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

A. Linnane, R. McGarvey, J. Feenstra and M. Hoare

SARDI Publication No. F2007/000714-7
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SARDI Aquatic Sciences
PO Box 120 Henley Beach SA 5022

December 2013

Status Report to PIRSA Fisheries and Aquaculture

PREMIUM FOOD AND WINE FROM OUR CLEAN ENVIRONMENT

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2 EXECUTIVE SUMMARY

In 2012 (1 November 2012 to 31 May 2013), the Total Allowable Commercial Catch (TACC) in the Northern Zone Rock Lobster Fishery (NZRLF) was 345 tonnes. The total reported catch from logbook data was 325.1 tonnes (94% of TACC). Over the past four seasons, effort has decreased considerably with the 2011 estimate of 287,480 potlifts reflecting a 52% reduction from 2008 (600,347 potlifts) and the lowest estimate on record. In 2012, effort was 334,285 potlifts representing a 16% increase from 2011.

Regional catches in 2012 were 11.3, 139.8, 53.1, and 118.2 tonnes in Regions A, B, C and D, respectively. The most notable increases in effort in 2012 were in Regions B (Eyre Peninsula) and D (Kangaroo Island).

With the exception of marginal increases in 2005 and 2006, zonal catch per unit effort (CPUE; Nov-April inclusive) decreased from 1.40 to 0.67 kg/potlift from 1999 to 2008. Over the next three seasons, CPUE increased to 1.08 kg/potlift in 2011, reflecting a 61% increase since 2008 and the highest estimate on record since 2001 (1.13 kg/potlift). In 2012, CPUE decreased by 8% to 0.99 kg/potlift.

There have been notable decreases in CPUE in some regions over the last two seasons. Specifically, the 2012 estimate of 0.80 kg/potlift in Region C reflects a 16% decrease from 2010 (0.95 kg/potlift), while CPUE has decreased by 14% from 1.08 to 0.93 kg/potlift in Region D over the same period.

High puerulus settlement indices (PSIs) were observed in 2002, 2005 and 2006 but since 2007, annual settlement has been below the long-term average with the exception of 2009. The estimated period between puerulus settlement and recruitment into the fishable biomass in the NZRLF is 4 years while pre-recruit individuals are observed 3 years after settlement. Based on these relationships, this suggests that recruitment to the fishery will most likely be reduced from 2011 to 2016.

In 2012, catch sampling and logbook based pre-recruit indices were 0.48 (55% increase from 2011) and 0.15 undersized/potlift (7% increase from 2011) respectively. These increases reflect average settlement levels experienced in 2009.

Estimates from the qR stock assessment model indicate a general decline in lobster biomass in the NZRLF over the last three decades. Over the last four seasons biomass has increased and in 2012 was estimated at 2,110 tonnes, an increase of 696 tonnes (49%) from 2008 (1,414 tonnes). While current exploitation rates are 15%, overall biomass estimates remain low in a historical context. The harvest strategy recommends retaining the TACC at 345 tonnes for the 2013 season.

3 INTRODUCTION

This fishery status report updates the 2011/12 stock assessment report for the Northern Zone Rock Lobster Fishery (NZRLF) (Linnane et al. 2012) 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 NZRLF and to assess the current status of the resource in relation to the current harvest strategy for the fishery (Anon. 2011). A comprehensive assessment that includes more detailed spatial and temporal analyses will be provided in the 2012/13 stock assessment report which is due in July 2014.

4 FISHERY STATISTICS

4.1 Catch, effort and CPUE

4.1.1 Zonal catch and effort

Between 1998 (1015.8 tonnes) and 2008 (402.7 tonnes) catch in the NZRLF decreased by 60% (Figure 1). Effort did not decline comparatively, remaining between ~550,000 and 720,000 potlifts. In 2003, a TACC of 625 tonnes was introduced but was incrementally reduced to 470 tonnes by 2008 without ever being fully taken. In 2009, the TACC was set at 310 tonnes and was subsequently fully landed for the next three seasons. In 2012, the TACC was increased to 345 tonnes with a logbook estimated catch of 325.1 tonnes recorded (94%). Over the past four seasons effort has decreased, with the 2012 estimate of 334,285 potlifts representing a 16% increase from 2011 (287,480 potlifts).

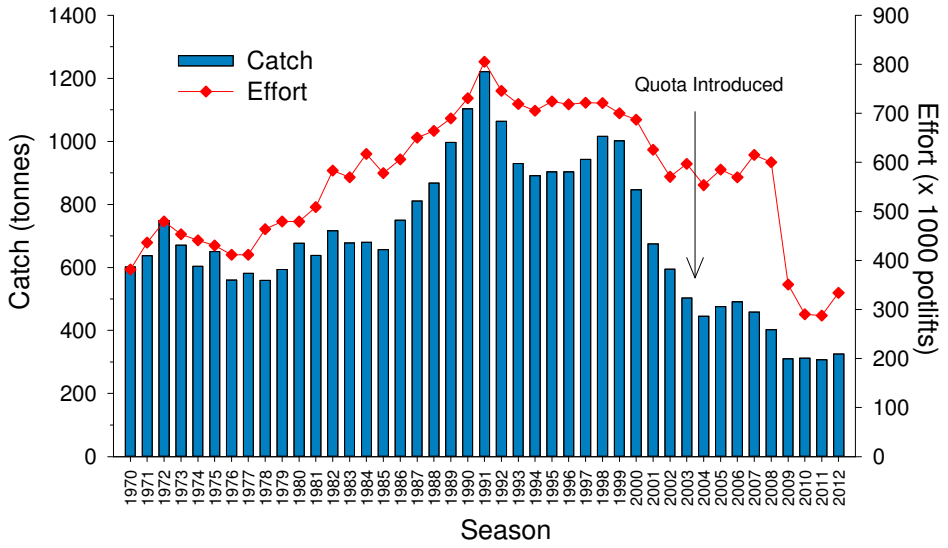

Figure 1 Inter-annual trends in catch and effort in the NZRLF from 1970 to 2012.

4.1.2 Within season trends

In 2012, 271 tonnes (79% of the 345 tonne TACC) were taken in the first four months of the fishery from November to February (Figure 2). The highest catch was taken in January (88.1 tonnes) with the lowest in May (6.5 tonnes). With the exception of November, the trends in effort reflected catch levels by month.

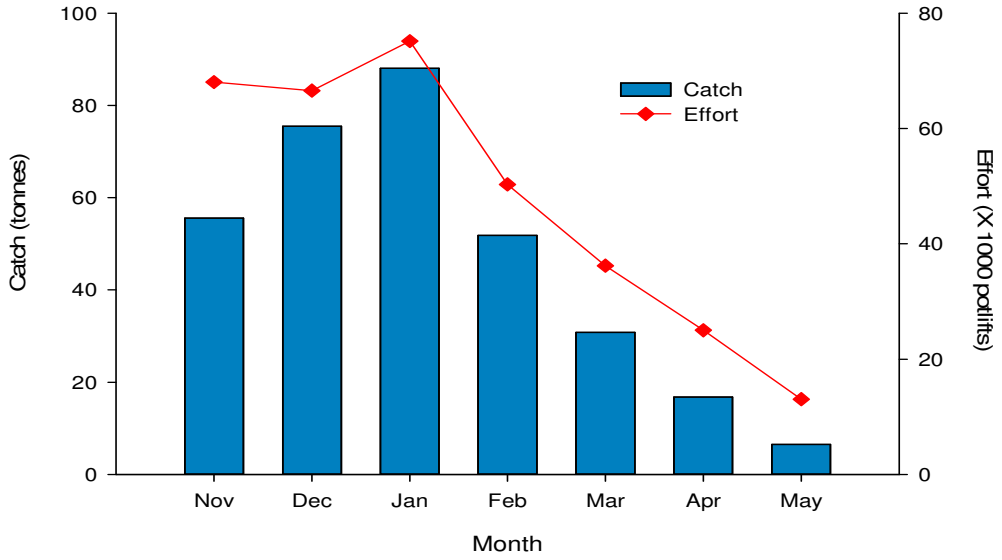

Figure 2 Within season trends in catch and effort in the NZRLF for the 2012 season.

