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Southern Zone Rock Lobster (*Jasus edwardsii*) Fishery Status Report 2012/13

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

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December 2013

Status Report to PIRSA Fisheries and Aquaculture

PREMIUM FOOD AND WINE FROM OUR CLEAN ENVIRONMENT

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South Australian Research and Development Institute
SARDI Aquatic Sciences
2 Hamra Avenue
West Beach SA 5024

Telephone: (08) 8207 5400
Facsimile: (08) 8207 5406
http://www.sardi.sa.gov.au

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Author(s):	A. Linnane, R. McGarvey, J. Feenstra and P. Hawthorne
Reviewer(s):	S. Mayfield and B. Stobart
Approved by:	S. Mayfield Science Leader – Fisheries
Signed:	SMayfield
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2 EXECUTIVE SUMMARY

In 2012 (i.e. 1 October 2012 to 31 May, 2013), the Total Allowable Commercial Catch (TACC) in the Southern Zone Rock Lobster Fishery (SZRLF) was 1,250 tonnes. The total commercial catch from logbook data was 1,226.7 tonnes. This represents the third consecutive season that >98% of the TACC has been taken. Effort in 2012 was 1,419,905 potlifts, representing an increase of 10.5% from 2011 (1,285,289 potlifts).

In 2012, 99% of catch came from four Marine Fishing Areas (MFAs) with 23.4, 419.4, 398.6 and 371.5 tonnes taken in MFAs 51, 55, 56 and 58, respectively. Effort increased in all regions in 2012.

The catch per unit effort (CPUE) in 2012 was 0.86 kg/potlift, reflecting a 10% decrease from 2011 (0.96 kg/potlift). This is the fifth consecutive season that catch rate has been below the long-term average of 1.02 kg/potlift for the fishery. CPUEs from February to May were close to historical lows for that period.

In 2012, CPUE decreased in all major MFAs with estimates of 0.60, 0.86, 0.80 and 0.98 kg/potlift in MFAS 51, 55, 56 and 58, respectively.

With the exception of increases in 2009 and 2010, the zonal estimate of logbook based pre-recruit index (PRI) shows a consistent long-term decline over the last decade. The 2012 estimate of 0.96 undersized/potlift reflects one of the lowest PRIs on record. The PRI has breached the limit reference point (1.3 undersized/potlift) in five of the last six seasons.

Four of the last five (2008-2012) puerulus settlement indices have been below the long-term average. In the SZRLF, the estimated period between settlement and recruitment into the fishable biomass is about 5 years. This indicates that the fishery will most likely experience reduced recruitment levels from 2013 to 2017.

From 2002 to 2009, estimates of legal sized biomass, as determined by the qR stock assessment model, decreased by 65% from 5,134 to 1,792 tonnes. Over the last three seasons, biomass has increased to 2,322 tonnes in 2012. However, current estimates for the fishery remain low in a historical context. Current exploitation rates are now estimated to exceed 50%.

Based on the 2012 estimates of catch rate and pre-recruit indices, the SZRLF harvest strategy recommends retaining the TACC at 1,250 tonnes for the fourth consecutive season. However, data presented in this report indicates that biomass rebuilding is not occurring at this catch level. In addition, the declining catch rate and biomass estimates observed in 2012 need to be considered in combination with predicted levels of low recruitment in the short-to-medium term based on puerulus settlement and pre-recruit indices.

3 INTRODUCTION

This fishery status report updates the 2011/12 stock assessment report for the Southern Zone Rock Lobster Fishery (SZRLF) (Linnane et al. 2013) and is part of SARDI Aquatic Sciences ongoing assessment program for the fishery. The aims of the report are to provide a brief synopsis of information available for the SZRLF and to assess the current status of the resource in relation to the performance indicators provided in the Management Plan (PIRSA 2013) for the fishery. A comprehensive assessment that includes more detailed spatial and temporal analyses will be provided in the 2012/13 stock assessment report which is due to be published in July 2014.

4 FISHERY STATISTICS

4.1 Catch, effort and catch per unit effort (CPUE)

4.1.1 Zonal catch and effort

In 2012 (i.e. the 2012/13 season), the total allowable commercial catch (TACC) in the SZRLF was 1,250 tonnes. The total reported commercial catch was 1,226.7 tonnes (98% of TACC) (Figure 1). Effort in 2012 was 1,419,905 potlifts, representing an increase of 10.5% from 2011 (1,285,289 potlifts).

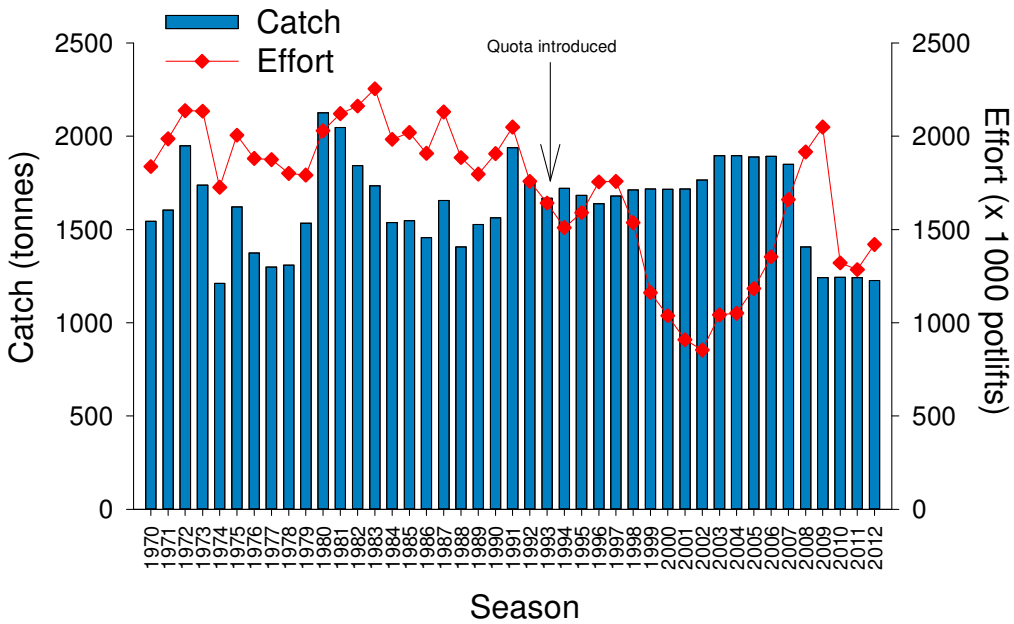

Figure 1 Inter-annual trends in catch and effort in the SZRLF from 1970 to 2012.

4.1.2 Within season trends in catch and effort

In 2012, the highest catches (>200 tonnes) were taken in the first four months of the season from October to January (Figure 2). The highest catch was taken in October at 276.9 tonnes, while the lowest was in May at 13.9 tonnes. The trends in effort generally reflected catch levels by month.

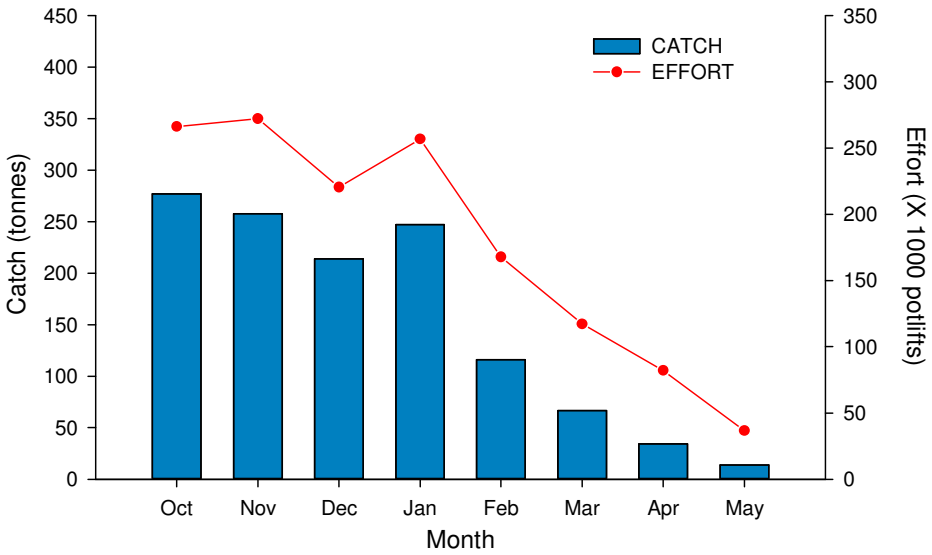

Figure 2 Within season trends in catch and effort in the SZRLF for the 2012 season.

4.1.3 Regional catch and effort

In 2012, 99% of the commercial catch came from four MFAs, i.e. 51, 55, 56 and 58 (see Figure 25). The highest proportion was harvested from MFA 55 (34%) while 2% of catch was taken from MFA 51 (Figure 3).

