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Northern Zone Rock Lobster (*Jasus edwardsii*) Fishery Status Report 2014/15

A. Linnane, R. McGarvey and J. Feenstra

SARDI Publication No. F2007/000714-9
SARDI Research Report Series No. 879

SARDI Aquatic Sciences
PO Box 120 Henley Beach SA 5022

November 2015

Status Report to PIRSA Fisheries and Aquaculture

PREMIUM FOOD AND WINE FROM OUR CLEAN ENVIRONMENT

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This publication may be cited as:
Linnane, A., McGarvey, R. and Feenstra, J. (2015). Northern Zone Rock Lobster (*Jasus edwardsii*) Fishery Status Report 2014/15. Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000714-9. SARDI Research Report Series No. 879. 19pp.

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

Telephone: (08) 8207 5400
Facsimile: (08) 8207 5406
www.pir.sa.gov.au/research

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Printed in Adelaide: November 2015

SARDI Publication No. F2007/000714-9
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Author(s): A. Linnane, R. McGarvey and J. Feenstra

Reviewer(s): T. Ward and G. Ferguson

Approved by: S. Mayfield
Science Leader - Fisheries

Signed: 

Date: 20 November 2015

Distribution: PIRSA Fisheries and Aquaculture, South Australian Rock Lobster Advisory Council, SAASC Library, University of Adelaide Library, Parliamentary Library, State Library and National Library

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EXECUTIVE SUMMARY

In 2014 (i.e. 1 November 2014 to 31 May 2015), the total allowable commercial catch (TACC) in the Northern Zone Rock Lobster Fishery (NZRLF) was 323.2 t. The total reported catch from logbook data was 320.6 t (99% of the TACC). Effort in 2014 was 365,609 potlifts reflecting a 3% increase from 2013 (354,557 potlifts).

From 2008 to 2011, catch per unit effort (CPUE) increased by 61% from 0.67 (the lowest on record) to 1.08 kg/potlift. However, over the last three seasons, CPUE has decreased and in 2014 was 0.88 kg/potlift reflecting a 19% decline since 2011.

Over the last five seasons, estimated biomass (qR fishery model), has been relatively stable and in 2014 was 2,262 t representing an increase of 39% from 2008 (1,627 t). This equates to a current exploitation rate of 14%, one of the lowest estimates on record.

In 2014, the pre-recruit index (PRI) based on catch sampling data, was 0.21 undersized/potlift which is below the limit reference point of 0.30 undersized/potlift.

Three of the four puerulus settlements between 2011 and 2014 have been below the long-term average. Using a four year period from settlement to recruitment, this suggests that recruitment from 2015 to 2018 will most likely be below the historical average.

In 2015, the NZRLF harvest strategy was amended with a number of changes implemented in relation to TACC levels at specific CPUE rates. In addition, spatial management of the fishery has been proposed based on inner and outer sub-regions.

Using the amended harvest strategy, the catch rate in 2014 indicates a TACC of 360 t (300 t inner sub-region and 60 t outer sub-region) for the 2015/16 season.

Based on a weight-of-evidence approach, the NZRLF is classified as “**sustainable**”.

1 INTRODUCTION

This fishery status report updates the 2013/14 stock assessment report for the Northern Zone Rock Lobster Fishery (NZRLF) (Linnane et al. 2015) 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 current harvest strategy for the fishery (PIRSA 2014). A comprehensive assessment that includes more detailed spatial and temporal analyses will be provided in the 2014/15 stock assessment report which is due in July 2016.

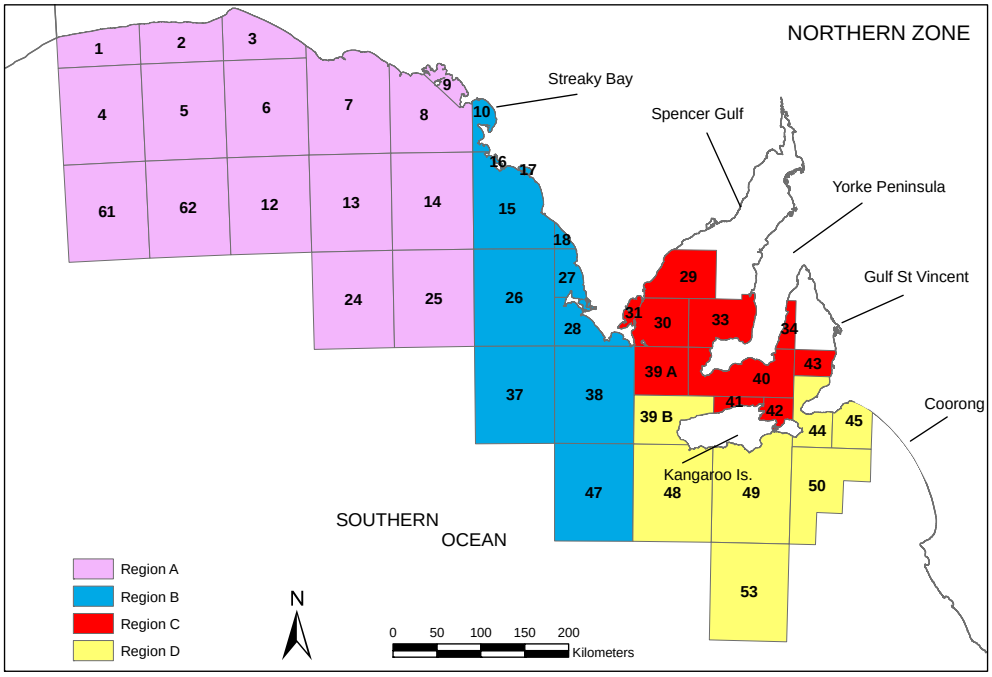

Figure 1 Northern Zone Marine Fishing Areas (MFAs) in the South Australian Rock Lobster Fishery.

2 FISHERY STATISTICS

2.1 Catch, effort and CPUE

2.1.1 Zonal catch and effort

In 2014 (i.e. the 2014/15 season), the total allowable commercial catch (TACC) in the NZRLF was 323.2 t. The total reported commercial catch was 320.6 t (99% of the TACC) (Figure 2). Effort in 2014 was 365,609 potlifts, reflecting a 3% increase from 2013 (354,557 potlifts).

