



Economic Development,
Jobs, Transport
and Resources

Victorian Rock Lobster Fishery

Stock Assessment Report
2015/16 Season



TABLE OF CONTENTS

1	Executive Summary	1
2	Introduction	2
3	Western Zone Rock Lobster Fishery	3
3.1	Fishery Statistics	3
3.1.1	Trends in catch and effort.....	3
3.1.2	Trends in recruitment	3
3.1.3	Mean weight	4
3.1.4	Length-frequency distributions	4
3.2	Trial Application of the Harvest Strategy	4
3.3	Model Outputs.....	4
3.3.1	Model estimated recruitment	4
3.3.2	Model estimated egg production	4
3.3.3	Model estimated available biomass and exploitation rate	5
4	Eastern Zone Rock Lobster Fishery	5
4.1	Fishery Statistics	5
4.1.1	Trends in catch and effort.....	5
4.1.2	Trends in recruitment	6
4.1.3	Mean weight	6
4.1.4	Length-frequency distributions	6
4.2	Trial Application of the Harvest Strategy	6
4.3.1	Model estimated recruitment	6
4.3.2	Model estimated egg production	7
4.3.3	Model estimated available biomass and exploitation rate	7
5	Methods	7
5.1	Catch Rate Standardisation	7
5.2	Stock Assessment Model	8
6	Western Zone Data.....	9
7	Eastern Zone Data.....	21



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Stock Assessment Report for the 2015/16 Season

1 Executive Summary

This report details the results of the 2015/16 stock assessment for the Victorian Rock Lobster Fishery and introduces parameters to be implemented in the new harvest strategy for the fishery.

Western Zone Rock Lobster Fishery

The total allowable commercial catch (TACC) for the Western Zone in 2015/16 was 230 tonne (t), which is the second year at this level and the seventh consecutive year that the TACC has been fully taken. The standardised catch per unit effort (CPUE) improved from 0.46kg/potlift in 2014/15 to 0.51kg/potlift in 2015/16. The 2016/17 summer data to February 2017 shows an indicative standardised CPUE at the same level of 0.51kg/potlift.

The numbers of undersize lobsters have increased from the historical low experienced two years ago, but are still at very low levels. The PRI was at 1.12 undersize/potlift, the lowest level since 2005/06 and below the reference point of 1.81. The harvest strategy has not been applied for the 2017/18 TACC, but would have provided no change in TACC.

The model outputs for recruitment, egg production, available biomass and exploitation rate show the same levels as 2014/15. With egg production at 42% of 1951 levels, well above the 20% reference point.

Eastern Zone Rock Lobster Fishery

The 2015/16 TACC for the Eastern Zone was set at 59t for the second consecutive year. While the quota was fully caught, comparatively more effort was required over the fishing season (November to September) to take the TACC. This has resulted in a standardised CPUE reduction from 0.56kg/potlift in 2014/15 to 0.48kg/potlift in 2015/16. The 2016/17 summer data to February 2017 that the standardised CPUE has fallen to 0.43kg/potlift.

The numbers of undersize lobsters continued to fall and are at a historical low. The PRI was at 0.22 undersize/potlift in 2014/15, the second lowest level since 2005/06 and below the reference point of 0.32.

The model output for recruitment to the 60mm carapace length size class indicates a slight upward trend to a level that is now consistent with that of the long term average. The model estimated level of egg production has remained static at 26-27% of 1951 levels for the past five years, which is above the 20% reference point. The harvest strategy has not been applied for the 2017/18 TACC, but would have resulted in a TACC decrease from 59t to 48t.

The estimated available biomass in the Eastern Zone has declined for a second year in a row. The stock assessment model estimated that 19.9% of the available biomass was taken in 2015/16, which is a reduction from 22.5% in 2014/15.

2 Introduction

The *Victorian Rock Lobster Fishery Management Plan* requires annual assessment of the southern rock lobster (*Jasus edwardsii*) stock in Victoria to enable review of the stock and setting of the TACC (Department of Primary Industries 2009).

The Rock Lobster Fishery is divided into two separately managed zones; the Western Zone and the Eastern Zone. The two zones are assessed separately and a TACC for each zone is determined using the fishery's harvest strategy. Each licence holder is then assigned a proportion of the zonal TACC based on the quota units attached to their licence. The quota units are transferable, through permanent sale or temporary lease, throughout the zone.

The performance of the fishery is evaluated against the biological reference points, decision rules and associated limit reference points specified in the fishery's harvest strategy. The limit reference points used in the harvest strategy to set the TACC are egg production, standardised CPUE and pre-recruit abundance. A secondary set of reference points, whilst not used in the TACC determination, are monitored as part of the overall stock health; these are available biomass and exploitation rate.

As the harvest strategy uses standardised CPUE, all references in this report (unless specified otherwise) are therefore standardised values.

The pre-recruit reference point is determined using data from fixed-site surveys and on-board observations and is averaged, weighting regions by their past commercial catch. The calculated PRI is then compared against a reference point calculated from a reference period 2005-2014.

A secondary set of reference points are also used and include exploitation rate and available biomass.

The data collected to assist in the assessment of the fishery against the reference points includes data from commercial catch and effort logbooks, a fixed-site survey program, an on-board observer program, puerulus sampling, in-port sampling of legally-sized rock lobsters, and a voluntary sampling program.

This report summarises the fishing activity and stock status of each zone for the 2015/16 season and provides the outputs from the southern rock lobster stock assessment model, including estimated egg production and available biomass. It also includes a snapshot of the 2016/17 summer season by including commercial catch and effort data up to the end of February 2017, as well as data from the February fixed-site surveys.

3 Western Zone Rock Lobster Fishery

3.1 Fishery Statistics

3.1.1 Trends in catch and effort

The TACC in the Western Zone Rock Lobster Fishery was set at 230 tonne (t) for the 2015/16 season, which was the second year at this level. The catch for the fishing year (November–September) was 226t and 229.6t during the quota year (July – June) (Table 1 and Table 2).

This represented the seventh consecutive year the TACC has been fully taken. The effort required to take the fishing year catch was 359,000 potlifts, which is a substantial reduction from the 418,000 potlifts needed to catch the same TACC in 2014/15 (Table 1, Figure 1). While effort has decreased, the number of active licences and vessels within the zone has remained stable for the past four years (Table 2).

Trends in nominal and standardised catch rates were similar over time. Between 1991/92 and 2003/04, the standardised CPUE was relatively stable at 0.45–0.59 kg/potlift, but then progressively declined over the next five years to a historical low of 0.34 kg/potlift in 2009/10. From this low, CPUE recovered to 0.47kg/potlift in 2013/14 and improved again in 2015/16 to 0.51 kg/potlift (Table 1, Figure 2).

Early data from the 2016/17 season through to February 2017 indicates that CPUE is at a similar level to 2015/16 (0.51 kg/potlift) (Table 1, Figure 2).

When examined by region, the breakdown of catch is consistent with previous years and the trends in catch, effort and CPUE broadly reflect the estimates for the whole zone. The highest catch in 2015/16 came from the Portland region at 99.9 t, followed by Warrnambool at 75.5 t, and Apollo Bay at 52 t. The CPUE in the Portland and Apollo Bay regions showed increases, but decreased in Warrnambool for the fourth consecutive year. Effort in the Portland region has decreased markedly over the past two years, and has been in decline since 2006/07 (Figure 3).

3.1.2 Trends in recruitment

Catch rates of undersized lobsters are estimated from the fixed-site surveys (closed escape gaps) and the on-board observer program (open escape gaps). The fixed-site surveys have been conducted each year since 2001/02 and the on-board observer program has been in place since 2004/05.

