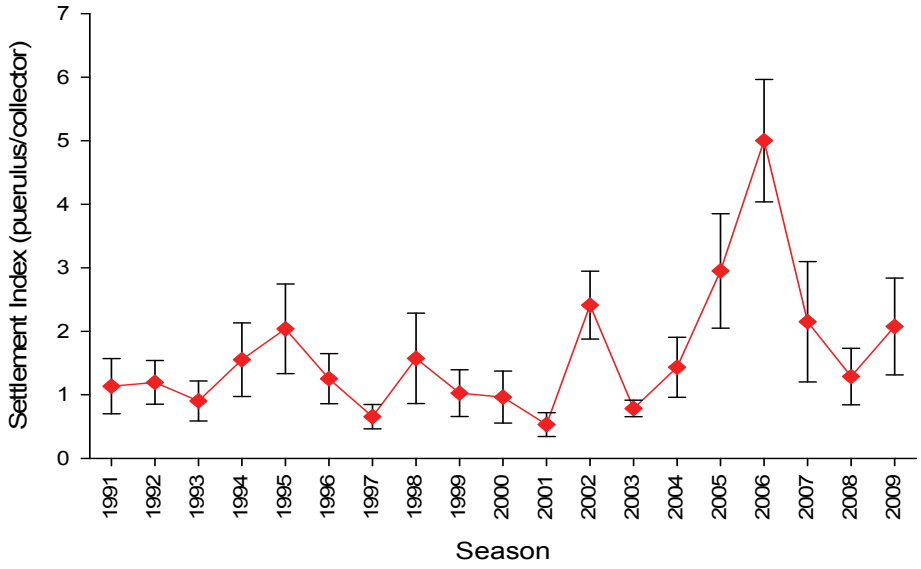

Figure 14 Puerulus settlement Index (PSI) (+/- SE) in the SZRLF from 1991 to 2009.

Two of the highest settlements on record were observed in 2005 and 2006 at 2.5 and 5.0 puerulus/collector, respectively (Figure 1). Over the next two seasons PSI decreased and in 2009 was 2.0 puerulus/collector which is still above the long-term average for the fishery (currently 1.6 puerulus/collector). In the SZRLF, the estimated period between puerulus settlement and recruitment into the fishable biomass is 5 years. Undersized individuals are generally observed 4 years after settlement.

3.3 Pre-recruit index

3.3.1 Zonal pre-recruit index

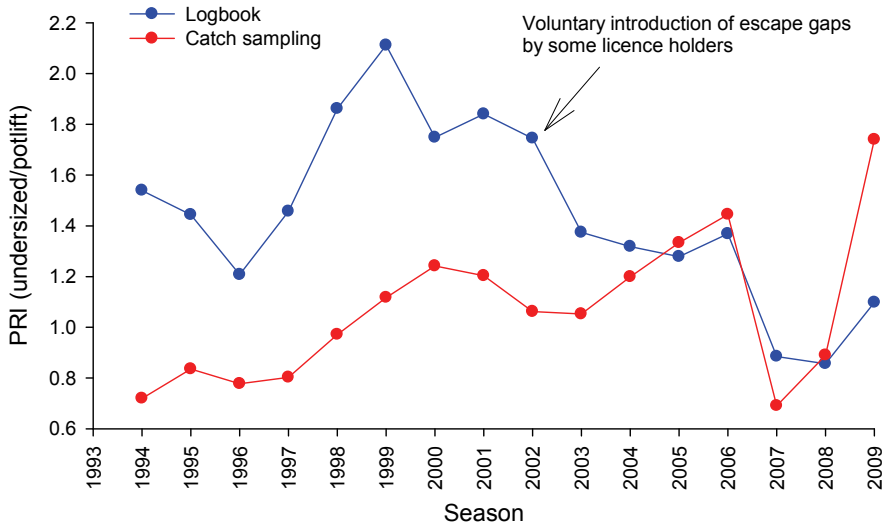

Figure 15 Inter-annual trends in pre-recruit index (PRI) in the SZRLF from 1994 to 2009 as calculated from both logbook and voluntary catch sampling (Nov–Mar inclusive).

Logbook PRI decreased from 2.1 in 1999 to 0.85 undersized/potlift in 2008 (Figure 15). In 2009, estimates increased to 1.0 undersized/potlift. PRI from catch sampling decreased from 1.44 in 2006 to 0.69 undersized/potlift in 2007. Since then PRI has increased and in 2009 was 1.73 undersized/potlift, the highest on record. Note that low levels of participation in the catch sampling program in recent seasons mean that estimates should be viewed with caution.