4.1.3 Regional catch and effort

In 2012, 43% and 37% of the 325 tonne total was harvested from Regions B and D, respectively with 16% taken from Region C (Figure 3). Only 4% of the catch was taken in Region A (see Figure 21 for regions).

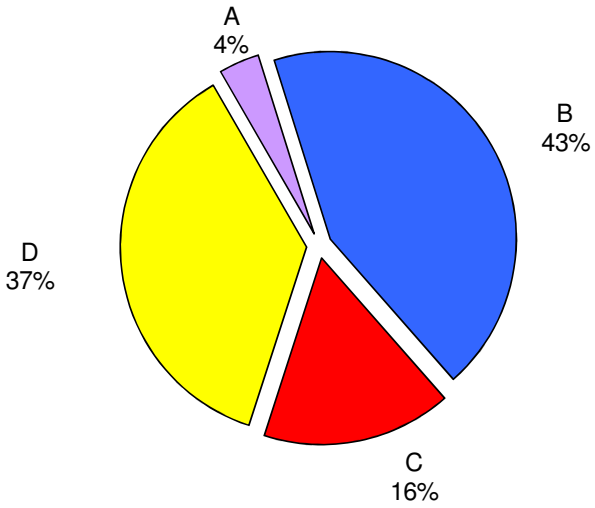

Figure 3 Percentage of total catch from Regions A-D in the NZRLF in 2012 (see Figure 21).

From 1998/1999 to 2009, catch decreased in all areas, with the exception of Region B, where it increased from 115.6 tonnes in 2004 to 218.7 tonnes in 2006 (Figure 4). From 2009 to 2012, catch has remained relatively stable in all regions. In 2012, the estimates were 11.3, 139.8, 53.1, and 118.2 tonnes in Regions A, B, C and D, respectively. As with zonal estimates (Figure 1), effort has decreased considerably in all regions over the last four seasons. The most notable increases in 2012 compared to 2011 were in regions B and D.

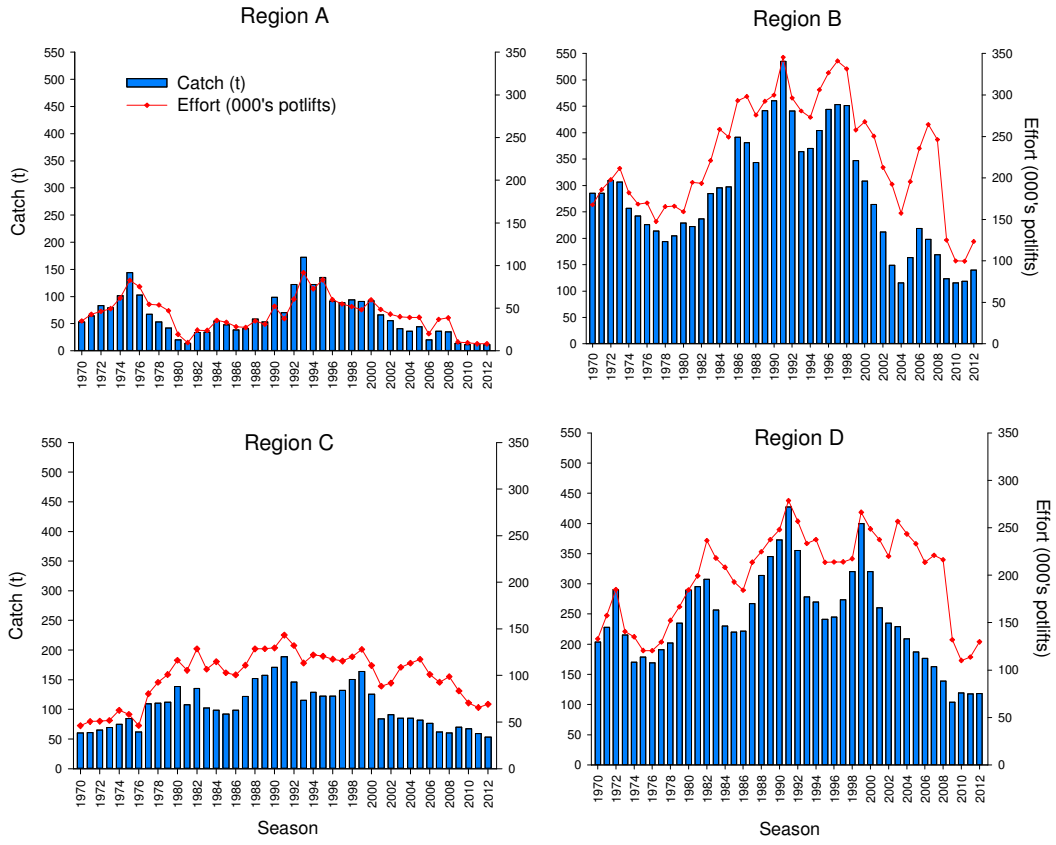

Figure 4 Inter-annual trends in catch and effort in the four Regions of the NZRLF for the fishing seasons between 1970 and 2012 (refer to Figure 21).

4.1.4 Zonal CPUE

With the exception of marginal increases in 2005 and 2006, CPUE (November-April inclusive) in the NZRLF decreased from 1999 (1.49 kg/potlift) to 2008 (0.67 kg/potlift, the lowest on record) (Figure 5). Over the next two seasons CPUE increased and in 2010 and 2011 was 1.08 kg/potlift, the highest on record since 2000 (1.23 kg/potlift). In 2012, CPUE decreased by 8% to 0.99 kg/potlift.

In the NZRLF, the period between settlement and recruitment is 4 years, with 3 years between settlement and pre-recruit index (PRI). Therefore, the increase in CPUE in 2010 and 2011 reflects recruitment into the fishery resulting from strong settlement in 2005 and 2006 (Figure 10) and PRI observed in 2008 and 2009 (Figure 11).

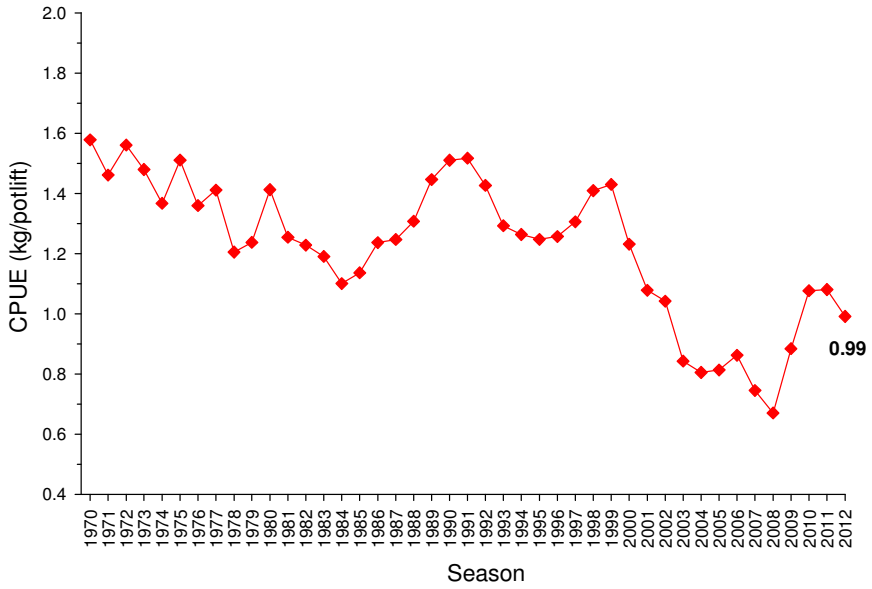

Figure 5 Inter-annual trends in zonal CPUE in the NZRLF between 1970 and 2012.