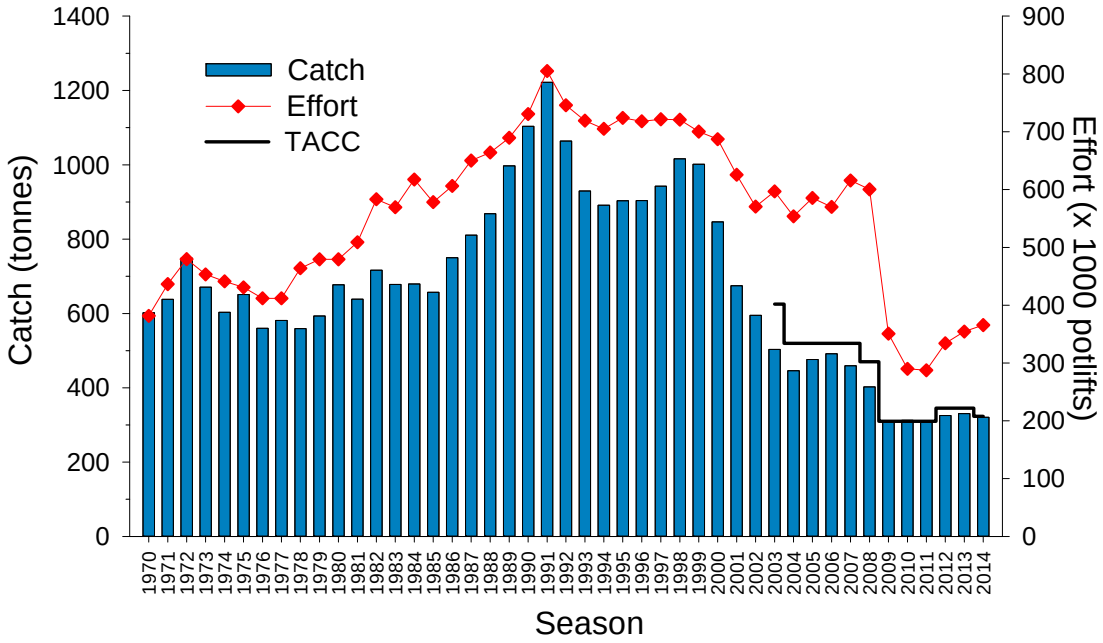

Figure 2 Inter-annual trends in catch and effort in the NZRLF from 1970 to 2014.

2.1.2 Within season trends

In 2014, 291 t (90% of the 323.2 t TACC) were taken in the first five months of the season from November to March (Figure 3). The highest catch was taken in January (70.6 t) with the lowest catch in May (7.9 t). Trends in monthly effort generally reflected those of catch.

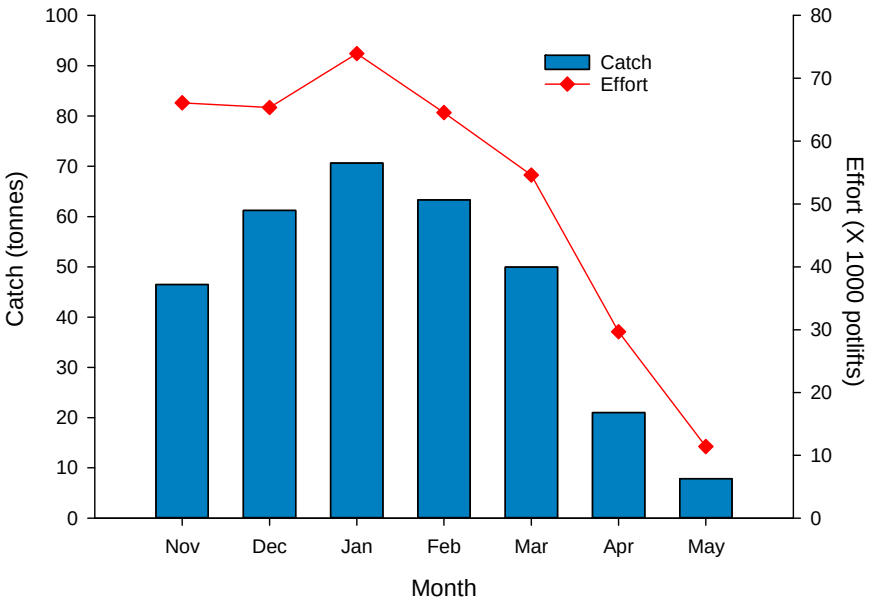

Figure 3 Within season trends in catch and effort in the NZRLF for the 2014 season.

2.1.3 Regional catch and effort

In 2014, 37% and 41% of the 321 t total catch was harvested from Regions B and D, respectively, with 18% taken from Region C (Figure 4). Only 4% of the catch was taken in Region A (see Figure 1 for regions).

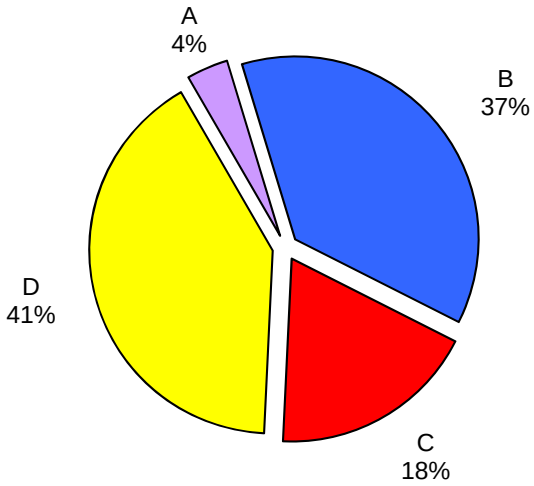

Figure 4 Percentage of total catch from Regions A-D in the NZRLF in 2014 (see Figure 1).

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. In 2014, the estimates were 12, 119, 59 and 131 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.

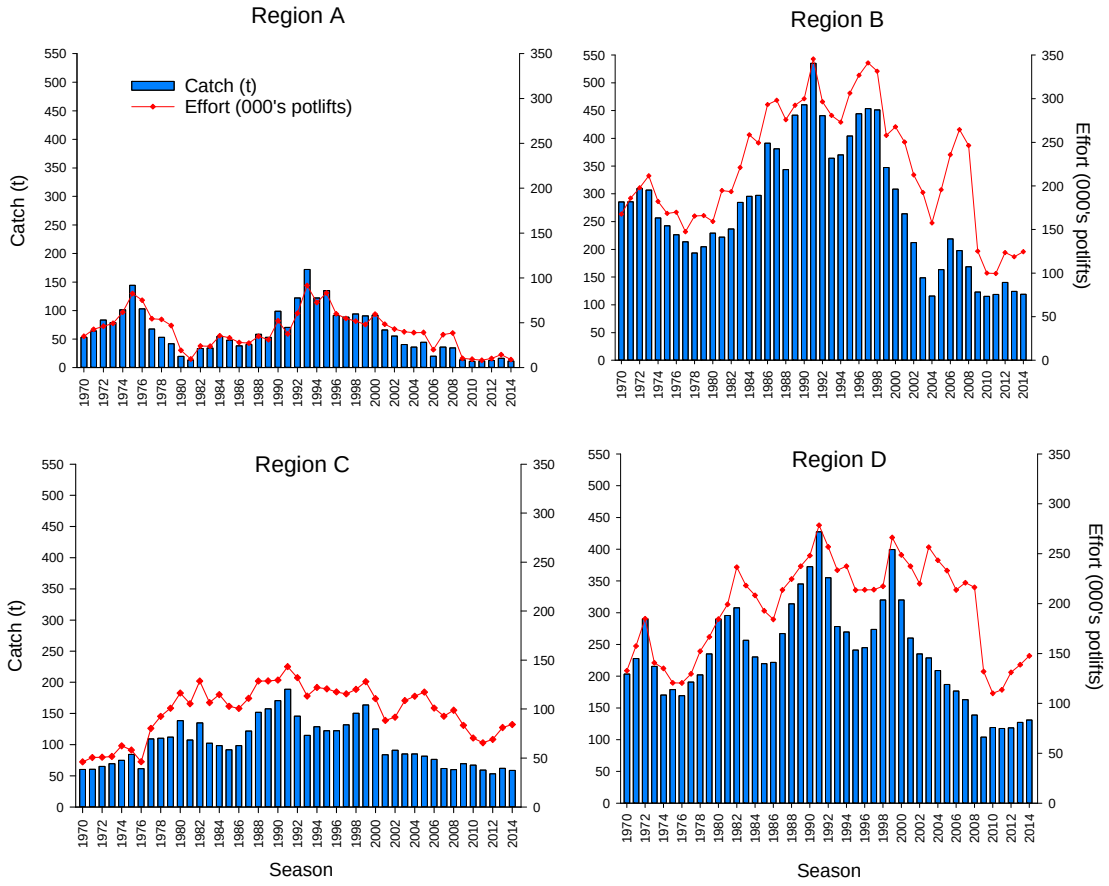

Figure 5 Inter-annual trends in catch and effort in the four Regions of the NZRLF for the fishing seasons between 1970 and 2014 (refer to Figure 21).