The number of undersize lobsters (animals between approximately 80mm carapace length (CL) up to the legal minimum lengths (LML)), caught in the fixed-site survey program has shown a significant downward trend over the life of the program. In 2002/03, the number of undersize per pot (male and female combined) was 3.2. By 2014/15, the number had declined to 0.96; the lowest on record. Since then, the trend has improved marginally with to 1.04 undersize/pot in 2015/16 and 1.17 in 2016/17 (Figure 4). On-board observer data followed a similar trend with the second lowest recorded level of 1.20 in 2015/16. The combined PRI is 35% below the reference point.

3.1.3 Mean weight

The mean weight of legal sized lobsters has increased over the last five seasons, which is an additional indicator of low recruitment to the fishery (Figure 5). It has been noted that mean weight may also be increasing as a result of lower yearly effort and therefore lower levels of exploitation on the stock, which may be allowing lobsters to survive longer prior to being harvested.

3.1.4 Length-frequency distributions

In addition to numbers of undersize lobsters, the fixed-site surveys and observer program collect data on the length-frequency distribution of lobsters in the population. The trends in the length-frequency data are consistent with the trends in pre-recruits and legal size commercial catch rates. That is, between 2008/09 and 2010/11, the number of undersize lobsters was higher relative to other years. The frequency of lobsters in size classes below the LML has decreased since 2010/11. The increase in commercial catch rates seen between 2010/11 and 2013/14 reflect the increase in numbers of legally sized lobsters entering the available biomass (Figure 6 to Figure 9).

3.2 Trial Application of the Harvest Strategy

It has previously been decided that the TACC will remain unchanged for the 2017/18 season whilst the harvest strategy is finalised. Here we provide an indication of the management guidance that the draft harvest strategy would have provided.

The harvest strategy states that with the current CPUE of 0.51 kg/potlift, the TACC could be increased from 230t to the next level of 245t (Table 3). However, an increase also requires the PRI to be above the threshold. The 2015/16 PRI is 1.12 undersize per potlift, which is well below the trigger point of 1.81. This indicates concern about future stock abundance and prevents a TACC increase.

3.3 Model Outputs

3.3.1 Model estimated recruitment

Model estimated recruitment to 60mm CL has been highly variable over the past 30 years, with a distinct change in the relative abundance over the length of the time series. Between 1988/89 and 1999/00, recruitment was mostly above the long-term average. Conversely, from 2001/02 onwards, with the exception of 2007/08 and 2008/09, recruitment has been well below the long-term average. It is therefore likely that the recent increases in catch rate are due to the animals from 2007-09 growing and becoming part of the available biomass (Figure 10).

3.3.2 Model estimated egg production

The harvest strategy sets a model estimated egg production limit reference point of 20% of E_{1951} (the year 1951 is used as a reference of unexploited stock). The Western Zone egg production has never fallen below the limit reference point and a declining trend observed

between 2001/02 and 2007/08 has halted to maintain a level of stability. The stock assessment model estimated egg production in 2015/16 at 42% of 1951 levels, which is well above the 20% reference point (Figure 11).

3.3.3 Model estimated available biomass and exploitation rate

Under the increasing exploitation rates experienced between 1980/81 and 2000/01, the modelled available biomass indicates a downward trend for the first decade before entering a phase of stability between 1993/94 to 2003/04 at approximately 850 to 980t. Exploitation rates dropped in 2001/02 with the introduction of quota, but steadily increased to a historical high of 66% in 2006/07. The corresponding available biomass decreased and reached a low of 524t in 2008/09. After 2006/07, the exploitation rate dropped significantly and the available biomass improved. In 2015/16, the available biomass was estimated to be 675t, with a corresponding fishing exploitation rate of 34.2% (Figure 12).

3.4 Summary

In summary, CPUE has increased over the last five years from a record low to a level near the long term average, however there are concerning signs of reduced recruitment over the last decade and in the current undersize catch rates. This indicates that conservative TACCs are required in the near future and that in the longer term it may not be possible to return to the higher TACCs experienced before 2000.

4 Eastern Zone Rock Lobster Fishery

4.1 Fishery Statistics

4.1.1 Trends in catch and effort

The 2015/16 Eastern Zone Rock Lobster Fishery TACC was 59t, which is the second year at this level. The catch in was 46t during the fishing year (November – September) (Table 4) and 58t during the quota year (July – June). While this was the seventh consecutive season the TACC was fully taken (Table 5), the 46t taken in the 2015/16 fishing year is considerably lower than the 58t taken in the equivalent time period in 2014/15. In 2015/16, 109,000 potlifts were used to catch 46t, however in 2014/15, 110,000 potlifts caught 58t (Table 4, Figure 13). These trends may be indicative of a reduced available biomass in the fishery.

The trends are echoed in the standardised CPUE, which after reaching a ~20 year peak of 0.63kg/potlift in 2012/13, has fallen to 0.48kg/potlift in 2015/16. Early data from the 2016/17 season through to February 2017 indicates that CPUE has fallen further to 0.43kg/potlift (Table 4, Figure 14).

The breakdown of catch within the Eastern Zone regions in 2015/16 was consistent with previous years. The majority of catch was taken in the Queenscliff region, followed by San Remo and a small, but consistent, amount taken in the Lakes Entrance region. The CPUE in the Queenscliff and San Remo regions have been in decline for several years, while there has been a steady increase in Lakes Entrance (Figure 15).

4.1.2 Trends in recruitment

As in the Western Zone, the abundance of undersized lobsters obtained from fixed-site surveys indicate that recruitment levels to the fishery have been low in recent seasons. The trend has been in marked decline from 0.51 undersized/potlift in 2012/13 to 0.07 in 2014/15, which is the lowest on record (Figure 16). On-board observer data followed a similar trend with a reduction from 0.74 in 2013/14 to 0.17 in 2015/16. The combined PRI could not be calculated as fixed surveys were not conducted in 2015/16. However, the 2014/15 PRI is 31% below the reference point.

From these trends, it is likely that the number of lobsters entering the fishable biomass in future years will be lower than current levels. However, while the trends are consistent over the years, it should be noted that the escape gaps in the Eastern Zone fixed-site surveys are not closed as they are in the Western Zone.

4.1.3 Mean weight

The mean weight of Eastern Zone lobsters has always been higher than those from the Western Zone, which is an artefact of the faster growth rate in the eastern area. The mean weight of lobsters in the eastern zone has been relatively consistent for the past three years and in 2015/16 was 1.26kg (Figure 17). In comparison, the mean weight in the Western Zone for 2015/16 was 0.97kg.

4.1.4 Length-frequency distributions

Despite the small sample sizes in the Eastern Zone fixed-site surveys and observer program, the trends in the undersize lobsters support those observed in other data sets. The observer program shows an increase in the abundance of legally sized lobsters from 2011/12 to 2015/16 comparative to the early years of the program (Figure 18 and Figure 19) which is consistent with the high level of pre-recruits recorded in 2007/08 – 2008/09. The increase in lobster abundance from the fixed-site survey program during 2012/13 to 2014/15 in the 105-130mm CL size range is consistent with the increase in catch rates observed across the fishery during these years (Figure 20 and Figure 21).

4.2 Trial Application of the Harvest Strategy

It has previously been decided that the TACC will remain unchanged for the 2017/18 season whilst the harvest strategy is finalised. Here we provide an indication of the management guidance that the draft harvest strategy would have provided.