3.3.2 Regional pre-recruit index

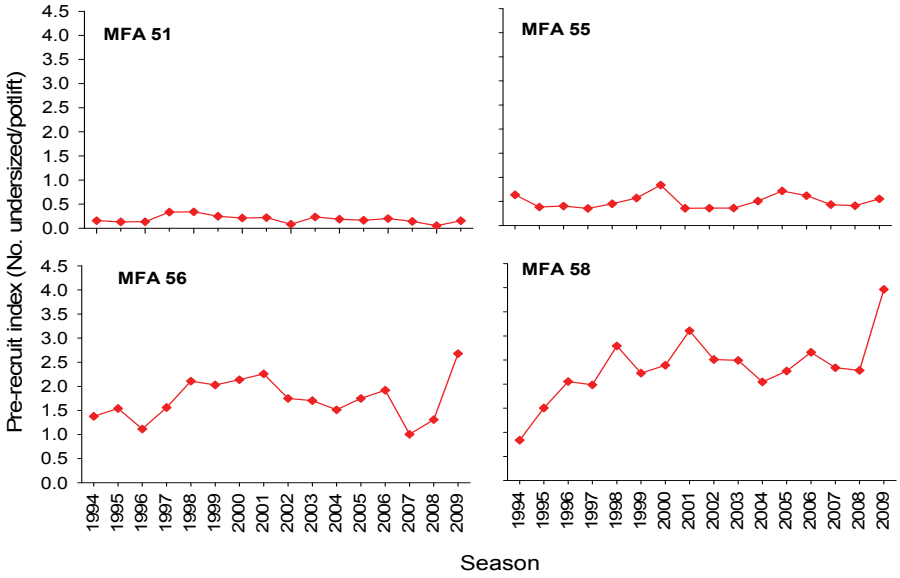

Figure 16 Interannual trends in regional PRI in the SZRLF from 1994 - 2009.

Regional estimates of catch sampling based PRI (Figure 16) indicate that the number of undersized/potlift is consistently lower in the northern regions of the SZRLF (i.e. MFAs 51 and 55; refer to Figure 28) compared to southern areas (i.e. MFA 56 and 58). In 2009, PRI increased in all major regions in the SZRLF with estimates of 0.15, 0.55, 2.6 and 3.9 undersized/potlift in MFAs 51, 55, 56 and 58 respectively.

3.4 Length Frequency data

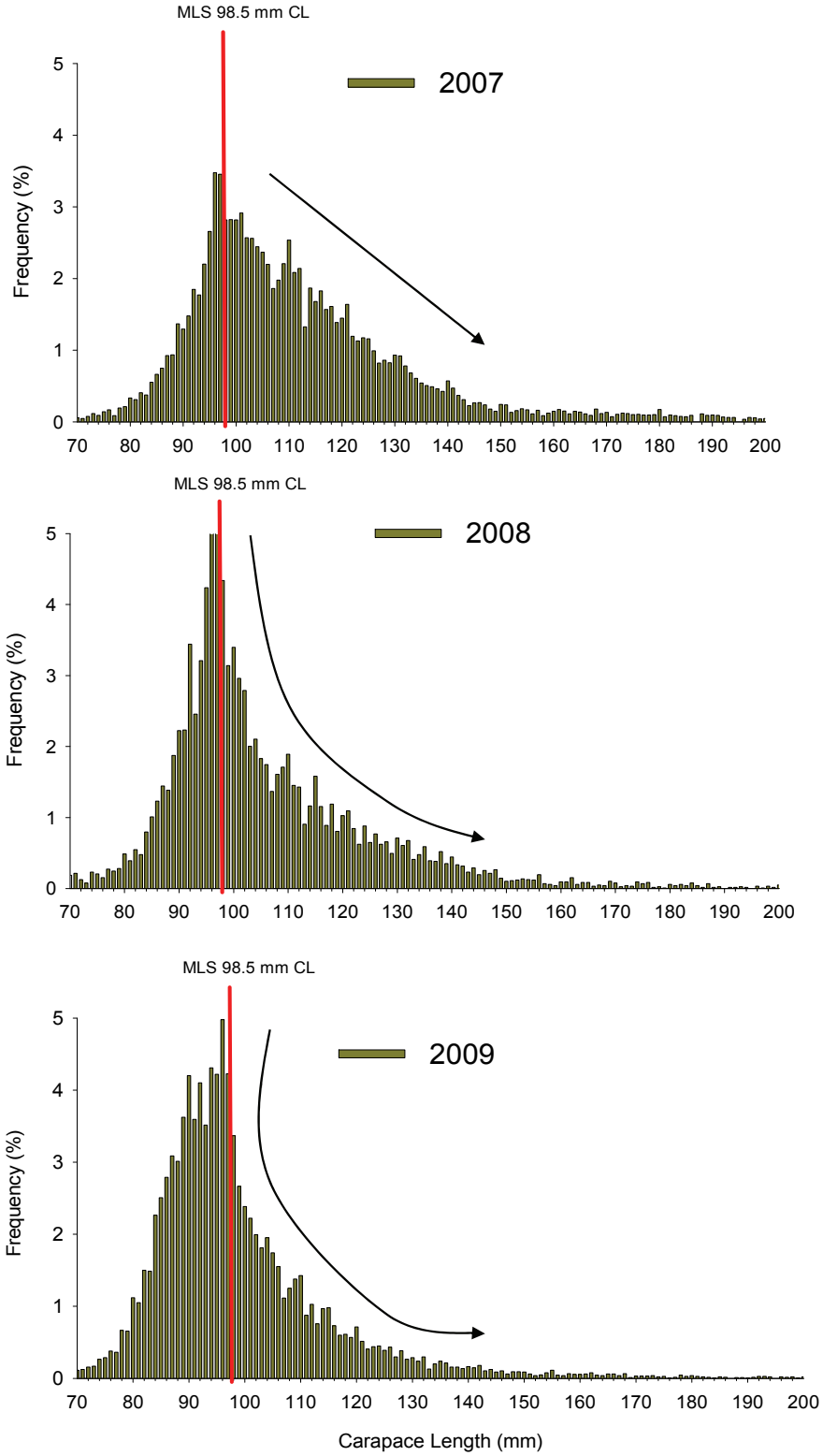

Figure 17 Length frequency data of both male and female lobsters sampled during the voluntary catch sampling programme from 2007-2009.