2.1.4 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, the highest since 2000 (1.23 kg/potlift). However, over the last three seasons, CPUE has again decreased and in 2014 was 0.88 kg/potlift, reflecting a 19% decline since 2011.

In the NZRLF, the period between settlement and recruitment is approximately four years. Therefore, the recent declines in CPUE are likely to reflect lower than average levels of settlement observed from 2007 to 2010 (Figure 11).

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Figure 6 Inter-annual trends in zonal CPUE in the NZRLF between 1970 and 2014.

2.1.5 Within season trends in CPUE

The reduction in CPUE in 2014 was driven by lower catch rates in all months with the exception of November and May (Figure 7). In 2014, CPUE was highest in February at 0.98 kg/potlift and lowest in May at 0.69 kg/potlift.

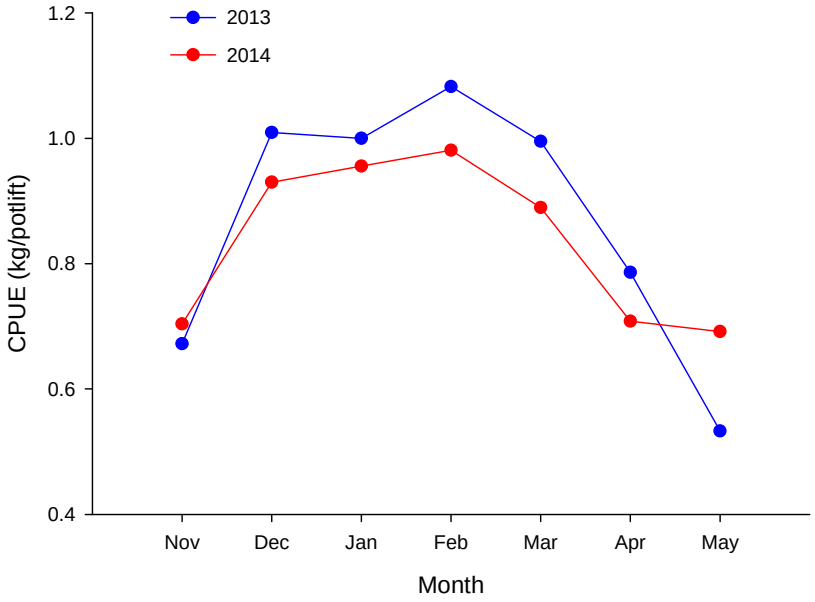

Figure 7 Within season trends in CPUE in the NZRLF in 2013 and 2014.

2.1.6 Regional CPUE

Regional trends in CPUE (November-April inclusive) (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 3-4 seasons, CPUE has decreased in all areas. In 2014, estimates in Regions A, B, C and D were 1.29, 0.97, 0.71 and 0.89 kg/potlift, respectively.

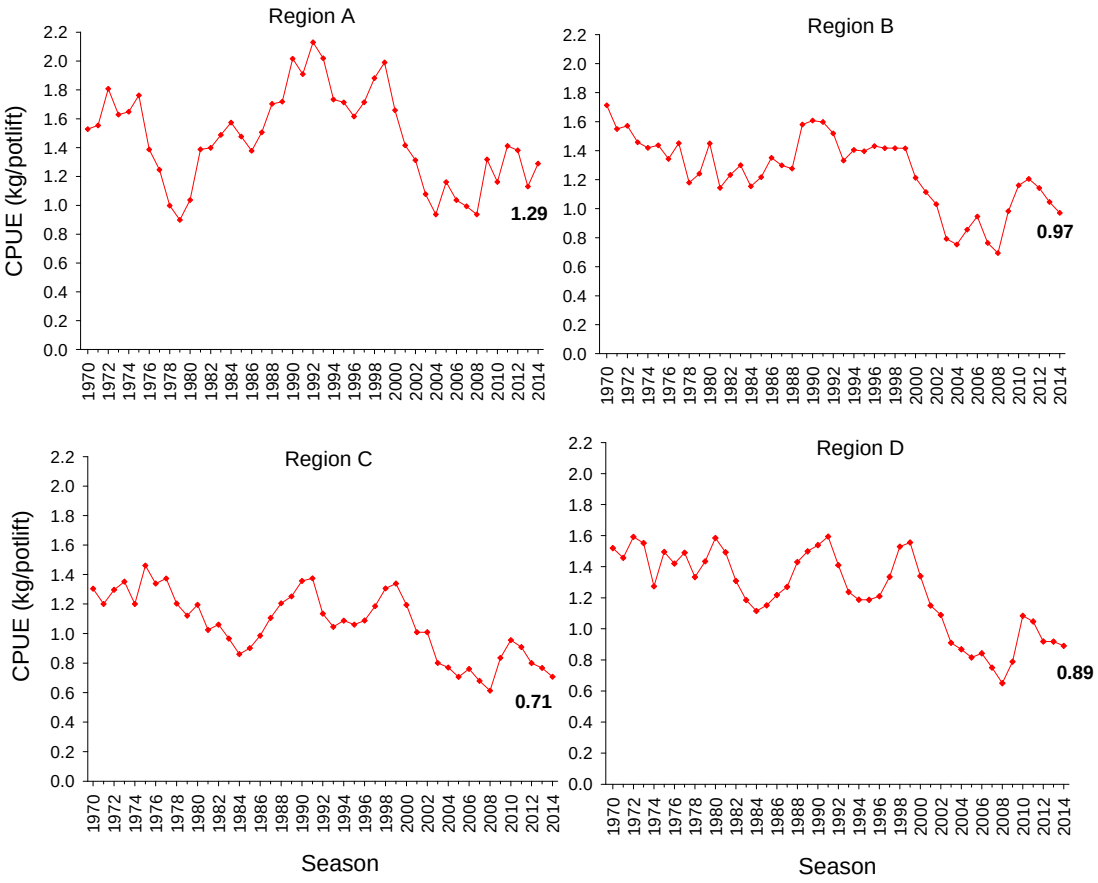

Figure 8 Inter-annual trends in regional CPUE in the NZRLF between 1970 and 2014.

2.1.7 Annual mean weight

Fluctuations in the mean weight of rock lobsters caught reflect variations in the number of lobsters recruiting to legal size (Figure 9). Over the last four seasons the mean weight of lobsters has increased reflecting reductions in the abundances of smaller legal-sized lobsters and declines in CPUE both zonally and regionally. In 2014, the mean weight was 1.11 kg.

