Fisheries

SOUTH AUSTRALIAN RESEARCH & DEVELOPMENT INSTITUTE
PIRSA

Northern Zone Rock Lobster (*Jasus edwardsii*) Fishery Status Report 2017/18

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

SARDI Publication No. F2007/000714-12
SARDI Research Report Series No. 997

SARDI Aquatic Sciences
PO Box 120 Henley Beach SA 5022

October 2018

Status Report to PIRSA Fisheries and Aquaculture

SOUTH AUSTRALIA

SARDI South Australian Research and Development Institute

Government of South Australia
Primary Industries and Regions SA

Northern Zone Rock Lobster (*Jasus edwardsii*) Fishery Status Report 2017/18

Status Report to PIRSA Fisheries and Aquaculture

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

SARDI Publication No. F2007/000714-12
SARDI Research Report Series No. 997

October 2018

This publication may be cited as:
Linnane, A., McGarvey, R., Feenstra, J. and Graske, D. (2018). Northern Zone Rock Lobster (*Jasus edwardsii*) Fishery Status Report 2017/18. Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000714-12. SARDI Research Report Series No. 997. 18pp.

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

Telephone: (08) 8207 5400
Facsimile: (08) 8207 5415
www.pir.sa.gov.au/research

SARDI Publication No. F2007/000714-12
SARDI Research Report Series No. 997

Author(s): A. Linnane, R. McGarvey, J. Feenstra and D. Graske

Reviewer(s): G. Ferguson, J. Earl (SARDI) and A. Jones (PIRSA)

Approved by: S. Mayfield
Science Leader - Fisheries

Signed:

Date: 25 October 2018

Distribution: PIRSA Fisheries and Aquaculture, Northern Zone fishery licence holders, SAASC Library, Parliamentary Library, State Library and National Library

Circulation: Public Domain

TABLE OF CONTENTS

TABLE OF FIGURES

EXECUTIVE SUMMARY

The status of South Australia's Northern Zone Rock Lobster Fishery (NZRLF) is determined using a weight-of-evidence analysis under the National Fishery Status Reporting Framework (NFSRF; Flood et al. 2014; Stewardson et al. 2016; unpublished).

In 2017 (i.e. 1 November 2017 to 31 October 2018), the total allowable commercial catch (TACC) in the NZRLF was 310 t (250 t Inner sub-region and 60 t Outer sub-region). The total reported catch from logbook data (November-May being the period for which the validated logbook data were available at the time of writing this report) was 294.04 t (247 t Inner sub-region and 47 t Outer sub-region) (95% of the TACC). Fishing effort in 2017 was 375,993 potlifts, reflecting a 31% increase from 2011 (287,480 potlifts).

Catch per unit effort (CPUE) of legal and undersized (pre-recruit) lobsters are the main indicators of legal and pre-recruit abundance. In 2017, zonal CPUE (November-April) was 0.79 kg/potlift, reflecting a 2.5% increase from 2016 (0.77 kg/potlift). Despite the recent increase, CPUE remains low in a historical context with the 2017 estimate the fourth lowest on record.

Regionally, from 2015-2017, catch rates have remained relatively stable in the Inner sub-region but have decreased by 20% between 2016 and 2017 in the Outer sub-region. Most notable are the CPUE declines observed in Marine fishing Areas (MFAs) 7 and 8 where catch rates have decreased by 49% and 43%, respectively, since 2014. Current catch rate estimates in both these MFAs are now the lowest on record.

In 2017, the catch sampling pre-recruit index (PRI; November-March) was 0.44 undersized/potlift, reflecting a 4% decrease from 2016 (0.46 undersized/potlift) but remaining above the Limit Reference Point (LRP) of 0.30 undersized/potlift.

Over the last six seasons, biomass estimates have declined but in 2017 stabilised at 1,482 t. Current estimates are low in a historical context, remain below the long-term average for the fishery (approximately 2,300 t) and reflect increasing exploitation rate over the same period. In 2017, the exploitation rate was 21%.

In 2017, the puerulus settlement was the highest on record. The 2016 estimate was also above the long-term average. Given that the time from settlement to recruitment to the fishable biomass is approximately four years, this indicates that higher than average recruitment could be expected in both 2020 and 2021.

While there is some evidence to suggest marginal improvements in the performance of the NZRLF in 2017, the status of the fishery remains low in a historical context. Specifically: (i) effort levels have increased by 31% since 2011; and (ii) catch rates have declined over the same period. While CPUE increased in 2017, the current estimate remains the fourth lowest on record; and (iii) declines in CPUE are consistent across broad temporal and spatial scales. In 2017, catch rates in MFAs 7 and 8 within the Outer sub-region were the lowest on record; and (iv) while declines in biomass were arrested in 2017, they remain close to historically low levels reflecting recent increases in exploitation rates.

As a result, based on a weight-of-evidence approach, the current status of the NZRLF is classified as "**depleting".** This means that current fishing pressure is too high and moving the stock in the direction of being recruitment overfished.

Table 1 Key statistics for the NZRLF

Statistic	2017/18	2016/17
TACC	310 t	360 t
Total commercial catch (Nov-May)	294.0	302.7 t
Total effort (Nov-May)	375,993 potlifts	400,576 potlifts
Commercial CPUE (Nov-Apr)	0.79 kg/potlift	0.77 kg/potlift
Pre-recruit index (Nov-Mar)	0.44 undersized/potlift	0.46 undersized/potlift
Biomass estimate	1,482 t	1,872 t
Exploitation rate	21%	17%
Status	**Depleting**	**Transitional-depleting***

***** In 2018, the SAFS terminology framework was simplified with “transitional-depleting” (Stewardson et al. 2016) being renamed “depleting” (Stewardson et al. unpublished).

Keywords: Rock lobster, Northern Zone, Fishery Status, *Jasus edwardsii*.

1 INTRODUCTION

This fishery status report updates the 2016/17 stock assessment report for the Northern Zone Rock Lobster Fishery (NZRLF) (Linnane et al. 2018) and is part of the SARDI Aquatic Sciences ongoing assessment program for the fishery. The aims of the report are to provide a synopsis of information available for the NZRLF and assess the current status of the resource in relation to the performance indicators specified in the management plan (PIRSA 2014) for the fishery.

In 2017, the total allowable commercial catch (TACC) in the NZRLF was 310 t (250 t Inner sub-region and 60 t Outer sub-region). As of the 2015 season, fishing in the NZRLF can be undertaken over the 12-month period from 1 November to 31 October of the following year (Linnane et al. 2016). This status report presents data from 1 November 2017 to 31 May 2018, which is the agreed assessment period for setting the TACC. A comprehensive assessment that includes data from all fishing months will be provided in the 2017/18 stock assessment report that is due in July 2019.

Primary Industries and Regions South Australia (PIRSA) has adopted the National Fishery Status Reporting Framework (NFSRF; Flood et al. 2014) to determine the status of all South Australian fish stocks. This framework has recently been revised by Stewardson et al. (unpublished) and will be released in the 2018 Status of Australian Fish Stocks Report.

2 METHODS

Information on data sources presented in this report are described in Linnane et al. (2018). In brief, the catch and effort data presented are obtained from a mandatory daily logbook program administered by SARDI Aquatic Sciences. Catch and effort data are presented by zone, sub-region and Marine Fishing Area (MFA) (Figure 1).

Logbook data from 1 November to 30 April are used to estimate the primary biological performance indicator of catch per unit effort (CPUE). Data from 1 November to 31 March are used to estimate the secondary performance indicator of pre-recruit index (PRI) and are obtained from a voluntary catch sampling program where the escape gaps on all commercial pots are closed. The catch sampling program also provides length frequency data as all lobsters are measured.