4.1.5 Within season trends in CPUE

The reduction in CPUE in 2012 was largely driven by lower catch rates in November, December, April and May (Figure 6). In 2012, CPUE was highest in January at 1.17 kg/potlift and lowest in May at 0.50 kg/potlift.

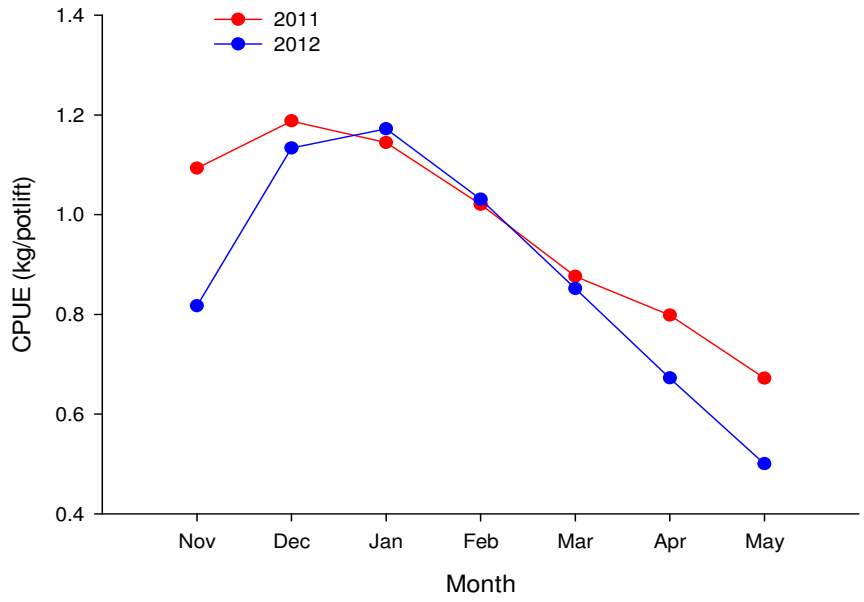

Figure 6 Within season trends in CPUE in the NZRLF in 2011 and 2012.

4.1.6 Regional CPUE

Regional trends in CPUE (November-April inclusive) (Figure 7 and refer to Figure 21) broadly reflect those of zonal catch rate (Figure 5). CPUE generally decreased in each of the four major regions from 1999 to 2010. Over the next two seasons, CPUE increased in all major areas in line with zonal estimates. However, in 2011 and 2012, CPUEs notably decreased in Regions C and D. Specifically, the 2012 estimate of 0.80 kg/potlift in Region C reflects a 16% decrease from 2010 (0.95 kg/potlift), while CPUE has decreased by 14% from 1.08 to 0.93 kg/potlift in Region D over the same period.

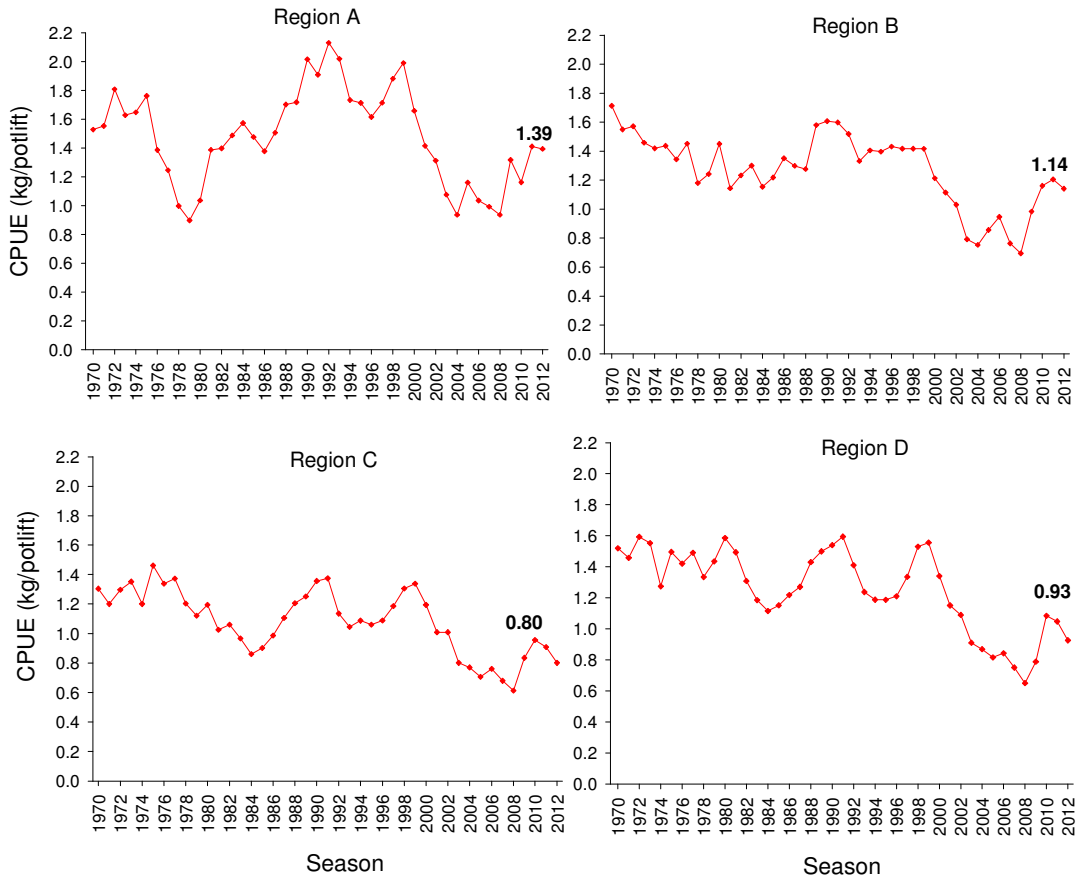

Figure 7 Inter-annual trends in regional CPUE in the NZRLF between 1970 and 2012.

4.1.7 Annual mean weight

Mean weight in the NZRLF generally decreased from 2001 to 2006, with the exception of 2005 (Figure 8). In 2007, mean weight increased to 1.13 kg, but subsequently decreased to 0.97 kg in both 2009 and 2010. Low mean weights in 2009 and 2010 are likely to reflect recruitment entering the fishery, as confirmed by increased catch rates both zonally and regionally during this period (Figure 5, Figure 7). Over the last two seasons mean weight has increased to 1.12 kg in 2012.

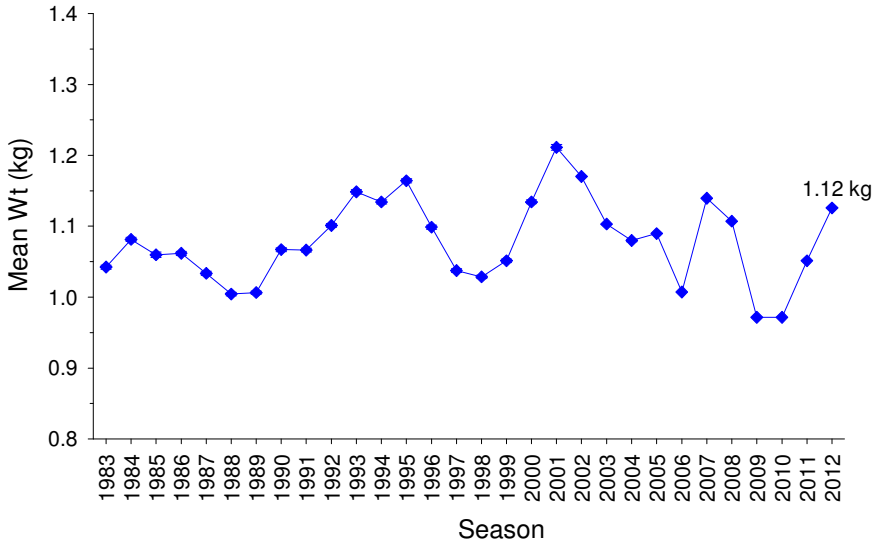

Figure 8 Inter-annual trends in mean lobster weight in the NZRLF from 1983 to 2012.