The harvest strategy states that with the current CPUE of 0.48 kg/potlift, the TACC should be decreased from 59t to 48t (Table 6).

4.3 Model outputs

4.3.1 Model estimated recruitment

The long-term time series for the model estimated recruitment to the 60mm CL size class shows that recent recruitment has been below the long-term average more than it has been

above it. Levels have been low since 2009/10, and reached a historical low in 2012/13, but have since trended upwards. In 2015/16, the level of recruitment was estimated to be at the long-term average (Figure 22).

4.3.2 Model estimated egg production

Unlike the Western Zone, the egg production in the Eastern Zone has been at levels below the long-term average. A historical low was reached in 1995/96 after which time there was a steady increase. Eastern Zone egg production levels are now considered to be well above the long-term average (Figure 23). The current stock assessment model estimated egg production in 2015/16 at 26.6% of the 1951 level, which is well above the 20% reference point.

4.3.3 Model estimated available biomass and exploitation rate

In 2015/16, the available biomass was estimated to be 233 tonnes, with a corresponding fishing exploitation rate of 20.4%.

4.4 Summary

In summary, whilst having reached a 20 year CPUE peak in 2012/13 the recent rapid decline coupled with a low PRI raise concerns. As with the Western Zone conservative TACCs are required in the near future. Unlike the Western Zone there area is no evidence of substantial recent changes in recruitment patterns (although this may be more difficult to detect in this zone due to lower data availability).

5 Methods

5.1 Catch Rate Standardisation

The stock assessment model uses standardised CPUE (Walker *et al.* 2012). All catch and effort data are obtained from mandatory logbook returns and are firstly checked for any errors before being entered into the Fisheries Victoria rock lobster database. Prior to standardisation, the data are filtered to ensure that only data from fishers contributing returns in more than two separate fishing years and contributing 200 or more records are included in the CPUE standardisation. CPUE is then standardised for each zone separately by adjusting for average long-term differences among the regions, depth ranges, fishing seasons, months, fishers and vessels. For standardisation, the regions are Portland, Warrnambool and Apollo Bay in the Western Zone, and Queenscliff, San Remo and Lakes Entrance in the Eastern Zone. The fishing depth ranges are <40 m and ≥40 m. Only interactions between region and year are now included, which permits yearly estimates of standardised CPUE by region.

5.2 Stock Assessment Model

The stock assessment uses a model that has been designed for rock lobster fisheries in Victoria, South Australia, and Tasmania. It was developed through CSIRO and a series of FRDC projects (Hobday and Punt 2001; Hobday and Punt 2009; Hobday *et al.* 2005). The model is length-structured and currently set up in Victoria to account for numbers of rock lobsters in 5-mm-carapace length-classes.

The model infers change and absolute levels of stock abundance from three principal data sources: (i) standardised CPUE, to which biomass is assumed to vary in direct proportion, (ii) catches in both weight and number, which provide a highly precise measure of mean weight of lobsters in the catch, and (iii) length-frequency data interpreted in combination with the length-transition matrices to yield estimates of mortality rate and absolute biomass.

Recruitment in the model is dependent on changes in mean size and size distribution of the catch from length-frequency data, and on changes in CPUE, where, for example, a rise in CPUE and a decrease in mean size signals an increase in recruitment and visa-versa. For males and females separately, the model tracks, for each month, the number of rock lobsters in the population of size equal to or larger than 60 mm carapace length. The model also accounts for both natural mortality and fishing mortality.

Growth is modelled using length-transition matrices that specify the proportion of lobsters in each length category that grow into larger length classes during each summer and autumn moulting period. Growth in the model is sex specific, as is length-selectivity. Catchability by month is non-sex specific. The length-transition matrices were estimated using extensive tag-recovery data.

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6 Western Zone Data

Table 1: Western Zone catch, fishing effort and CPUE (Fishing Year: November-September; SRL: Southern rock lobster; CPUE: Catch per unit effort).

Fishing Year	Catch (tonne)	Catch ('000)	Nominal Effort ('000 potlifts)	Nominal CPUE (kg/potlift)	Standardised CPUE (kg/potlift)	Mean Mass (kg/lobster)
1978/79	485	485	621	0.78	0.80	1.00
1979/80	451	442	576	0.78	0.81	1.02
1980/81	546	546	679	0.80	0.82	1.00
1981/82	498	498	637	0.78	0.78	1.00
1982/83	460	455	608	0.76	0.79	1.01
1983/84	421	414	571	0.74	0.74	1.02
1984/85	406	394	578	0.70	0.70	1.03
1985/86	345	346	569	0.61	0.62	1.00
1986/87	351	353	595	0.59	0.60	0.99
1987/88	345	349	557	0.62	0.61	0.99
1988/89	303	321	577	0.52	0.53	0.94
1989/90	332	355	613	0.54	0.54	0.94
1990/91	317	337	650	0.49	0.50	0.94
1991/92	409	439	712	0.57	0.59	0.93
1992/93	408	433	779	0.52	0.55	0.94
1993/94	449	456	754	0.59	0.57	0.98
1994/95	435	444	789	0.55	0.51	0.98
1995/96	423	442	761	0.56	0.50	0.96
1996/97	402	414	787	0.51	0.45	0.97
1997/98	467	493	842	0.55	0.49	0.95
1998/99	517	569	864	0.60	0.54	0.91
1999/00	523	596	901	0.58	0.52	0.88
2000/01	526	599	898	0.59	0.50	0.88
2001/02	438	510	703	0.62	0.55	0.86
2002/03	431	495	631	0.68	0.58	0.87
2003/04	460	514	658	0.70	0.56	0.90
2004/05	410	452	667	0.61	0.52	0.91
2005/06	358	405	705	0.51	0.43	0.88
2006/07	336	392	698	0.48	0.42	0.86
2007/08	289	338	668	0.43	0.37	0.86
2008/09	235	267	605	0.39	0.35	0.88
2009/10	240	277	651	0.37	0.34	0.87
2010/11	255	307	590	0.43	0.40	0.83
2011/12	233	279	475	0.49	0.44	0.83
2012/13	259	296	485	0.53	0.46	0.87
2013/14	269	299	486	0.55	0.47	0.90
2014/15	225	242	418	0.54	0.46	0.93
2015/16	226	234	359	0.63	0.51	0.97
2016/17	N/A	N/A	N/A	N/A	0.51*	N/A

* Indicative CPUE using data from the partial 2016/17 season (to February 2017).

Table 2: Western Zone history of TACCs for each quota period from 2001-02 to 2015-16 (TACC: Total Allowable Commercial Catch).

Year	Season	TACC Set (t)	Catch (t)	% TACC Caught	Months Fished	Active Licenses	Vessels
2001-02*	1 Nov - 31 Mar	320					
2002-03	1 Apr - 31 Mar	450	440	98	12	79	83
2003-04	1 Apr - 31 Mar	450	436	97	12	80	79
2004-05	1 Apr - 31 Mar	450	421	94	12	79	86
2005-06	1 Apr - 31 Mar	450	405	90	12	75	77
2006-07	1 Apr - 31 Mar	450	329	73	12	71	68
2007-08	1 Apr - 31 Mar	380	319	84	12	68	64
2008-09	1 Apr - 31 Mar	320	244	76	12	61	60
2009	1 Apr – 30 Jun	55.2	36	64	3	54	53
2009-10	1 Jul – 30 Jun	240	230	96	12	54	55
2010-11	1 Jul – 30 Jun	240	237	99	12	54	55
2011-12	1 Jul – 30 Jun	240	237	99	12	51	54
2012-13	1 Jul – 30 Jun	260	258	99	12	47	46
2013-14	1 Jul – 30 Jun	260	260	100	12	48	48
2014-15	1 Jul – 30 Jun	230	230	100	12	48	47
2015-16	1 Jul - 30 Jun	230	230	100	12	48	48

Table 3: CPUE thresholds and corresponding TACC levels for the Western Zone.