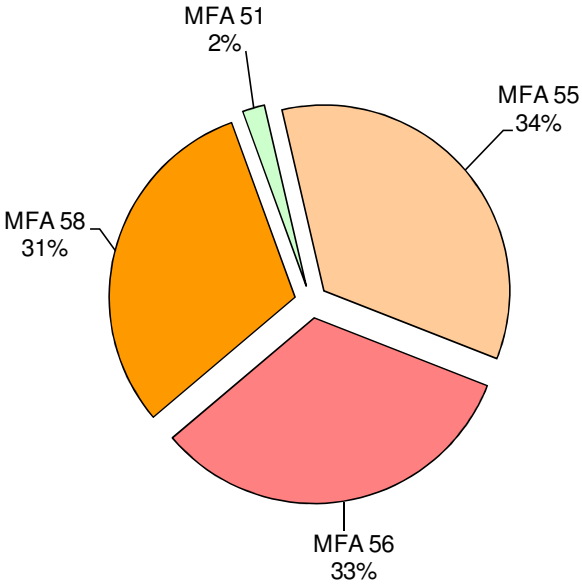

Figure 3 Percentage of total catch taken in the four major MFAs (in terms of tonnage landed) of the SZRLF in 2012.

In 2012, the catch taken in MFAs 51, 55, 56 and 58 was 23.4, 419.4, 398.6 and 371.5 tonnes, respectively (Figure 4). As with zonal estimates, effort increased in all major regions in 2012. In MFAs 55 and 56 effort increases did not reflect a corresponding increase in catch. Effort estimates in 2012 were 38,107, 488,999, 496,916 and 378,921 potlifts in MFAs 51, 55, 56 and 58, respectively.

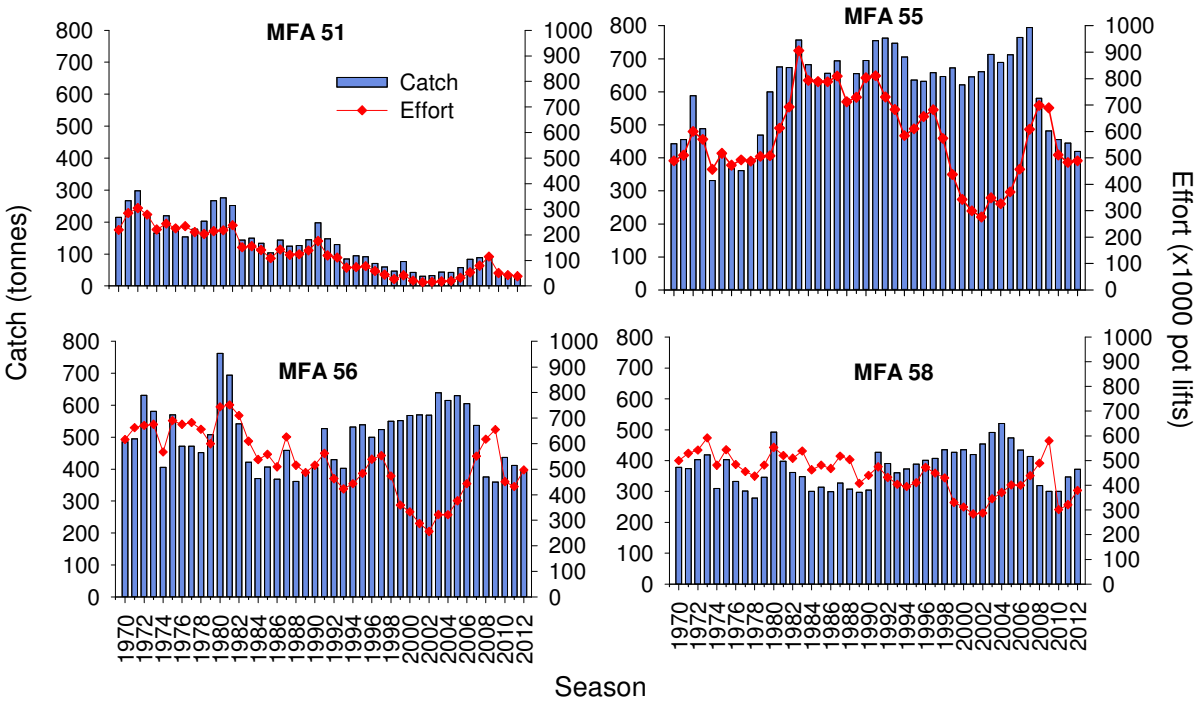

Figure 4 Inter-annual trends in catch and effort in the main Marine Fishing Areas (MFAs) of the SZRLF from 1970 to 2012 (note: alternate seasonal ticks on X-axis).

4.1.4 Zonal catch per unit effort (CPUE)

Catch per unit effort (CPUE) declined from 2.06 kg/potlift in 2002 to 0.60 kg/potlift in 2009, a decrease of 71% (Figure 5). Over the next two seasons it increased and in 2011 was 0.96 kg/potlift reflecting a 60% increase since 2009. In 2012, CPUE decreased to 0.86 kg/potlift reflecting the fifth consecutive season that catch rate has been below the long-term average of 1.02 kg/potlift for the fishery.

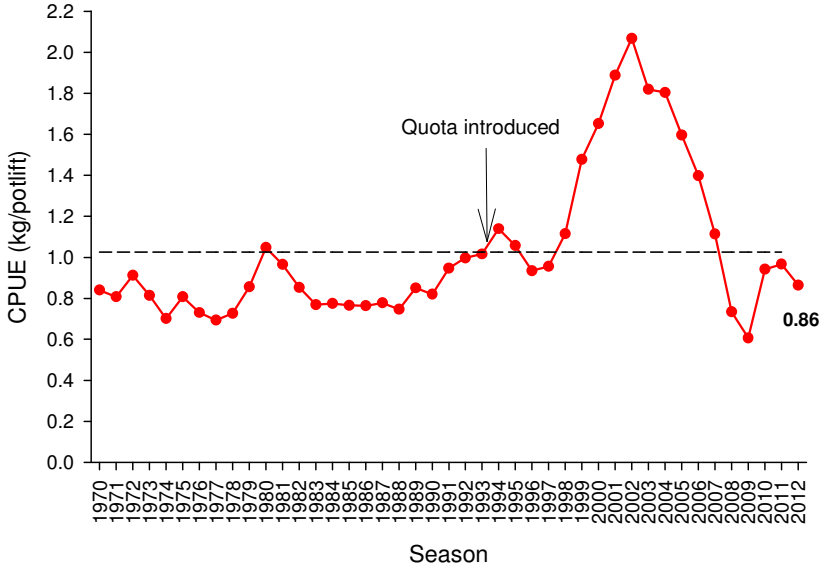

Figure 5 Inter-annual trends in CPUE in the SZRLF between 1970 and 2012. Dashed line represents long-term average.

4.1.5 Within season trends in CPUE

Within season CPUE generally increases from November to January before decreasing thereafter (Figure 6). Monthly CPUE values in 2012 were consistently below those in 2011. In 2012, CPUE was highest in October at 1.04 kg/potlift and lowest in May at 0.37 kg/potlift. From February to May of 2012, the monthly estimates were comparable to those observed in 2009 when the zonal catch rate estimate decreased to the lowest on record (0.60 kg/potlift) (Figure 5).

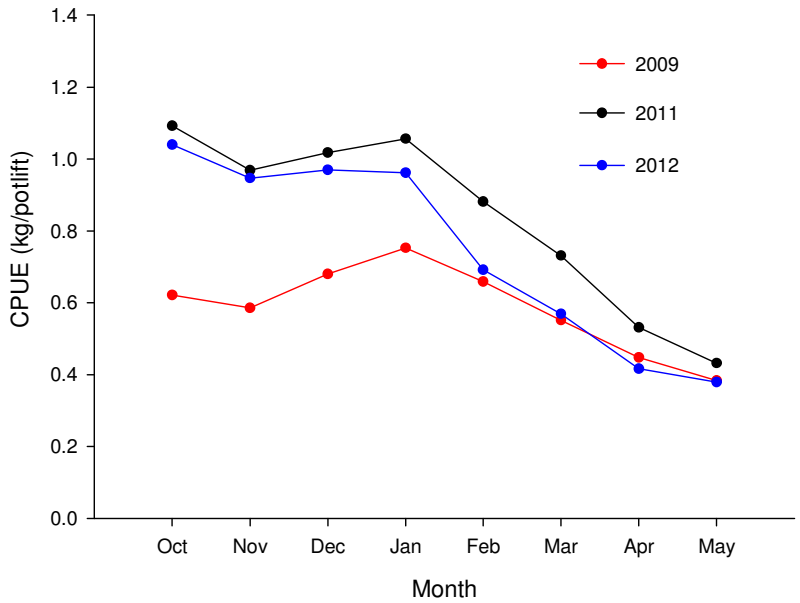

Figure 6 Within season trends in CPUE in the SZRLF in the 2009, 2011 and 2012 seasons.

