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Northern Zone Rock Lobster (*Jasus edwardsii*) Fishery Status Report 2015/16

A. Linnane, R. McGarvey, J. Feenstra and D. Graske

SARDI Publication No. F2007/000714-10
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SARDI Aquatic Sciences
PO Box 120 Henley Beach SA 5022

November 2016

Status Report to PIRSA Fisheries and Aquaculture

PREMIUM FOOD AND WINE FROM OUR CLEAN ENVIRONMENT

SOUTH AUSTRALIA

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EXECUTIVE SUMMARY

2015 was the first fishing season that allowed for commercial fishing in the months of June to October. Reporting of fishery statistics for 2015 in this status report will be for the historic fishing season (November to May). In 2015 (i.e. 1 November 2015 to 31 October 2016), the total allowable commercial catch (TACC) in South Australia's Northern Zone Rock Lobster Fishery (NZRLF) was 360 t. The total reported catch from logbook data (November-May being the period for which the validated logbook data was available at the time of writing this report) was 331.7 t (92% of the TACC). Effort in 2015 was 408,090 potlifts (November-May), reflecting a 12% increase from 2014 (365,609 potlifts) but remaining low in a historical context.

From 2008 to 2011, catch per unit effort (CPUE; November-April) increased by 61% from 0.67 (the lowest on record) to 1.08 kg/potlift. However, over the last four seasons, CPUE has decreased and in 2015 was 0.83 kg/potlift reflecting a 23% decline since 2011. CPUE remains above the upper limit reference point (LRP) of 0.70 kg/potlift.

In 2015, the biomass estimate (qR fishery model) was 2,073 t which equates to an exploitation rate of 16%, one of the lowest estimates on record.

In 2015, the pre-recruit index (PRI) based on catch sampling data (November-March), was 0.36 undersized/potlift which is above the trigger reference point (TRP) of 0.30 undersized/potlift.

Three of the four annual estimates of puerulus settlement between 2012 and 2015 were below the long-term average. Using a four year period from settlement to recruitment to the fishable biomass, this suggests that recruitment from 2016 to 2019 will most likely be below the historical average.

Based on current CPUE and PRI levels, the harvest strategy decision rules indicated that the TACC should be retained at 360 t (300 t inner sub-region and 60 t outer sub-region) for the 2016/17 season.

Despite declining catch rates in recent seasons, in relation to the overall status of the fishery; (i) TACC levels implemented since 2009 have constrained catch to historically low levels; (ii) effort levels are low in a historical context; (iii) the current exploitation rate is one of the lowest on record; (iv) the PRI is above the TRP and (v) the CPUE in 2015 was above the upper LRP (Table 1). As a result, based on a weight-of-evidence approach, the NZRLF is classified as "**sustainable**".

Table 1 Key NZRLF statistics for the 2015/16 season.

Statistic	2015/16
TACC	360 t
Total commercial catch (Nov-May)	331.7 t
Total effort (Nov-May)	408,090 potlifts
Commercial CPUE (Nov-Apr)	0.83 kg/potlift
Pre-recruit index (Nov-Mar)	0.36 undersized/potlift
Biomass estimate	2,073 t
Exploitation rate	16%
Status	**Sustainable**

1 INTRODUCTION

This fishery status report updates the 2014/15 stock assessment report for the Northern Zone Rock Lobster Fishery (NZRLF) (Linnane et al. 2016) and is part of the 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 NZRLF and assess the current status of the resource in relation to the harvest strategy for the fishery (PIRSA 2014).

2015 was the first fishing season that allowed for commercial fishing from June to October. Reporting of fishery statistics for 2015 in this status report will be for the historic fishing season (November to May) unless otherwise stated. A comprehensive assessment that includes more detailed spatial and temporal analyses will be provided in the 2015/16 stock assessment report which is due in July 2017.

2 METHODS

Detailed information on data sources of the fishery statistics presented in this report are described in Linnane et al. (2016). In brief, the catch and effort data presented are obtained from a mandatory daily logbook program administered by SARDI Aquatic Sciences. As of the 2015 season, fishing in the NZRLF can be undertaken over the 12-month period from 1 November 2015 to 31 October 2016. To facilitate timely reporting, the assessment period runs from November to May, with data from November to April used to estimate the primary biological performance indicator of catch per unit effort (CPUE).

Data to estimate the secondary performance indicator of pre-recruit index are obtained from a voluntary catch sampling program where the escape gaps on all commercial pots are closed. The November to March period is used as these are the known months where the catchability of undersized lobsters is highest. As all lobsters are measured as part of this program, length frequency data are also obtained from catch sampling.

Puerulus sampling is undertaken at four sites in the NZRLF and based on data from July to October. A detailed description of the qR fishery model is provided in McGarvey and Matthews (2001).

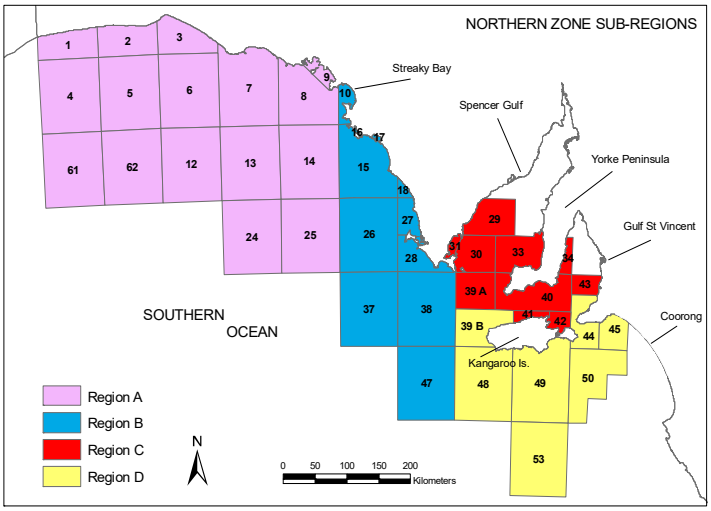

Figure 1 Northern Zone rock lobster fishery Marine Fishing Areas (MFAs).

3 FISHERY STATISTICS

3.1 Catch, effort and CPUE

3.1.1 Zonal catch and effort

In 2015 (i.e. the 2015/16 season), the total allowable commercial catch (TACC) in the NZRLF was 360 t (from 323.2 t in 2014) which could be caught over the 12-month season from 1 November 2015 to 31 October 2016. The total reported commercial catch from November to May was 331.7 t (92% of the TACC) (Figure 2). Effort levels within the fishery decreased considerably in 2009 when the TACC was reduced to 310 t. In 2015 it was 408,090 potlifts, reflecting a 12% increase from 2014 (365,609 potlifts) but remaining low in a historical context.

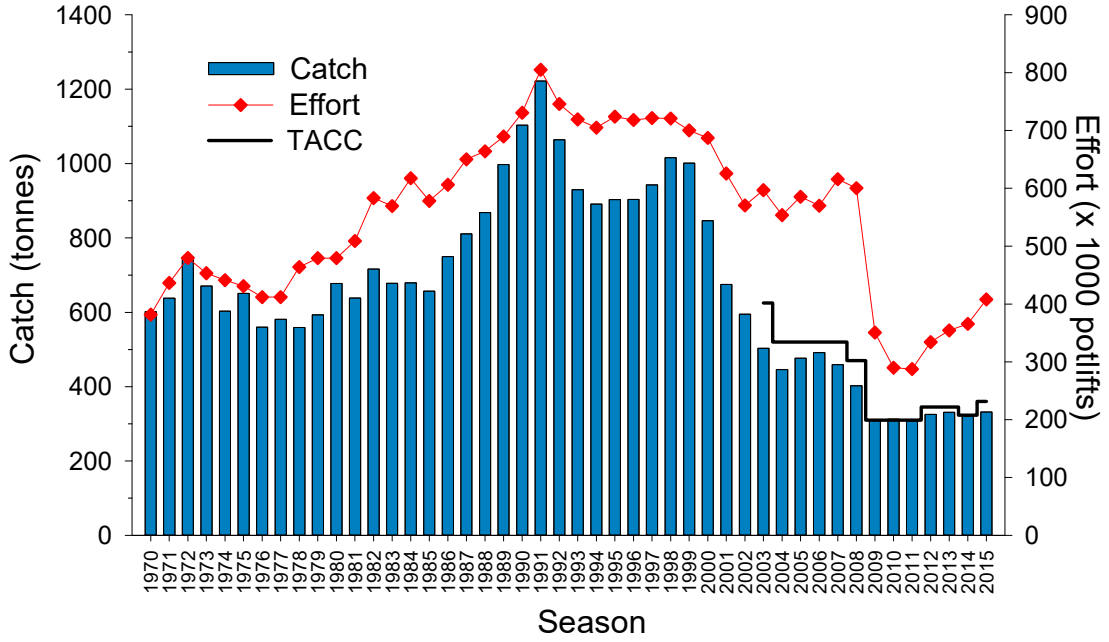

Figure 2 Inter-annual trends in catch and effort in the NZRLF from 1970 to 2015. Catch and effort are reported from November to May.

