Southern Zone
Rock Lobster (Jasus edwardsii)
Fishery Status Report 2010/11

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

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2 EXECUTIVE SUMMARY

- In 2010 (i.e. the 2010/11 season), the TACC in the SZRLF was 1,250 tonnes. The total commercial catch from logbook data was 1,244.1 tonnes. This was the first time since 2007 that the TACC was close to being fully taken. Effort in 2010 was 1,321,824 potlifts, representing a decrease of 35% from 2009 (2,049,961 potlifts) and reflecting the lowest estimate since 2005 (1,183,037 potlifts).

- In 2010, a total of 99% of catch came from four MFAs in the SZRLF with 44.8, 455.5, 437.2 and 300.4 tonnes taken in MFAs 51, 55, 56 and 58 respectively. As with the zonal estimate, effort decreased considerably in all regions. Most notable was the decline in MFA 58 which decreased from 580,257 potlifts in 2009 to 301,756 potlifts in 2010 reflecting a 48% effort reduction.

- Catch per unit effort (CPUE) declined from 1.82 to 0.60 kg/potlift from 2003 to 2009, a decrease of 67%. In 2010, it increased by 56% to 0.94 kg/potlift, representing the highest CPUE since 2007 (1.11 kg/potlift).

- The zonal increase in CPUE was observed in all of the four major MFAs in the SZRLF with catch rates highest in the southern regions of MFAs 56 and 58 at 0.97 and 0.99 kg/potlift respectively.

- 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 2010, biomass increased by 50% to 2,697 tonnes, the highest estimate since 2007 (3,032 tonnes) while exploitation rates decreased to 46%.

- 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 2010 was 0.73 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 last two seasons it has increased and in 2010 was 1.43 undersized/potlift, the highest since 2002. The increase in PRI in 2009 and 2010 reflects high PSIs in 2005 and 2006. The 2005 recruitment pulse entered the fishery in 2010 while the 2006 pulse should result in further recruitment increases in 2011.

- In summary, based on decreasing biomass and CPUE estimates, there are clear signs that the status of the SZRLF has declined in recent seasons. Despite this, there were some positive signs for the fishery in 2010. The TACC was close to being fully taken for the first time since 2007 and CPUE increased by 56% on 2009 estimates. In addition, the 2010 exploitation rate of 46% is the lowest since 2005 and reflects a considerable reduction from 69% reported in 2009. However, given the decline in fishery performance in recent seasons, there is a clear need to protect current recruitment in order to rebuild lobster biomass levels. The new harvest strategy for the fishery utilises CPUE to determine appropriate TACCs. As a result, future catch rates will be closely monitored to determine if current TACCs remain sustainable over the coming seasons.
3 INTRODUCTION

This fishery Status Report updates the 2009/10 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 for the fishery. A more comprehensive study that includes more detailed spatial and temporal analyses will be provided in the 2010/11 Stock Assessment report which is due for publication in July, 2012.
4 FISHERY STATISTICS

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

4.1.1 Zonal catch and effort

Figure 1 Inter-annual trends in catch and effort in the SZRLF from 1970 to 2010.

In 2010 (i.e. the 2010/11 season), the TACC in the SZRLF was 1,250 tonnes. The total reported commercial catch was 1,244.1 tonnes (Figure 1). This is the first time since 2007 that the TACC has been fully taken. Effort in 2010 was 1,321,824 potlifts, representing a decrease of 35% from 2009 (2,049,961 potlifts) and reflecting the lowest estimate of effort since 2005 (1,183,037 potlifts).

4.1.2 Within season trends in catch and effort

Figure 2 Within season trends in catch and effort in the SZRLF for the 2010 season.

In 2010, October was closed to fishing. Highest catches (>170 tonnes) were taken in the first five months of the season from November to March (Figure 2). The highest catch was taken January at 338.2 tonnes while the lowest was in May at 16.0 tonnes. The trends in effort reflected catch levels by month.
4.1.3 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 2010.

In 2010, 99% of the commercial catch came from four just MFAs, i.e. 51, 55, 56 and 58 (see Figure 25). The highest proportion came from MFA 55 with 37% while just 4% of catch came from MFA 51 (Figure 3). The spatial distribution of catch for 2010 reflected the trends of previous seasons.