A detailed description of the qR fishery model is provided in McGarvey and Matthews (2001) and Linnane et al. (2018). A number of updates have been made in the 2017 version of the qR model based on recommendations by Smith (2017) and to accommodate the extended 12-month fishing season within the NZRLF. These include: (i) improved estimates of lobster weights-at-age; (ii) summing logbook catch data over the 12 month fishing season starting on 1 June of each year; and (iii) from 2014-2017, using a rescaled measure of fishing effort that corrects for the consistently lower winter catch rates from June-October.

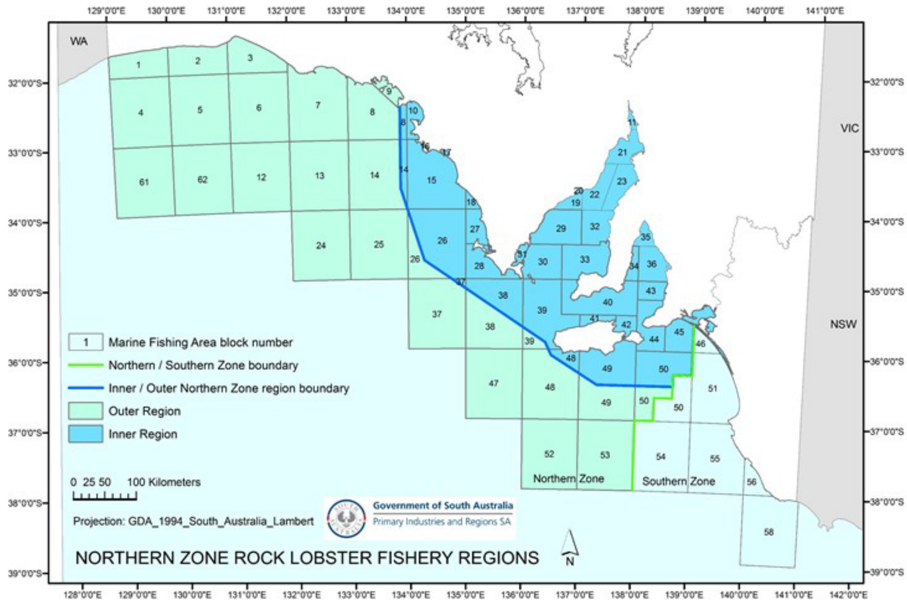

Figure 1 Northern Zone Rock Lobster Fishery Marine Fishing Areas (MFAs) and associated sub-regions.

3 RESULTS

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

3.1.1 Zonal catch and effort

In 2017 (i.e. the 2017/18 season), the TACC in the NZRLF was 310 t (reduced from 360 t in 2016) which could be caught over the 12-month season from 1 November 2017 to 31 October 2018. The total reported commercial catch from 1 November 2017 to 31 May 2018 was 294.04 t (95% of the TACC with 5 months remaining) (Figure 2). Of this, 247 t was taken from the Inner-sub region and 47 t from the Outer sub-region (see Table 2 for further sub-regional statistics).

Effort within the fishery decreased considerably in 2009 when the TACC was reduced to 310 t. In 2017, effort was 375,993 potlifts, reflecting a 31% increase from 2011 (287,480 potlifts).

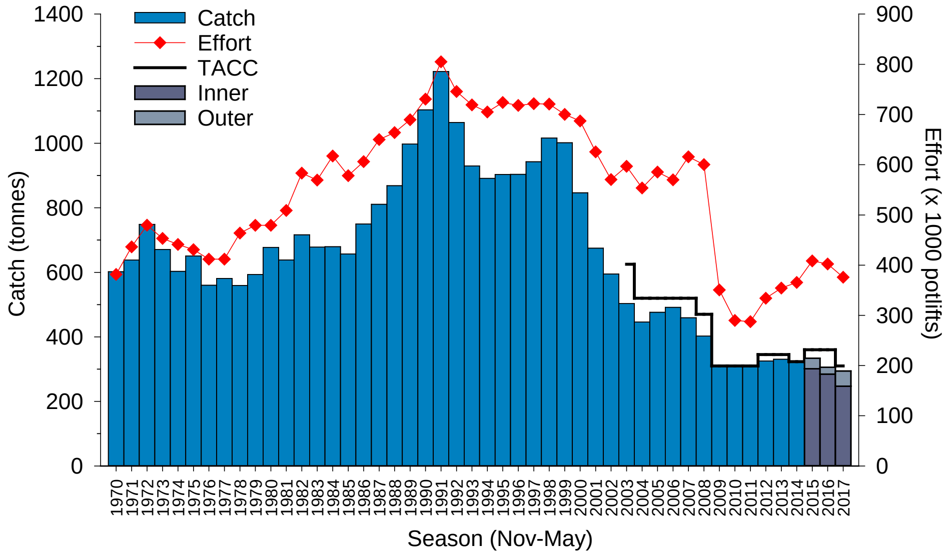

Figure 2 Inter-annual trends in catch and effort in the NZRLF from 1970 to 2017. Catch and effort separated by Inner and Outer sub-regions shown for 2015–2017.

3.1.2 Within-season trends

In 2017, 268 t (91% of total catch) was taken from November through March (Figure 3). The lowest catch was landed in May (2 t), while the highest was in January (67 t). Trends in monthly effort generally reflected those of catch.

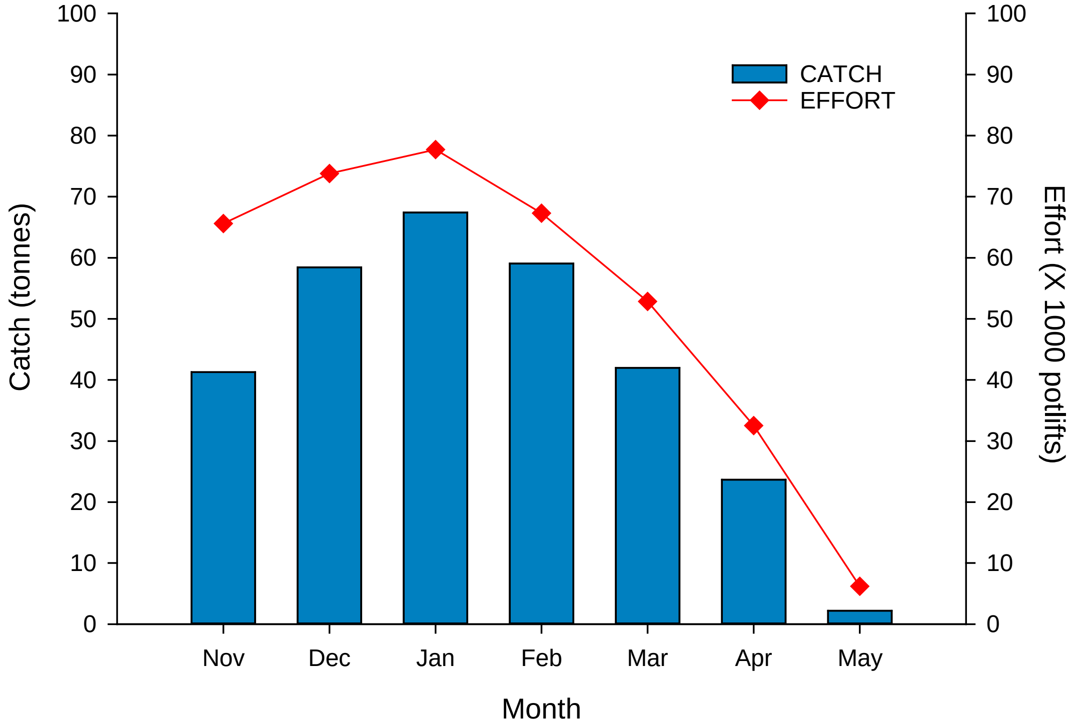

Figure 3 Within-season trends in catch and effort in the NZRLF for the 2017 season.