3.1.2 Within season trends

In 2015, catch increased from 46.6 t in November to 62.4 t in February before decreasing thereafter to 10.1 t in May (Figure 3). Trends in monthly effort generally reflected those of catch.

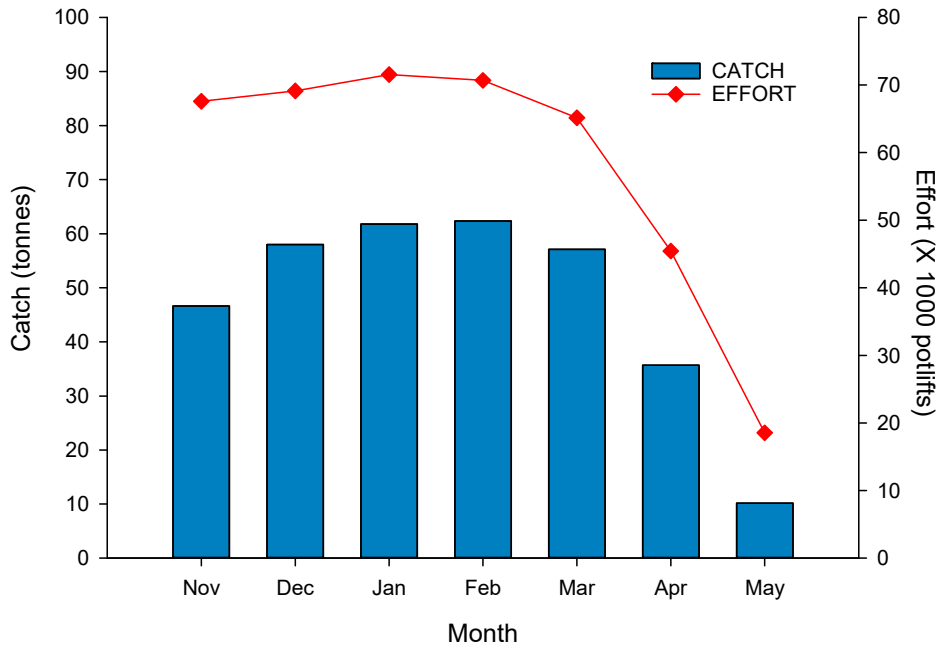

Figure 3 Within season trends in catch and effort in the NZRLF for the 2015 season.

3.1.3 Regional catch and effort

In 2015, 36% and 41% of the 331.7 t total catch was harvested from Regions B and D, respectively, with 16% taken from Region C (Figure 4). Only 7% of the catch was taken in Region A (see Figure 1 for regions).

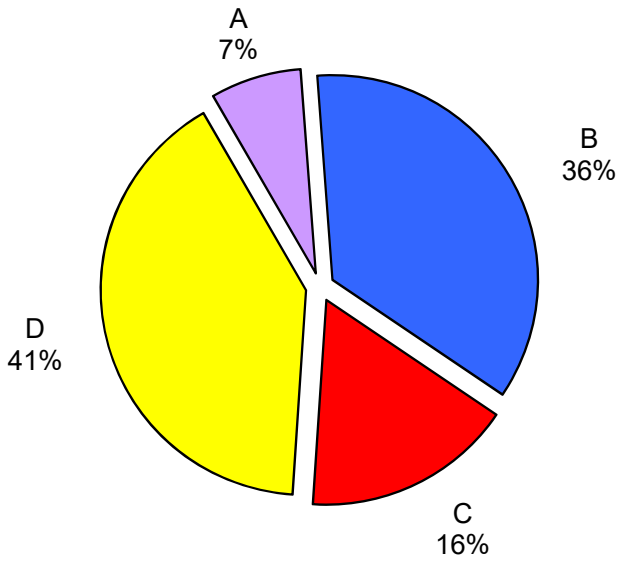

Figure 4 Percentage of total catch from Regions A-D in the NZRLF in 2015 as reported from November to May (see Figure 1).

From 1998 to 2009, catch decreased in all areas, with the exception of Region B, where it increased from 115.6 t in 2004 to 218.7 t in 2006 (Figure 5). From 2009 to 2014, catch has remained relatively stable in all regions with the exception of Region D where marginal increases have been observed. In 2015 (November to May), the catch estimates were 24, 118, 55 and 135 t in Regions A, B, C and D, respectively. As with zonal estimates (Figure 2), effort has increased in all regions over the last 3-4 seasons.

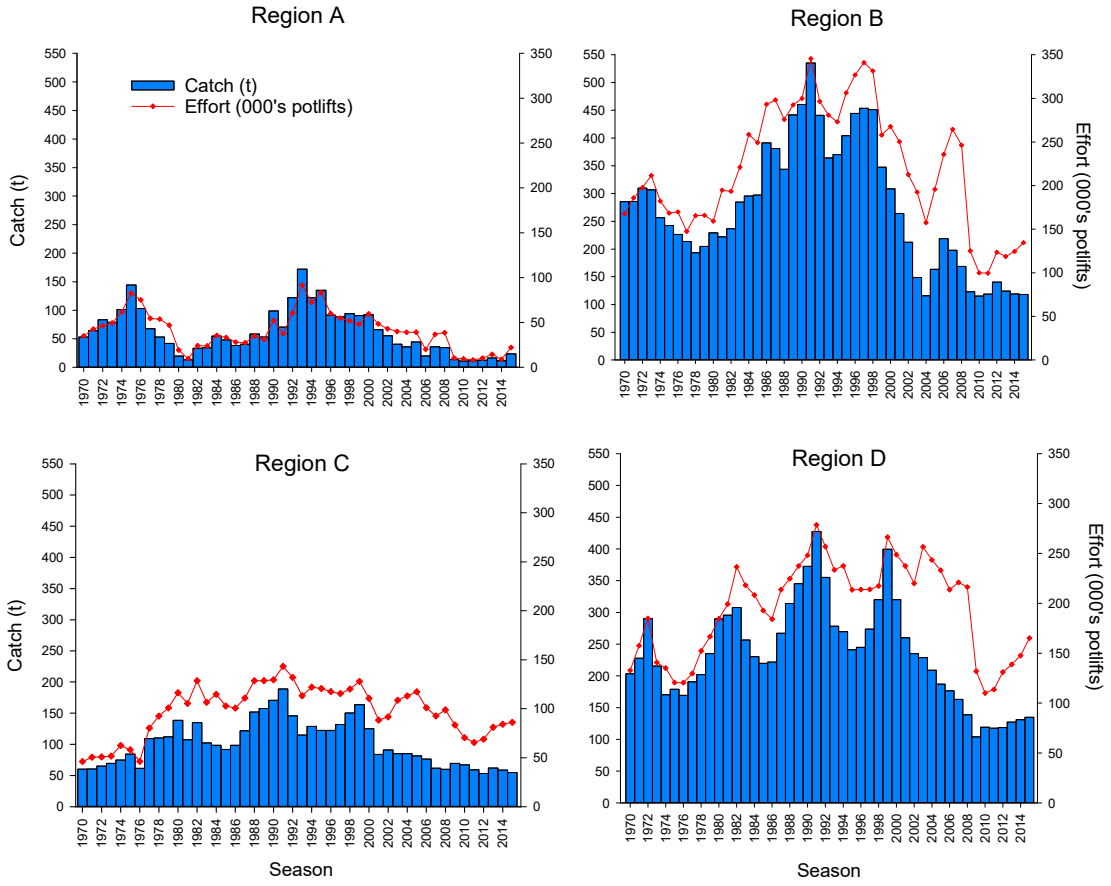

Figure 5 Inter-annual trends in catch and effort (November to May) in the four Regions of the NZRLF between 1970 and 2015 (refer to Figure 1).