4.1.6 Regional CPUE

The trends in CPUE across the major MFAs generally reflect zonal estimates (Figure 7). In 2012, CPUE decreased in all major MFAs with estimates of 0.60, 0.86, 0.80 and 0.98 kg/potlift in MFAS 51, 55, 56 and 58, respectively.

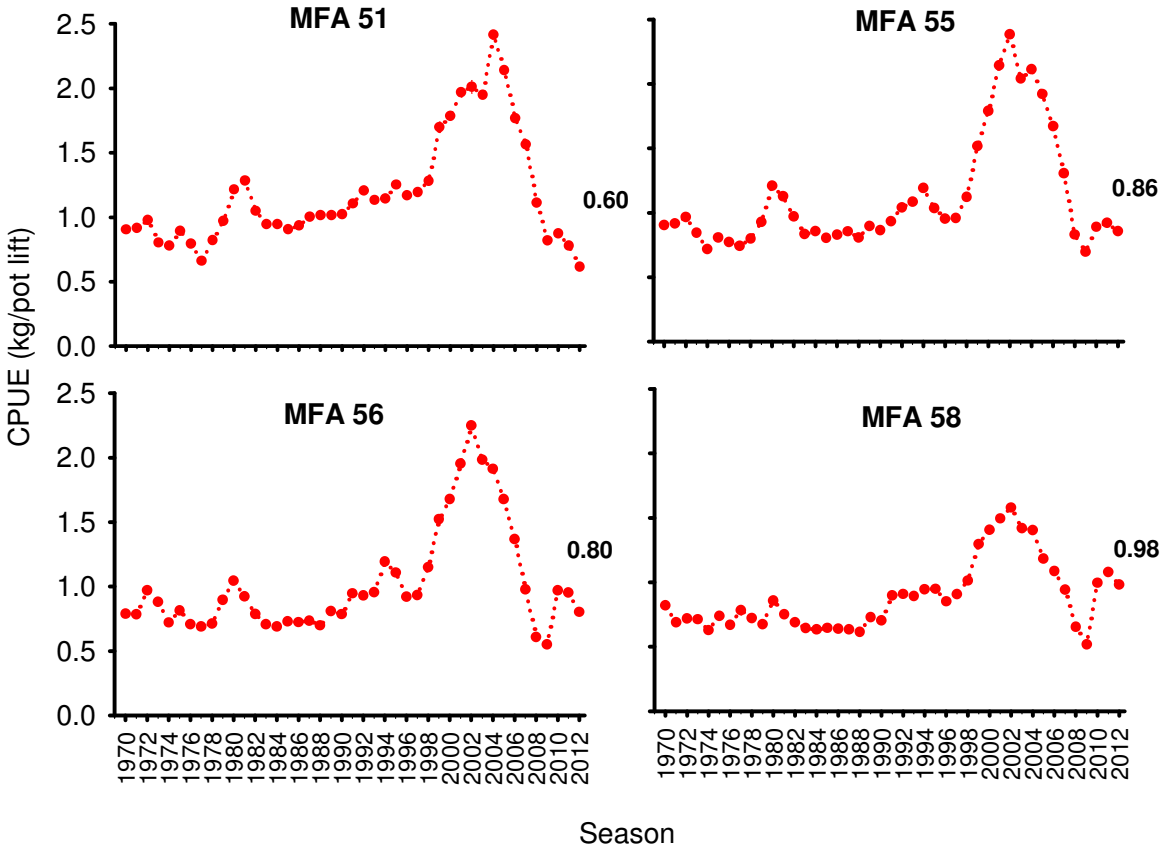

Figure 7 Inter-annual trends in CPUE in the four main MFAs of the SZRLF between 1970 and 2012 (note: alternate annual ticks on X-axis).

4.1.7 Spatial trends in catch by depth

Over the last seven seasons >80% of the catch has been taken from depths of <60 m (Figure 8). In 2012, the proportion of catch taken in 0-30, 31-60, 61-90 and >90 m was 35%, 49%, 10% and 6%, respectively. The relative proportion of catch by depth has remained relatively stable since 2006.

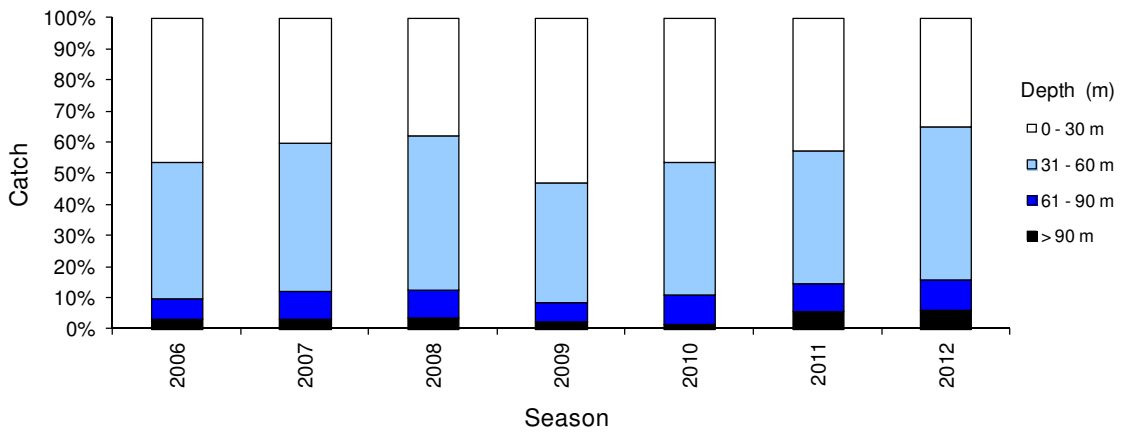

Figure 8 Catch by depth in the SZRLF over the last seven seasons.

4.1.8 Spatial trends in CPUE by depth

While >80% of catch is taken from depths of <60 m (Figure 8), catch rates in the shallower depths of 0-30 m and 31-60 m are consistently lower than those in deeper waters (Figure 9). In 2012, CPUE decreased across all depth ranges compared to 2011 estimates.

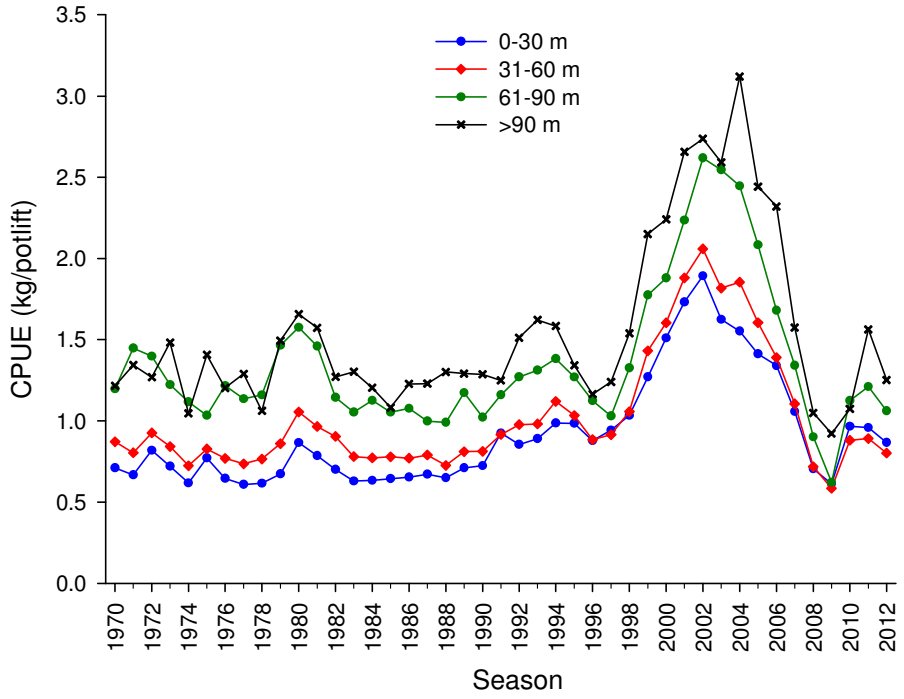

Figure 9 CPUE by depth in the SZRLF from 1970 to 2012.

4.1.9 Average number of days fished

From 2003 to 2009, the average numbers of days fished per licence holder increased despite declining TACCs over the same period (Figure 10). In 2012, the estimate was 121 days, representing an 8% increase from 2011 (112 days).