Length frequency data as obtained through the voluntary catch sampling programme confirm commercial catch rate indices over the period 2007 to 2009 (Figure 17). The frequency of lobsters above the minimum legal size (MLS) of 98.5 mm CL has consistently decreased reflecting a decrease in legal sized catch rates (Figure 5). The high frequency of lobsters below the MLS in 2009 presumably reflects the high pre-recruit index expected from the strong settlement observed in 2005 and 2006 (Figure 14). This recruitment is predicted to start entering the fishery in 2010.

3.5 Seasonal Water Temperature

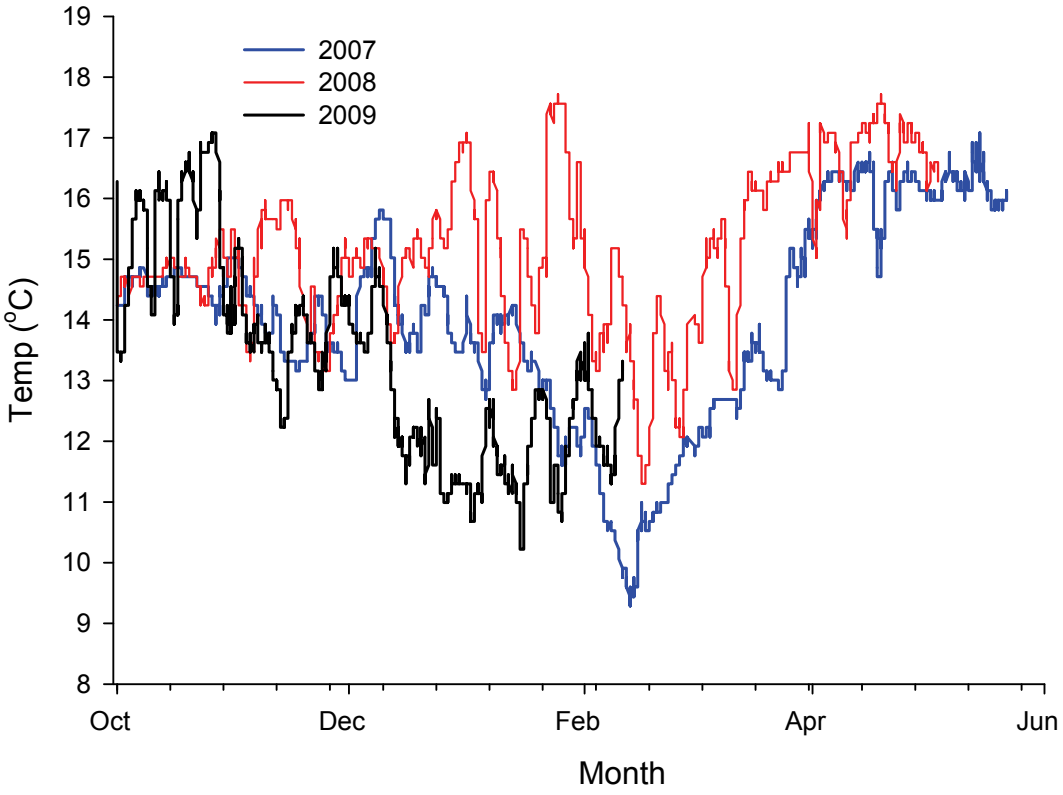

Figure 18 Profile of water temperature taken at 60 m depth off Southend during the 2007, 2008 and 2009 SZRLF seasons (note 2009 data only available to March 2010).

Temperature data are provided in response to speculation as to the impact of coldwater events on catchability. The possible affect of water temperature on rock lobster catch rates is being investigated as part of an FRDC project titled "*Sustainability of rock lobster resource in south-eastern Australia in a changing environment: implications for assessment and management*" which is been undertaken across South Australia, Victoria and Tasmania.

Temperature data taken off Southend in the SZRLF season indicates a significant upwelling event during the 2009/10 season (Figure 18). Bottom temperatures dropped to 10.2 C for a very brief period in January of 2010 and on large were below 12 C for the December-January period. This is similar to data from the 2007/08 season where over the period December 14th 2007 to February 14th, 2008 the temperature dropped from rapidly from 15.8 C to 9.2 C and where the temperature was below 12 C for most of February of 2008.