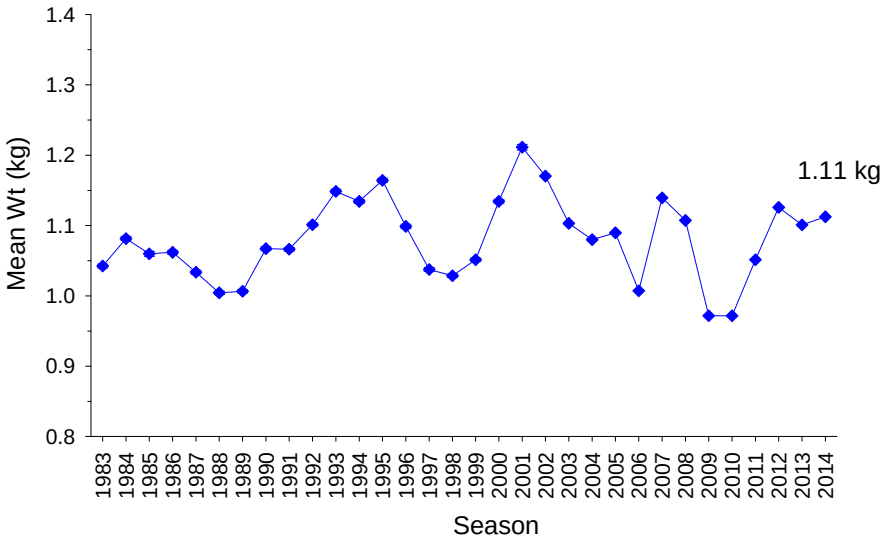

Figure 9 Inter-annual trends in mean lobster weight in the NZRLF from 1983 to 2014.

2.1.8 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. After the introduction of quota in 2003, 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 88 days in 2010. Over the last four seasons, the average number of days fished has increased to 122 days in 2014. The increase in recent seasons partly reflects the increase in TACC from 310 to 345 t in 2012.

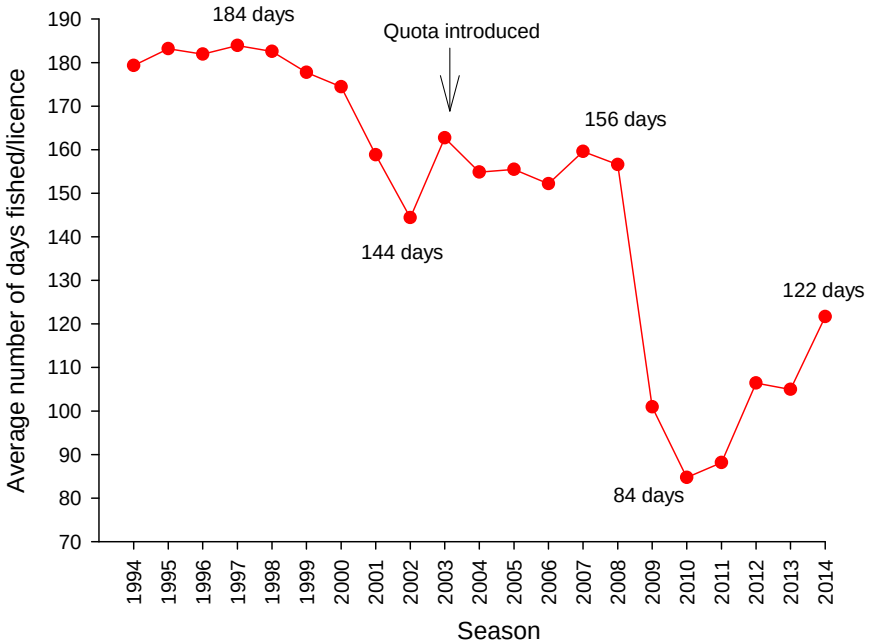

Figure 10 Average numbers of days fished per licence from 1994 to 2014 in the NZRLF.

2.2 Puerulus settlement index (PSI)

Puerulus settlement index (PSI) estimates in the NZRLF are highly variable (Figure 11). High PSIs were observed 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 2014, the PSI was 0.24 puerulus/collector. In the NZRLF, the estimated period between settlement and recruitment is 4 years. As a result, lower settlement levels from 2011 to 2014 indicate that recruitment to the fishery may be reduced from 2015 to 2018.

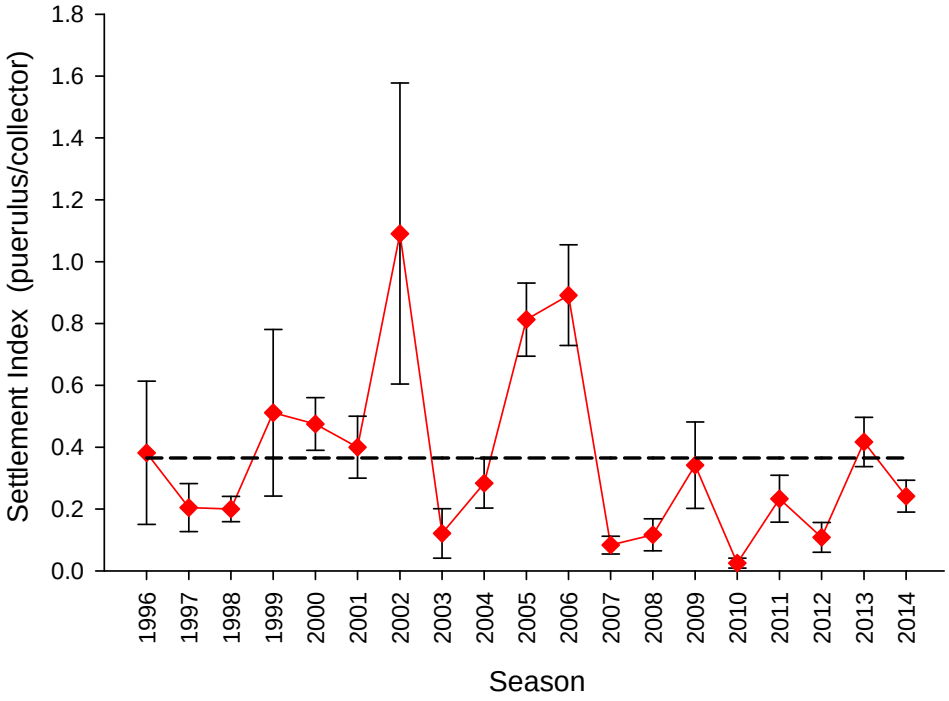

Figure 11 Puerulus settlement index (PSI) (mean ±SE) in the NZRLF from 1996 to 2014. Dashed line represents long-term average.

2.3 Pre-recruit index (PRI)

2.3.1 Zonal pre-recruit index

The PRI (November-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 2014, catch sampling PRI was 0.13 undersized/potlift, reflecting a decrease of 59% since 2013 (0.51 undersized/potlift). In the NZRLF, the time taken for pre-recruits to enter into the fishable biomass is estimated to be approximately one year.