3.1.3 Regional catch and effort

In 2015, the NZRLF was spatially divided into Inner and Outer sub-regions (Figure 1). In 2017, from November to May, 247 t was taken in the Inner sub-region (99% of 250 t TACC) and 47 t in the Outer sub-region (78% of 60 t TACC) (Table 2).

In 2017, 88% of the total catch (258 t) came from ten MFAs: 7, 8, 15, 27, 28, 39, 40, 48, 49 and 50 (Figure 4). Current catch levels are now low in a historical context and have remained relatively stable across most MFAs over the last eight seasons. The exception are the western MFAs of 7 and 8, where, despite having low levels of catch compared to more eastern areas, catch has increased considerably over the last three seasons. Specifically, the average catch taken in MFA 7 from 2015 to 2017 was 9 t compared to 3.5 t from 2012 to 2014. Similarly, catch in MFA 8 from 2015 to 2017 has averaged 15 t compared to 8 t from the previous three seasons.

In 2017, among the ten primary MFAs, the highest catch was taken in MFA 39 (55 t) and the lowest in MFA 7 (7 t).

Fishing effort levels largely reflect trends in catch (Figure 4). In recent seasons, the highest effort has been in MFA 39 (approximately 70,000-90,000 potlifts annually over the last five seasons). In 2017, effort decreased in all primary MFAs with the exception of MFAs 27 and 48.

Table 2 Catch, Effort and Catch per unit effort (CPUE) in the Inner and Outer sub-regions of the NZRLF from 2015–2017 based on data from November to May. The 2017 TACC was 250 t in the Inner sub-region and 60 t in the Outer sub-region.

Inner sub-region			
Season	Catch (t)	Effort (potlifts)	CPUE (kg/potlift)
2015	301.18	378,667	0.80
2016	284.53	381,927	0.75
2017	247.21	317,104	0.78
Outer sub-region			
Season	Catch (t)	Effort (potlifts)	CPUE (kg/potlift)
2015	32.74	34,705	0.94
2016	20.94	20,576	1.01
2017	46.83	58,889	0.80

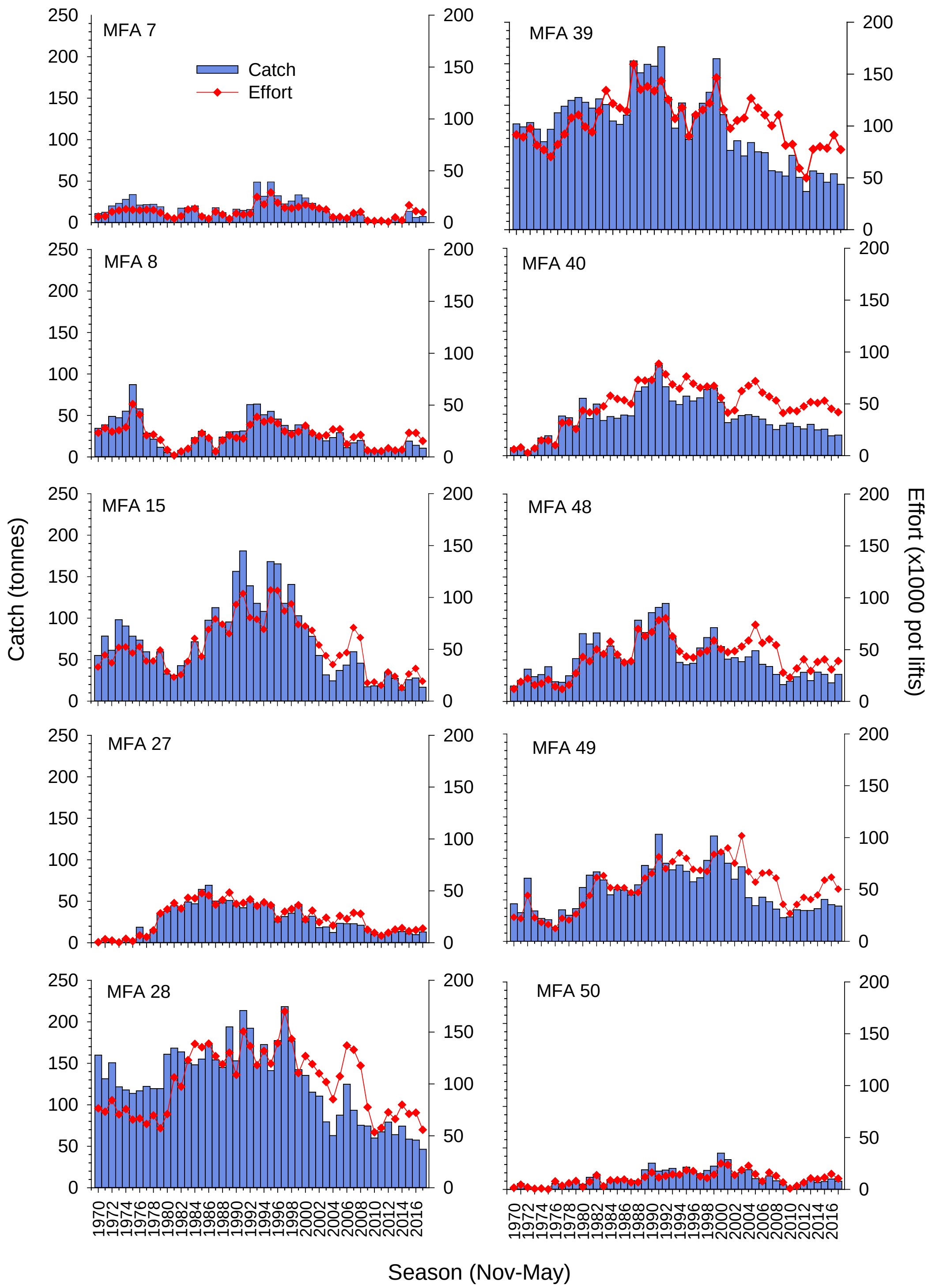

Figure 4 Inter-annual trends in catch and effort in the primary MFAs of the NZRLF from 1970 to 2017 (see Figure 1). Note: MFAs 7 and 8 are located in the Outer sub-region.

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 5). 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 next five seasons, CPUE again decreased and in 2016 was 0.77 kg/potlift, reflecting a 29% decline since 2011. In 2017, CPUE increased by 2.5% to 0.79 kg/potlift reflecting the fourth lowest estimate on record.

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 puerulus settlement observed from 2007 to 2012, in addition to impacts of fishery harvest under varying levels of TACC (Figure 10).