4 qR MODEL OUTPUTS

4.1 Biomass

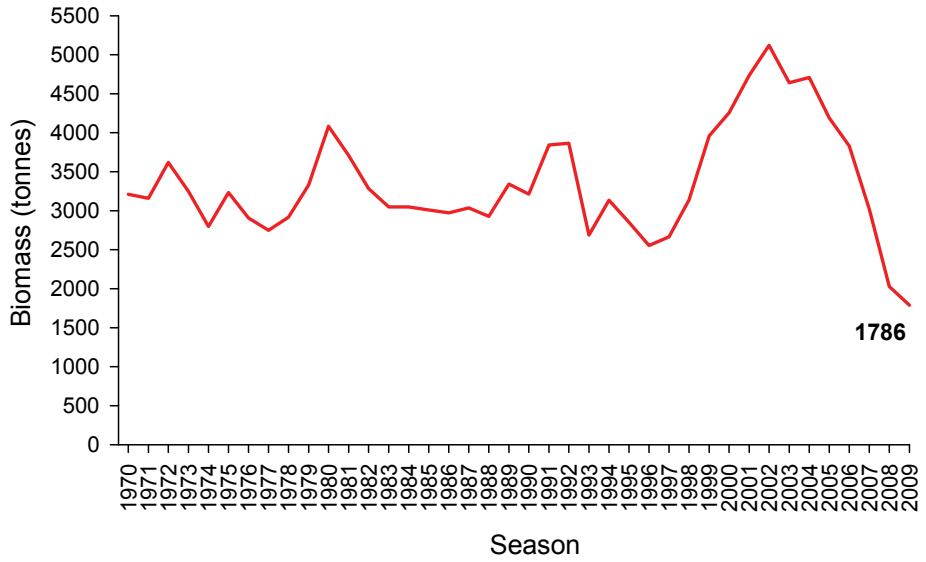

Figure 19 Estimates of exploitable biomass (1970-2009) for the SZRLF obtained from the qR fishery model. Note: estimates reflect average yearly biomass.

Biomass, as determined by the qR model, increased from 1996, peaking at 5,120 tonnes in 2002 (Figure 19). However, over the last seven seasons, biomass has decreased and in 2009 was 1,786 tonnes, the lowest estimate on record. The 2009 estimate represents a decrease in biomass of 62% from 2003 (4,641 tonnes) when the TACC was first increased to 1,900 tonnes from 1,770 tonnes.

4.2 Egg production

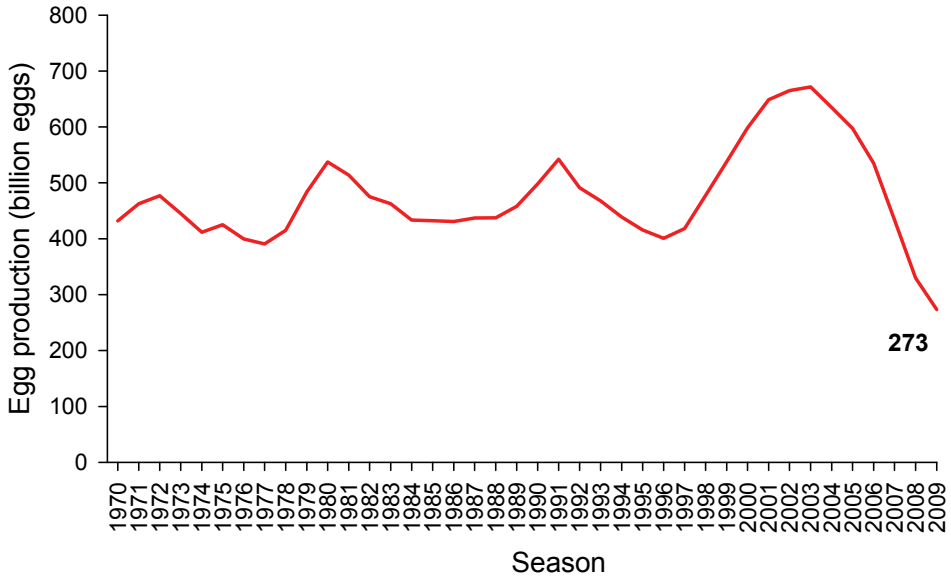

Figure 20 Estimates of egg production (1970-2009) for the SZRLF obtained from the qR fishery model.

Egg production in the SZRLF increased from 401 billion eggs in 1996 to 672 billion eggs in 2003 (Figure 20). Over the last six seasons however, egg production has decreased and in 2009 was 273 billion, the lowest estimate on record.

