Southern Zone
Rock Lobster (*Jasus edwardsii*)
Fishery Status Report 2011/12

Status Report to PIRSA Fisheries and Aquaculture

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SARDI Publication No. F2007/000715-6
SARDI Research Report Series No. 677

December 2012
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In 2011 (i.e. October 1, 2011 to May 31, 2012 season), 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 1,242.1 tonnes. This represents the second consecutive season that >99% of the TACC has been taken. Effort in 2011 was 1,285,289 potlifts, representing a decrease of 37% from 2009 (2,049,961 potlifts) reflecting the lowest estimate of effort since 2005 (1,183,037 potlifts).

In 2011, a total of 99% of catch came from four Marine Fishing Areas (MFAs) in the SZRLF with 33.3, 445.0, 411.0 and 346.7 tonnes taken in MFAs 51, 55, 56 and 58, respectively. As with the zonal estimate, effort decreased considerably in all regions.

Zonal catch per unit effort (CPUE) declined from 2.06 to 0.60 kg/potlift from 2002 to 2009, a decrease of 71%. Over the last two seasons CPUE has increased and in 2011, was 0.96 kg/potlift reflecting a 60% increase since 2009 and the highest CPUE on record since 2007 (1.11 kg/potlift).

Trends in CPUE varied spatially with decreases in MFA 51 and 56 and increases in 55 and 58. In 2011, the estimates were 0.77, 0.92, 0.95 and 1.07 kg/potlift in MFAs 51, 55, 56 and 58, respectively.

Three of the highest puerulus settlements indices (PSIs) on record were observed from 2005 to 2007 at 2.9, 5.0 and 2.6 puerulus/collector, respectively. PSI decreased over the next four seasons and in 2011 was 0.72 puerulus/collector, the lowest since 2001. The estimated period between puerulus settlement and recruitment into the fishable biomass in the SZRLF is 5 years while undersized individuals are observed 4 years after settlement.

Logbook derived pre-recruit indices (PRI) decreased from 2.1 in 1999 to 0.85 undersized/potlift in 2008. Over the next two seasons it increased and in 2010 was 1.43 undersized/potlift, the highest since 2002. In 2011, PRI decreased by 31% to 0.99 undersized/potlift. The increase in PRI in 2009 and 2010 reflects high PSIs in 2005 and 2006 while the decrease in 2011 is the result of reduced settlement observed in 2007.

Outputs from the qR fishery model show that from 2003 to 2009 biomass in the SZRLF decreased by 61%. Over the same period, exploitation rates increased from 34% to 69%. In 2011, the biomass estimate was 2,597 tonnes reflecting a 45% increase from 2009. However, current estimates of biomass remain low in a historical context.

In summary, while catch rates have recently increased in the SZRLF, the decrease in abundance of undersized lobsters in 2011 suggests that the fishery may now be entering a period of reduced recruitment as observed by low settlement recorded from 2008 to 2011. In 2011, the harvest strategy decision rules for the fishery were reviewed. Based on the current levels of legal sized catch rate (primary indicator) and pre-recruit indices (secondary indicator), the new strategy recommends retaining the TACC at 1,250 tonnes.
3 INTRODUCTION

This fishery status report updates the 2010/11 stock assessment report for the Southern Zone Rock Lobster Fishery (SZRLF) 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 (Anon 2012) for the fishery. A more comprehensive assessment that includes more detailed spatial and temporal analyses will be provided in the 2011/12 stock assessment report which is due in July 2013.
4 FISHERY STATISTICS

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

4.1.1 Zonal catch and effort

In 2011 (i.e. the 2011/12 season), the total allowable commercial catch (TACC) in the SZRLF was 1,250 tonnes. The total reported commercial catch was 1,242.1 tonnes (Figure 1). This represents the second consecutive season that >99% TACC has been taken. Effort in 2011 was 1,285,289 potlifts, representing a decrease of 37% from 2009 (2,049,961 potlifts) and is the lowest estimate since 2005 (1,183,037 potlifts).

Figure 1 Inter-annual trends in catch and effort in the SZRLF from 1970 to 2011.

4.1.2 Within season trends in catch and effort

In 2011, the highest catches (>240 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 251.9 tonnes while the lowest was in May at 6.6 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 2011 season.
4.1.3 Regional catch and effort

In 2011, 99% of the commercial catch came from four MFAs, i.e. 51, 55, 56 and 58 (see Figure 25). The highest proportion came from MFA 55 (36%) while 3% of catch came from MFA 51 (Figure 3).

![Figure 3](image_url) Percentage of total catch taken in the four major MFAs (in terms of tonnage landed) of the SZRLF in 2011.