4.1.8 Average number of days fished

The average numbers of days fished/licence holder decreased from 184 days in 1997 to 144 days in 2002. 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 tonnes and average days fished decreased considerably to 88 days in 2010. Over the last two seasons, the estimate has increased to 106 days. The increase between 2011 and 2012 is likely to reflect the increase in TACC from 310 to 345 tonnes in 2012.

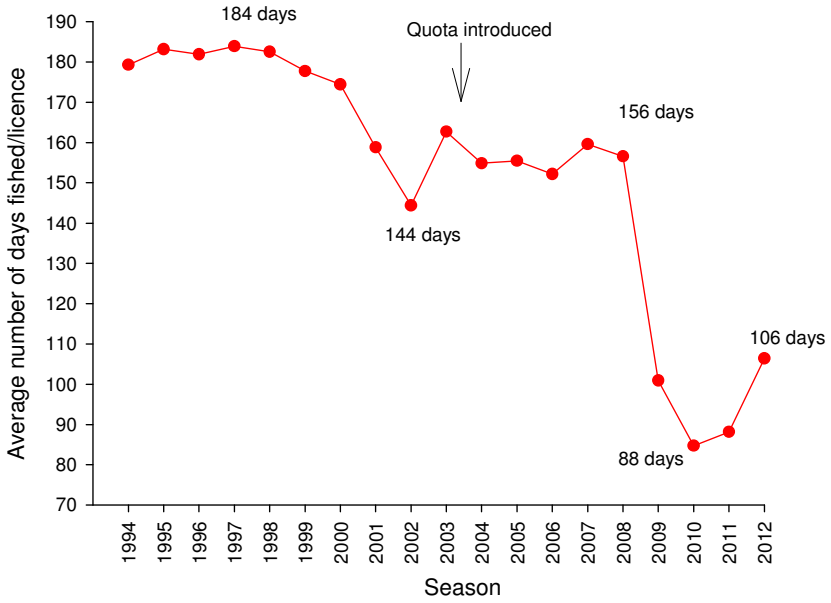

Figure 9 Average numbers of days fished per licence from 1994 to 2012 in the NZRLF.

4.2 Puerulus settlement index (PSI)

Puerulus settlement index (PSI) estimates in the NZRLF are highly variable (Figure 10). High PSIs were observed in 2002, 2005 and 2006, but since 2007, annual settlement has been below the long-term average (0.37 puerulus/collector). In 2010, the PSI was 0.02 puerulus/collector, the lowest on record. The 2012 estimate was 0.10 puerulus/collector. In the NZRLF, the estimated period between settlement and recruitment is 4 years. As a result, the increase in CPUE in 2009 and 2010 (Figure 5) reflects strong settlement in 2005 and 2006. However, lower settlement levels from 2007 to 2012 indicate that recruitment to the fishery may be reduced from 2011 to 2016.

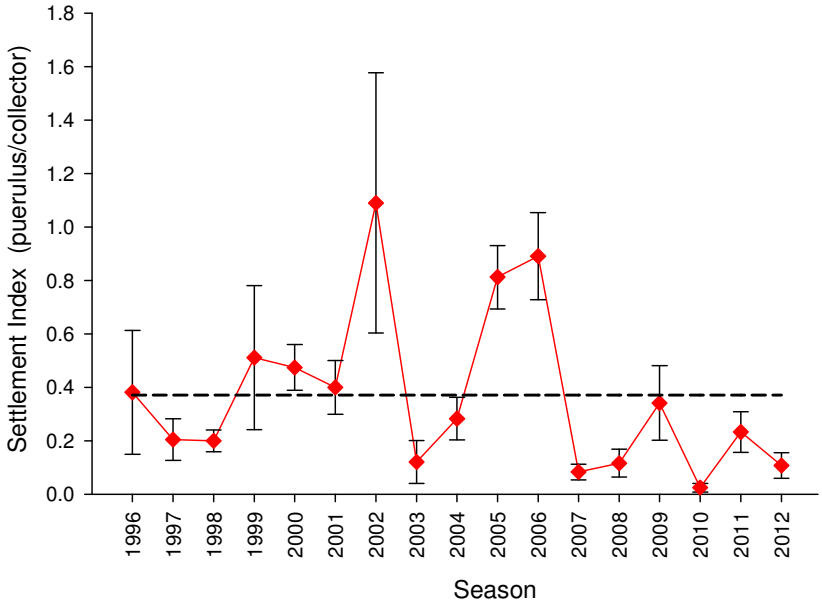

Figure 10 Puerulus settlement index (PSI) (mean ±SE) in the NZRLF from 1996 to 2012. Dashed line represents long-term average.

4.3 Pre-recruit index (PRI)

4.3.1 Zonal pre-recruit index

PRI (November-March inclusive) based on logbook data is underestimated due to mandatory introduction of escape gaps in 2003 (Figure 11). 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 the NZRLF, the estimated period between settlement and PRI is 3 years. As a result, the high PRIs in 2008 and 2009 reflect the high settlements in 2005 and 2006 (Figure 10). In 2011, both catch sampling and logbook derived PRI decreased. Catch sampling PRI declined from 0.67 undersized/potlift in 2010 to 0.31 undersized/potlift in 2011, a decrease of 55%. Similarly, logbook PRI decreased from 0.21 undersized/potlift to 0.14 undersized/potlift, a decrease of 33%. Low PRIs in 2011 are likely to reflect reduced levels of puerulus settlement observed in 2007 and 2008 (Figure 10). In 2012, catch sampling and logbook based PRI were 0.48 (55% increase) and 0.15 undersized/potlift (7% increase), respectively. These increases correlate with average settlement levels experienced in 2009 (Figure 10).

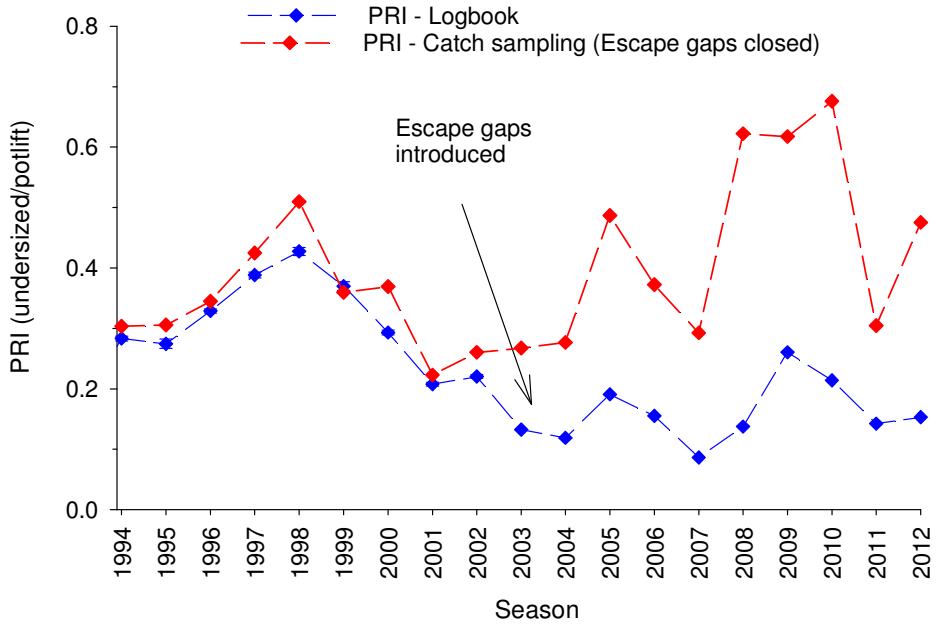

Figure 11 Inter-annual trends in pre-recruit index (PRI) in the NZRLF from 1994 to 2012 based on logbook and voluntary catch sampling data.