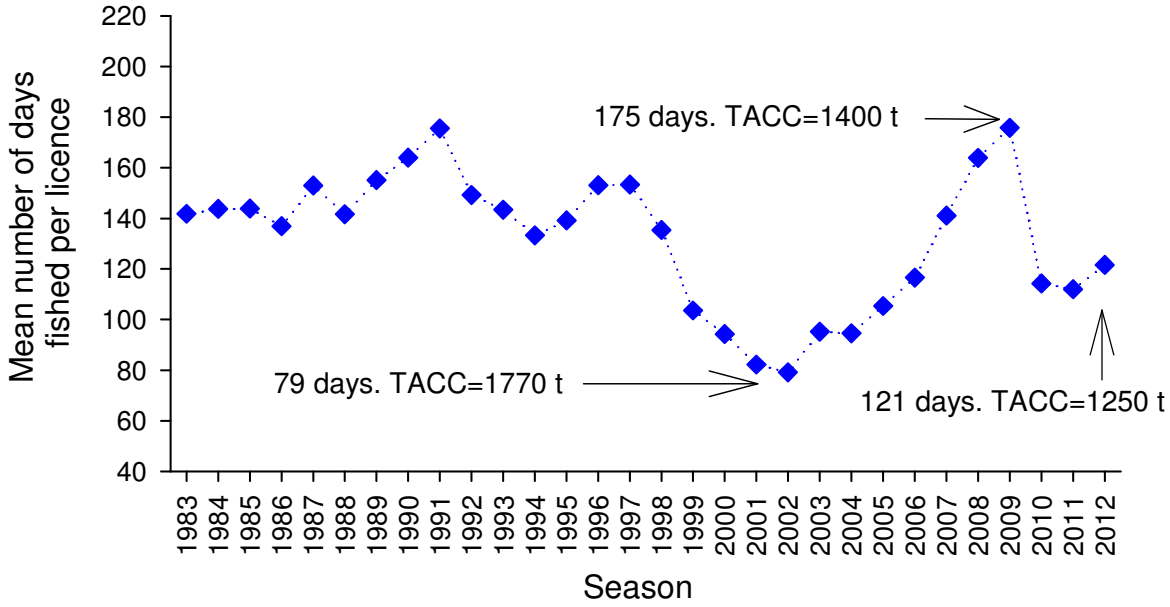

Figure 10 Mean number of days fished/licence holder from 1983 to 2012 in the SZRLF.

4.1.10 Zonal mean weight

Fluctuations in mean weight reflect variations in recruitment to the legal size (Figure 11). Over the last two seasons mean weight has increased and in 2012 was 0.77 kg. This is likely to represent reduced recruitment into the fishery as reflected by decreases in catch rate (Figure 5). As with CPUE, the estimate can be influenced by high-grading when smaller individuals are preferentially selected (see Figure 13).

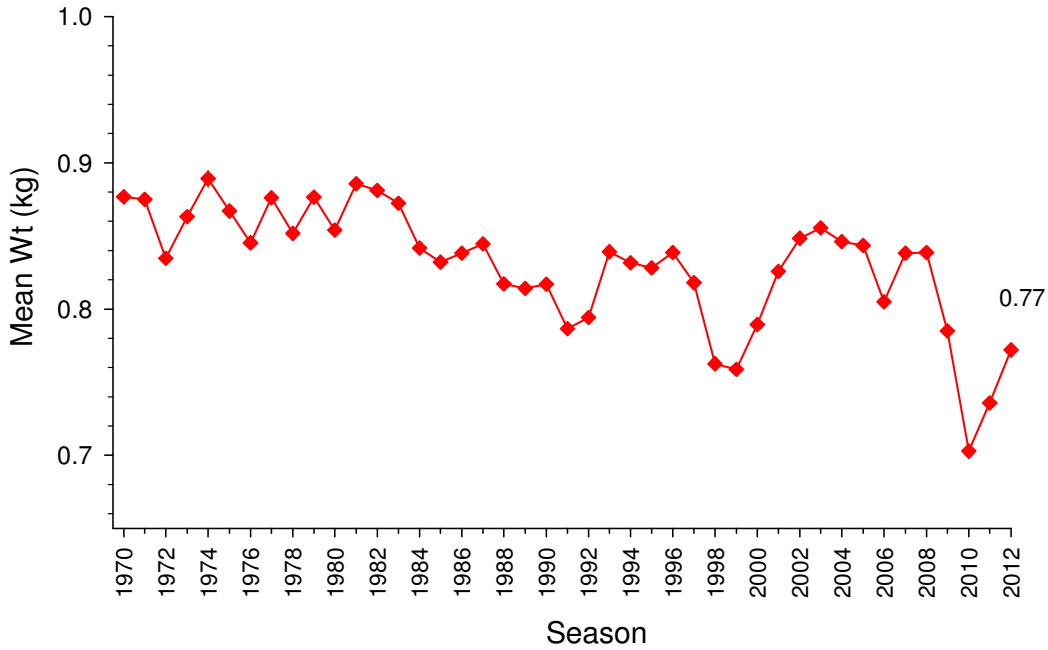

Figure 11 Inter-annual trends in mean lobster weight in the SZRLF from 1970 to 2012.

4.1.11 Within season trends in mean weight

In the SZRLF, mean weight tends to increase as the season progresses (Figure 12). In 2012, trends were similar to those from previous seasons with mean weight lowest in November at 0.72 kg and highest in March at 0.85 kg.

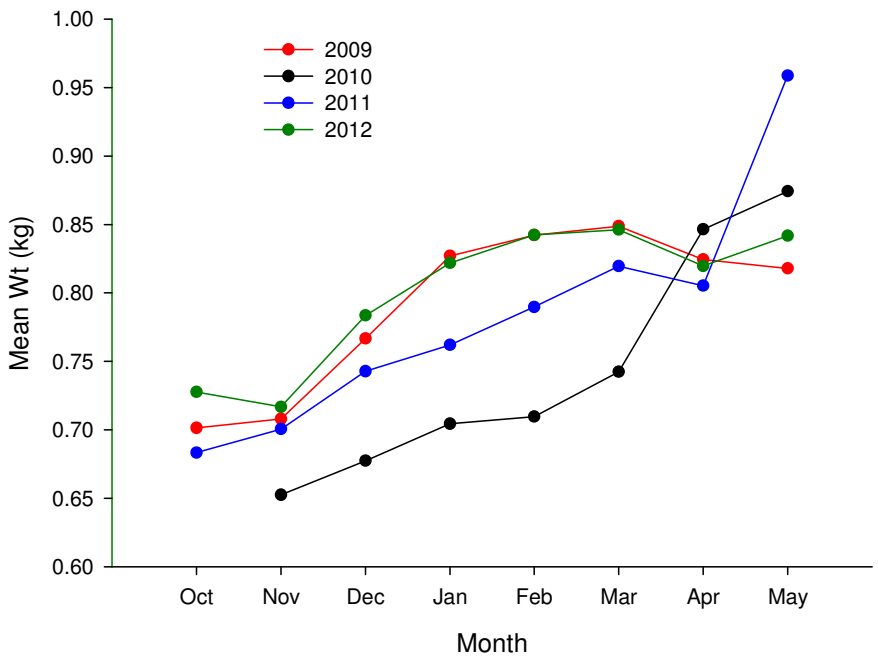

Figure 12 Within season trends in mean weight in the SZRLF over the last four seasons.

4.1.12 High-grading

Estimates of high-grading (i.e. tonnage of lobsters returned to the water due to unsuitable size, colour or physical damage) exceeded 100 tonnes between 2003 and 2006 (Figure 13). Since then, estimates have steadily decreased and in 2012 only 22.6 tonnes were not retained. As the recording of high-grades in logbooks is undertaken on a voluntary basis, values are likely to be conservative.

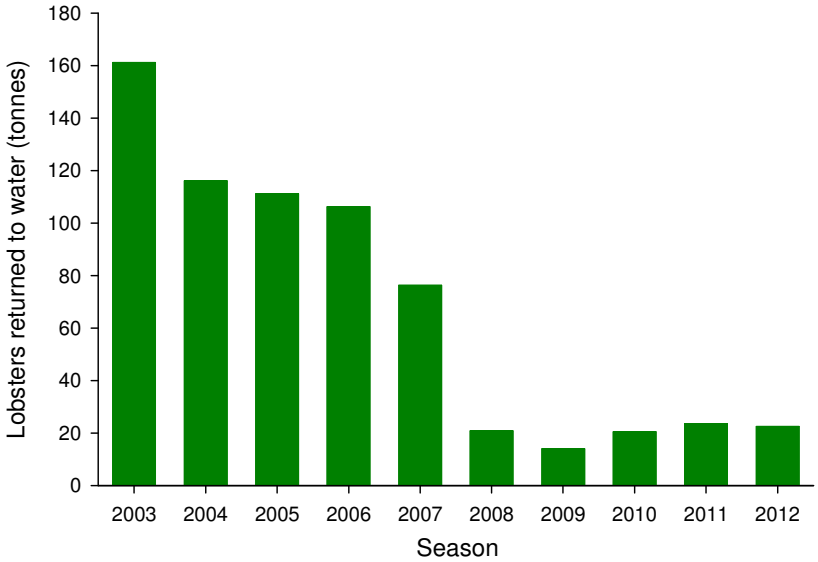

Figure 13 Tonnage returned to the water due to high-grading in the SZRLF from 2003-2012.