4.3 Percent of virgin egg production

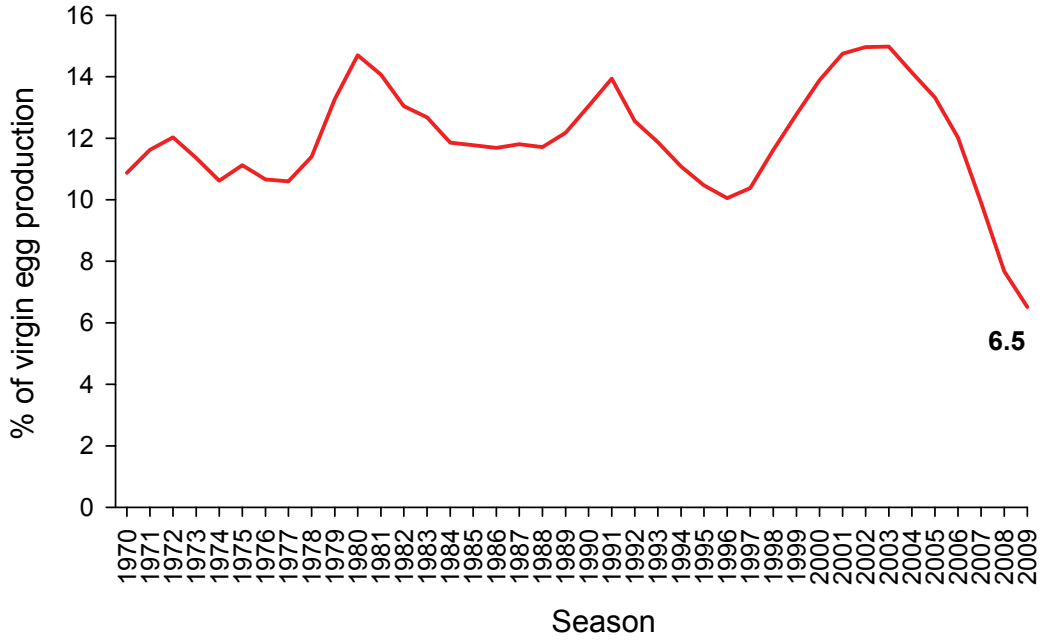

Figure 21 Estimates of % of virgin egg production (1970-2009) for the SZRLF as obtained from the qR fishery model.

Model outputs for the 2009 season suggest that egg production equated to 6.5% of virgin levels, the lowest on record (Figure 21).

4.4 Exploitation rate

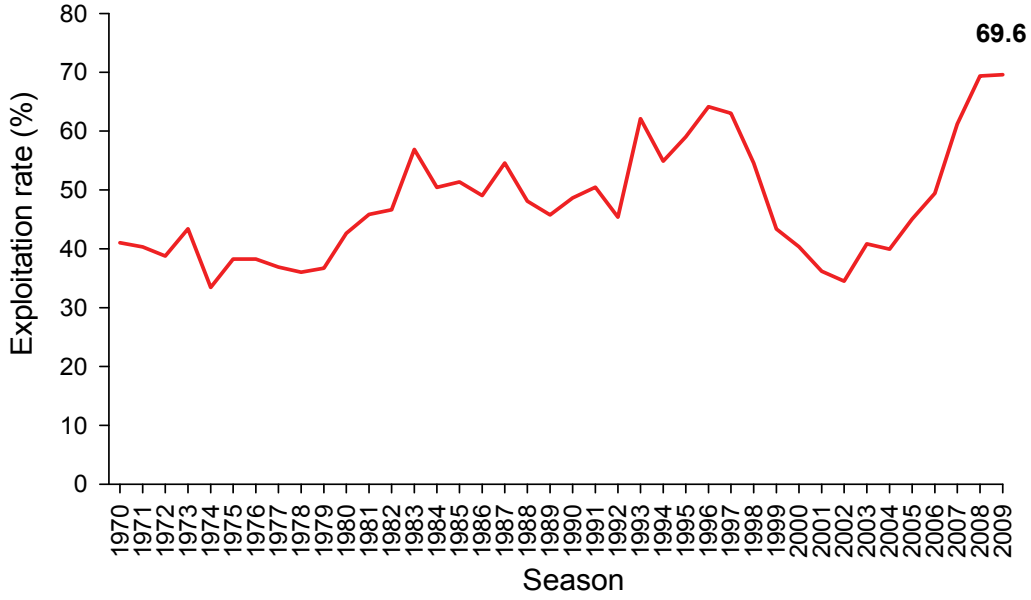

Figure 22 Estimates of exploitation (1970-2009) for the SZRLF as obtained from the qR model.

Exploitation rate in the SZRLF decreased between 1996 and 2002. However, over the last seven seasons it has generally increased and in 2009 was 69.6%, the highest estimate on record (Figure 22).

4.5 Recruitment

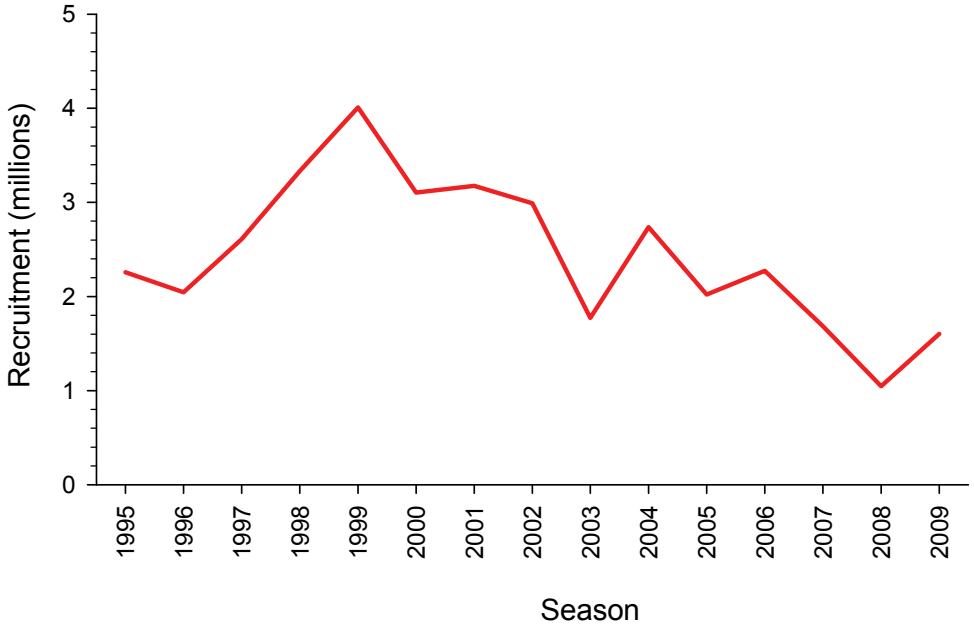

Figure 23 Estimates of recruitment (1995-2009) for the SZRLF as obtained from the qR model.