Figure 4 Inter-annual trends in catch and effort in the main Marine Fishing Areas (MFAs) of the SZRLF from 1970 to 2010 (note: alternate seasonal ticks on X-axis).

In 2010, the amount of catch taken in MFAs 51, 55, 56 and 58 was 44.8, 455.5, 437.2 and 300.4 tonnes respectively. (Figure 4, refer to Figure 25). As with zonal estimates, effort decreased considerably in all regions. Most notable was the decline in MFA 58 which decreased by 48% from 580,257 potlifts in 2009 to 301,756 potlifts.
4.1.4 Zonal catch per unit effort (CPUE)

**Figure 5** Inter-annual trends in CPUE in the SZRLF between 1970 and 2010.

Catch per unit effort (CPUE) declined from 1.82 kg/potlift in 2003 to 0.60 kg/potlift in 2009, a decrease of 67% (Figure 5). In 2010, it increased by 56% from the previous season to 0.94 kg/potlift, representing the highest CPUE since 2007 (1.11 kg/potlift).

**Within season trends in CPUE**

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

CPUE generally increases from November to January within the SZRLF before decreasing thereafter (Figure 6). In 2010, CPUE was consistently higher across all months of the season compared to 2009 (note: October closed to fishing in 2010). CPUE was highest in January at 1.10 kg/potlift and lowest in May at 0.56 kg/potlift.
4.1.5 Regional CPUE

The trends in CPUE across the major MFAs of the fishery generally reflect zonal estimates (Figure 7). In 2010, CPUE increased in all MFAs and was highest in the southern regions of MFAs 56 and 58 at 0.97 and 0.99 kg/potlift respectively.

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 2010, the proportion of catch taken in 0-30, 31-60, 61-90 and >90m was 46, 43, 10 and 1% respectively. The relative proportion of catch by depth has remained relatively stable since 2006.
4.1.7 Spatial trends in CPUE by depth

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). In 2010, CPUE increased across all depth ranges and ranged from 0.88 kg/potlift in 31-60m to 1.12 kg/potlift in 61-90 m.

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 2010, the estimate was 114 days representing a 35% decrease from 2009 (175 days).
4.1.9 Zonal mean weight

Fluctuations in mean weight reflect variations in recruitment to the legal size biomass within the SZRLF (Figure 11). Over the last two seasons mean weight has decreased with the 2010 estimate of 0.7 kg the lowest on record. This is likely to represent increased recruitment into the fishery as reflected by increases in catch rate (Figure 5). As with CPUE, the estimate can be influenced by high-grading in the zone, when smaller individuals are preferentially selected (see Figure 13).

4.1.10 Within season trends in mean weight

In the SZRLF, mean weight tends to increase as the season progresses (Figure 12). In 2010, trends were similar to those from previous seasons with mean weight lowest in November at 0.65 kg and highest in May at 0.87 kg.
4.1.11 High-grading

![Figure 13](image)

Figure 13 Tonnage returned to the water due to high-grading in the SZRLF from 2002-2010.

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 2010 only 20.5 tonnes were recorded as having been 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.

4.2 Puerulus Settlement Index

![Figure 14](image)

Figure 14 Puerulus settlement Index (PSI) (+/- SE) in the SZRLF from 1991 to 2010.

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 four seasons PSI decreased and in 2010 was 0.73 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 ~5 years. Undersized individuals are generally observed ~4 years after settlement.
4.3 Pre-recruit index (PRI)

4.3.1 Zonal pre-recruit index

Figure 15 Logbook and catch sampling derived PRI from 1994-2010 (Nov–Mar inclusive).

Logbook 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. Catch sampling PRI has increased since 2007 and in 2010 was 1.78 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.

4.3.2 Regional pre-recruit index

Figure 16 Interannual trends in regional PRI in the SZRLF from 1994-2010.

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 2010, PRI increased in all major regions in the SZRLF with estimates of 0.33, 0.55, 2.06 and 3.96 undersized/potlift in MFAs 51, 55, 56 and 58 respectively.
4.4 Length Frequency data

Length frequency data obtained through the catch sampling programme confirmed commercial catch rate indices over the period 2008 to 2010 (Figure 17). The frequency of lobsters above the minimum legal size (MLS) of 98.5 mm CL decreased between 2008 and 2009 reflecting a decrease in legal sized catch rates (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, 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 this season.