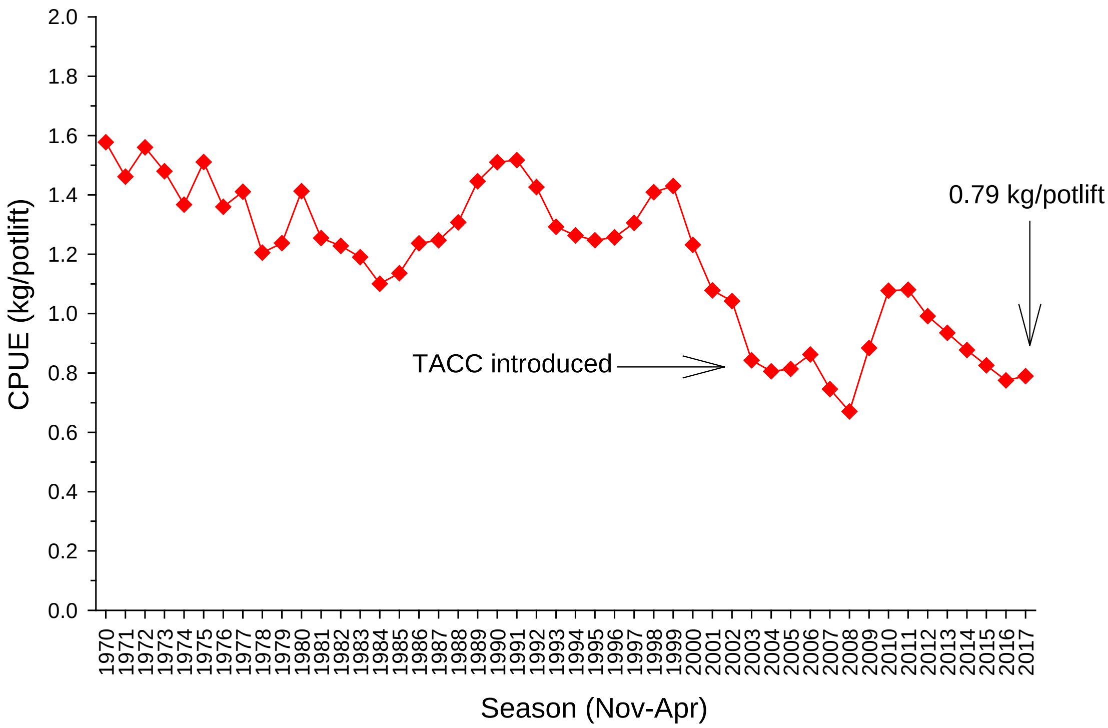

Figure 5 Inter-annual trends in zonal CPUE (November to April) in the NZRLF between 1970 and 2017.

3.1.5 Within-season trends in CPUE

Within-season CPUE estimates are generally highest from December to February before decreasing thereafter (Figure 6). In 2017, monthly catch rates were broadly similar across all months of the fishing season compared to 2016. The zonal increase in 2017 largely reflected higher catch rates in November, December and February. In 2017, CPUE was highest in February at 0.88 kg/potlift and lowest in May at 0.35 kg/potlift.

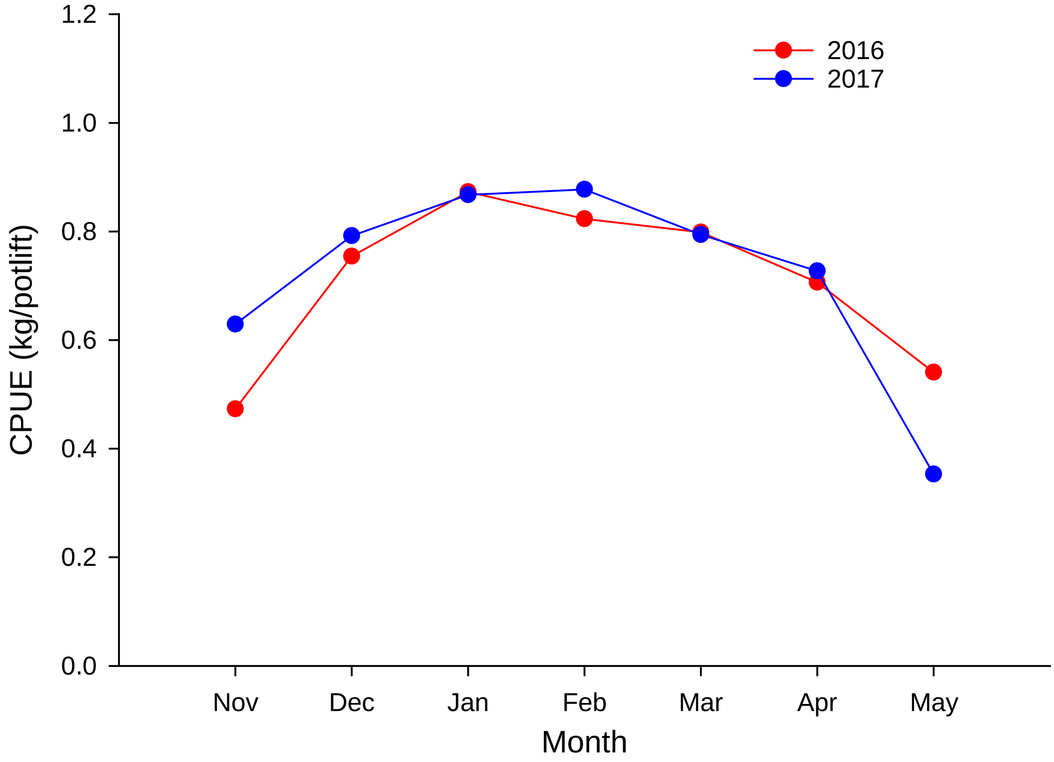

Figure 6 Within-season trends in CPUE in the NZRLF during the 2016 and 2017 seasons.

3.1.6 Regional CPUE

Within the Inner sub-region, catch rates (November to May) over the last three seasons have ranged between 0.75 and 0.80 kg/potlift (Table 2). In the Outer sub-region, CPUE increased from 0.94 kg/potlift in 2015 to 1.01 kg/potlift in 2016 before decreasing by 20% to 0.80 kg/potlift in 2017.

Trends in legal-sized CPUE are temporally consistent among the primary MFAs, with peaks occurring in the 1970s, early 1980s and late 1990s, and lows in the early to mid-1980s (Figure 7). From the late 1990s to 2008, CPUE generally declined in most areas with the estimates in MFAs 7, 28, 39, 40, 48 and 49 the lowest on record in 2008. Over the next two seasons CPUE increased in almost all major MFAs before generally declining over the next seven seasons. In 2017, CPUE increased in MFAs 27, 28, 40, 48, 49 and 50 but decreased in all remaining areas.

Most notable are the CPUE declines observed in MFAs 7 and 8 over the last three seasons where catch rates have decreased by 49% and 43%, respectively, since 2014. Current CPUE estimates in both of these MFAs are now the lowest on record.