WESTERN ZONE	
CPUE band	TACC Levels - with 300t cap
<0.25	0
0.25 - <0.275	19
0.275 - <0.3	42
0.3 - <0.325	69
0.325 - <0.35	100
0.35 - <0.375	134
0.375 - <0.4	171
0.4 - <0.45	219
0.45 - <0.5	245
0.5 - <0.55	271
0.55 - <0.6	297
0.6 - <0.65	300
0.65 - <0.7	300
0.7 - <0.75	300
0.75 - <0.8	300

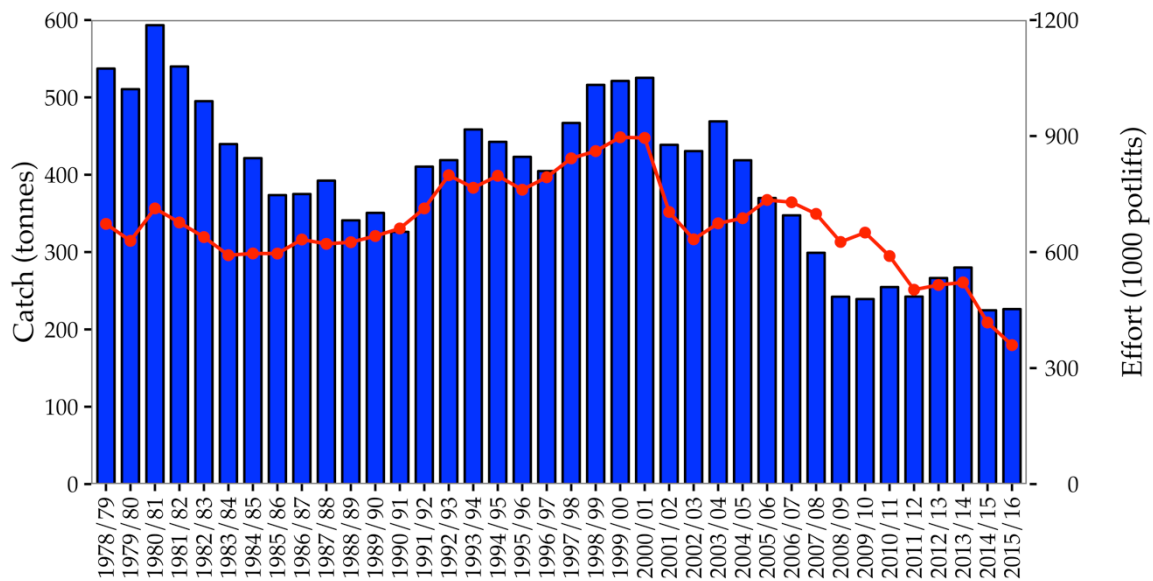


Figure 1: Total catch (blue bars; tonnes) and nominal effort (red line; x1000 potlifts) in the Western Zone from 1978/79–2015/16.

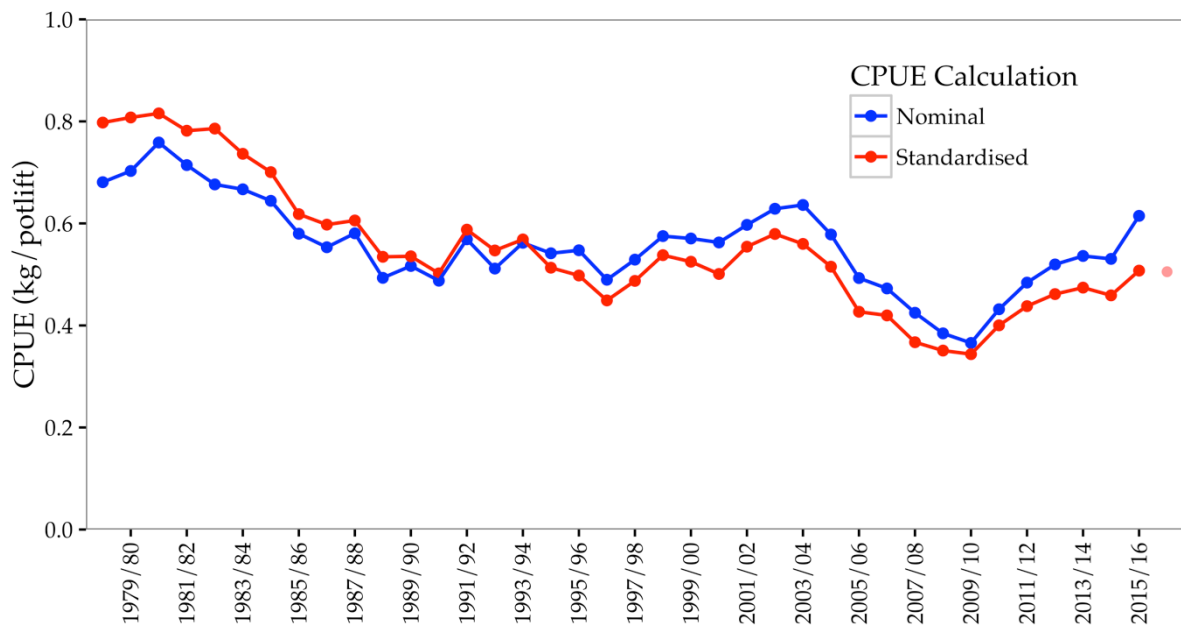
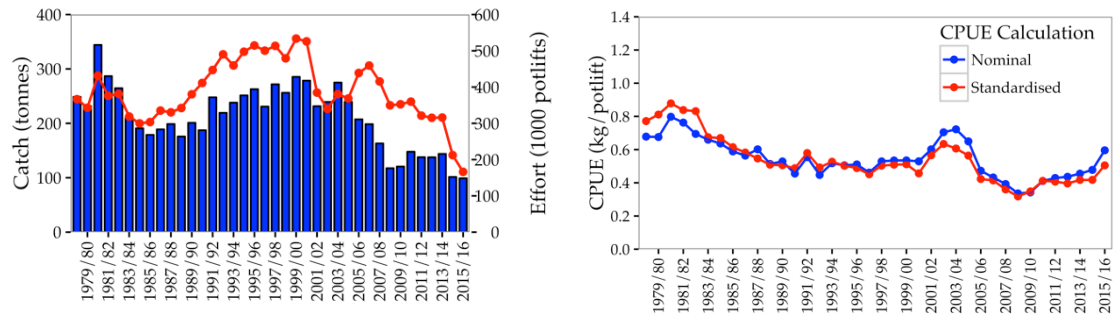
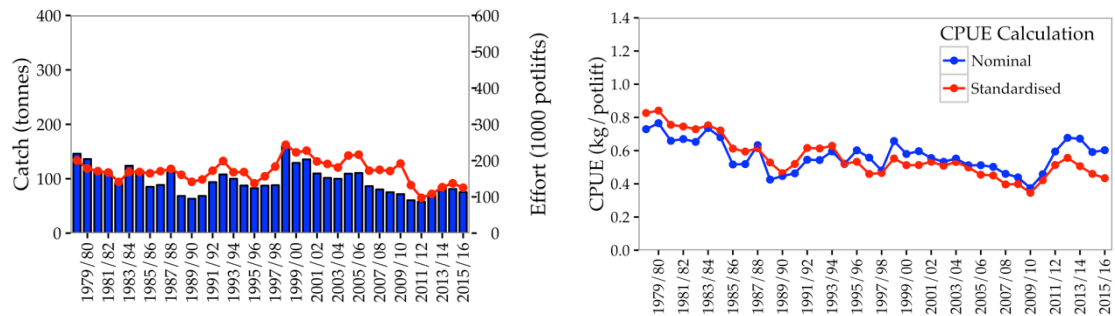


Figure 2: Standardised versus nominal CPUE (kg/potlift) in the Western Zone from 1978/79–2015/16. The standardised CPUE for the partially completed 2016/17 year has been calculated from catch and effort data through to February 2017. Note that standardised CPUE values differ slightly from one assessment to the next as the depth, seasonal and fisher coefficients are shared across years and are re-estimated including the new data.