4.3.2 Regional pre-recruit index

The zonal increase observed in catch sampling PRI in 2012 was primarily driven by Regions C and D (Figure 12). In 2012, regional PRI estimates (November-March inclusive) were 0.02, 0.13, 0.42 and 0.74 undersized/potlift in Regions A, B, C and D, respectively.

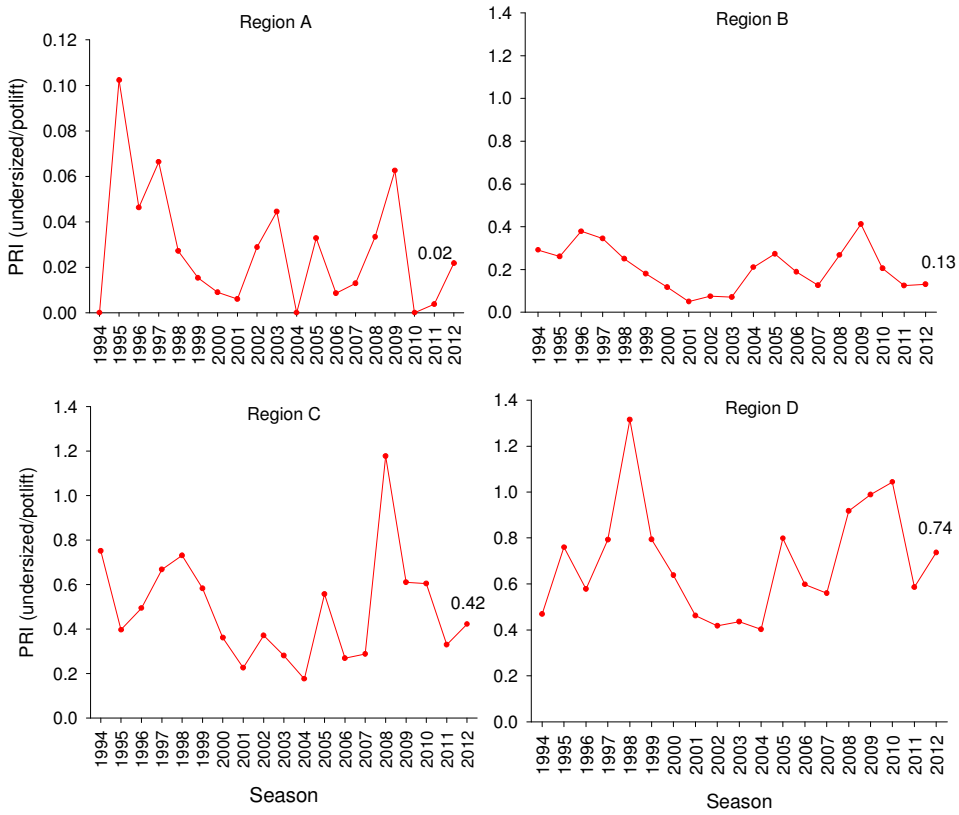

Figure 12 Inter-annual trends in regional pre-recruit index (PRI) in the NZRLF from 1994 to 2012 based on voluntary catch sampling data. Note that the scale of y-axis in Region A differs from other regions.

4.4 Length Frequency

Length frequency data obtained through the voluntary catch sampling program confirm commercial catch rate indices (Figure 13). The frequency of legal sized lobsters above the MLS within the 105-130 mm carapace length (CL) size range has increased over the last two seasons reflecting increasing catch rates between 2010 and 2011 (Figure 5). However, in 2011, the frequency of lobsters within the 70-104 mm CL range decreased reflecting the considerable reduction in undersized lobster abundance observed in logbook data. This also correlates with low levels of puerulus settlement observed in 2007 and 2008 (Figure 10) given a three year period between settlement and pre-recruit indices. Overall, length frequency data in 2012 were similar to 2011 estimates.

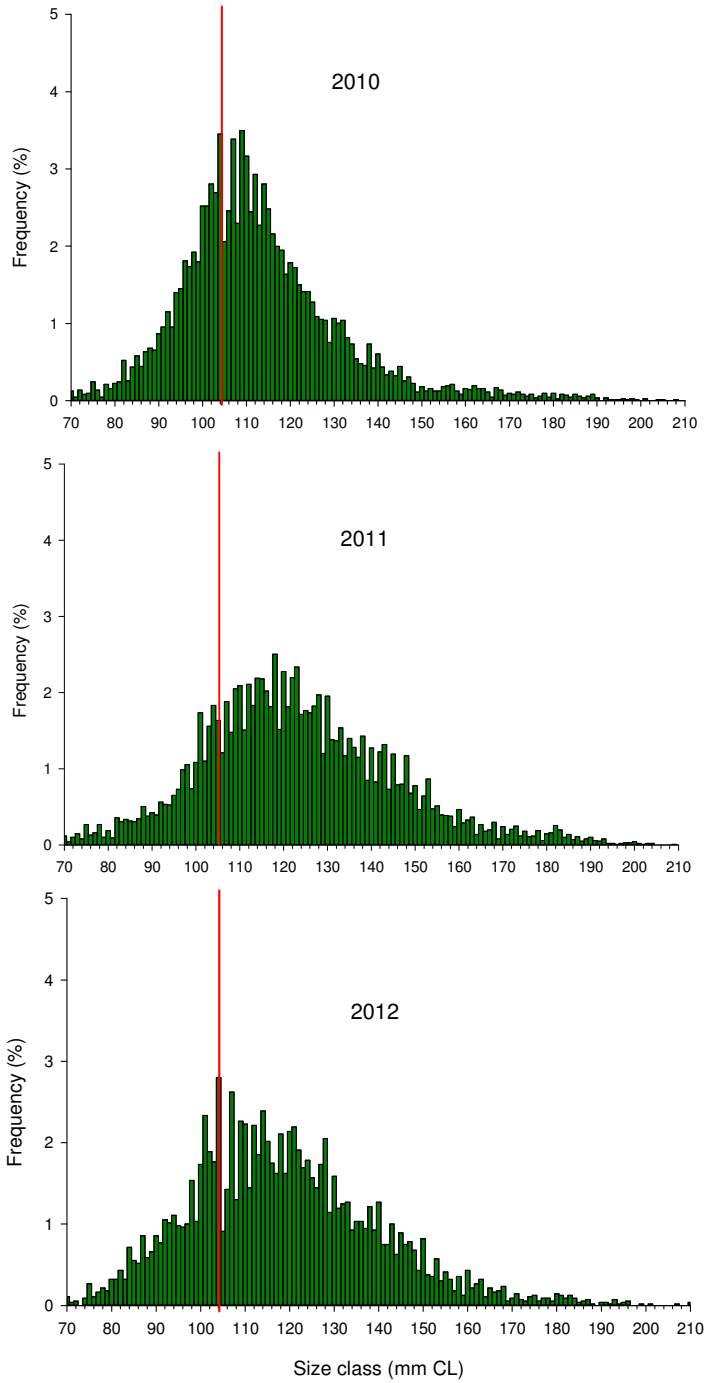

Figure 13 Length frequency data of both male and female lobsters sampled during the voluntary catch sampling program over the last three seasons. Red line represents minimum legal size (MLS) at 105 mm CL.

5.1 Biomass

Estimates from the qR stock assessment model indicate a general decline in lobster biomass in the NZRLF from 1970 to 2008 (Figure 14). Over the last four seasons biomass has increased and in 2012 was estimated at 2,110 tonnes, an increase of 696 tonnes (49%) from 2008 (1,414 tonnes).