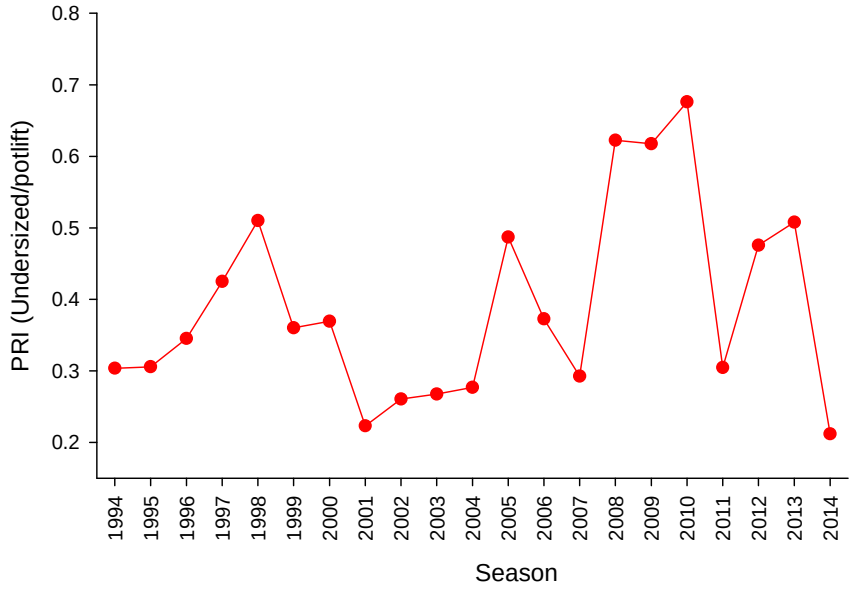

Figure 12 Inter-annual trends in pre-recruit index (PRI) in the NZRLF from 1994 to 2014 based on voluntary catch sampling data.

2.3.2 Regional pre-recruit index

In 2014, regional PRI estimates (November-March) were 0.00, 0.12, 0.19 and 0.40 undersized/potlift in Regions A, B, C and D, respectively (Figure 13).

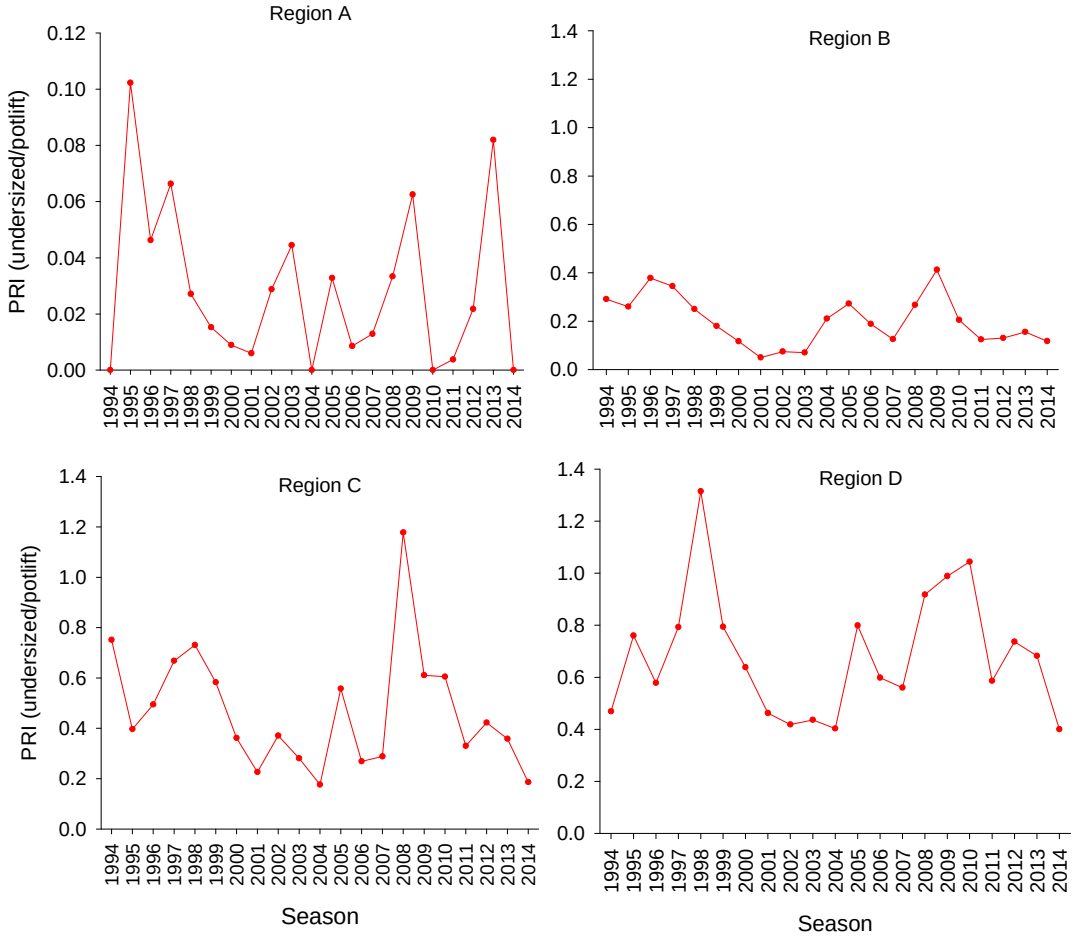

Figure 13 Inter-annual trends in regional pre-recruit index (PRI) in the NZRLF from 1994 to 2014 based on voluntary catch sampling data. Note that the scale of y-axis in Region A differs from other regions.

2.4 Length Frequency

In 2014, 60% of all lobsters measured as part of the catch sampling program were within the 105 to 140 mm CL size range (Figure 14). Approximately 20% of lobsters in 2014 were below the minimum legal size (MLS), compared to 32% in 2013, reflecting the decrease in PRI over the same period.