PORTLAND



WARRNAMBOOL



APOLLO BAY

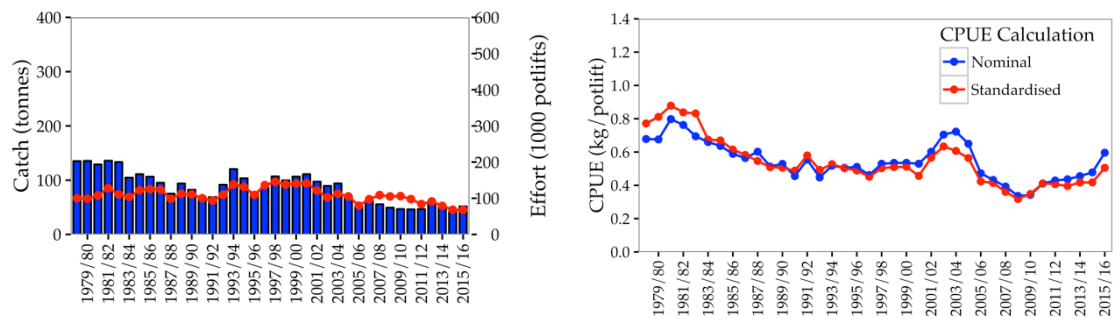


Figure 3: Regional catch (blue bars), effort (red line), and standardised CPUE (kg/potlift) in the Western Zone from 1978/79-2015/16.

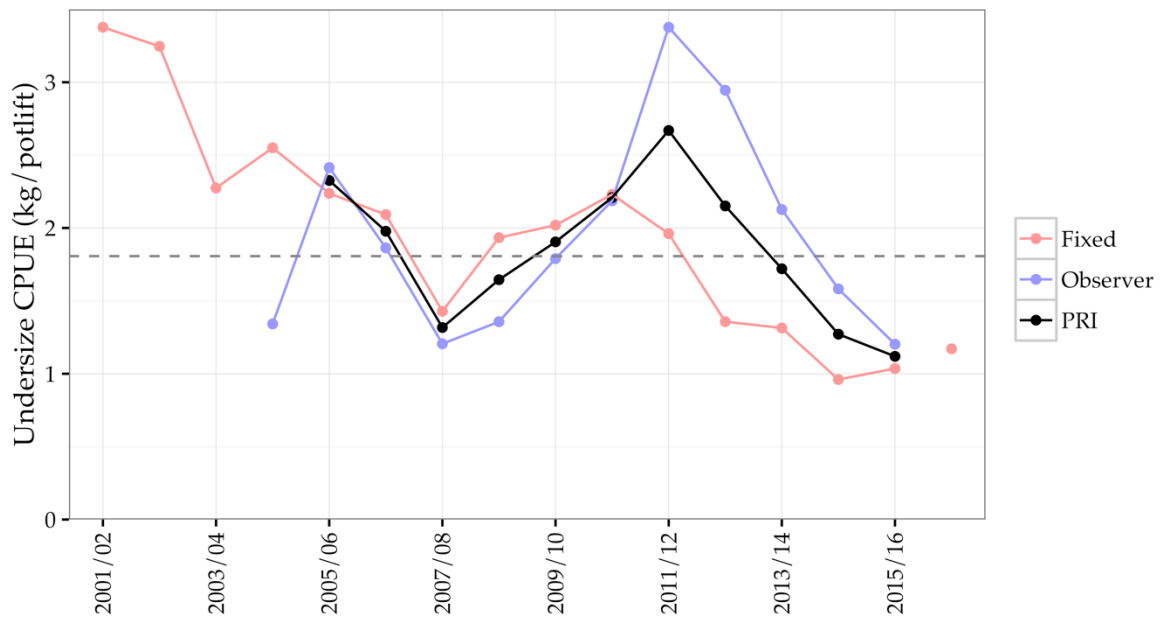


Figure 4: The undersize catch rate (kg/potlift) for the Western Zone as calculated from fixed sites, observer coverage and the final combined PRI. The dashed lines shows the trigger point (1.81 undersize/potlift).

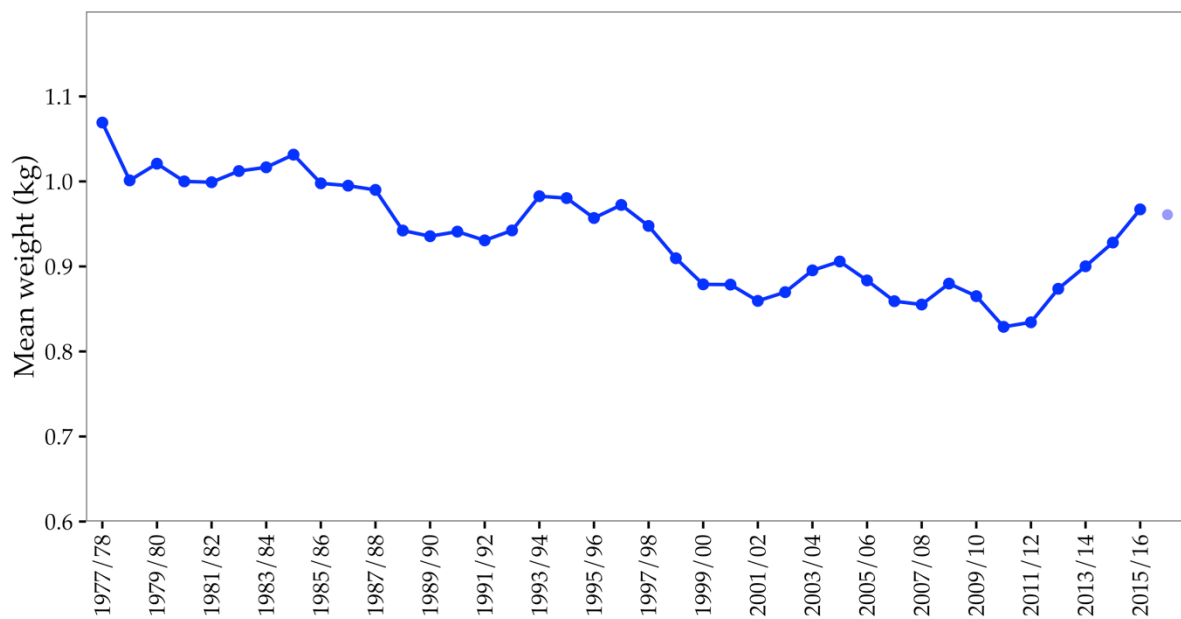


Figure 5: Mean weight of legal sized lobster in the Western Zone fishery from 1978/79 to 2015/16. The mean weight for the partially completed 2016/17 year has been calculated from catch and effort data through to February 2017.