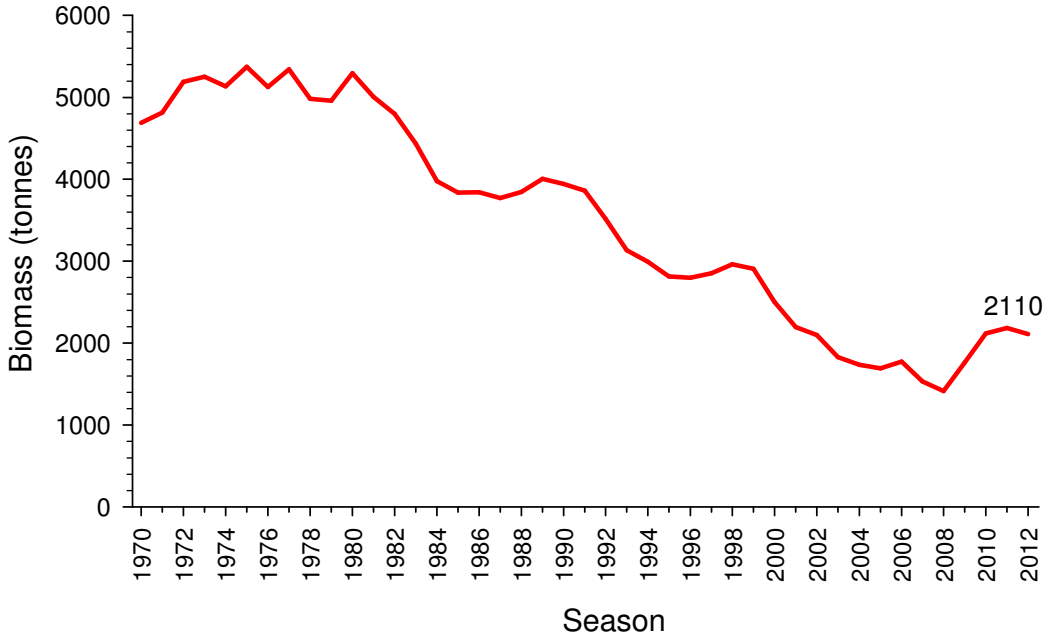

Figure 14 Estimates of biomass for the NZRLF as obtained from the qR fishery model.

5.2 Egg Production

Due to decreasing biomass, egg production in the NZRLF has also similarly decreased (Figure 15). In 2012, total egg production was estimated to be 249 billion eggs reflecting marginal increases over the last four seasons.

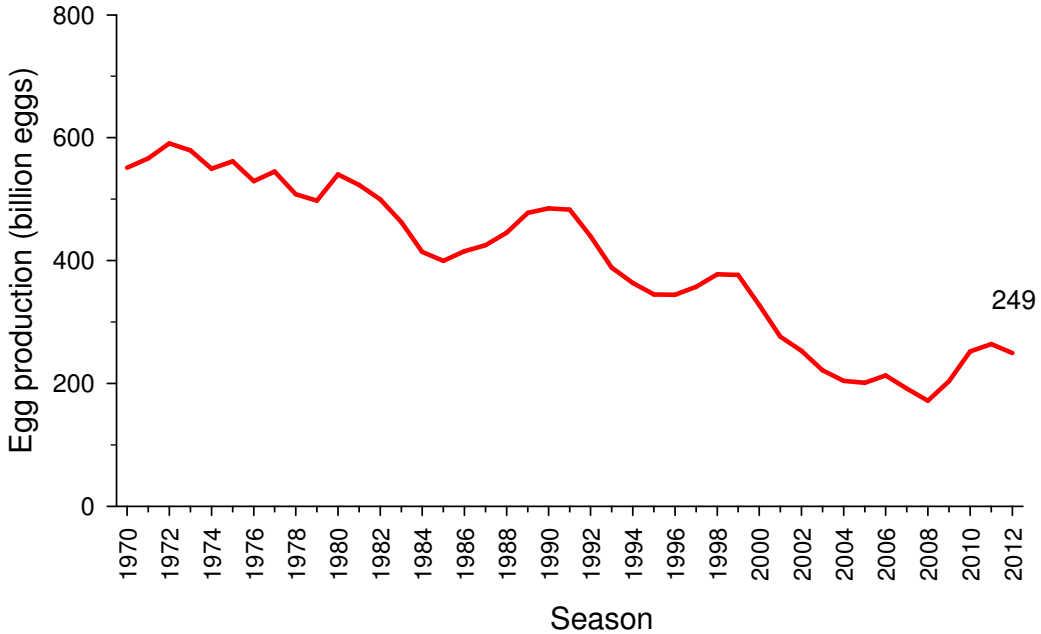

Figure 15 Estimates of egg production for the NZRLF as obtained from the qR fishery model.

5.3 Percent of virgin egg production

In 2012, egg production in the NZRLF equated to 22% of virgin egg production (Figure 16).

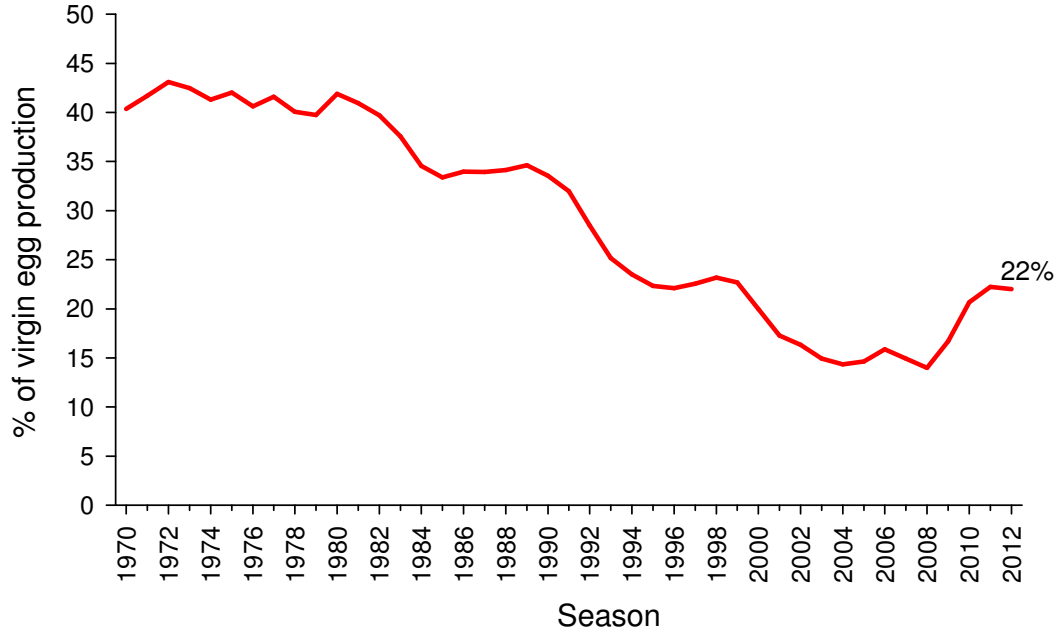

Figure 16 Estimates of % virgin egg production for the NZRLF as obtained from the qR fishery model.

5.4 Exploitation Rate

Exploitation levels increased substantially through the 1970s, 1980s and 1990s, reaching a peak of 34% in 1999 (Figure 17). Since then, they have generally decreased and in 2012 were estimated at 15%. The 2012 figure reflects a substantial decrease from 2008 (28%) and is one of the lowest estimates on record.