3.1.4 Zonal CPUE

With the exception of marginal increases in 2005 and 2006, CPUE (November-April) in the NZRLF decreased from 1999 (1.49 kg/potlift) to 2008 (0.67 kg/potlift; the lowest on record) (Figure 6). Over the next two seasons, CPUE increased and in 2010 and 2011 was 1.08 kg/potlift, which was the highest since 2000 (1.23 kg/potlift). However, over the last four seasons, CPUE has again decreased and in 2015 was 0.83 kg/potlift, reflecting a 23% decline since 2011.

In the NZRLF, the period between settlement and recruitment to the fishable biomass is approximately four years. Therefore, the recent declines in CPUE are likely to reflect lower than average levels of settlement observed from 2007 to 2011 (Figure 11).

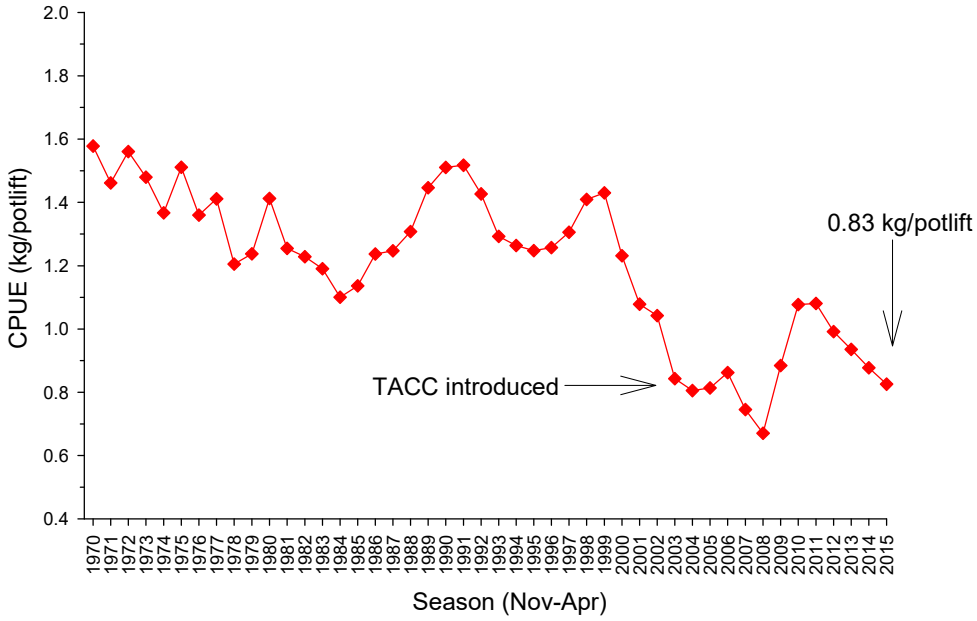

Figure 6 Inter-annual trends in zonal CPUE (November to April) in the NZRLF between 1970 and 2015.

3.1.5 Within season trends in CPUE

The reduction in CPUE in 2015 was driven by lower catch rates in all months compared to 2014, with the exception of April (Figure 7). In 2015, CPUE was highest in February at 0.88 kg/potlift and lowest in May at 0.55 kg/potlift.

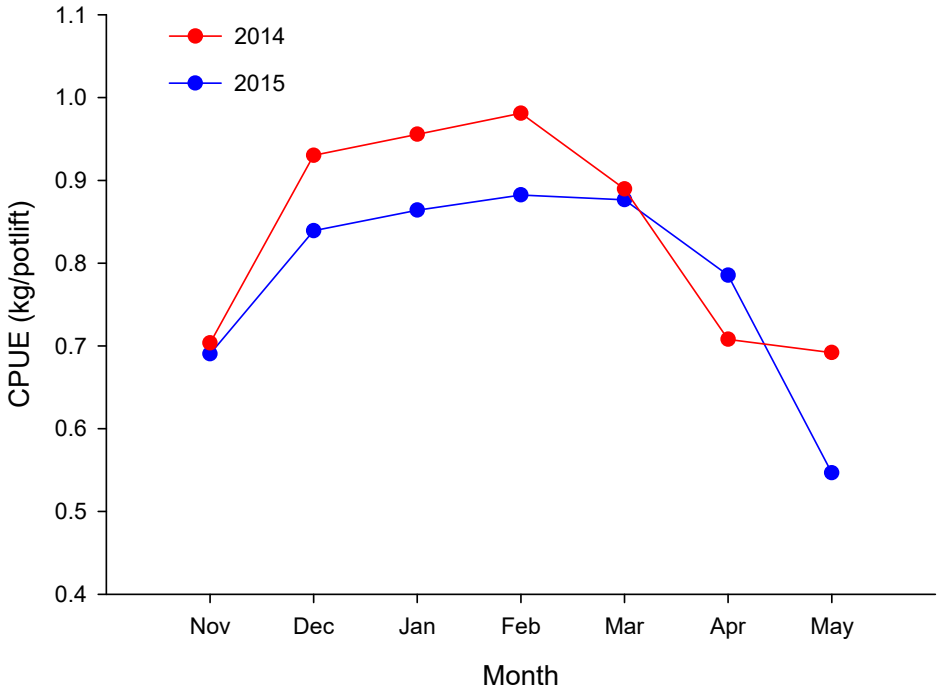

Figure 7 Within season trends in CPUE in the NZRLF in 2014 and 2015.

3.1.6 Regional CPUE

Regional trends in CPUE (November-April) (Figure 8) broadly reflect the zonal pattern (Figure 6). CPUE generally decreased in each of the four major regions from 1999 to 2010 before increasing over the next two seasons. However, with the exception of Region A, over the last 4-5 seasons, CPUE has decreased in all areas. In 2015, estimates in Regions A, B, C and D were 1.11, 0.91, 0.65 and 0.83 kg/potlift, respectively.