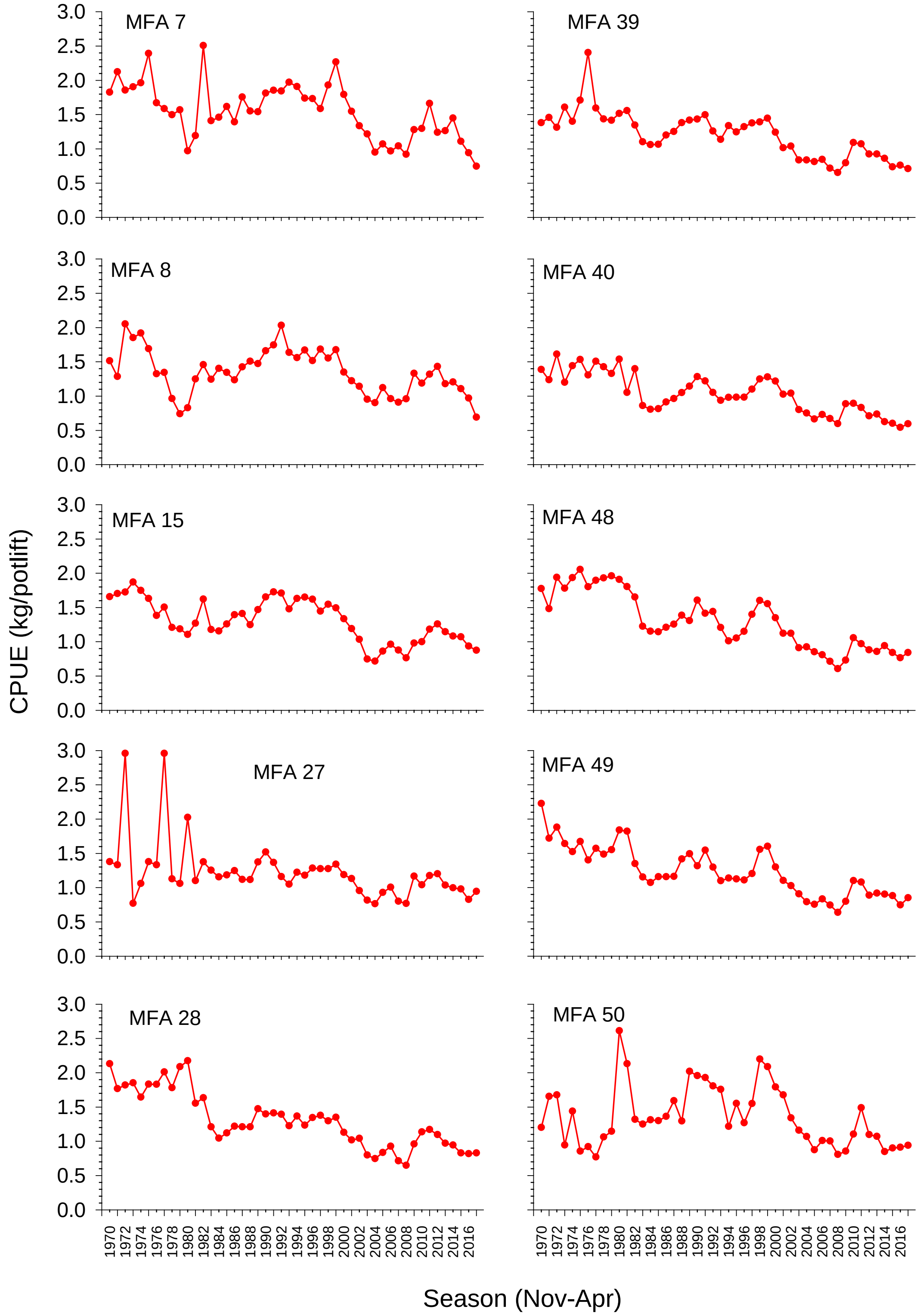

Figure 7 Inter-annual trends in regional CPUE (November to April) in the NZRLF between 1970 and 2017. Note: MFAs 7 and 8 are located in the Outer sub-region.

3.1.7 Annual mean weight

Fluctuations in the mean weight of lobsters likely reflects inter-annual variations in the number of individuals recruiting to legal size and long-term changes in mortality rate and thus overall stock structure (Figure 8). Over the six seasons to 2016, the mean weight of lobsters generally increased reflecting lower average recruitment that translated into decreases in CPUE both zonally and regionally. In 2017, the mean weight decreased from 1.17 kg to 1.08 kg.

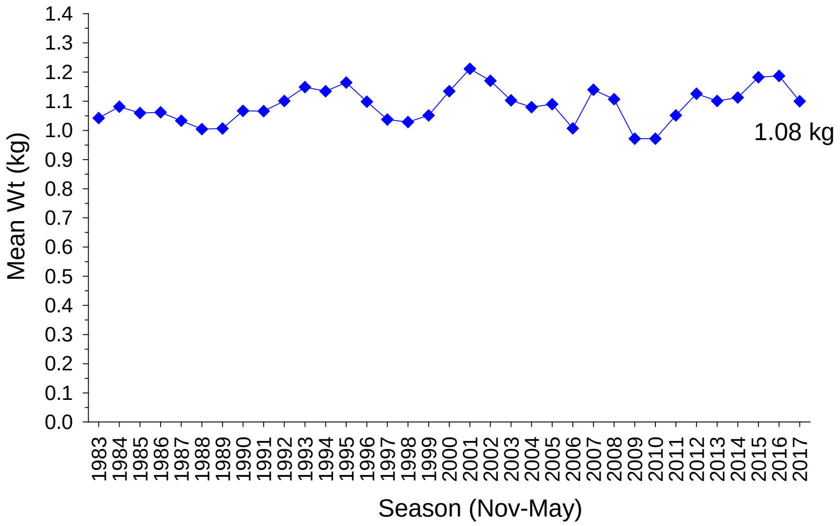

Figure 8 Inter-annual trends in mean lobster weight in the NZRLF (November to May) from 1983 to 2017.

3.1.8 Average number of days fished

The average number of days fished per licence decreased from 184 days in 1997 to 144 days in 2002 (Figure 9). This decrease reflects effort management controls that directly limited the number of fishable days per licence 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 at 150-160 days. In 2009, the TACC was reduced from 470 t to 310 t and in 2010, the average number of days fished decreased to 84 days. Over the next six seasons, the number of days fished increased to 136 days in 2015. The recent increase is likely to relate, in part, to increases in TACC from 310 t to 345 t in 2012, and from 323.2 to 360 t in 2015 (Figure 2). In 2017, the TACC was reduced to 310 t and the average number of days fished was 129 days.

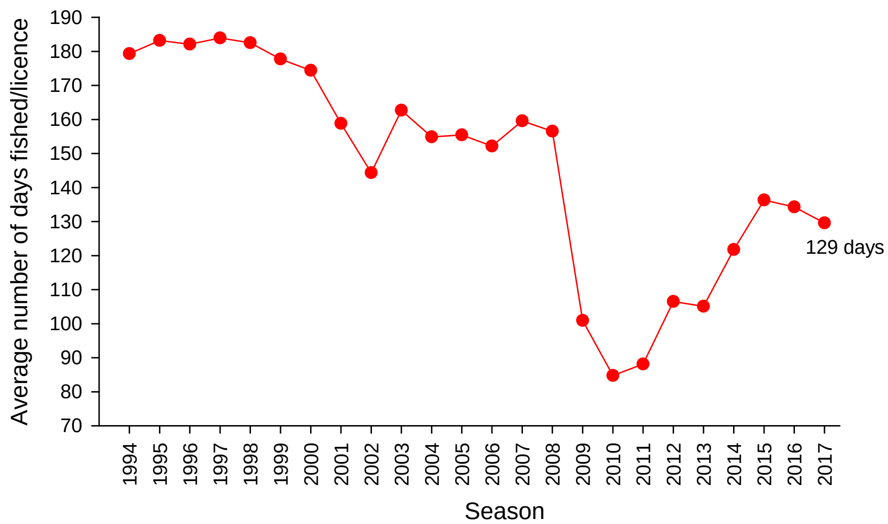

Figure 9 Average numbers of days fished per licence from 1994 to 2017 in the NZRLF.

3.2 Puerulus settlement index (PSI)

Annual estimates of the puerulus settlement index (PSI) in the NZRLF have been highly variable (Figure 10). PSIs were high in 2002, 2005 and 2006, but from 2007 to 2015, with the exception of 2013, annual settlement has been below the long-term average (0.40 puerulus/collector). In 2017, the PSI was 1.14 puerulus/collector which is the highest settlement on record. In the NZRLF, the estimated period between settlement and recruitment to the fishery is four years. As a result, higher than average recruitment could be expected in both 2020 and 2021 based on recent PSIs.