Outputs from the qR model indicate that since the late 1990s recruitment has generally declined in the SZRLF. In 1999 the estimate of recruitment was 4 million individuals but by 2009 this was reduced to 1.6 million, a decrease of 60%. It is worth noting that the estimates of qR recruitment are highly correlated (R^2=0.95) with independent estimates of undersized lobsters based on logbook data (Figure 15).

5 BIOLOGICAL PERFORMANCE INDICATORS

Table 1 Target and limit reference points for both catch rate and pre-recruit index as defined in the Management Plan for the SZRLF (refer to Sloan and Crosthwaite 2007).

Region	Catch rate (kg/potlift)	Catch rate (kg/potlift)	Pre-recruit index (Pot sampling data)
	Limit	Target	Limit
Southern Zone	1.47	2.07	1.03
MFA 55	1.60	2.38	0.46
MFA 56	1.54	2.25	1.77
MFA 58	1.23	1.58	2.31

Limit reference points for both catch rate and pre-recruit index (PRI) are based on long-terms averages between 1995 and 2004 as this represents a period when the fishery was considered to have been performing within a desirable range both biologically and economically. In relation to pre-recruit index, as detailed in the Management Plan (Sloan and Crosthwaite 2007), the relevant measure for any particular year is the average for the most recent three years. For example, for calculating the PRI for 2009/10, the average of 2007/08, 2008/09 and 2009/10 are used to determine whether PRI is considered to be above or below the reference points.

5.1 Zonal catch rate

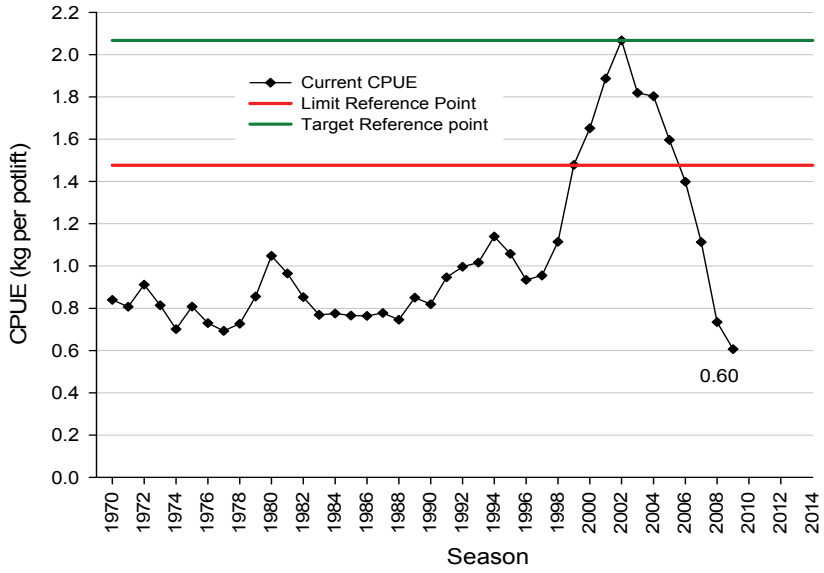

Figure 24 Zonal limit and target reference points for CPUE in the SZRLF including current estimates from the 2009 season.

In 2009, the zonal estimate of 0.60 kg/potlift was below the limit reference point (LRP) of 1.47 kg/potlift (Figure 24) as per the Management Plan for the resource (Sloan and Crosthwaite 2007). This represents the fourth consecutive season that the zonal catch rate LRP has triggered.

5.2 Regional catch rate

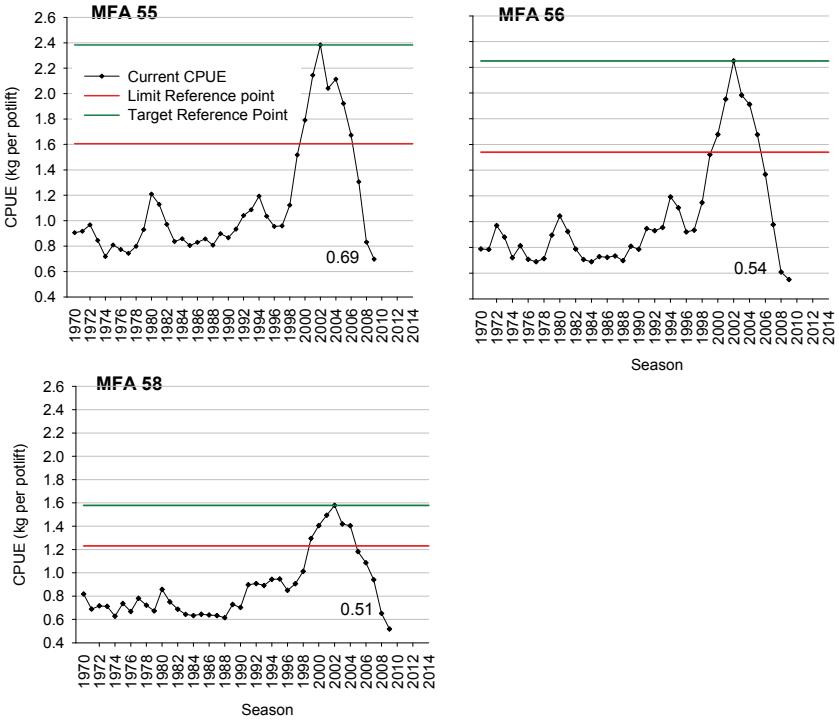

Figure 25 Regional limit and target reference points for CPUE in the SZRLF including current estimates from the 2009 season.