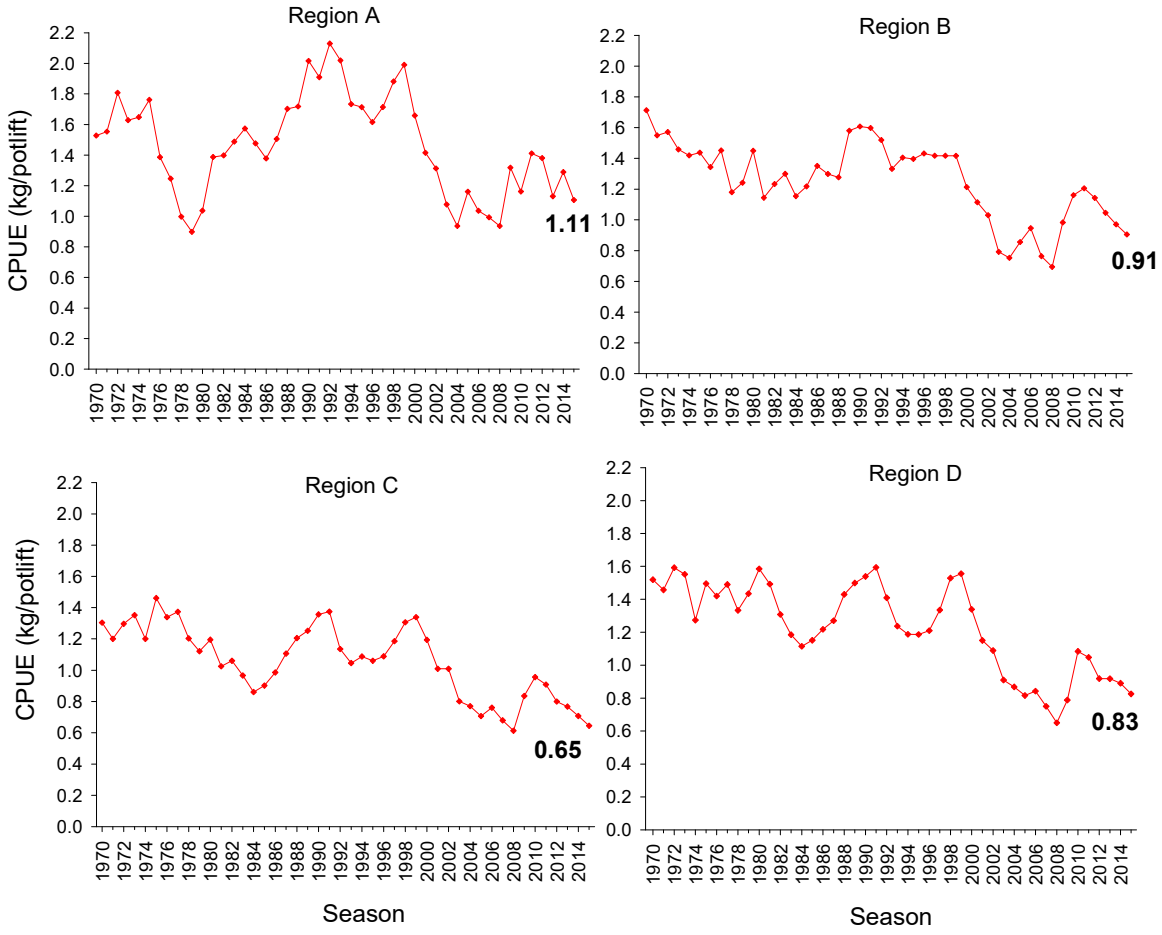

Figure 8 Inter-annual trends in regional CPUE (November to April) in the NZRLF between 1970 and 2015.

3.1.7 Annual mean weight

Fluctuations in the mean weight of rock lobsters caught in each fishing season likely reflects inter-annual variations in the number of lobsters recruiting to legal size (Figure 9). Over the last five seasons, the mean weight of lobsters has increased reflecting declines in recruitment which has ultimately translated into decreases in CPUE both zonally and regionally. In 2015, the mean weight was 1.18 kg, which was among the highest on record.

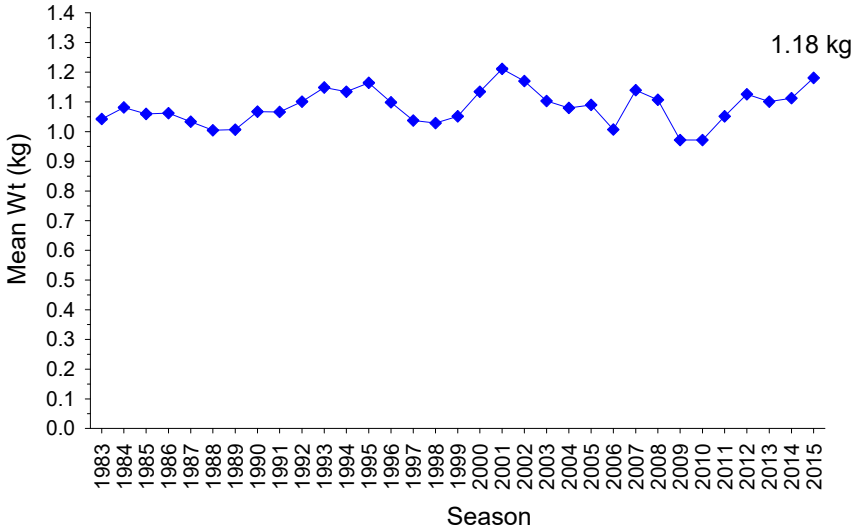

Figure 9 Inter-annual trends in mean lobster weight in the NZRLF (November to May) from 1983 to 2015.

3.1.8 Average number of days fished

The average number of days fished/licence holder decreased from 184 days in 1997 to 144 days in 2002 (Figure 10). This decrease reflects direct limitations on the number of fishable days prior to the introduction of quota in 2003. In the five years following the introduction of quota, the number of days fished remained relatively stable between 150 and 160 days. In 2009, the TACC was reduced from 470 to 310 t and the average number of days fished decreased to 84 days in 2010. Over the last five seasons, the estimate has increased to 134 days in 2015. The recent increase is likely to relate, in part, to increases in TACC from 310 to 345 t in 2012, and from 323.2 to 360 t in 2015 (Figure 2).

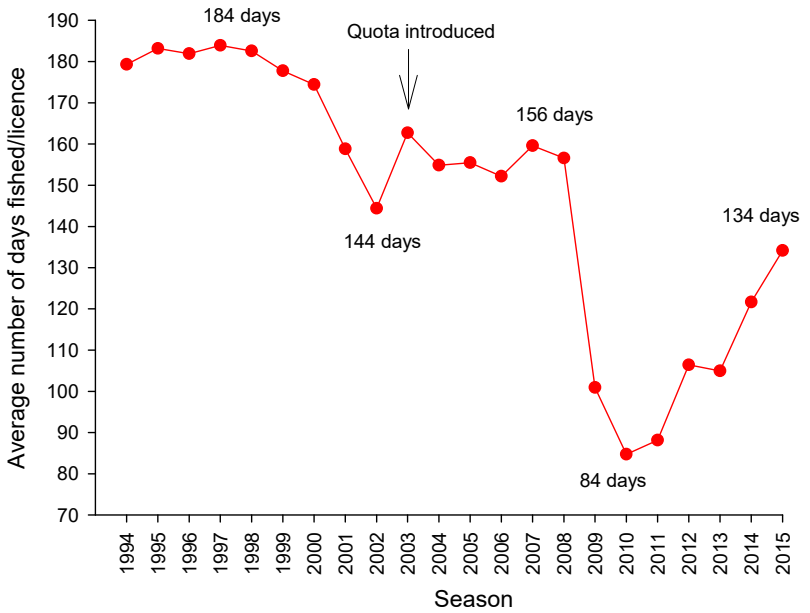

Figure 10 Average numbers of days fished per licence from 1994 to 2015 in the NZRLF.

3.2 Puerulus settlement index (PSI)

Annual estimates of puerulus settlement index (PSI) estimates in the NZRLF have been highly variable (Figure 11). PSIs were high in 2002, 2005 and 2006, but from 2007 to 2014, with the exception of 2013, annual settlement has been below the long-term average (0.37 puerulus/collector). In 2015, the PSI was 0.28 puerulus/collector. In the NZRLF, the estimated period between settlement and recruitment to the fishery is 4 years. As a result, lower settlement levels from 2012 to 2015 indicate that recruitment to the fishery may be reduced from 2016 to 2019.

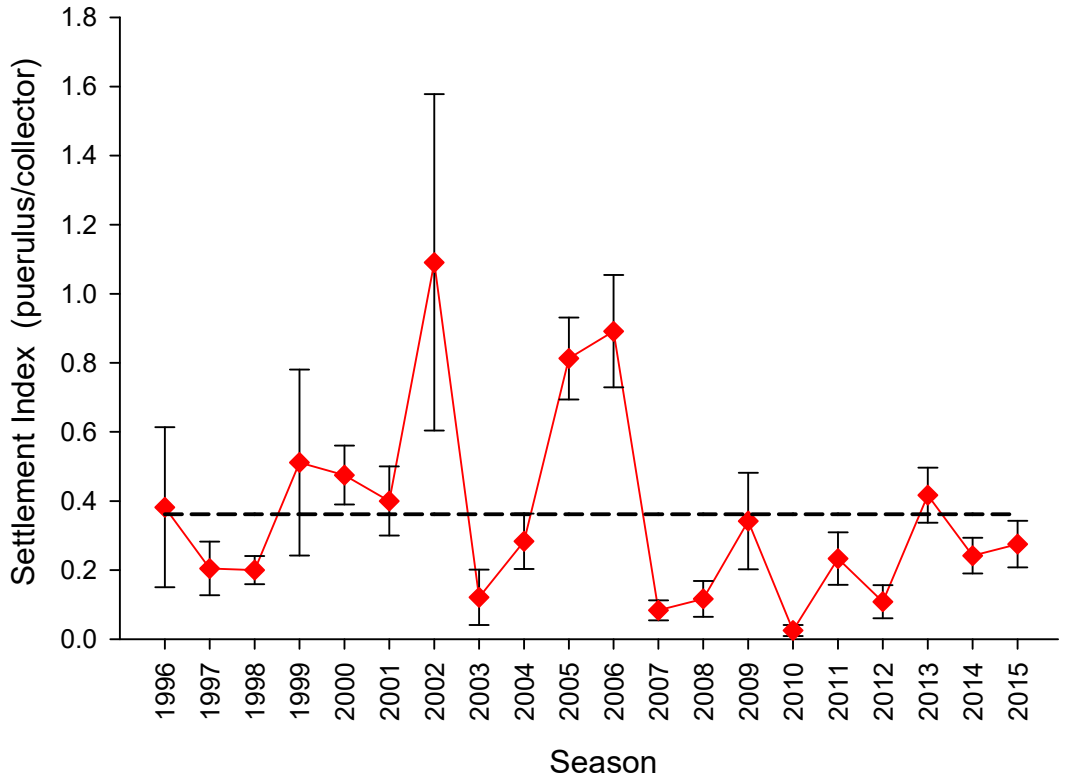

Figure 11 Puerulus settlement index (PSI) (mean ±SE) in the NZRLF from 1996 to 2015. Dashed line represents long-term average.