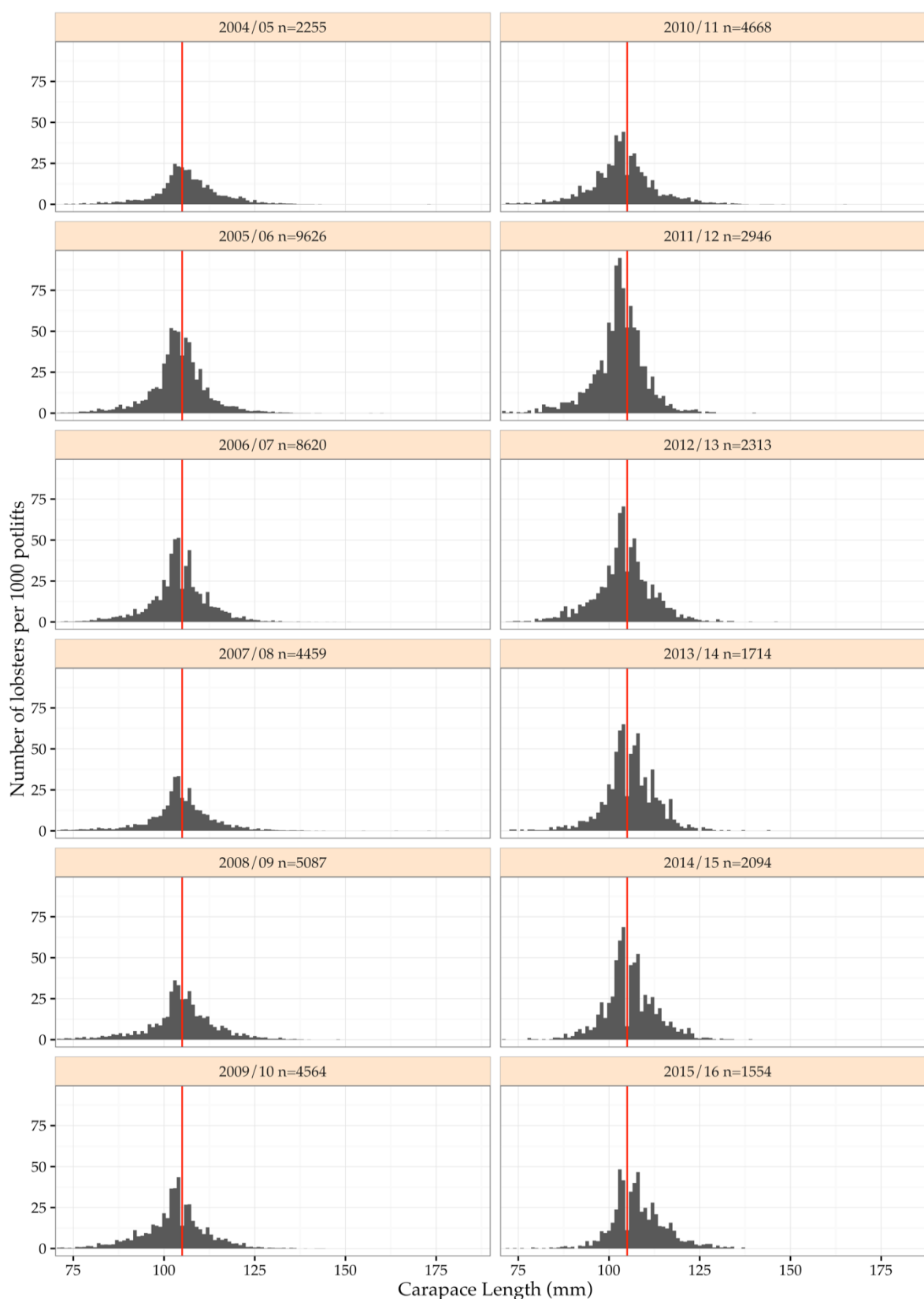


Figure 6: Length-frequency distribution of the number of female rock lobsters per 1,000 potlifts caught in the Western Zone onboard observer program from 2004–05 to 2015–16 fishing years (Nov–Sept). *n*, total number of lobsters measured.

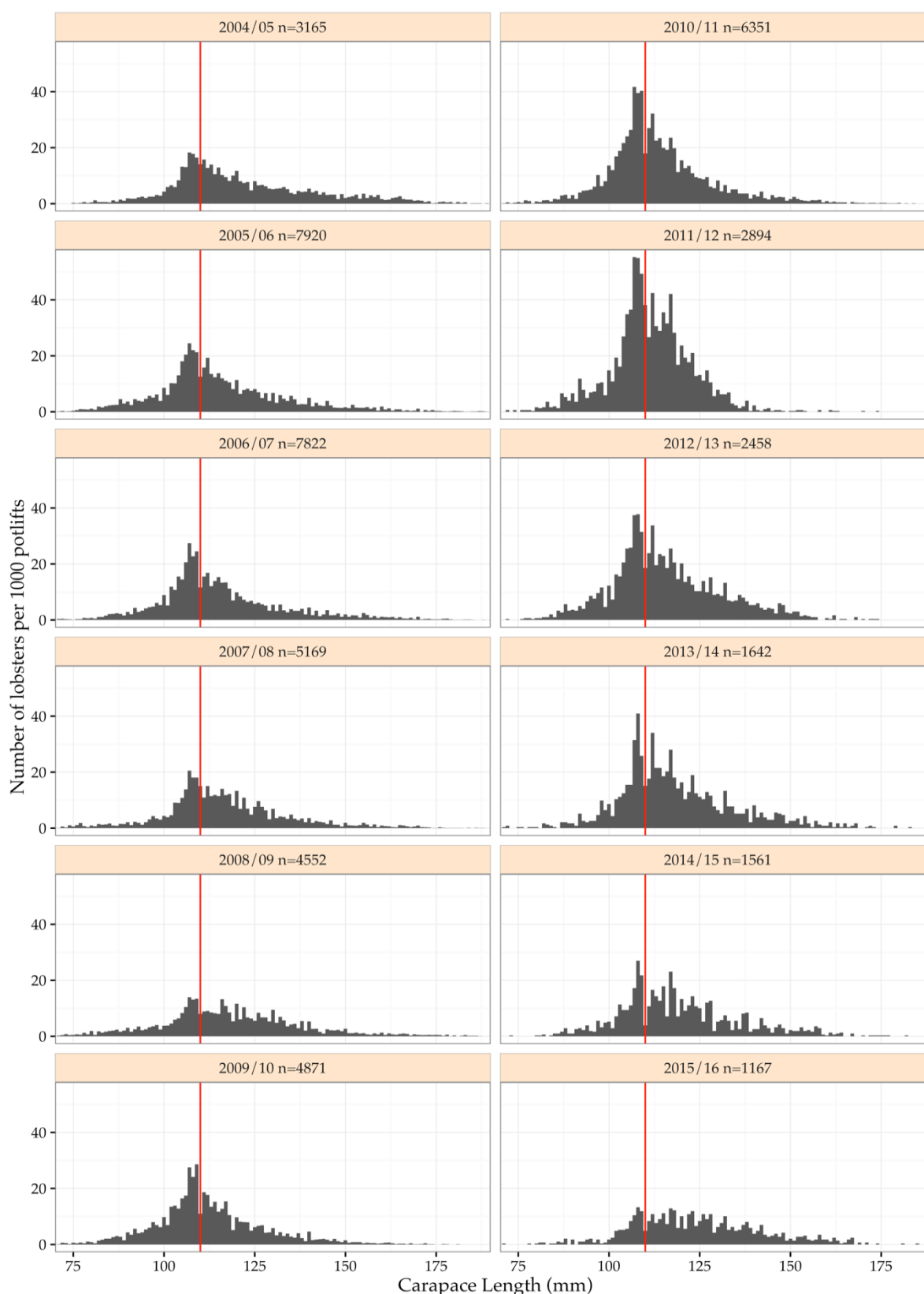


Figure 7: Length-frequency distribution of the number of male rock lobsters per 1,000 potlifts caught in the Western Zone on-board observer program from 2004–05 to 2015–16 fishing years (Nov–Sept). *n*, total number of lobsters measured.