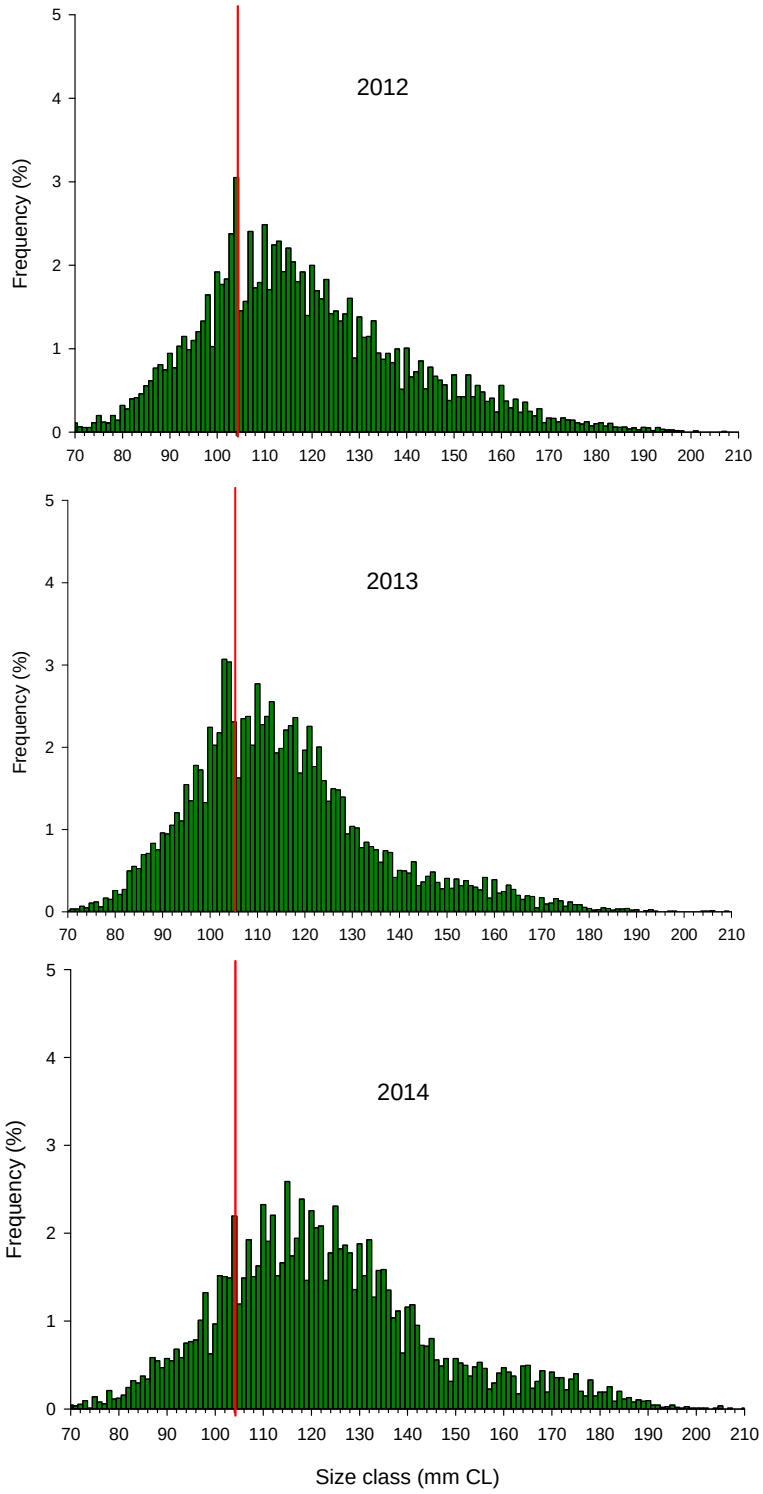

Figure 14 Length frequency data of both male and female lobsters sampled during the voluntary catch sampling program over the last three seasons. Red line represents minimum legal size (MLS) at 105 mm CL.

3 MODEL OUTPUTS

3.1 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 has remained relatively stable since 2010. In 2014, the estimate was 2,262 t, an increase of 39% from 2008 (1,627 t). Current estimates remain below the long-term average for the fishery (approximately 3,000 t).

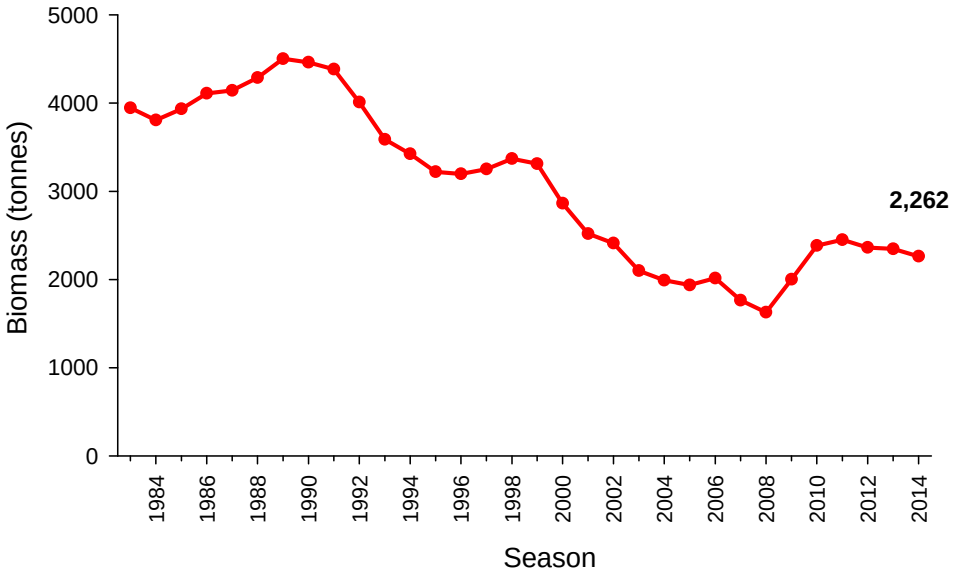

Figure 15 Estimates of biomass for the NZRLF as obtained from the qR fishery model.

3.2 Egg production

Due to decreasing biomass, egg production in the NZRLF has also decreased since the 1980s (Figure 16). In 2014, total egg production was estimated to be 244 billion eggs, reflecting declines over the last three seasons and remain below the long-term average for the fishery (364 billion).

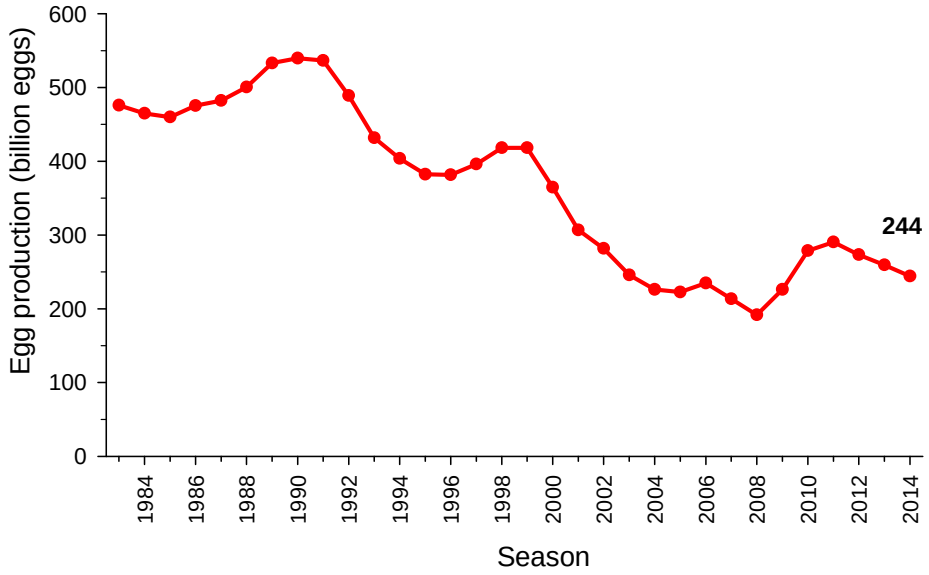

Figure 16 Estimates of egg production for the NZRLF as obtained from the qR fishery model.

3.3 Percent of virgin egg production

In 2014, egg production in the NZRLF equated to 23% of virgin egg production (Figure 17).