In 2009, the current regional CPUE was below the LRP in all of the major MFAs within the SZRLF (Figure 25). This is the third, fourth and fifth consecutive season that the LRP has triggered in MFAs 55, 56 and 58 respectively.

5.3 Zonal pre-recruit index

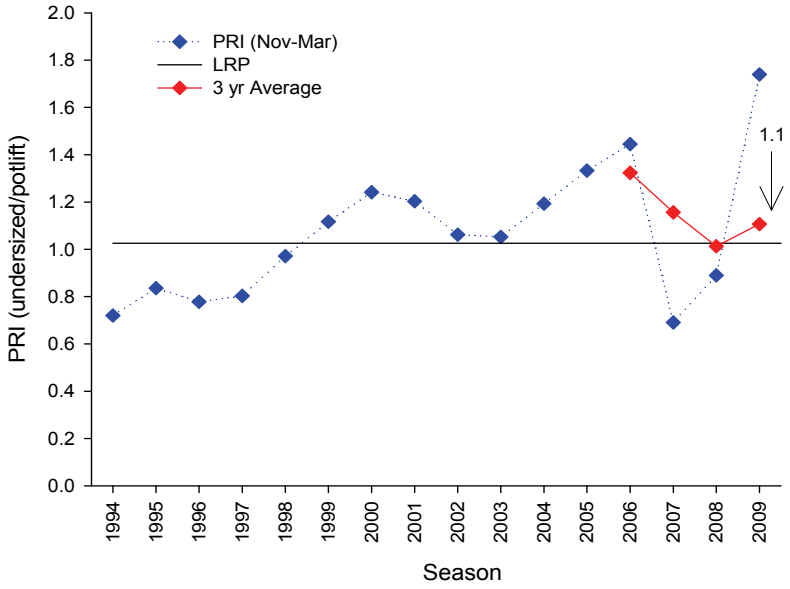

Figure 26 Zonal pre-recruit indices (PRI) (1994-2009) with Limit Reference Point (LRP) and current 3-year average.

In 2009, the 3-year average PRI (2007-2009) was 1.1 undersized/potlift, which is above the long-term LRP for the SZRLF (Figure 26).

5.4 Regional pre-recruit index

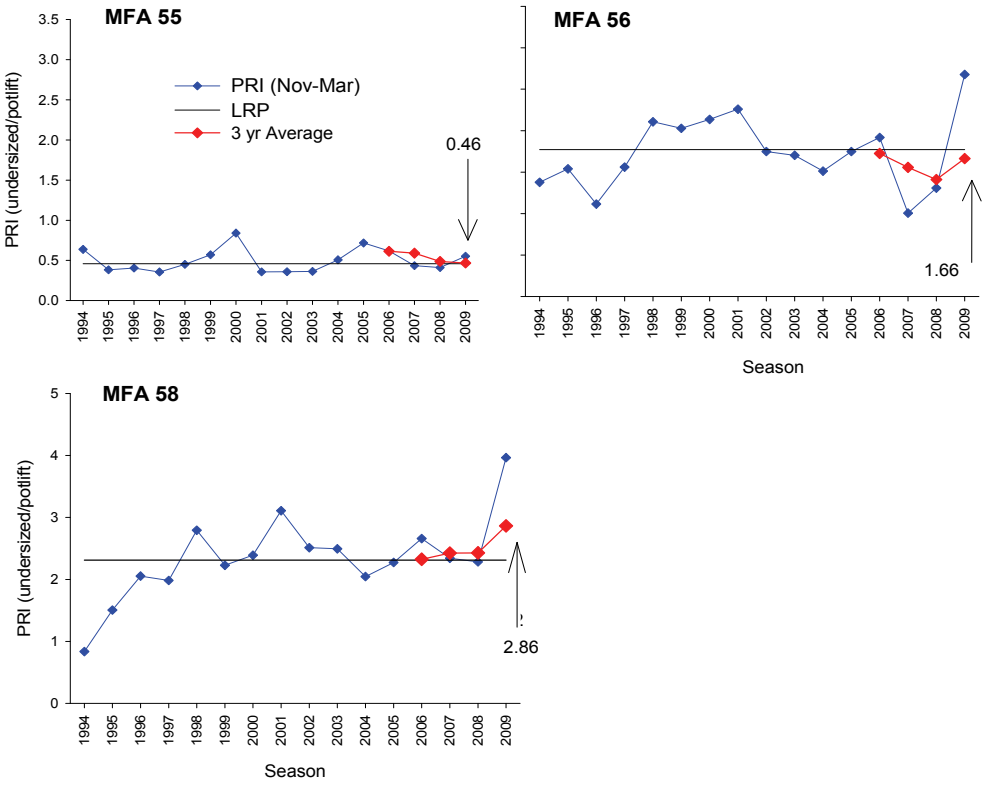

Figure 27 Regional pre-recruit indices (PRI) (1994-2009) with Limit Reference Points (LRPs) and current 3-year average.