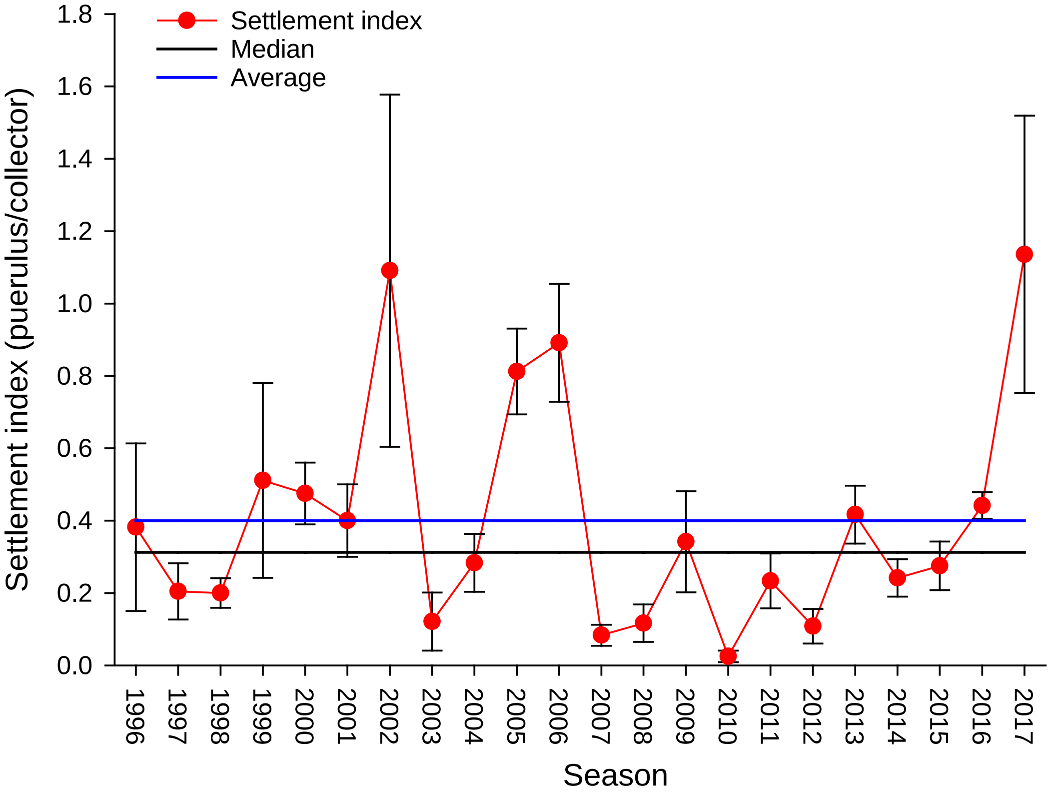

Figure 10 Puerulus settlement index (PSI) (mean ±SE) in the NZRLF from 1996 to 2017.

3.3 Pre-recruit index (PRI)

3.3.1 Zonal pre-recruit index

In the NZRLF, PRI, as used in the harvest strategy, is estimated from the catch sampling program where fishers are allowed to close the escape gaps in up to three pots and/or when an observer is on-board a vessel (and all escape gaps are closed) (Figure 11).

In 2017, catch sampling PRI (November to March) was 0.44 undersized/potlift, reflecting a 4% decrease from 2016 (0.46 undersized/potlift) but remaining above the Limit Reference Point (LRP) of 0.30 undersized/potlift. In the NZRLF, the time taken for pre-recruits to enter into the fishable biomass is estimated to be approximately one year.

While the PRI (November to March) based on logbook data is under-estimated due to the mandatory introduction of escape gaps in 2003, estimates from this data source are still regarded as meaningful based on the large sample size. Logbook based PRI has increased over the last two seasons and in 2017 was 0.20 undersized/potlift, the highest since 2010.

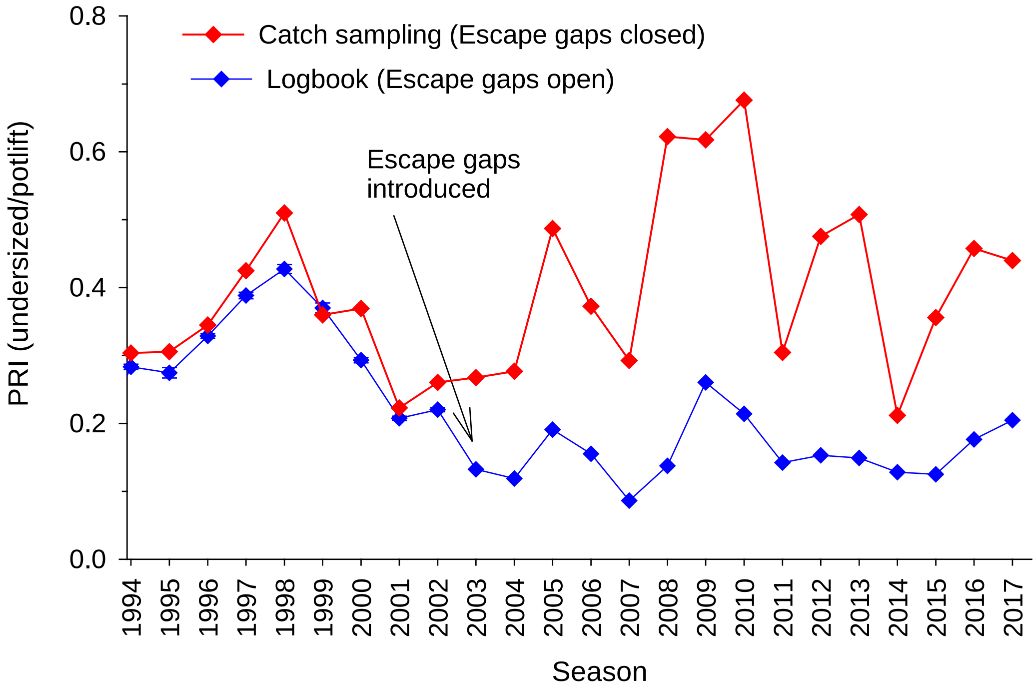

Figure 11 Voluntary catch sampling and logbook derived pre-recruit index (PRI) from 1994 to 2017 (November-March inclusive).

3.4 Length frequency

In 2017, 58% of all lobsters measured as part of the catch sampling program were within the 105 to 150 mm carapace length (CL) size range (Figure 12). Approximately 33% of lobsters in 2017 were below the minimum legal size (MLS; 105 mm CL), compared to 37% in 2016, reflecting a decrease in the PRI over the same period.