In 2011, the catch taken in MFAs 51, 55, 56 and 58 was 33.3, 445.0, 411.0 and 346.7 tonnes, respectively. (Figure 4, refer to Figure 25). As with zonal estimates, effort has decreased considerably in all regions since 2009. The estimates of effort in 2011 were 42,836, 482,559, 432,107 and 321,308 potlifts in MFAs 51, 55, 56 and 58, respectively.

![Figure 4](image_url) Inter-annual trends in catch and effort in the main Marine Fishing Areas (MFAs) of the SZRLF from 1970 to 2011 (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). In 2011, it was 0.96 kg/potlift reflecting a 60% increase since 2009 and the highest CPUE on record since 2007 (1.11 kg/potlift) but below the long-term average for the fishery of 1.02 kg/potlift.

Figure 5 Inter-annual trends in CPUE in the SZRLF between 1970 and 2011. Dashed line represents long-term average.

Within season trends in CPUE

Within season CPUE generally increases from November to January before decreasing thereafter (Figure 6). Monthly levels in 2011 were above those in 2008 and 2009. Similarly, estimates from November and December 2011 were above those in 2010 (note: October closed to fishing in 2010) and below 2010 for all other months. In 2011, CPUE was highest in January at 1.09 kg/potlift and lowest in May at 0.43 kg/potlift.

Figure 6 Within season trends in CPUE in the SZRLF over the last four seasons.
4.1.5 Regional CPUE

The trends in CPUE across the major MFAs generally reflect zonal estimates (Figure 7). In 2011, CPUE increased in MFAs 55 and 58 and decreased in MFAs 51 and 56. In 2011, estimates of CPUE in MFAs 51, 55, 56 and 58 were 0.77, 0.92, 0.95 and 1.07 kg/potlift, respectively.

![Figure 7](image)

**Figure 7** Inter-annual trends in CPUE in the four main MFAs of the SZRLF between 1970 and 2011 (note: alternate annual ticks on X-axis).

4.1.6 Spatial trends in catch by depth

Over the last seven seasons >85% of the catch has been taken from depths of <60 m (Figure 8). In 2011, the proportion of catch taken in 0-30, 31-60, 61-90 and >90 m was 43%, 42%, 9% and 6% respectively. The relative proportion of catch by depth has remained relatively stable since 2005.

![Figure 8](image)

**Figure 8** Catch by depth in the SZRLF over the last seven seasons.
4.1.7 Spatial trends in CPUE by depth
While >85% of catch is taken from depths of <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). In 2011, CPUE remained relatively stable in 0-30 m (0.95 kg/potlift), and 31-60 m (0.89 kg/potlift) and increased in 61-90 m (1.21 kg/potlift) and >90 m (1.56 kg/potlift) compared to 2010.

Figure 9 CPUE by depth in the SZRLF from 1970 to 2011.

4.1.8 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 2011, the estimate was 112 days representing a 36% decrease from 2009 (175 days).

Figure 10 Average numbers of days fished/licence holder from 1983 to 2011 in the SZRLF.
4.1.9 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 decreased with the 2010 estimate of 0.70 kg the lowest on record. This is likely to represent increased recruitment into the fishery as reflected by increases in catch rate (Figure 5). In 2011, the estimate increased marginally to 0.74 kg. As with CPUE, the estimate can be influenced by high-grading when smaller individuals are preferentially selected (see Figure 13).

![Figure 11](image1.png)
**Figure 11** Inter-annual trends in mean lobster weight in the SZRLF from 1970 to 2011.

4.1.10 Within season trends in mean weight
In the SZRLF, mean weight tends to increase as the season progresses (Figure 12). In 2011, trends were similar to those from previous seasons with mean weight lowest in November at 0.68 kg and highest in May at 0.95 kg.

![Figure 12](image2.png)
**Figure 12** Within season trends in mean weight in the SZRLF over the last four seasons.
4.1.11 High-grading
Estimates of high-grading (i.e. tonnage of lobsters returned to the water due to unsuitable size, colour or physical damage) between 2002 and 2006 exceeded 100 tonnes (Figure 13). Since then, estimates have steadily decreased and in 2011 only 23.6 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 2002-2011.

4.2 Puerulus Settlement Index
The three highest puerulus settlements indices (PSIs) on record were observed from 2005 to 2007 at 2.9, 5.0 and 2.6 puerulus/collector, respectively (Figure 1). Over the next five seasons, with the exception of 2009, the PSI decreased and in 2011 was 0.72 puerulus/collector, the lowest since 2001. 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 2011.
4.3 Pre-recruit index (PRI)

4.3.1 Zonal pre-recruit index

The zonal estimate of logbook based PRI decreased from 2.1 in 1999 to 0.85 undersized/potlift in 2008 (Figure 15). Over the next two seasons it increased and in 2010 was 1.43 undersized/potlift, the highest since 2002. In 2011, PRI decreased by 31% to 0.99 undersized/potlift.