In 2009, the 3-year average PRI (2007-2009) was at the LRP in MFA 55, below the LRP in MFA 56 and above the LRP in MFA 58 (Figure 27).

6 SUMMARY

The Management Plan for the SZRLF is currently being reviewed. The previous Plan (Sloan and Crosthwaite 2007) required that both legal-sized catch rate and pre-recruit indices should be triggered before a management response is taken. As catch rate was below the limit reference point (LRP), both zonally and regionally, this biological performance indicator triggered in 2009. The three-year pre-recruit index average was above the LRP zonally and in MFA 58 and therefore did not trigger.

Nonetheless, the information provided in this report provides clear evidence that the resource on which the SZRLF is based has declined. CPUE has decreased over the last seven seasons. This reflects a corresponding decline in biomass which in turn reflects low recruitment over this period. Both pre-recruit and length frequency data indicate that a pulse of recruitment will enter the fishery in 2010 as a result of strong settlement in 2005 and 2006. However, given current fishery trends, there is a clear need to protect this pulse in order to rebuild the currently depleted biomass. As a result, a precautionary TACC for the 2010 season is strongly recommended.

References

Sloan, S. & Crosthwaite, K., 2007. Management Plan for the South Australian Southern Zone Rock Lobster Fishery. South Australian Fisheries Management Series Paper No.52. Primary Industries and Resources South Australia. Adelaide, 73pp.

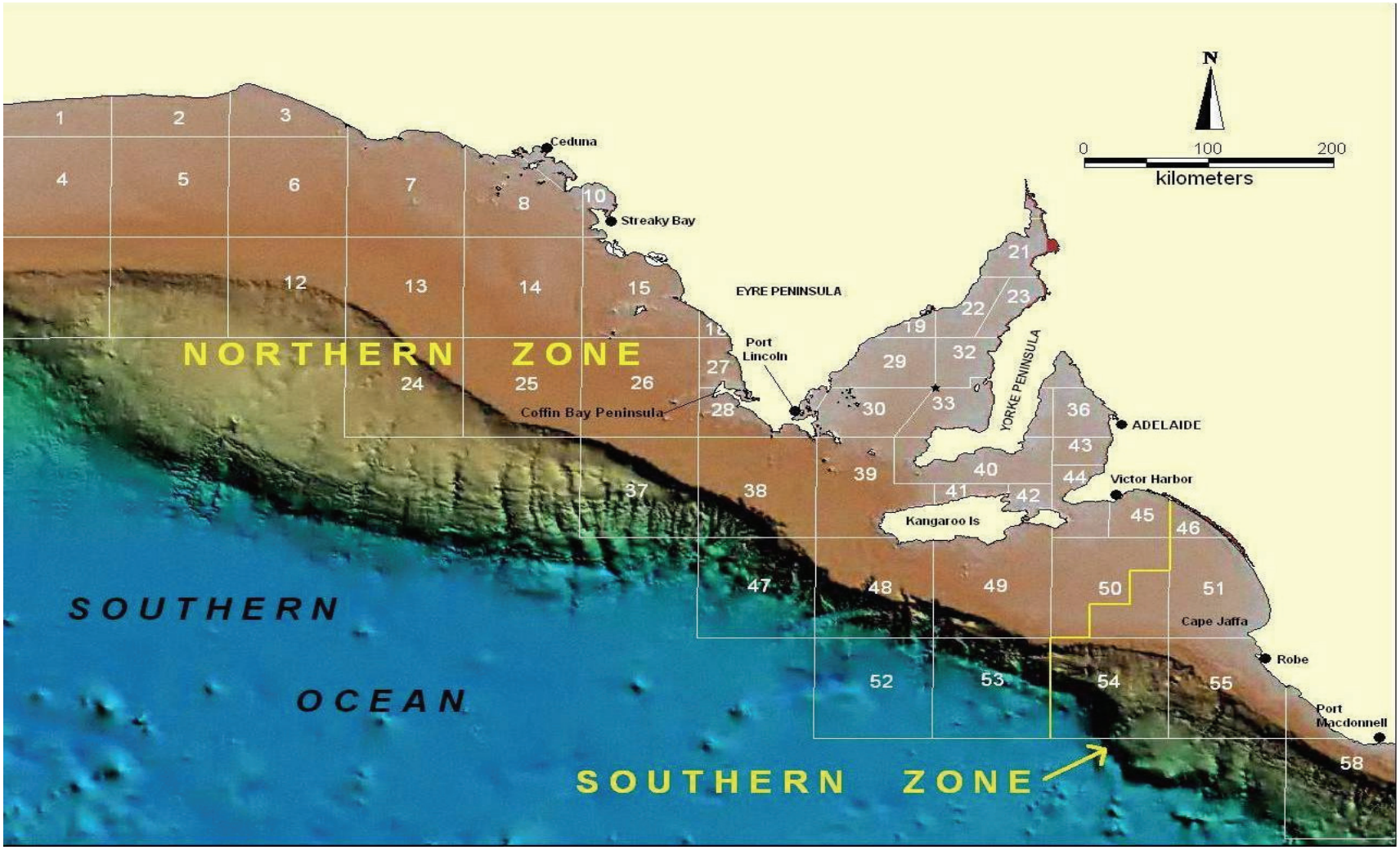

Figure 28 Northern and Southern Zones and Marine Fishing Areas in the South Australian Rock Lobster Fishery.