3.3 Pre-recruit index (PRI)

3.3.1 Zonal pre-recruit index

The PRI (November to March) based on logbook data is under-estimated due to the mandatory introduction of escape gaps in 2003 (Figure 12). As a result, PRI in the NZRLF is now estimated from the catch sampling program where fishers are allowed to close the escape gaps in up to three pots. In addition, when an observer is on-board the vessel, all escape gaps can be closed.

In 2015 (November to March), catch sampling PRI was 0.36 undersized/potlift, reflecting an increase of 71% since 2014 (0.21 undersized/potlift). In the NZRLF, the time taken for pre-recruits to enter into the fishable biomass is estimated to be approximately one year.

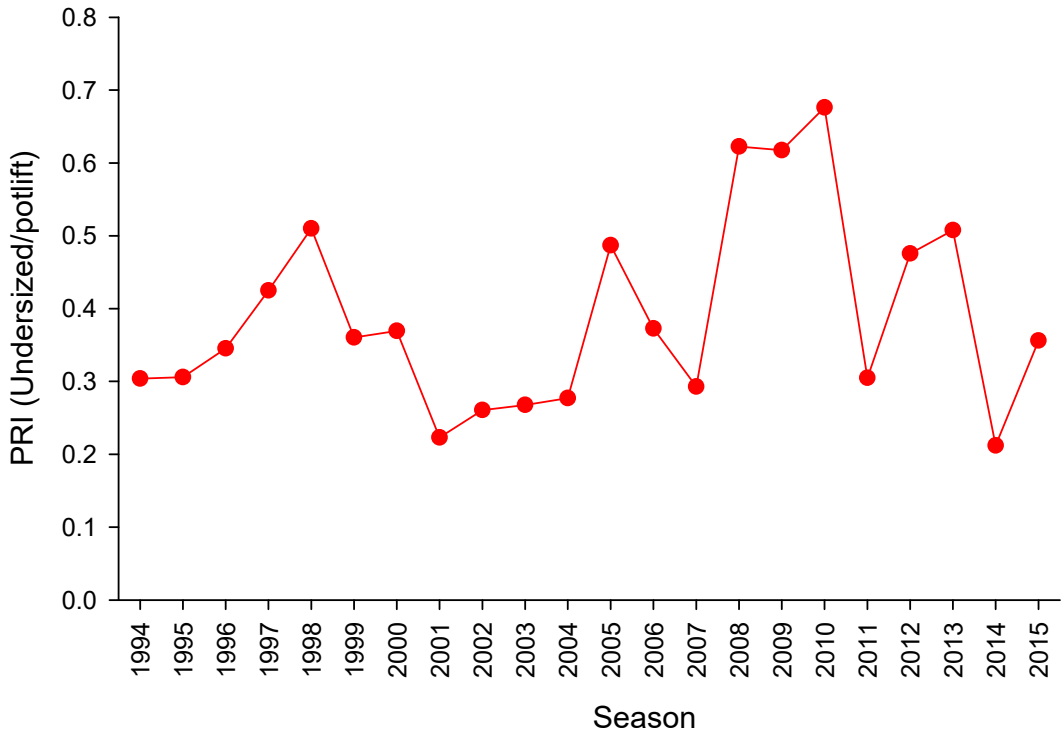

Figure 12 Inter-annual trends in pre-recruit index (PRI) in the NZRLF from 1994 to 2015 based on voluntary catch sampling data (November to March).

3.3.2 Regional pre-recruit index

In 2015, regional PRI estimates (November to March) were 0.00, 0.14, 0.38 and 0.48 undersized/potlift in Regions A, B, C and D, respectively (Figure 13).

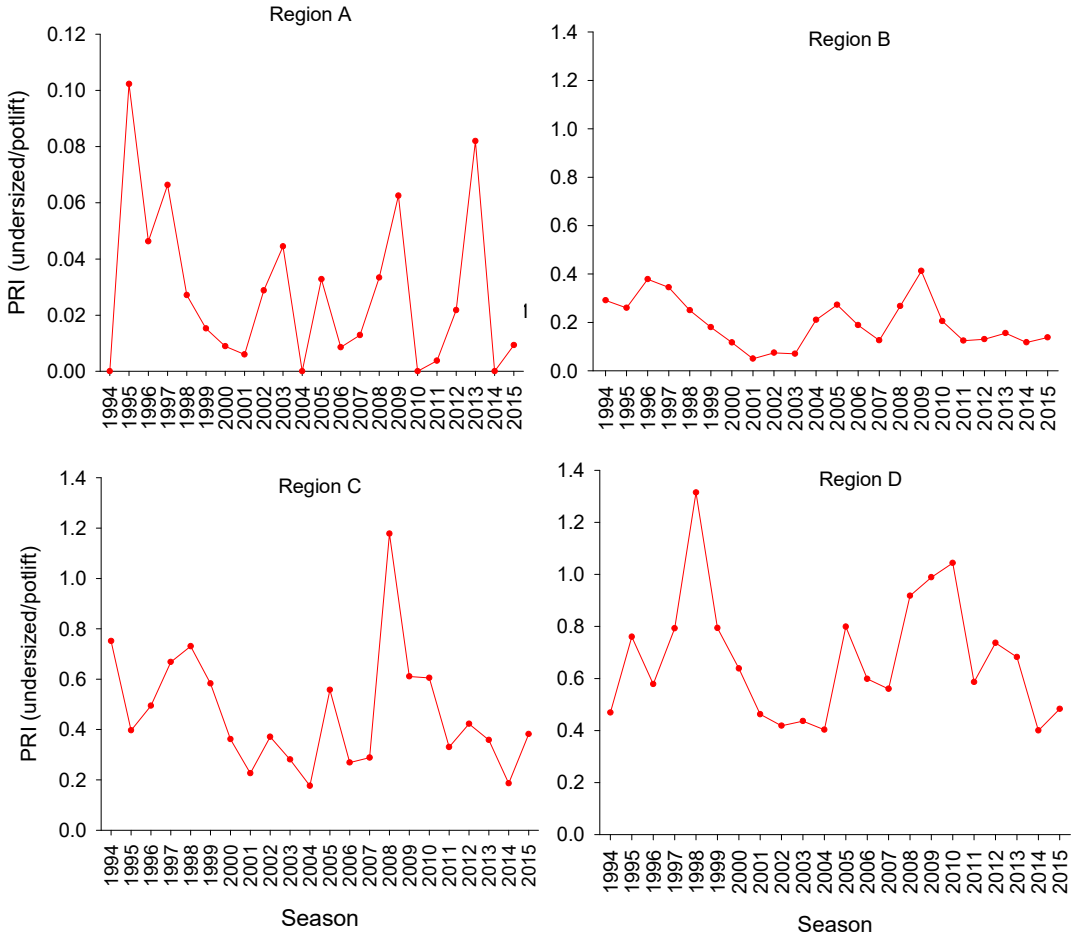

Figure 13 Inter-annual trends in regional pre-recruit index (PRI) in the NZRLF from 1994 to 2015 based on voluntary catch sampling data (November to March). Note that the scale of y-axis in Region A differs from other regions.