4.2 Puerulus Settlement Index

The three highest puerulus settlements indices (PSIs) were observed from 2005 to 2007 at 2.9, 5.0 and 2.6 puerulus/collector, respectively (Figure 14). Over the next five seasons, with the exception of 2009, the PSI decreased and in 2012 was 0.98 puerulus/collector. Four of the last five settlements have been below the long-term average (1.54 puerulus/collector). In the SZRLF, the estimated period between puerulus settlement and recruitment into the fishable biomass is estimated to be about 5 years. Undersized individuals are generally observed about 4 years after settlement.

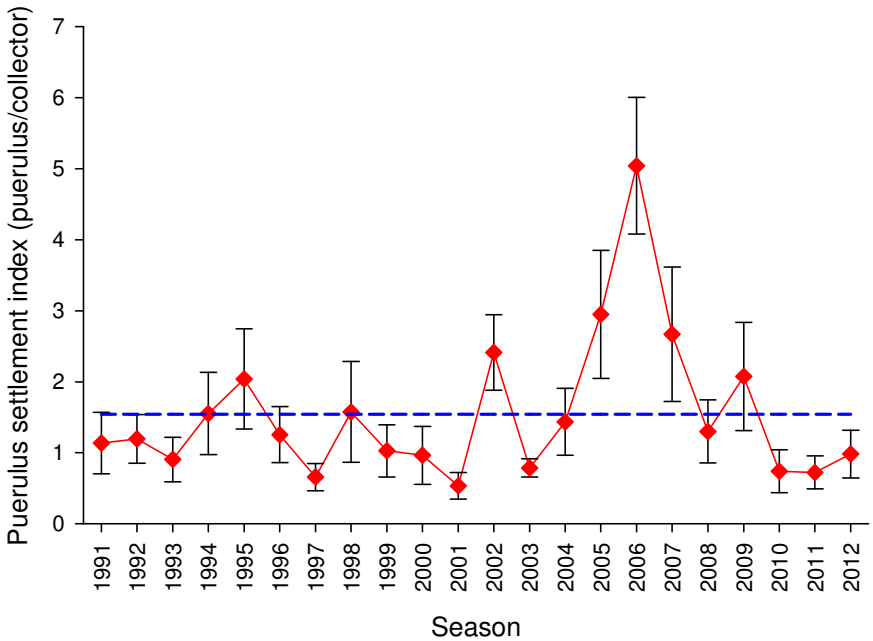

Figure 14 Puerulus settlement index (PSI) (mean ±SE) in the SZRLF from 1991 to 2012. Dashed blue line represents long-term average.

4.3 Pre-recruit index (PRI)

4.3.1 Zonal pre-recruit index

With the exception of increases in 2009 and 2010, the zonal estimate of logbook based PRI shows a consistent long-term decline (Figure 15). Specifically, PRI has decreased from 2.1 undersized/potlift in 1999 to 0.96 undersized/potlift in 2012. Current estimates are now close to historical lows. In the SZRLF, the period between pre-recruits and recruitment into the fishable biomass is estimated to be about one year.

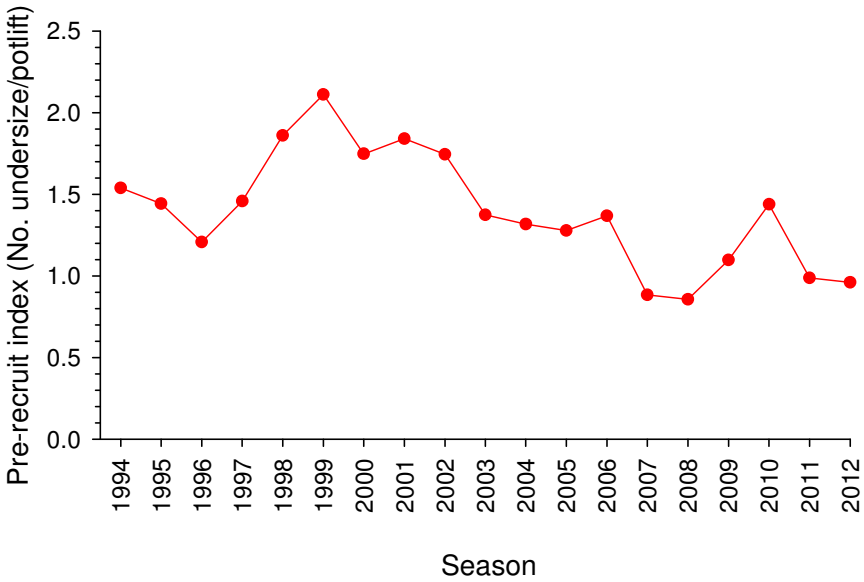

Figure 15 Logbook derived PRI from 1994-2012 (November–March inclusive).

4.3.2 Regional pre-recruit index

Regional estimates of logbook based PRI (Figure 16) indicates 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 25) compared to southern areas (i.e. MFA 56 and 58). In 2012, PRI increased in MFA 51 and 58 but decreased in 55 and 56 with estimates of 0.23, 0.29, 1.09 and 2.73 undersized/potlift in MFAs 51, 55, 56 and 58, respectively. Long-term trends in MFA 56 and 58, the two key pre-recruit regions, indicate consistent declines with the exception of 2009 and 2010. Estimates in MFA 56 are currently the lowest on record.

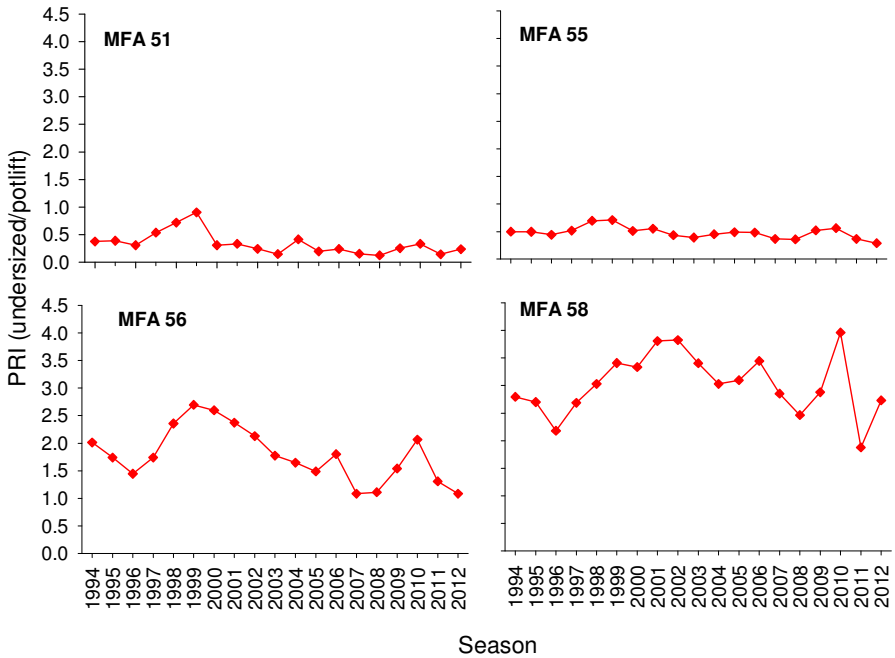

Figure 16 Interannual trends in regional PRI in the SZRLF from 1994-2012.

4.4 Length Frequency Data

Length frequency data obtained through the catch sampling program confirmed increases in commercial catch rate indices over the period 2009 to 2011 (Figure 17). The frequency of lobsters above the minimum legal size (MLS) of 98.5 mm carapace length (CL) was low in 2009 reflecting the lowest catch rate of legal sized lobsters on record (Figure 5). The high frequency of lobsters below the MLS in 2009 reflects the high pre-recruit index expected from the strong settlement observed in 2005 and 2006 (Figure 14). In 2010 and 2011, the frequency of lobsters in the 98.5-110 mm CL size classes increased, indicating recruitment into the fishery as observed by increased catch rates during these seasons. Length frequency data in 2012 were broadly similar to 2011.