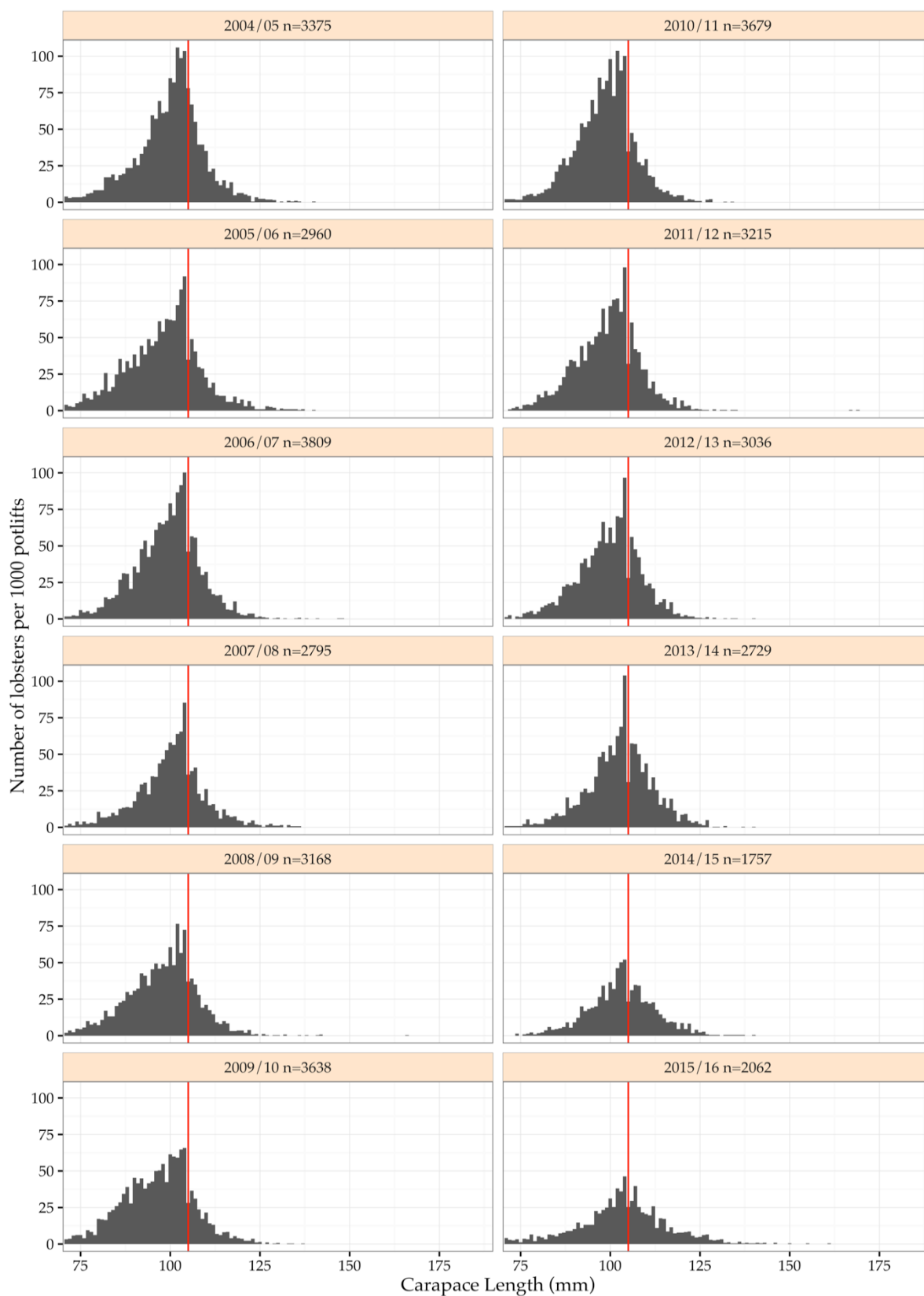


Figure 8: Length-frequency distribution of the number of female rock lobsters per 1,000 potlifts caught in the Western Zone fixed-site survey program from 1995–96 to 2015–16 fishing years (Nov–Sept). n, total number of lobsters measured.