3.4 Length frequency

In 2015, 53% of all lobsters measured as part of the catch sampling program were within the 105 to 140 mm carapace length (CL) size range (Figure 14). Approximately 27% of lobsters in 2015 were below the minimum legal size (MLS), compared to 20% in 2014, reflecting the increase in PRI over the same period.

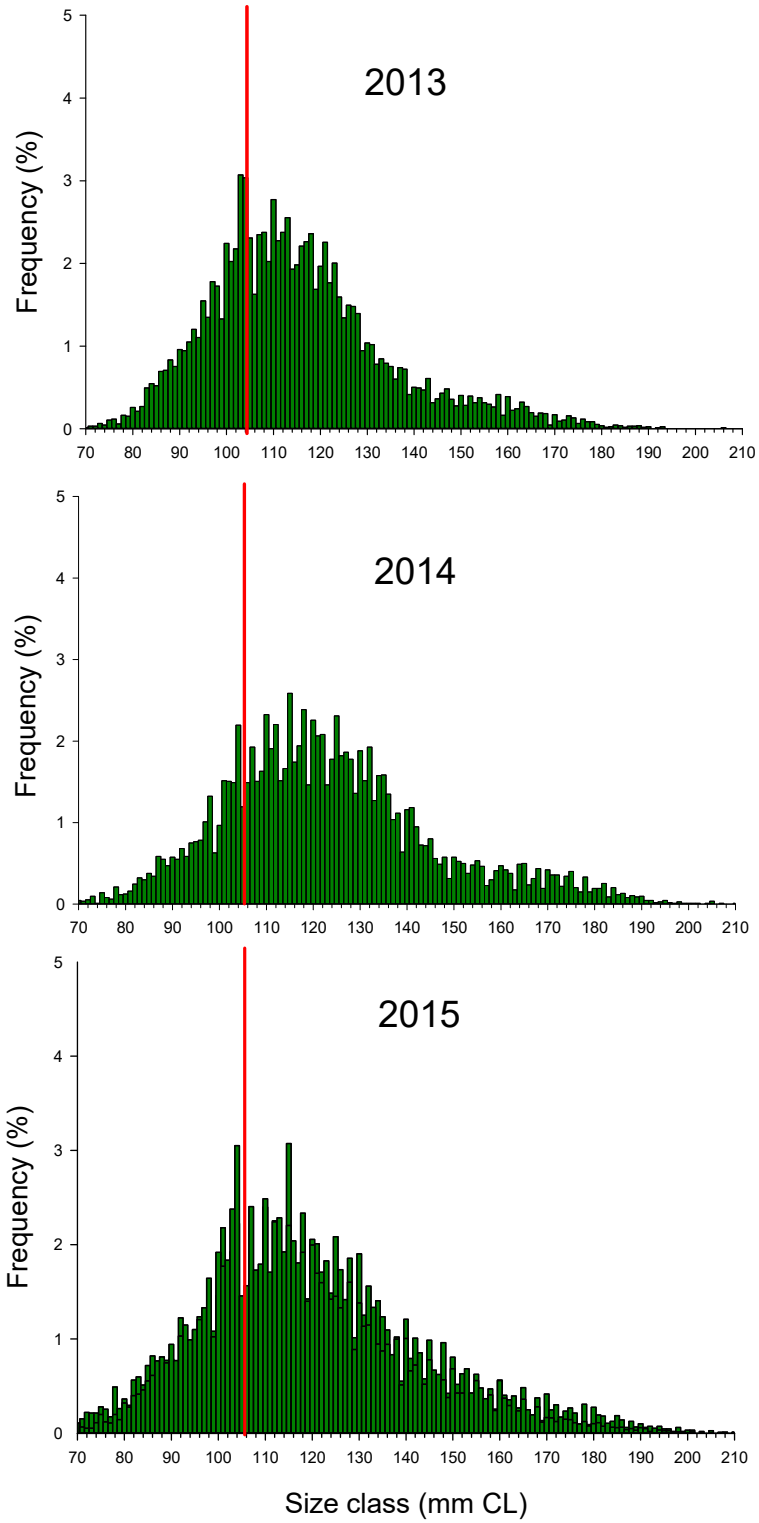

Figure 14 Length frequency data of both male and female lobsters sampled during the voluntary catch sampling program over the last three seasons. Red line represents minimum legal size (MLS) at 105 mm CL.

4 MODEL OUTPUTS

4.1 Biomass

Estimates from the qR stock assessment model indicate a general decline in lobster biomass in the NZRLF from the late 1980s to 2008 (Figure 15). Over the next two seasons biomass increased and remained relatively stable from 2010 to 2013 before gradually decreasing to 2,073 t in 2015. Current estimates remain below the long-term average for the fishery (approximately 3,000 t).

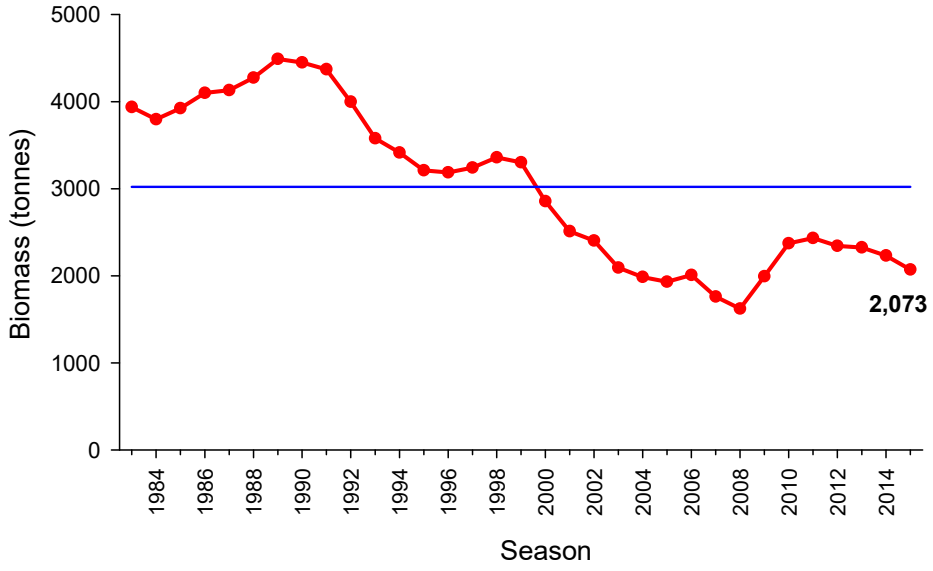

Figure 15 Estimates of biomass for the NZRLF as obtained from the qR fishery model. Blue line represents long-term average.

4.2 Egg production rate

Due to decreasing biomass, egg production in the NZRLF has also decreased since the 1980s (Figure 16). In 2015, total egg production was estimated to be 221 billion eggs, reflecting declines over the last four seasons and below the long-term average for the fishery (358 billion).

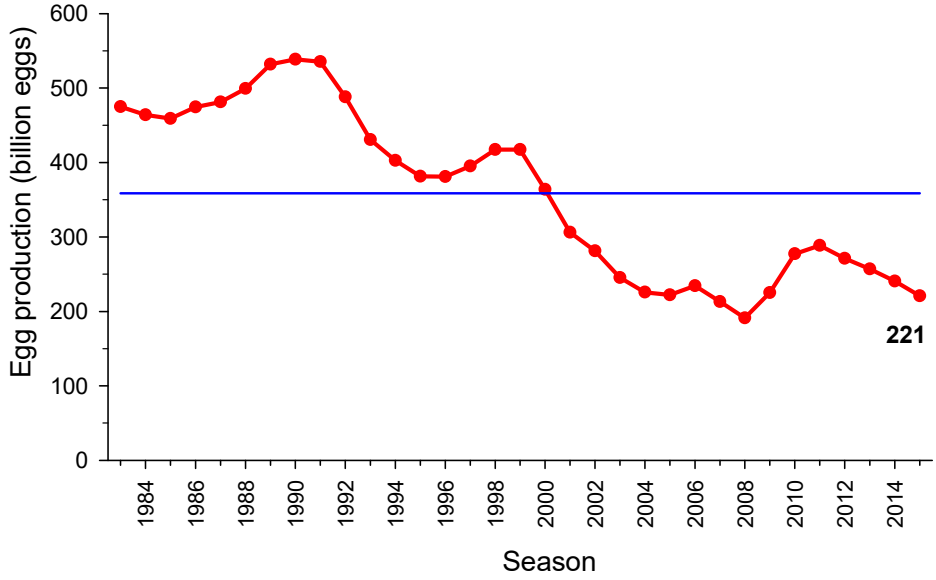

Figure 16 Estimates of egg production for the NZRLF as obtained from the qR fishery model. Blue line represents long-term average.