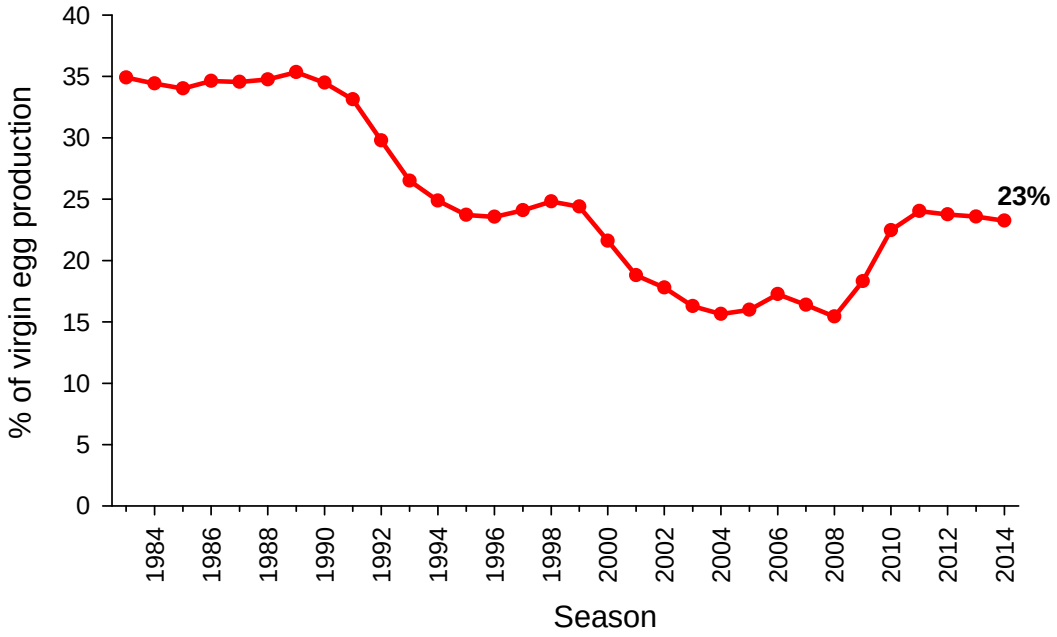

Figure 17 Estimates of % virgin egg production for the NZRLF as obtained from the qR fishery model.

3.4 Exploitation Rate

Over the last six seasons exploitation rates have decreased considerably in the fishery (Figure 18). The 2014 estimate of 14% is one of the lowest estimates on record.

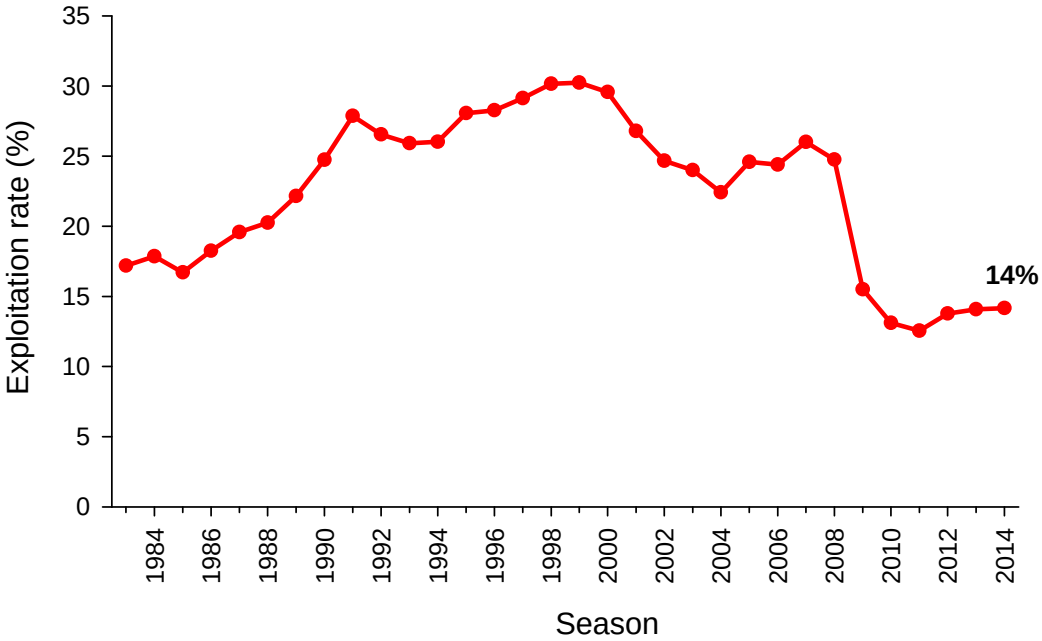

Figure 18 Estimates of exploitation rate in the NZRLF as obtained from the qR fishery model.

3.5 Recruitment

Model estimated recruitment in the NZRLF has been highly variable (Figure 19). Over the last four seasons recruitment levels have been low and in 2014 was estimated at 0.34 million recruits.

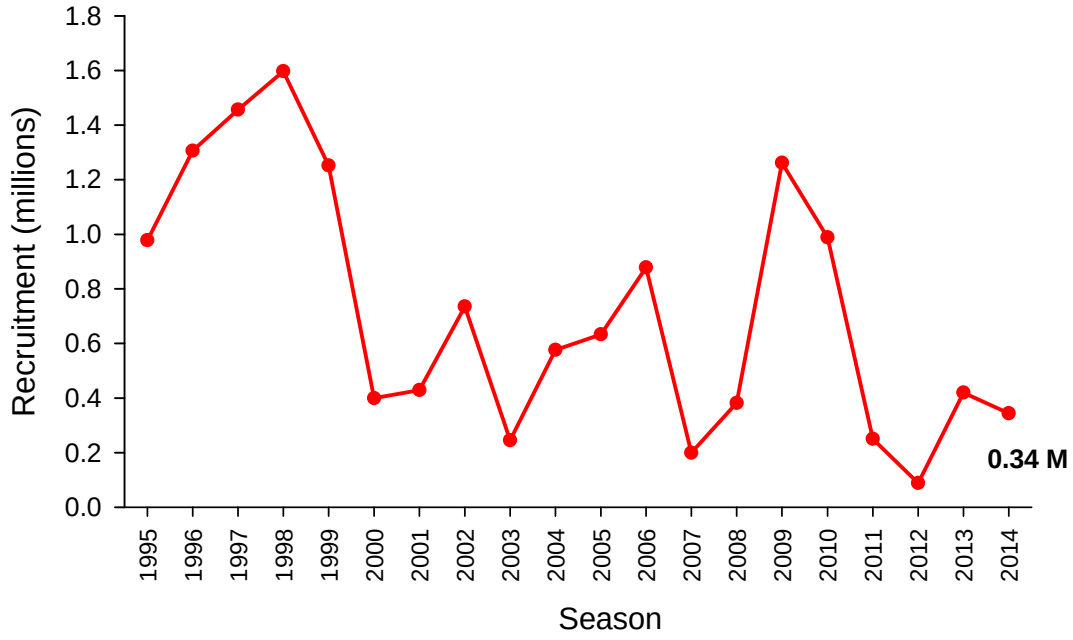

Figure 19 Estimates of recruitment as obtained from the qR fishery model.

4 BIOLOGICAL PERFORMANCE INDICATORS

4.1 Reference points

The harvest strategy component of the NZRLF management plan (PIRSA 2014) details reference points for both the primary biological performance indicator of CPUE and 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. In addition, spatial management of the fishery has been proposed based on inner and outer sub-regions (Figure 21). This involves separate TACCs in each sub-region, levels of which were developed through a dedicated Fisheries Research and Development Corporation (FRDC) project which investigated spatial and temporal management options for the fishery (Linnane et al. 2015).

4.1.1 Catch per unit effort (CPUE)

Levels of TACC in both the inner and outer sub-regions are based on zonal CPUE estimates. In 2014, the zonal CPUE for the NZRLF was 0.88 kg/potlift. Based on the current harvest strategy (Table 1), this indicates a 360 t TACC (300 t in the inner sub-region and 60 t in the outer sub-region) for the 2015/16 season.

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

Table 1 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).

4.1.2 Pre-recruit index (PRI)

The secondary indicator of fishery performance is the PRI, which is derived from catch sampling data, with a limit reference point (LRP) of 0.30 undersized/potlift (Figure 20). In 2014, the PRI was 0.21 undersized/potlift which is below the LRP.