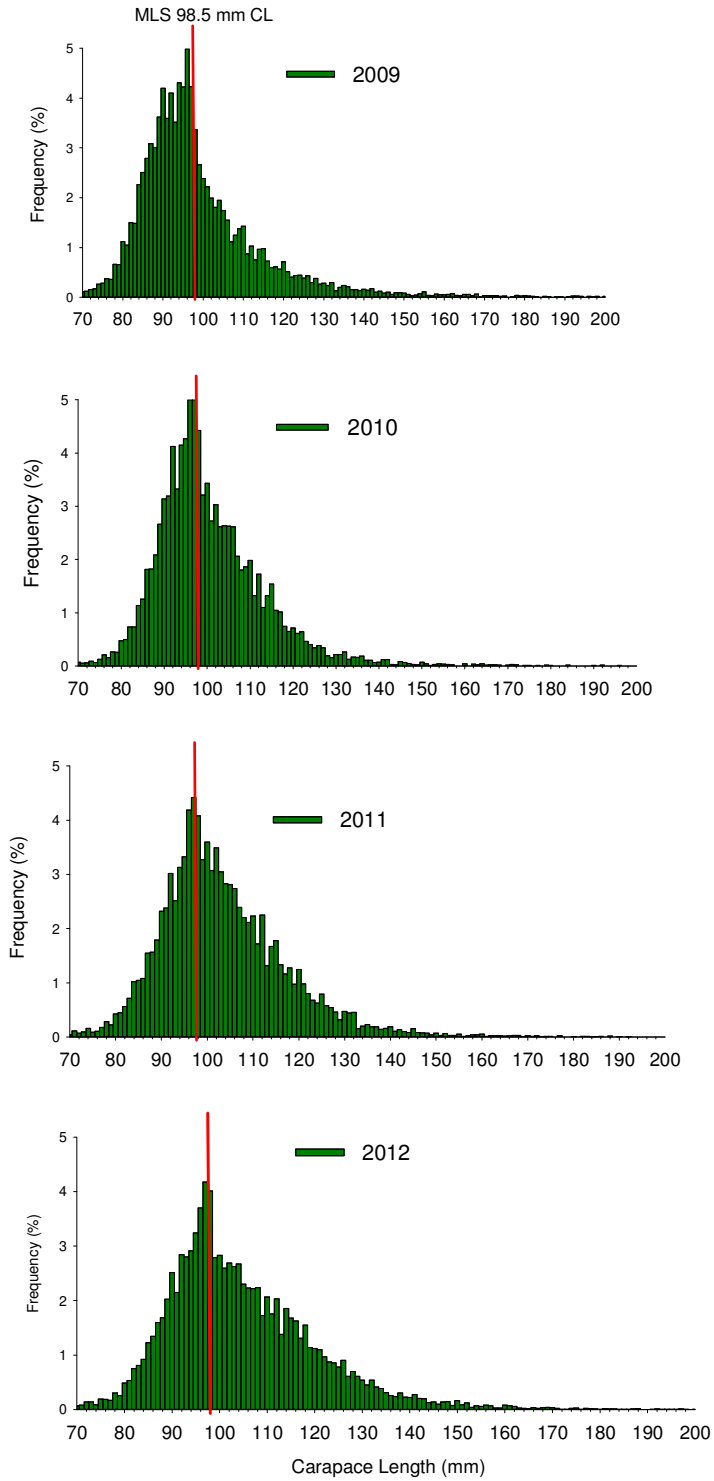

Figure 17 Length frequency data of both male and female lobsters sampled during the voluntary catch sampling program from 2009-2012.

5 qR MODEL OUTPUTS

5.1 Biomass

From 2002 to 2009, estimates of legal sized biomass, as determined by the qR stock assessment model, decreased by 65% from 5,134 to 1,792 tonnes (Figure 18). Over the last three seasons, there has been an increase to 2,322 tonnes in 2012. However, current estimates for the fishery remain low in a historical context.

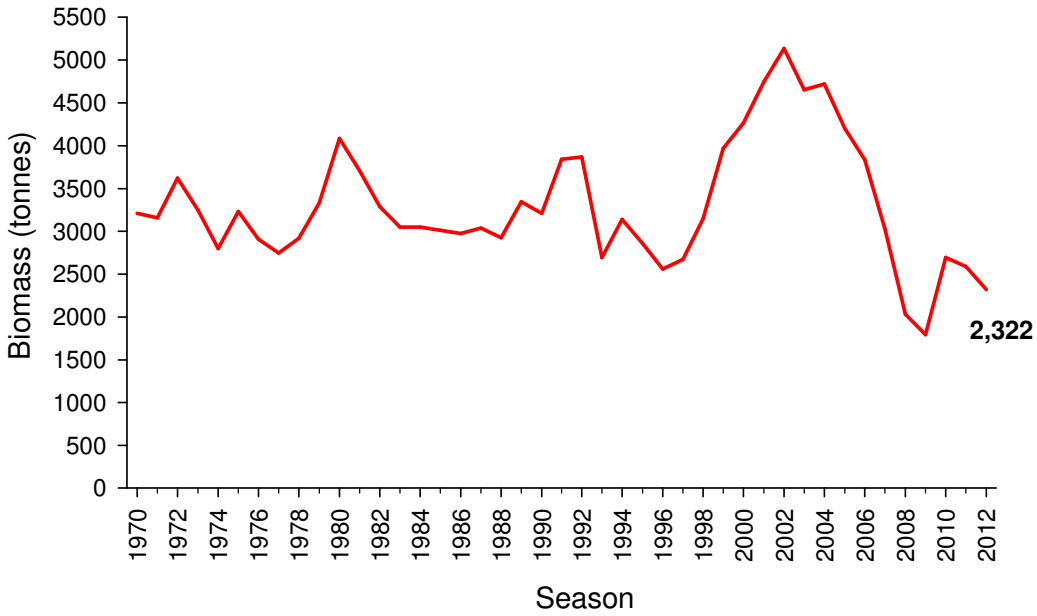

Figure 18 Estimates of biomass for the SZRLF as obtained from the qR fishery model.

5.2 Egg production

Over the last decade, egg production in the SZRLF has decreased by 49% from 673 billion in 2003 to 340 billion in 2012 (Figure 19). Current estimates of egg production are at historical lows for the fishery.

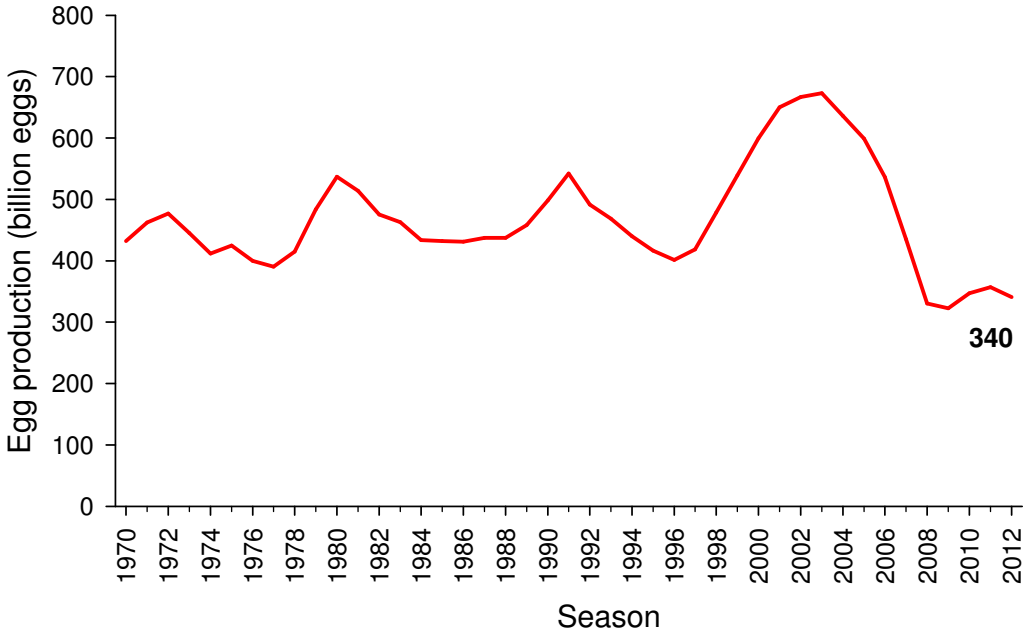

Figure 19 Estimates of egg production for the SZRLF as obtained from the qR fishery model.

5.3 Percent of virgin egg production

Model outputs for the 2012 season suggest that egg production equated to 8% of virgin levels, one of the lowest estimates on record (Figure 20).