4.3 Percent of virgin egg production

In 2014, egg production in the NZRLF equated to 22% of virgin egg production (Figure 17).

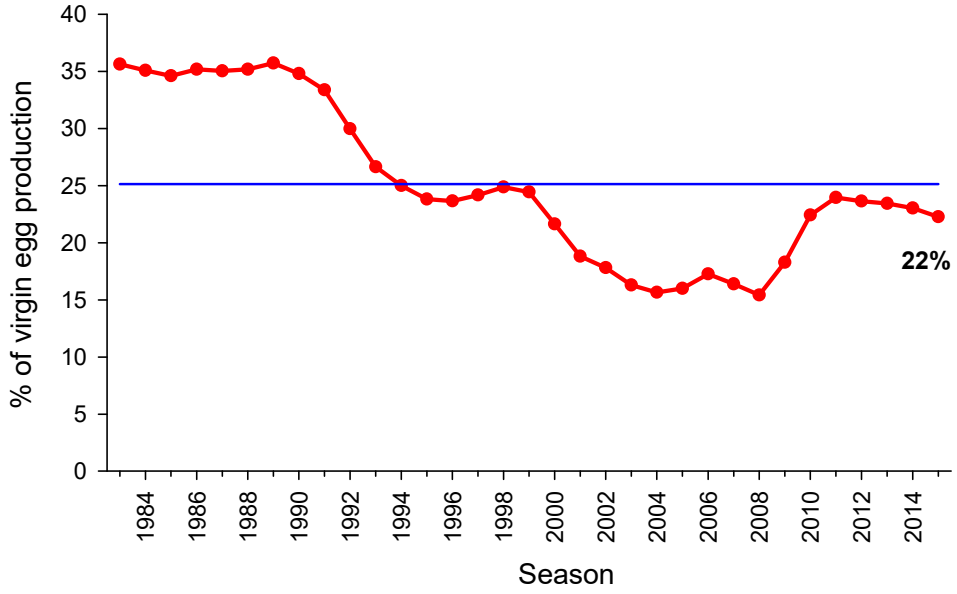

Figure 17 Estimates of % virgin egg production for the NZRLF as obtained from the qR fishery model. Blue line represents long-term average.

4.4 Exploitation Rate

Over the last seven seasons exploitation rates have been considerably lower in the fishery (Figure 18). The 2015 estimate of 16% is one of the lowest estimates on record and blow the long-term average of 22%.

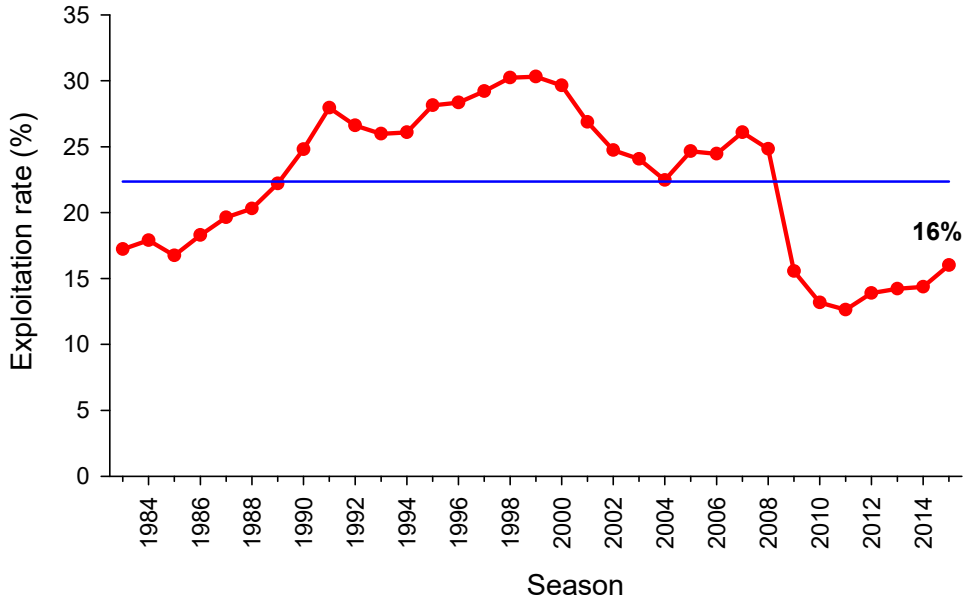

Figure 18 Estimates of exploitation rate in the NZRLF as obtained from the qR fishery model. Blue line represents long-term average.

4.5 Recruitment

Model estimated recruitment in the NZRLF has been highly variable (Figure 19). Over the last five seasons recruitment levels have been low and in 2015 was estimated at 0.24 million recruits.

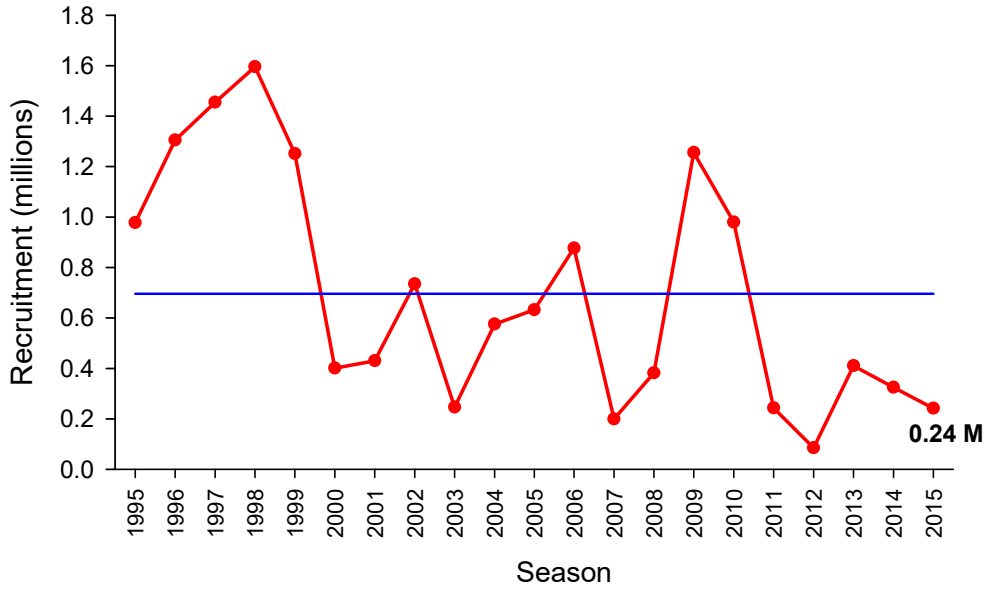

Figure 19 Estimates of recruitment as obtained from the qR fishery model. Blue line represents long-term average.

5 BIOLOGICAL PERFORMANCE INDICATORS

5.1 Reference points

The harvest strategy component of the NZRLF management plan (PIRSA 2014) details limit reference points (LRPs) for the primary biological performance indicator of CPUE and a trigger reference point (TRP) for the secondary biological performance indicator of PRI. In 2015, this strategy was amended with a number of changes implemented in relation to TACC levels at specific CPUE rates (Table 2). This included an upper LRP of 0.70 kg/potlift. In addition, spatial management of the fishery was introduced in 2015 based on inner and outer sub-regions (Figure 21). This is based on separate TACCs in each sub-region, levels of which were informed from the outcomes of a dedicated Fisheries Research and Development Corporation (FRDC) project which investigated spatial and temporal management options for the fishery (Linnane et al. 2016a).

5.1.1 Primary Indicator: Catch per unit effort (CPUE)

Levels of TACC in both the inner and outer sub-regions are based on zonal CPUE estimates (November to April). In 2015, the CPUE was 0.83 kg/potlift which was above the upper LRP of 0.70 kg/potlift.