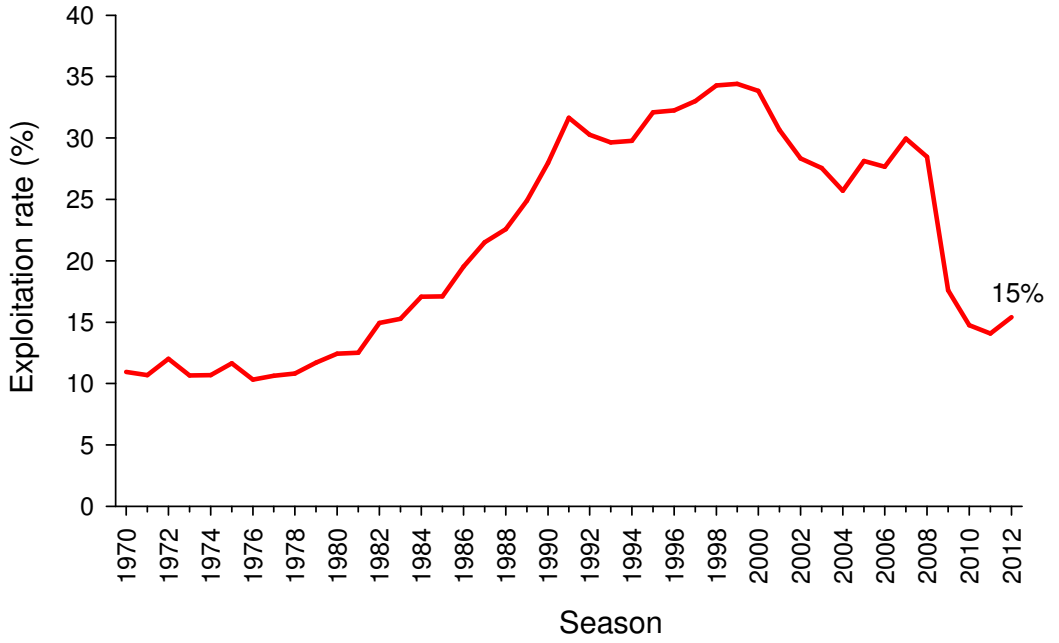

Figure 17 Estimates of exploitation rate in the NZRLF as obtained from the qR fishery model.

5.5 Recruitment

Model estimated recruitment increased from 0.2 million in 2007 to 1.19 million in 2009, the highest since 1999 (Figure 18). Over the last three seasons recruitment has decreased and in 2012 was 0.13 million, the lowest on record.

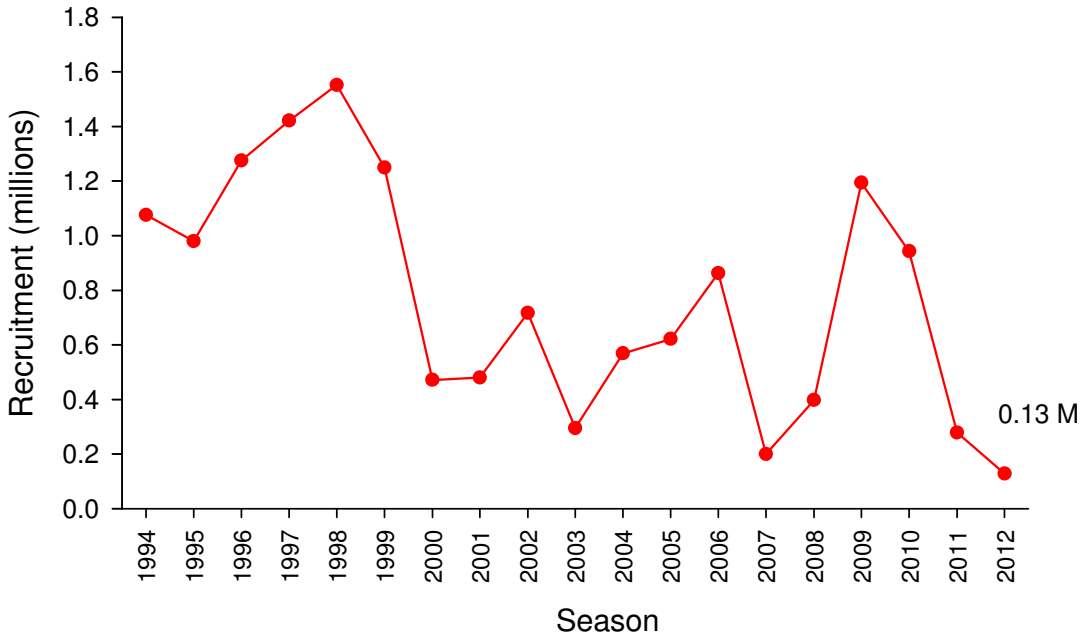

Figure 18 Estimates of recruitment as obtained from the qR fishery model.

6.1 Reference points

The current harvest strategy for the NZRLF 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)

For 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 TACCs used are based on historical levels of effort of 425,000 potlifts per season. Given the current reduced stock levels in the fishery, only 50% of these levels will be implemented in the first three years of this harvest strategy (i.e. 310, 345, 390 and 430 tonnes). The four TACC levels which may be used in the fourth and fifth year of the harvest strategy (i.e. 310, 380, 470 and 550 tonnes) are based on historical levels of effort of 425,000 potlifts per season at 100% implementation.

In 2012, the CPUE was 0.99 kg/potlift, while the TACC was 345 tonnes. Based on the current harvest strategy, this indicates that the catch rate is within the lower tier of the green target range.

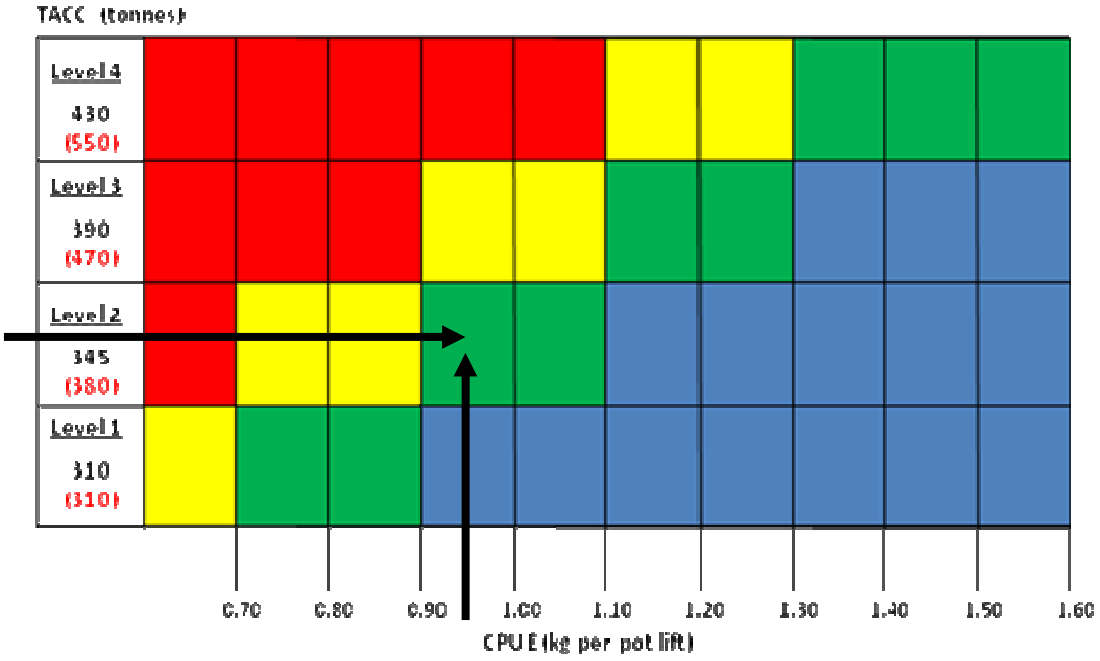

Figure 19 TACC levels at various catch per unit effort (CPUE) rates where blue is above the target level, green is at the target level, while both yellow and red are below the target level. The TACCs in black will be used for the first three years of the harvest strategy, while those in red brackets may be considered in the fourth and fifth year.

6.1.2 Pre-recruit index (PRI)

The secondary indicator of fishery performance is PRI, derived from catch sampling data, with a limit reference point (LRP) of 0.30 undersized/potlift (Figure 20). In 2012, the PRI was 0.48 undersized/potlift which is above the LRP.