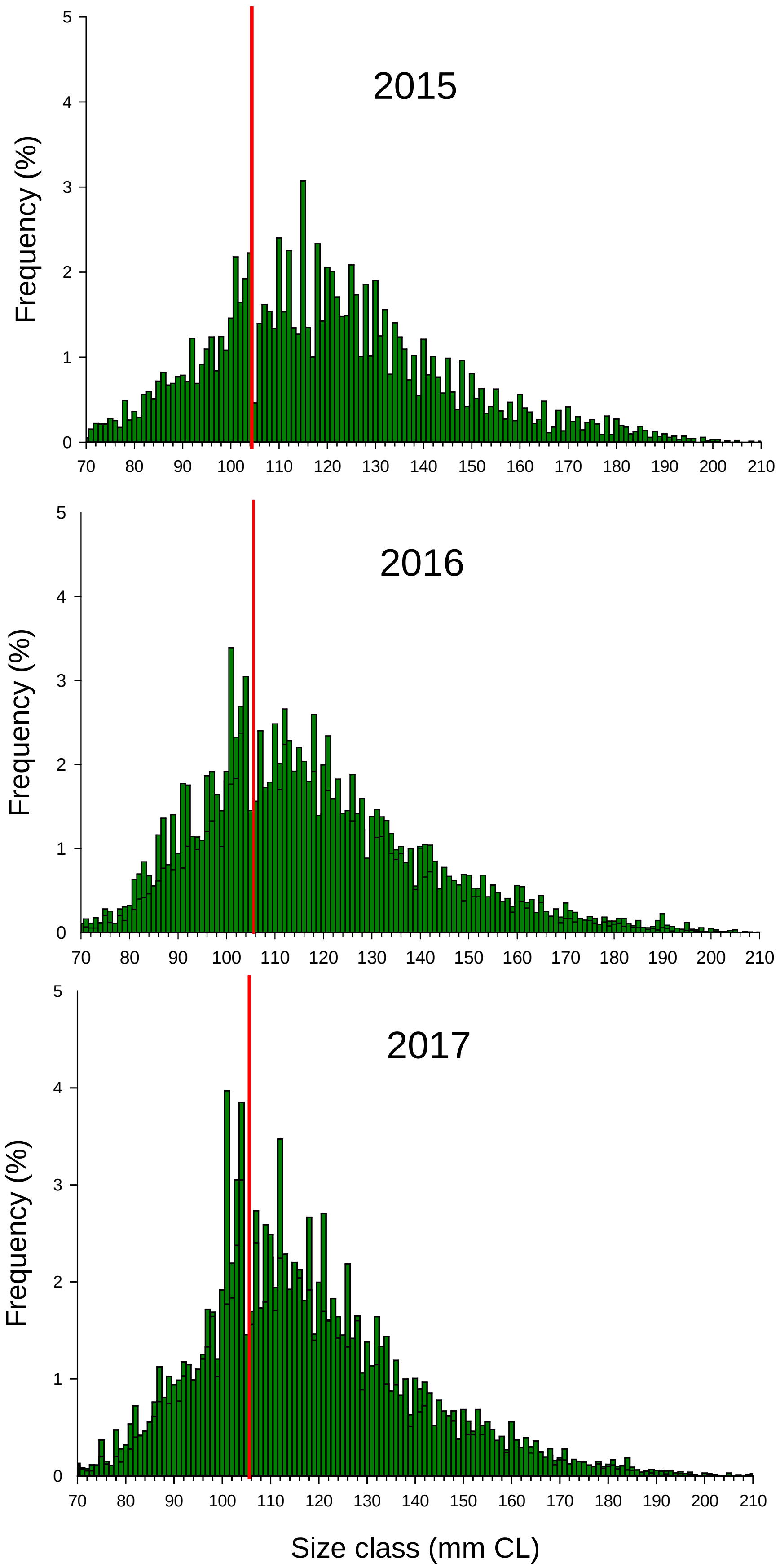

Figure 12 Length frequency data of male and female lobsters (combined) sampled during the voluntary catch sampling program over the last three seasons. Red line represents minimum legal size (MLS) at 105 mm CL.

3.5 qR Model outputs

3.5.1 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 13). Over the next two seasons biomass increased before generally decreasing to the third lowest estimate on record in 2016. In 2017, biomass stabilised at 1,482 t but current estimates remain below the long-term average for the fishery (approximately 2,300 t).

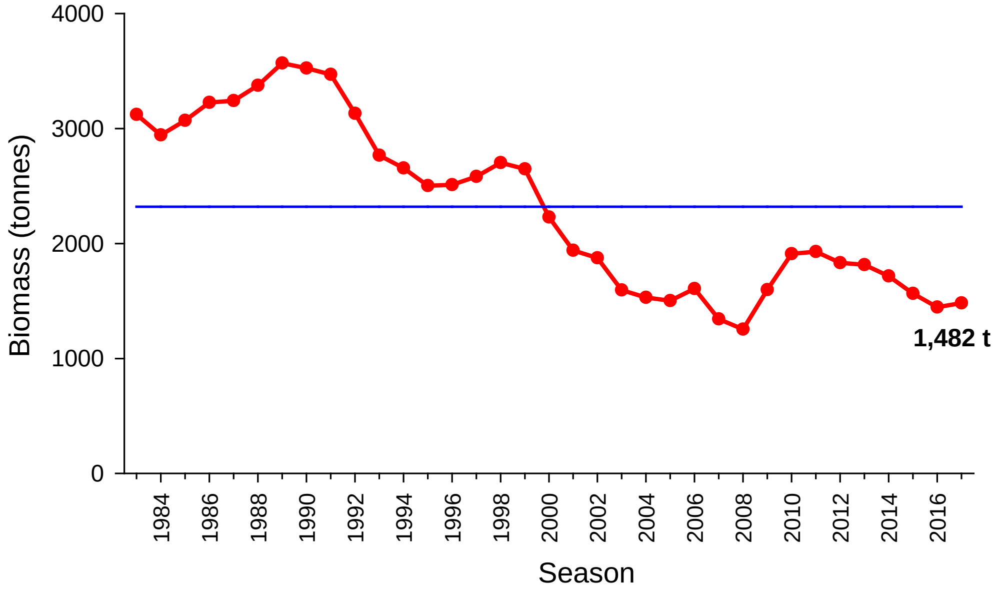

Figure 13 Estimates of biomass for the NZRLF as obtained from the qR fishery model. Blue line represents long-term average.

3.5.2 Egg production rate

Due to decreasing stock biomass, egg production in the NZRLF has also decreased since the 1980s (Figure 14). In 2017, total egg production was estimated to be 151 billion eggs, reflecting declines over the last six seasons. Current estimates are below the long-term average for the fishery (262 billion).

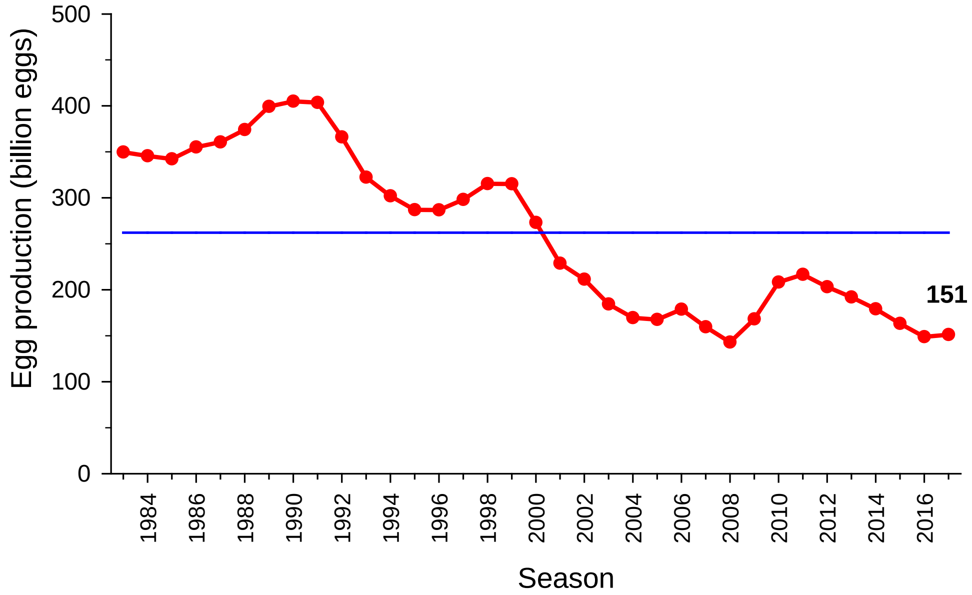

Figure 14 Estimates of egg production for the NZRLF as obtained from the qR fishery model. Blue line represents long-term average.

3.5.3 Exploitation rate

With the decrease in the TACC to 310 t in 2009 (see Figure 2), the exploitation rate was reduced considerably (Figure 15). Over the last six seasons exploitation rate has generally increased and in 2017 was 21%, remaining below the long-term average of 28%.

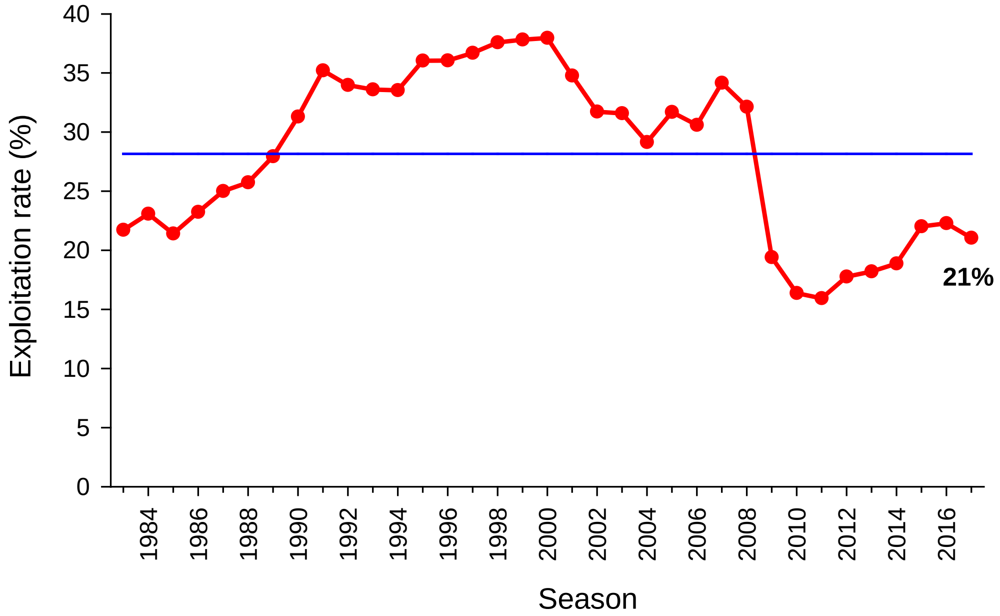

Figure 15 Estimates of exploitation rate in the NZRLF as obtained from the qR fishery model. Blue line represents long-term average.