Table 2 TACC levels at various catch per unit effort (CPUE) rates for both the inner and outer sub-regions of the NZRLF. *****When a TACC is recommended based on a CPUE range of 0.8-1.0kg/potlift, if CPUE is less than 0.9kg/potlift for two consecutive years, the TACC will drop to that corresponding to the next lowest CPUE range level (0.7-0.8 kg/potlift).

CPUE (kg/potlift)	Inner TACC	Outer TACC	Total TACC
>1.0	300t	80t	380t
0.8-1.0*	300t	60t	360t
0.7-0.8	215t	50t	265t
0.65-0.7	170t	46t	216t
0.6-0.65	150t	43t	193t
0.55-0.6	93t	27t	120t
0.5-0.55	43t	13t	56t
<0.5	0t	0t	0t

5.1.2 Secondary Indicator: Pre-recruit index (PRI)

The secondary indicator of fishery performance is the PRI, which is derived from catch sampling data (November to March inclusive), with a TRP of 0.30 undersized/potlift (Figure 20). In 2015, the PRI was 0.36 undersized/potlift which was above the TRP.

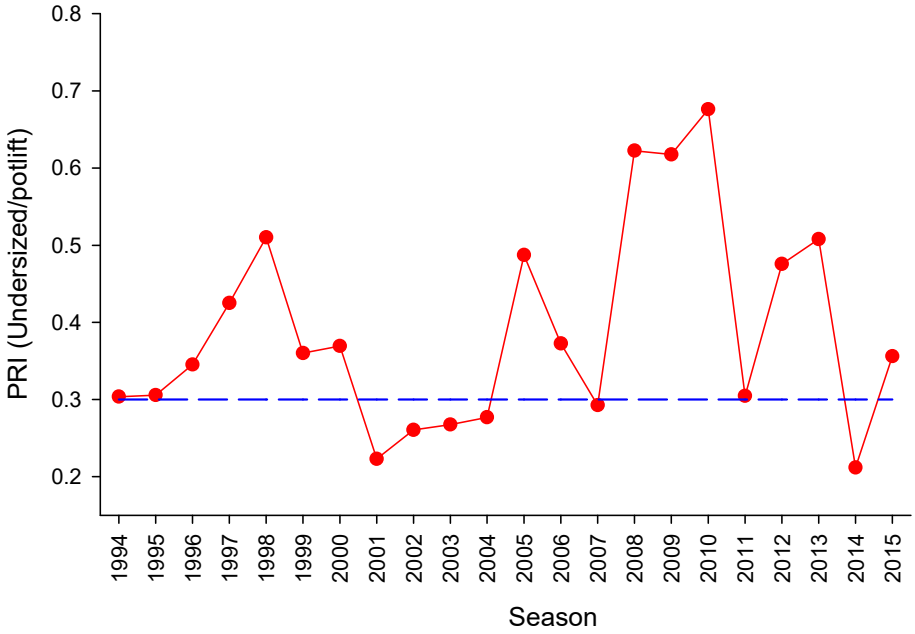

Figure 20 Inter-annual trends in the pre-recruit index (PRI) in the NZRLF from 1994 to 2015 based on voluntary catch sampling data. Dashed line represents trigger reference point (0.30 undersized potlift).

5.2 Implications for management

Based on the current harvest strategy, the primary catch rate indicator is currently within the 0.8-1.0 kg/potlift range which indicated a 360 t TACC (300 t in the inner sub-region and 60 t in the outer sub-region) for the 2016 season.

6 SUMMARY

In 2015, a spatially defined harvest strategy was developed for the fishery and adopted by industry and government. This new harvest strategy proposed a TACC of 360 t for the fishery in 2015, representing an overall TACC increase from the 2014 fishing season (323.3 t).

Despite declining catch rates in recent seasons, in relation to the overall status of the fishery; (i) TACC levels implemented since 2009 have constrained catch to historically low levels; (ii) effort levels are low in a historical context; (iii) the current exploitation rate is one of the lowest on record; (iv) the PRI is above the TRP and (v) the CPUE in 2015 was above the upper LRP. As a result, based on a weight-of-evidence approach, the NZRLF is classified as "**sustainable**".

7 REFERENCES

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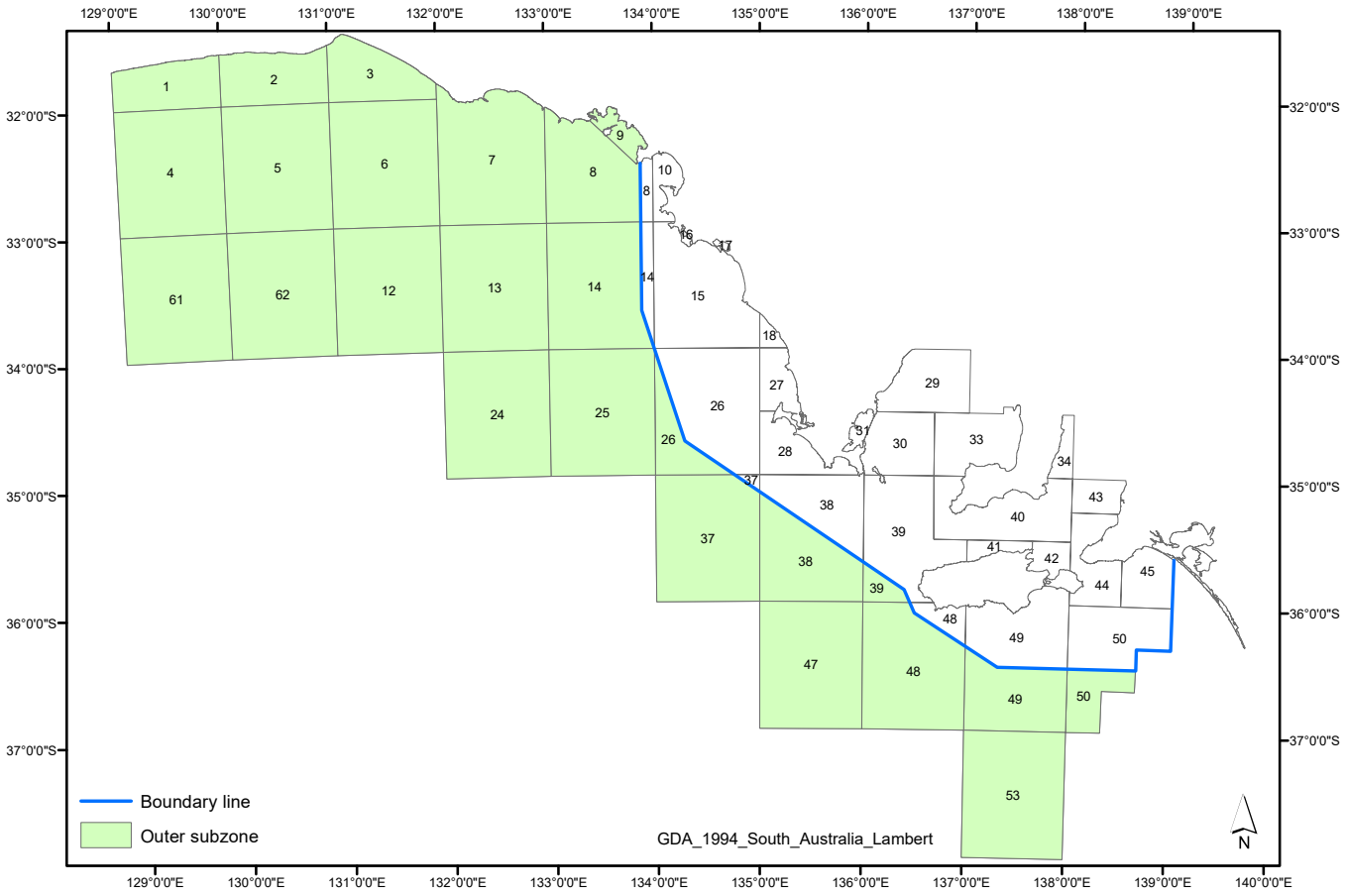

Figure 21 Northern Zone sub-regions and Marine Fishing Areas in the South Australian Rock Lobster Fishery.