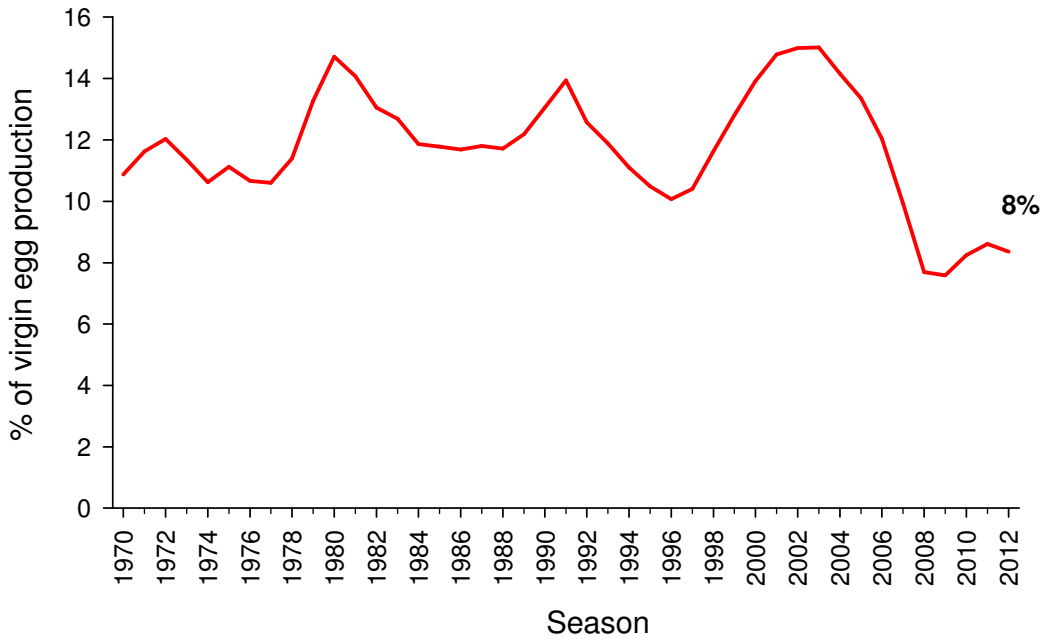

Figure 20 Estimates of % of virgin egg production for the SZRLF as obtained from the qR fishery model.

5.4 Exploitation rate

Exploitation rate increased from 34% in 2002 to 69% in 2009 (Figure 21) in response to decreasing biomass over the same period (Figure 18). Over the next two seasons estimates decreased to 48% in 2011 before increasing to 53% in 2012.

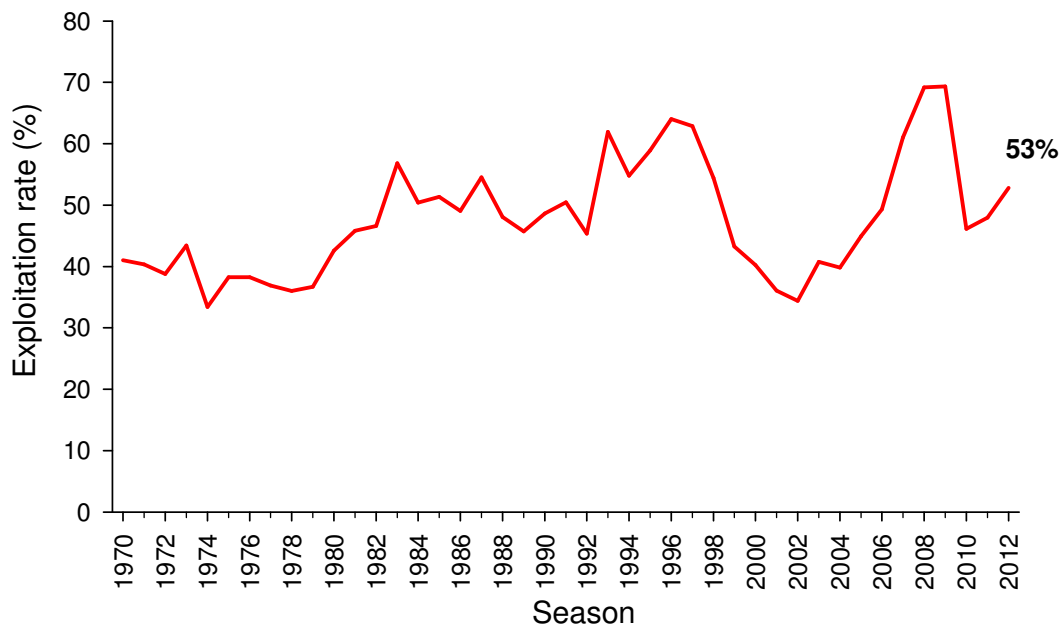

Figure 21 Estimates of exploitation for the SZRLF as obtained from the qR fishery model.

5.5 Recruitment

Outputs from the qR model indicate that since the late 1990s recruitment has generally declined in the SZRLF (Figure 22). In 1999, the estimate of recruitment was 4 million individuals but by 2008 this was reduced to 1 million, a decrease of 75%. In 2010, recruitment increased to 3.3 million, but subsequently decreased to 1.4 million in 2012.

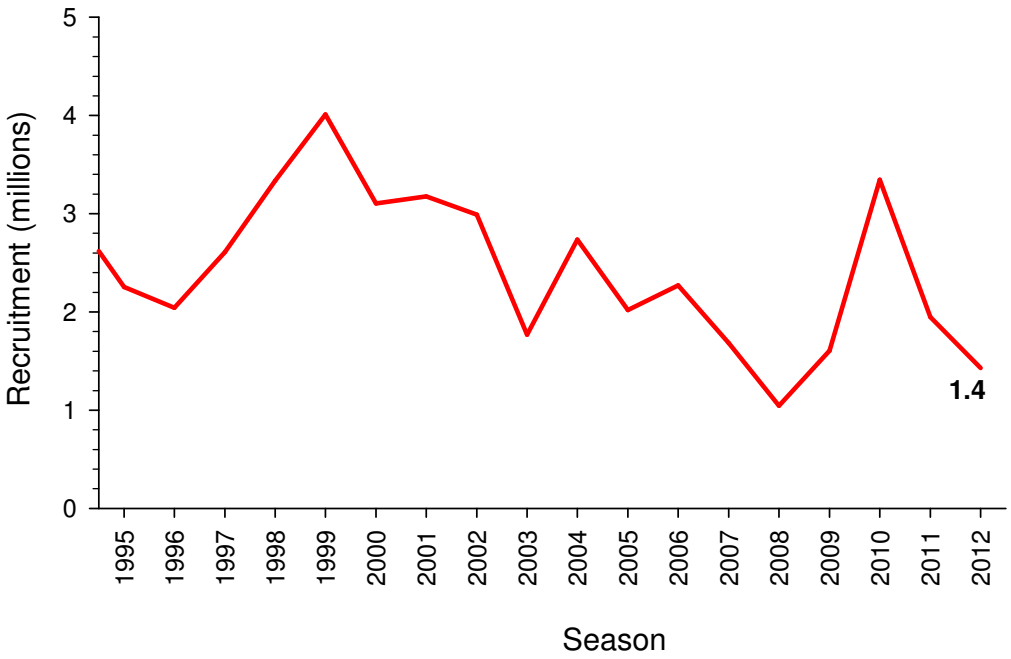

Figure 22 Estimates of recruitment for the SZRLF as obtained from the qR fishery model.

6 BIOLOGICAL PERFORMANCE INDICATORS

6.1 Reference Points

The current harvest strategy for the SZRLF details specific reference points for both the primary biological performance indicator of CPUE and the secondary biological performance indicator of pre-recruit index (PRI) (PIRSA, 2013).

6.1.1 Primary Indicator: Catch per unit effort (CPUE)

For CPUE, a modified "traffic light" method is now used to determine the current status of the fishery relative to a target reference range, where blue is above the target range (TACC increase), green is within the target range (no change to TACC), while both yellow and red are below the target range (TACC decrease).

The four levels of TACC used in this harvest strategy are based on historical levels of fishing effort between 1.4 and 1.6 million potlifts per season. The two lower TACCs (950 and 1250 tonnes) are based on 1.6 million potlifts, while the two higher TACCs (1400 and 1600 tonnes) are based on 1.4 million potlifts. Such levels of effort in the past have resulted in an upward trajectory in catch rates for southern rock lobster in the Southern Zone.

In 2012, the CPUE was 0.86 kg/potlift, while the TACC was 1,250 tonnes. Based on the current harvest strategy, this indicates that the catch rate is within the lower tier of the green target range.