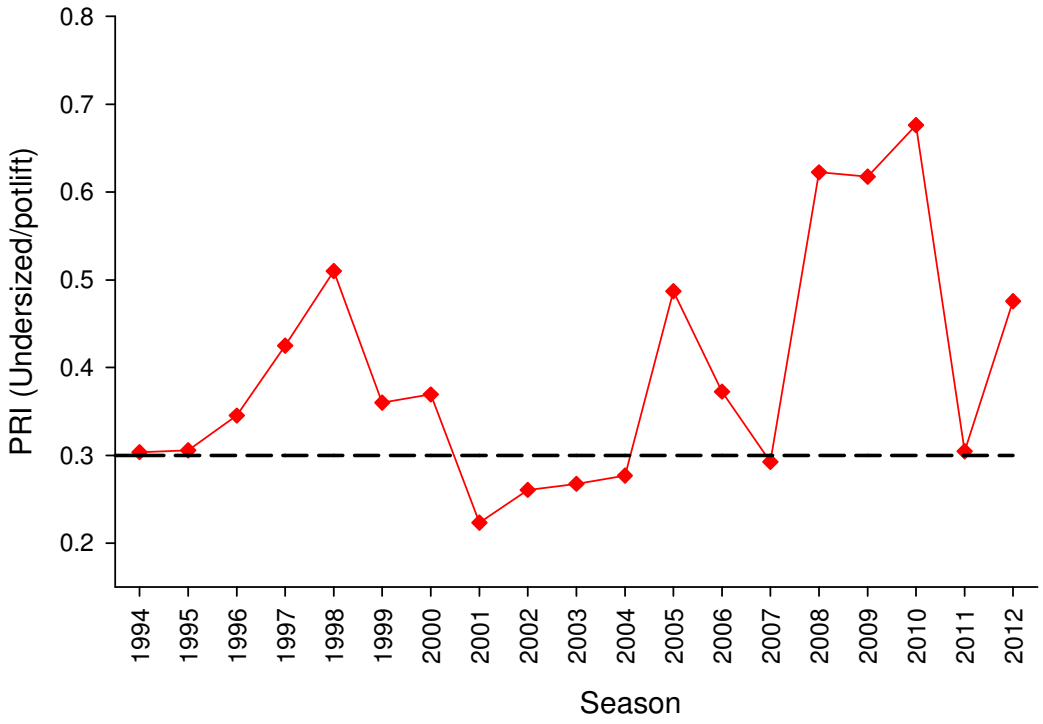

Figure 20 Inter-annual trends in pre-recruit index (PRI) in the NZRLF from 1994 to 2012 based on voluntary catch sampling data. Dashed line represents limit reference point (0.30 undersized potlift).

6.2 Implications for management

Based on the current harvest strategy, the primary catch rate indicator is currently within the green target range which recommends that the TACC should be retained at 345 tonnes. The secondary pre-recruit indicator is currently above the LRP but based on catch rate estimates, a TACC increase should not be considered.

7 SUMMARY

The decline in stock status of the NZRLF from 1999 to 2008 has been detailed in previous stock assessment reports on the fishery (e.g. Linnane et al., 2013). These reports highlighted the decrease in catch from 1015 tonnes in 1998 to 403 tonnes in 2008. In addition, CPUE decreased from 1.40 to 0.67 kg/potlift over the same period. In response to this decline, the TACC was reduced from 470 tonnes in 2008 to 310 tonnes in 2009.

Since the TACC reduction to 310 tonnes, there have been some positive signs for the fishery. For example, in 2011, the TACC was fully taken for the third consecutive season. In addition, zonal CPUE was 1.08 kg/potlift, representing a 61% increase from 2008 (0.67 kg/potlift) and the highest on record since 2000 (1.23 kg/potlift). However, PRI decreased substantially by 55% in 2011 which is likely to reflect the reduced levels of puerulus settlement observed in 2007 and 2008.

In 2012, the TACC was increased to 345 tonnes. Catch rates decreased by 8% to 0.99 kg/potlift reflecting the second consecutive year that CPUE has decreased in Regions C (Yorke Peninsula) and D (Kangaroo Island). While the 2012 zonal estimate remained within the limit reference points, close monitoring of catch rate in these areas is warranted, particularly in light of low settlement levels over the last six seasons.

Current catch rate and pre-recruit indices recommend retaining the TACC at 345 tonnes for the 2013 season.

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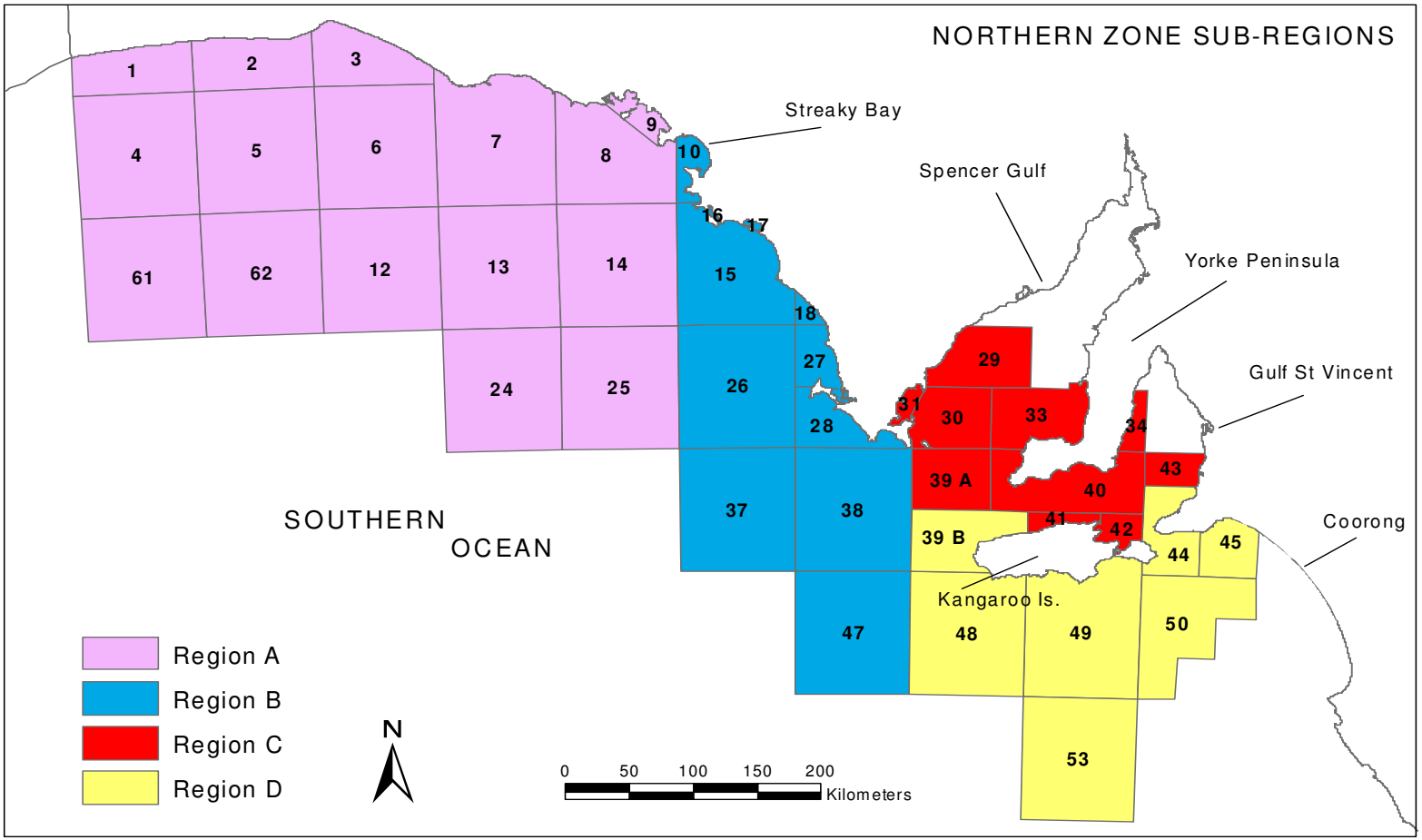

Figure 21 Northern Zone sub-regions and Marine Fishing Areas in the South Australian Rock Lobster Fishery.