Figure 15 Logbook and catch sampling derived PRI from 1994-2011 (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 2011, PRI decreased in the four major regions in the SZRLF with estimates of 0.14, 0.36, 1.31 and 1.87 undersized/potlift in MFAs 51, 55, 56 and 58, respectively. The decreases in MFAs 56 and 58 reflect declines of 36% and 53%, respectively, compared to 2010 estimates. PRIs in MFAs 55 and 58 are currently the lowest on record.

Figure 16 Interannual trends in regional PRI in the SZRLF from 1994-2011.
4.4 Length Frequency data

Length frequency data obtained through the catch sampling programme 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 are obtained through voluntary catch sampling. In 2011, of the 168 active fishing vessels, only 27 participated in the program.

Figure 17 Length frequency data of both male and female lobsters sampled during the voluntary catch sampling program from 2009-2011.
5 qR MODEL OUTPUTS

5.1 Biomass
Biomass, as determined by the qR stock assessment model, increased from 1996, peaking at 5,143 tonnes in 2002 (Figure 18). Over the next seven seasons biomass declined and in 2009 was 1,795 tonnes, representing a 61% decrease from 2003 (4,662 tonnes) and the lowest estimate on record. In 2011, the estimate was 2,597 tonnes reflecting a 45% increase from 2009. Current estimates of biomass remain low in a historical context.

![Figure 18](image1.png)

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

5.2 Egg production
Egg production in the SZRLF increased from 401 billion eggs in 1996 to 673 billion eggs in 2003 (Figure 19). Over the next six seasons egg production decreased and in 2009 was 322 billion, the lowest estimate on record. In 2011, egg production increased to 372 billion but was one of the lowest estimates on record.

![Figure 19](image2.png)

**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 2011 season suggest that egg production equated to 9% of virgin levels, one of the lowest estimates on record (Figure 20).

![Figure 20](image)

**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 and in 2011 were 48%, the lowest since 2006 (49%).

![Figure 21](image)

**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, the highest on record since 1999. In 2011, the estimate declined to 1.9 million lobsters.

Figure 22 Estimates of recruitment for the SZRLF as obtained from the qR fishery model.
6 BIOLOGICAL PERFORMANCE INDICATORS

6.1 Reference Points

In 2011, the Harvest Strategy for the SZRLF was reviewed. The new harvest strategy details specific reference points for both the primary biological performance indicator of CPUE and the secondary biological performance indicator of pre-recruit index (PRI) (Anon, 2012).

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 2011, the CPUE was 0.96 kg/potlift while the TACC was 1,250 tonnes. Based on the current harvest strategy this indicates that the catch rate is within the green target range.

![TACC CPUE Diagram](image)

**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)

A 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 2011, the PRI was 0.99 undersized/potlift which is below the LRP. This LRP has been breached in four of the last five seasons.

![Figure 24](Image) Inter-annual trends in pre-recruit index (PRI) in the SZRLF from 1994 to 2011 based on logbook data. Dashed line represents limit reference point (1.3 undersized/potlift).

6.2 Implications for Management

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

7 SUMMARY

There is clear evidence to suggest that from 2002 to 2009, the status of the SZRLF declined. CPUE decreased by 71% from 2.06 kg/potlift to 0.60 kg/potlift, while the TACC was not fully taken from 2007 to 2009. Over this period, exploitation rates increased to about 70%, the highest on record. The decline in status reflects poor recruitment to the fishable biomass as evidenced by model estimated outputs and decreasing estimates of pre-recruit indices from 1999 to 2008.

Based on puerulus data, recruitment levels were predicted to increase in 2010 and 2011 due to strong settlement observed from 2005–2007 (the period between settlement and recruitment in the SZRLF is 5 years). In 2011, effort levels decreased by 37% compared to 2009, while catch rate increased by 60% to 0.96 kg/potlift, the highest since 2007. However, while catch rates have recently increased, the abundance of undersized lobsters in 2011 decreased by 31% compared to 2010 estimates. This suggests that the fishery may now be entering a period of reduced recruitment as observed by low settlement recorded from 2008 to 2011.

In summary, while the recently observed increases in catch rate are positive signs for the SZRLF, there is a continued need to rebuild lobster biomass levels. Based on the current levels of legal sized catch rate and pre-recruit indices, the newly developed harvest strategy recommends retaining the TACC at 1,250 tonnes.
References

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