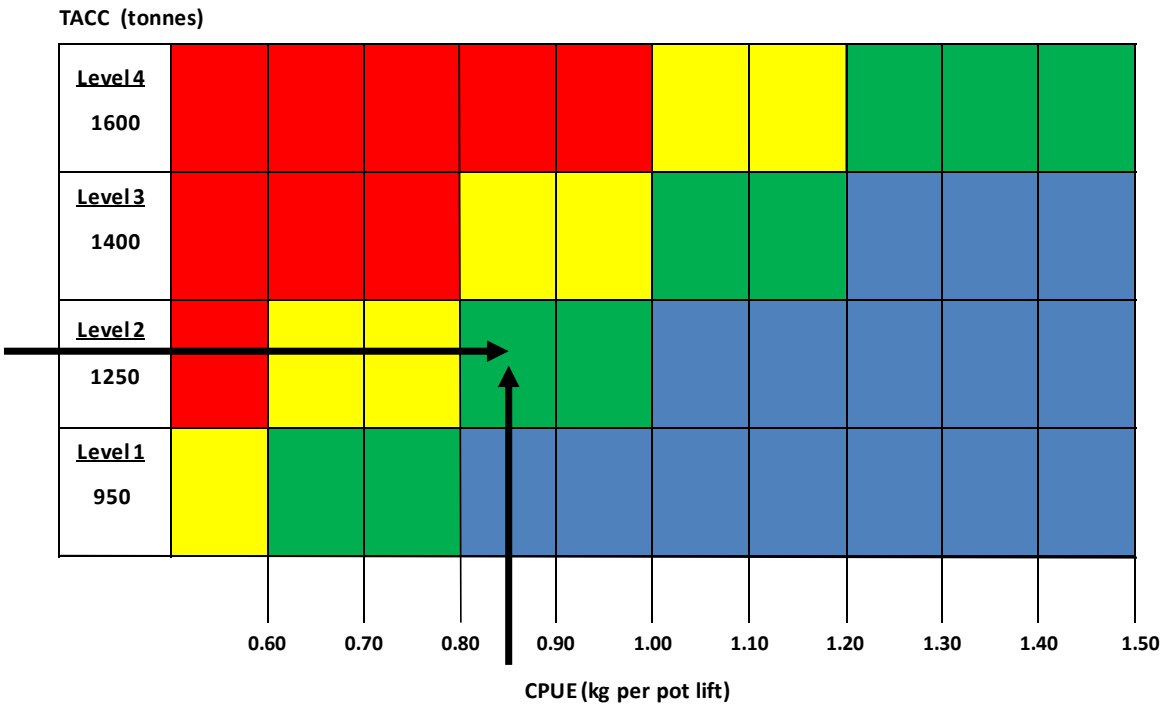

Figure 23 TACC levels at various catch per unit effort (CPUE) rates where blue is above the target level, green is at the target level, while both yellow and red are below the target level.

6.1.2 Secondary Indicator: Pre-recruit index (PRI)

The secondary indicator of fishery performance is PRI, derived from logbook data, with a limit reference point (LRP) of 1.3 undersized/potlift (Figure 24). In 2012, the PRI was 0.96 undersized/potlift which is below the LRP. This LRP has been breached in five of the last six seasons.

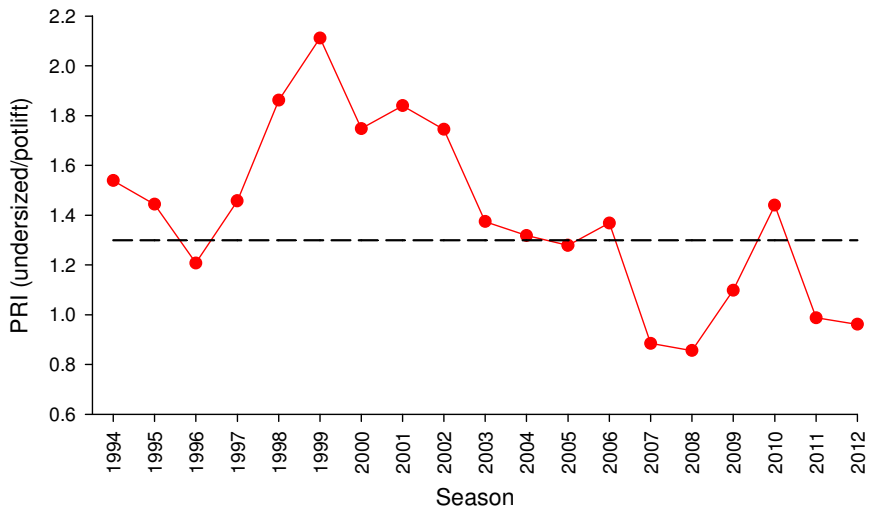

Figure 24 Inter-annual trends in pre-recruit index (PRI) in the SZRLF from 1994 to 2012 based on logbook data. Dashed line represents limit reference point (1.3 undersized/potlift).

6.2 Implications for management

Based on the harvest strategy, the primary catch rate indicator is within the green target range which recommends that the TACC should be retained at 1,250 tonnes. The secondary pre-recruit indicator is below the LRP, therefore a TACC increase should not be considered.

7 SUMMARY

The stock status of the SZRLF has declined considerably over the last decade. Catch rate has decreased by 58% from 2.06 kg/potlift in 2002 to 0.86 kg/potlift in 2012. Estimates of legal sized biomass and egg production are close to historical lows, while exploitation rates are above 50%. The current status reflects a long-term decline in recruitment to the fishable biomass as evidenced by decreasing estimates of both pre-recruit indices and model recruitment.

The two sources of information in relation to short-to-medium-term future recruitment are the pre-recruit and puerulus settlement indices. In 2012, the pre-recruit index was one of the lowest on record suggesting that recruitment to the fishery in 2013 will be poor. Four of the last five settlements between 2008 and 2012 have been below the long-term average, suggesting that recruitment from 2013 to 2017 will also be reduced.

Based on the current levels of catch rate and pre-recruit indices, the harvest strategy recommends retaining the TACC at 1,250 tonnes. However, data presented in this report indicates that biomass rebuilding is most likely not occurring at this catch level. In addition, the declining catch rate and biomass estimates observed in 2012 need to be considered in combination with predicted levels of low recruitment in the short-to-medium term, based on puerulus settlement and pre-recruit indices.

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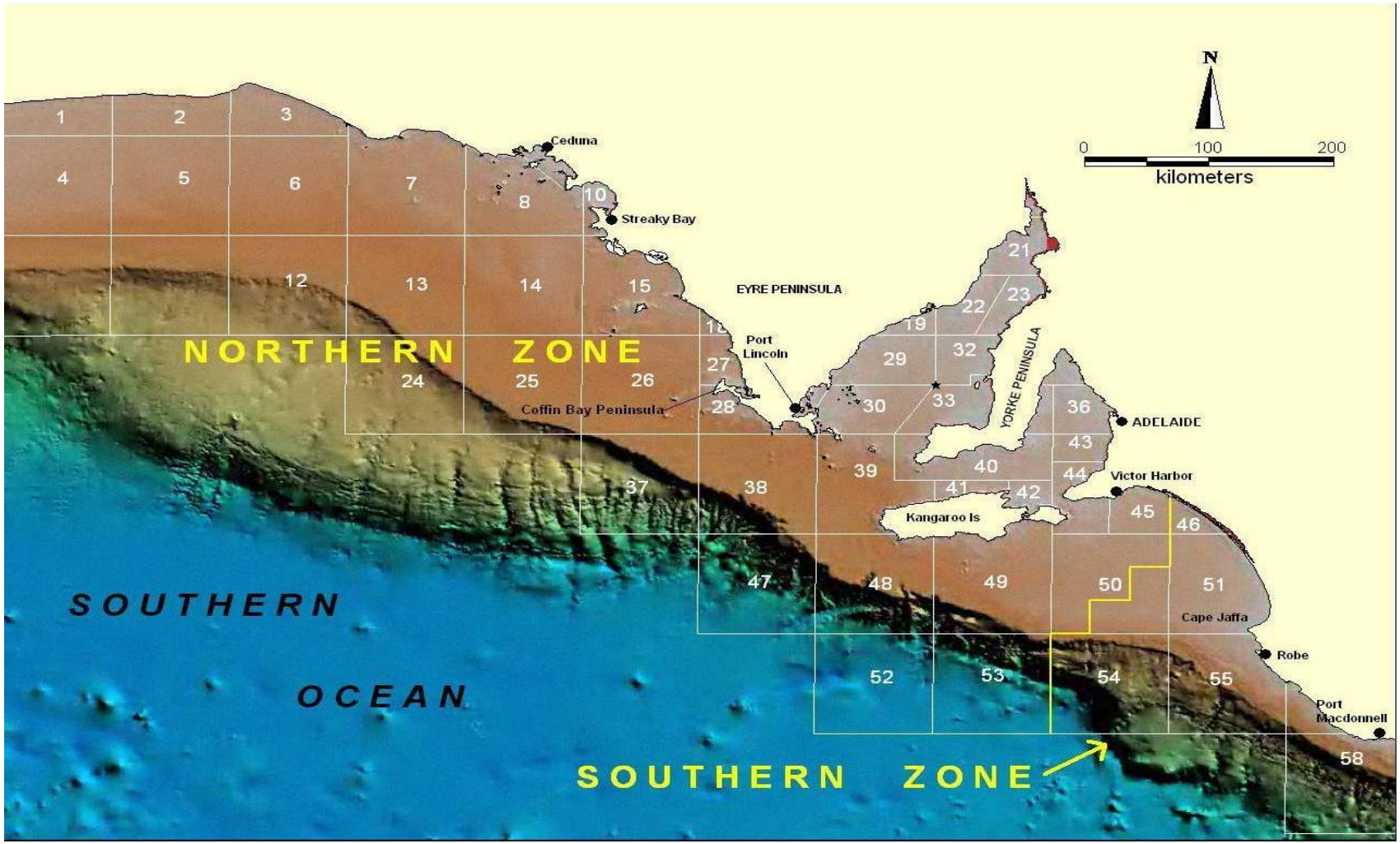

Figure 25 Northern and Southern Zones and Marine Fishing Areas in the South Australian Rock Lobster Fishery.