3.5.4 Recruitment

Model estimated recruitment in the NZRLF has been highly variable (Figure 16). Over the last seven seasons recruitment has been below the long-term average and in 2017 was estimated at 0.52 million recruits.

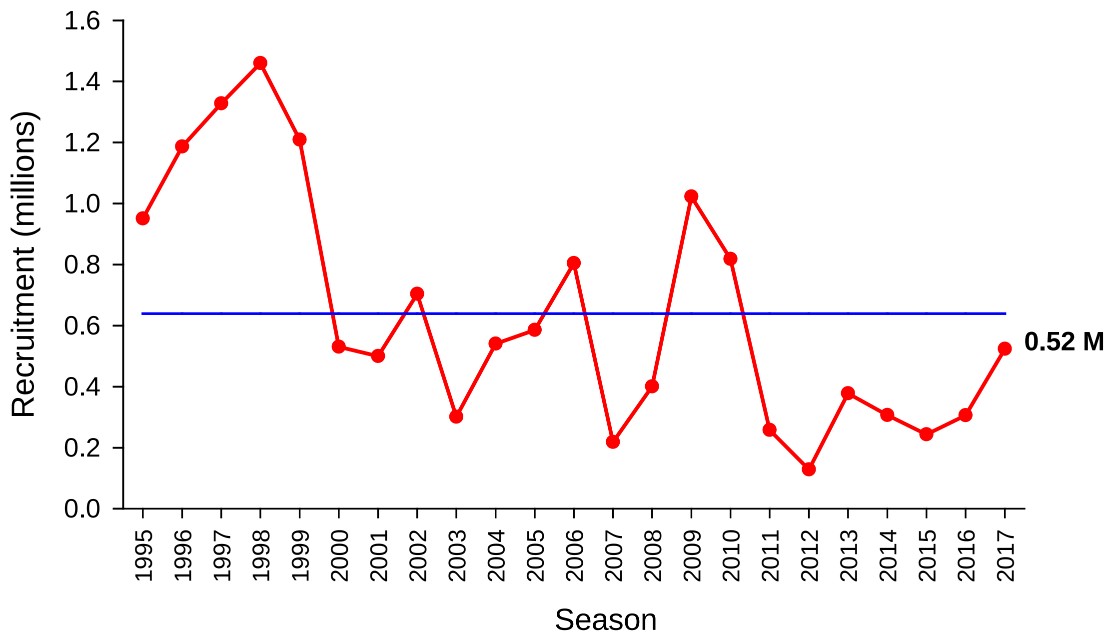

Figure 16 Estimates of recruitment as obtained from the qR fishery model. Blue line represents long-term average.

3.6 Biological performance indicators

The NZRLF harvest strategy describes multiple performance indicators to monitor the performance of the fishery (PIRSA 2014). Broadly, the harvest strategy aims to target a sustainable exploitation rate based on historical fishery performance using two fishery-dependent indicators.

The primary indicator is commercial logbook CPUE (kg of legal sized lobster/potlift) based on data from November to April, inclusive. The secondary indicator is commercial catch sampling PRI (number of undersized lobsters/potlift) based on data from November to March, inclusive.

In 2017, the CPUE was 0.79 kg/potlift, while the PRI was 0.44 undersized/potlift which is above the LRP.

4 SUMMARY

In 2017, the overall zonal estimate of CPUE increased by 2.5%. However, differences in fishery performance were observed between sub-regions in the NZRLF. Increases in zonal CPUE in 2017 reflected modest increases in the catch rate in all of the major MFAs, primarily within the Inner sub-region, compared to 2016.

Within the Outer sub-region, overall catch rates decreased by 20% compared to 2016. Declines in Outer sub-region performance were largely driven by MFAs 7 and 8 where catch rates have decreased by 49% and 43%, respectively, since 2014. Importantly, while the Inner sub-region TACC was reduced from 300 t to 250 t in 2017, the TACC within the Outer sub-region has remained at 60 t since the implementation of spatial management in the fishery in 2015.

In summary, while there is some evidence to suggest marginal improvements in the performance of NZRLF in 2017, the status of the fishery remains low in a historical context. Specifically: (i) effort levels have increased by 31% since 2011; and (ii) catch rates have declined over the same period. While CPUE increased in 2017, the current estimate remains the fourth lowest on record; and (iii) declines in CPUE are consistent across broad temporal and spatial scales. In 2017, catch rates in MFAs 7 and 8 within the Outer sub-region were the lowest on record; and (iv) while declines in biomass were arrested in 2017, they remain close to historically low levels reflecting recent increases in exploitation rates.

As a result, based on a weight-of-evidence approach, the current status of the NZRLF is classified as "**depleting".** This means that current fishing pressure is too high and moving the stock in the direction of being recruitment overfished.

5 REFERENCES

Flood, M., Stobutzki, I., Andrews, J., Ashby, C., Begg, G., Fletcher, R., Gardner, C., McDonald, B., Moore, A., Roelofs, A., Sainsbury, K., Saunters, T., Smith, T., Stewardson, C., Stewart, J., and Wise, B. (2014). Status of key Australian fish stock reports 2014. Fisheries Research and Development Corporation, Canberra.

Linnane, A., McGarvey, R., Feenstra, J. and Graske, D. (2018). Northern Zone Rock Lobster (*Jasus edwardsii*) Fishery 2016/17. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000320-12. SARDI Research Report Series No. 989. 82pp.

Linnane, A., McGarvey, R., Matthews, J., Feenstra, J., Jones, A. and Toumazos, K. (2016). Informing spatial and temporal management of the South Australian Northern Zone Southern Rock Lobster (*Jasus edwardsii*) fishery. Final Report to the Fisheries Research and Development Corporation (FRDC Project No. 2014/702). Adelaide, March.

McGarvey, R. and Matthews, J.M. (2001). Incorporating numbers harvested in dynamic estimation of yearly recruitment: onshore wind in interannual variation of South Australian rock lobster (*Jasus edwardsii*). Journal of the International Council for the Exploration of the Sea 58(5): 1092-99.

PIRSA (2014). The South Australian Fisheries Management Series. Paper number 71: Management Plan for the South Australian Commercial Northern Zone Rock Lobster Fishery. ISBN 978-0-9924621-6-1. ISSN 1322-8072.

Smith, T. (2017) Review of the Stock Assessment and Monitoring Program for the South Australian Rock Lobster Fishery. A report prepared for the South Australian Rock Lobster Advisory Council Inc. June, 2017.

Stewardson, C., Andrews, J. Ashby, C., Haddon, M., Hartmann, K., Hone, P., Horvat, P., Mayfield, S., Roelofs, A., Sainsbury, K., Saunders, T., Stewart, J., Stobutzki, I., and Wise, B. (eds) (2016). Status of Australian Fish Stocks Reports 2016. Fisheries Research and Development Corporation, Canberra. www.fish.gov.au.