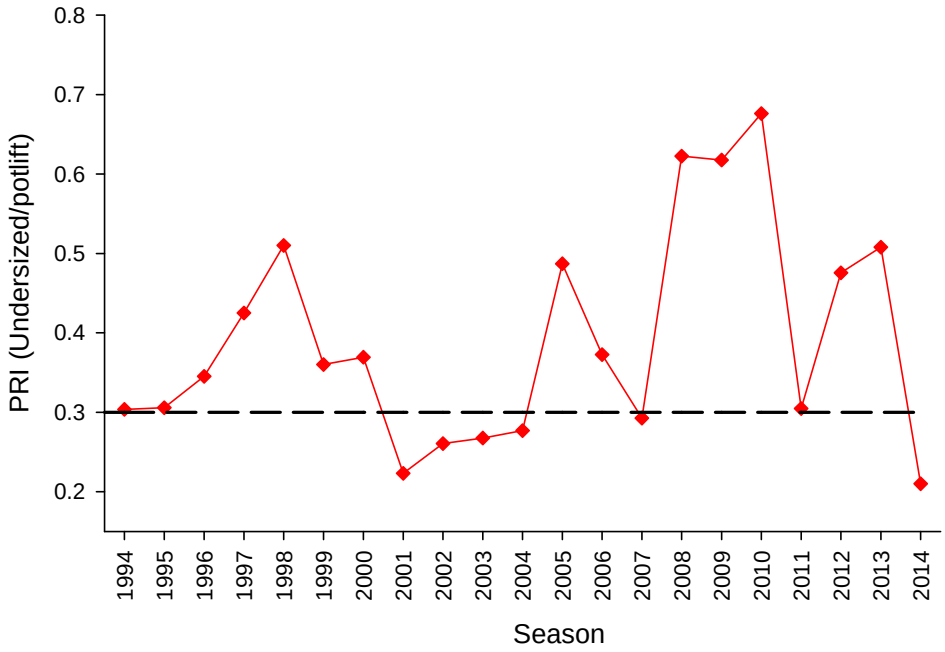

Figure 20 Inter-annual trends in the pre-recruit index (PRI) in the NZRLF from 1994 to 2014 based on voluntary catch sampling data. Dashed line represents the limit reference point (0.30 undersized potlift).

4.2 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 indicates a 360 t TACC (300 t in the inner sub-region and 60 t in the outer sub-region) for the 2015/16 season.

5 SUMMARY

Since the TACC was increased from 310 t to 345 t in 2012, CPUE has declined by 19% from 1.08 kg/potlift in 2011 to 0.88 kg/potlift in 2014.

Two sources of information confirm that conservative TACCs are warranted under existing harvest strategies. In 2014, the pre-recruit index was 0.21 undersized/potlift which is below the limit reference point. In addition, three of the last four settlements between 2011 and 2014 have been below the long-term average. Using a four year period from settlement to recruitment, this suggests that recruitment from 2015 to 2018 will most likely be below the historical average.

In 2015, a spatially defined harvest strategy was developed for the fishery. Based on the 2014 CPUE, this strategy indicates a TACC of 360 t (300 t inner sub-region and 60 t outer sub-region) for the 2015/16 season. Based on a weight-of-evidence approach, the NZRLF is classified as "**sustainable**".

6 REFERENCES

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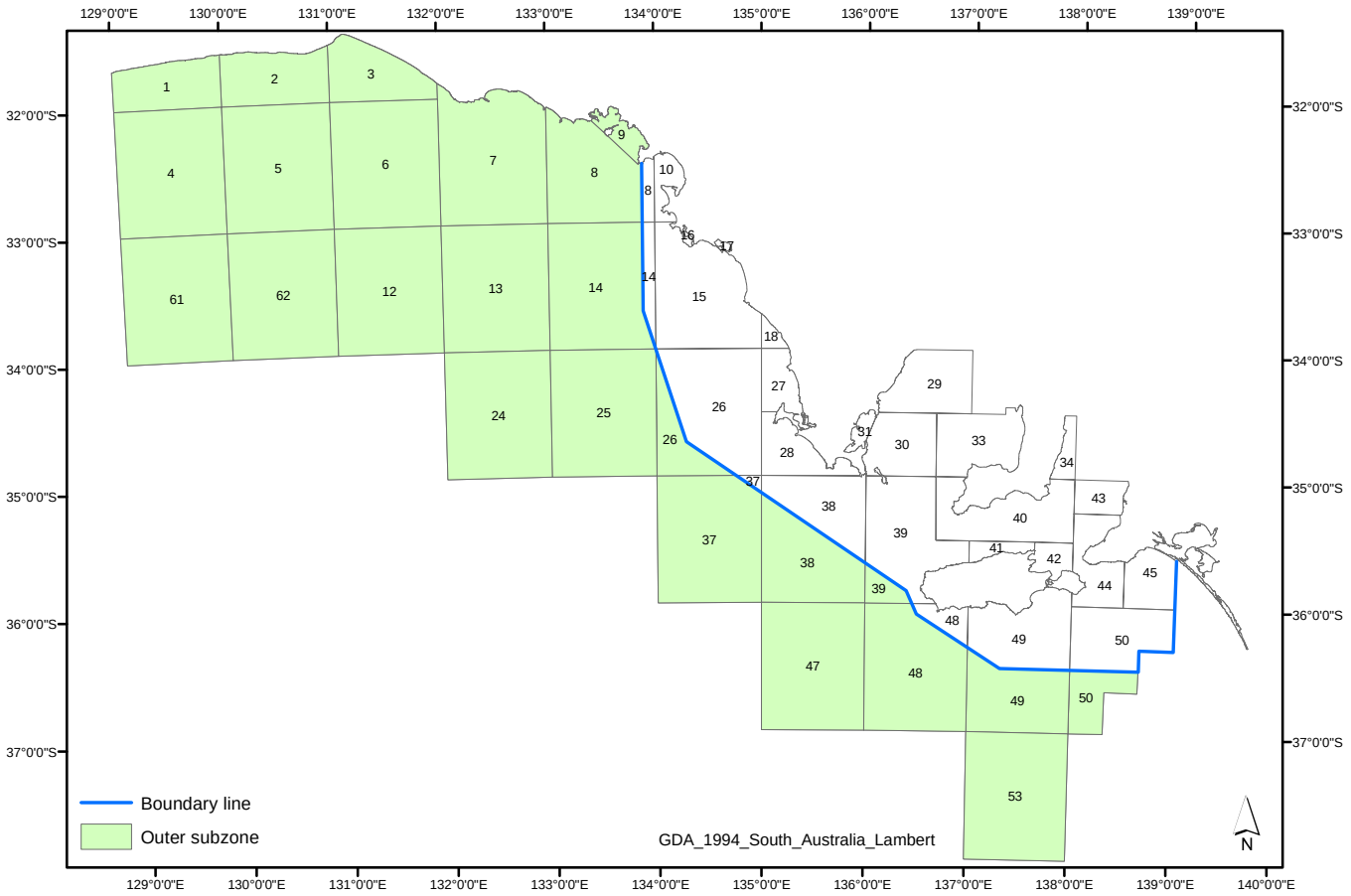

Figure 21 Northern Zone sub-regions and Marine Fishing Areas in the South Australian Rock Lobster Fishery.