Figure 17 Length frequency data of both male and female lobsters sampled during the voluntary catch sampling programme from 2008-2010.
5 qR MODEL OUTPUTS

5.1 Biomass

Figure 18 Estimates of exploitable biomass (1970-2010) 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 5,139 tonnes in 2002 (Figure 18). Over the next seven seasons biomass declined and in 2009 was 1,794 tonnes, representing a 61% decrease from 2003 (4,659 tonnes) and the lowest estimate on record. In 2010, biomass increased by 50% to 2,697 tonnes, the highest estimate since 2007 (3,032 tonnes).

5.2 Egg production

Figure 19 Estimates of egg production (1970-2010) for the SZRLF obtained from the qR fishery model.

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 2010, egg production increased by 20% to 385 billion, the highest since 2007 (435 billion).
5.3 Percent of virgin egg production

![Graph showing percent of virgin egg production from 1970 to 2010](image)

**Figure 20** Estimates of % of virgin egg production (1970-2010) for the SZRLF as obtained from the qR fishery model.

Model outputs for the 2010 season suggest that egg production equated to 9% of virgin levels (Figure 20).

5.4 Exploitation rate

![Graph showing exploitation rate from 1970 to 2010](image)

**Figure 21** Estimates of exploitation (1970-2010) for the SZRLF as obtained from the qR model.

Exploitation rate increased from 34% in 2002 to 69% in 2009 in response to decreasing biomass over the same period (Figure 21). In 2010, exploitation rate decreased to 46%, the lowest since 2005 (45%).
5.5 Recruitment

Figure 22 Estimates of recruitment (1995-2010) 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 (Figure 22). In 1999, the estimate of recruitment was 4 million individuals but by 2009 this was reduced to 1.6 million, a decrease of 60%. In 2010, recruitment increased to 3.3 million, the highest on record since 1999.
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, 2011).

6.1.1 Catch per unit effort (CPUE)

In relation to CPUE, a modified “traffic light” method is used to determine the current status of the fishery relative to a target CPUE 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 fishery effort between 1.4 and 1.6 million pot lifts per season. The two lower TACCs (950 tonnes and 1250 tonnes) are based on 1.6 million pot lifts, while the two higher TACCs (1400 tonnes and 1600 tonnes) are based on 1.4 million pot lifts. Such levels of effort in the past have resulted in an upward trajectory in catch rates for southern rock lobster in the Southern Zone.

![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.](image-url)
6.1.2 Pre-recruit index (PRI)

A limit reference point for PRI of 1.3 undersized/potlift, derived from logbook data, is used as a measure of fishery performance. Therefore, at any time, PRI is either above or below this reference point.

![Inter-annual trends in pre-recruit index (PRI) in the SZRLF from 1994 to 2010 based on logbook data. Dashed line represents limit reference point.](image)

**Figure 24** Inter-annual trends in pre-recruit index (PRI) in the SZRLF from 1994 to 2010 based on logbook data. Dashed line represents limit reference point.

6.2 Implications for Management

During the harvest strategy development it was agreed that the TACC would remain at 1250 tonnes for the 2011 season. The new harvest strategy will be used to set the TACC for the 2012 season.

7 SUMMARY

There is clear evidence to suggest that from 2003 to 2009, the status of the SZRLF declined. CPUE decreased by 67% from 1.82 kg/potlift to 0.60 kg/potlift while the TACC was not fully taken from 2007 through to 2009. Over this period, exploitation rates increased to ~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 due to strong settlement observed from 2005–2007 (the period between settlement and recruitment in the SZRLF is five years). In 2010, effort levels were reduced by 36% while catch rate increased by 56% to 0.94 kg/potlift, the highest since 2007. In 2010, the pre-recruit index increased for the second consecutive season to 1.47 undersized/potlift, the highest since 2002. This suggests further recruitment to the fishery in 2011 as predicted by high settlement levels in 2006.

While the recently observed increases in catch rate are positive signs for the SZRLF, given the decline in fishery performance in recent seasons, there is a clear need to protect current recruitment in order to rebuild lobster biomass levels. The new harvest strategy for the fishery utilises CPUE to determine appropriate TACCs. As a result, future catch rates will be closely monitored to determine if current TACCs remain sustainable over the coming seasons.
References

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