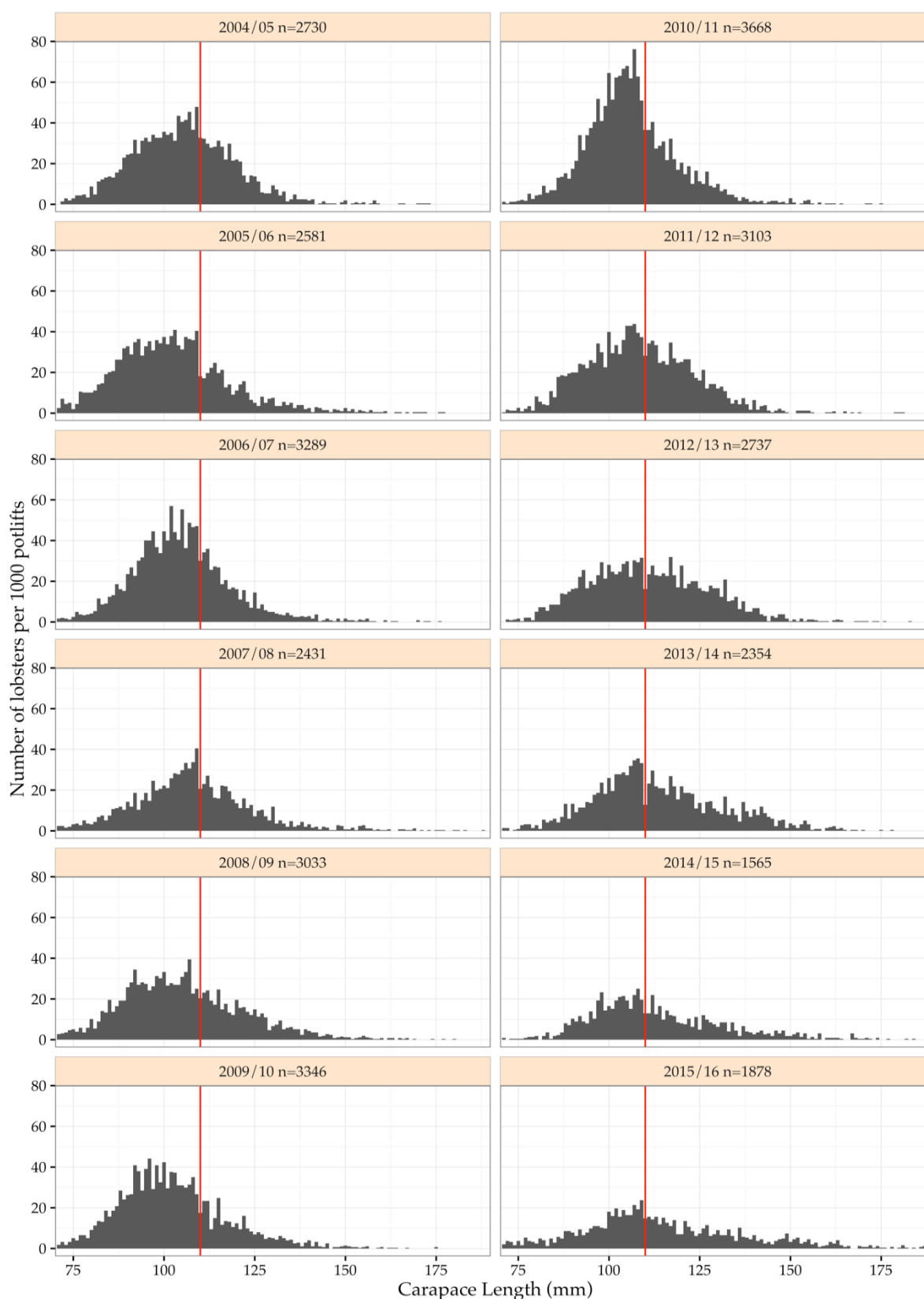


Figure 9: Length-frequency distribution of the number of male rock lobsters per 1,000 potlifts caught in the Western Zone fixed-site survey program from 1995–96 to 2015–16 fishing years (Nov–Sept). *n*, total number of lobsters measured.

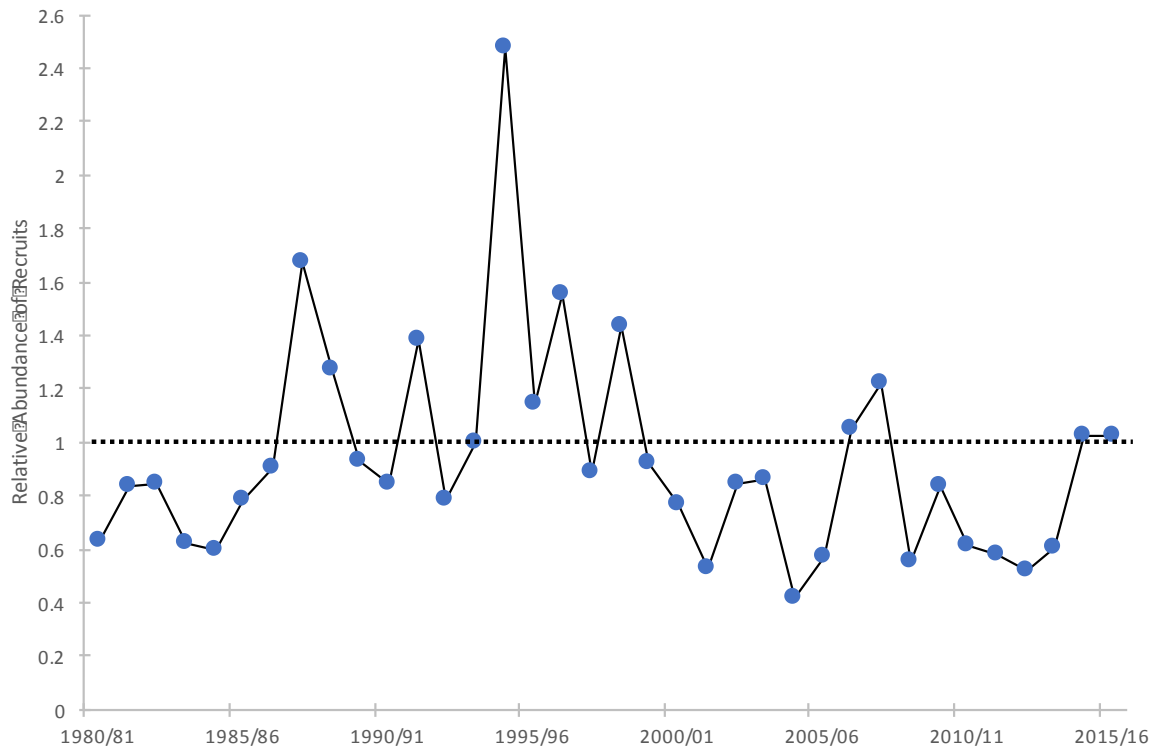


Figure 10: Relative number of recruits (to 60 mm in CL) in the Western Zone Fishery. These data are generated by the length-frequency model. The long-term average is indicated by the dotted black line.

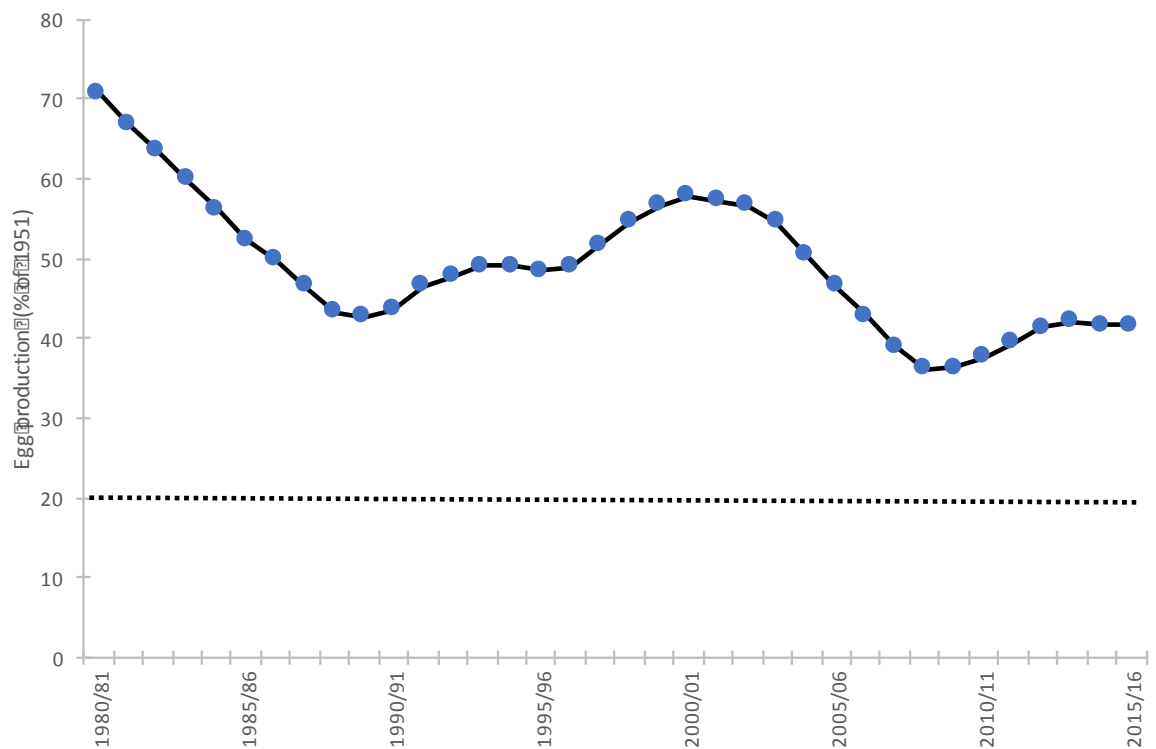


Figure 11: Model estimated level of egg production through time in the Western Zone fishery. The limit reference point (dotted line) is 20% of egg production estimated in 1951 (E1951) as defined under the 2016 harvest strategy.

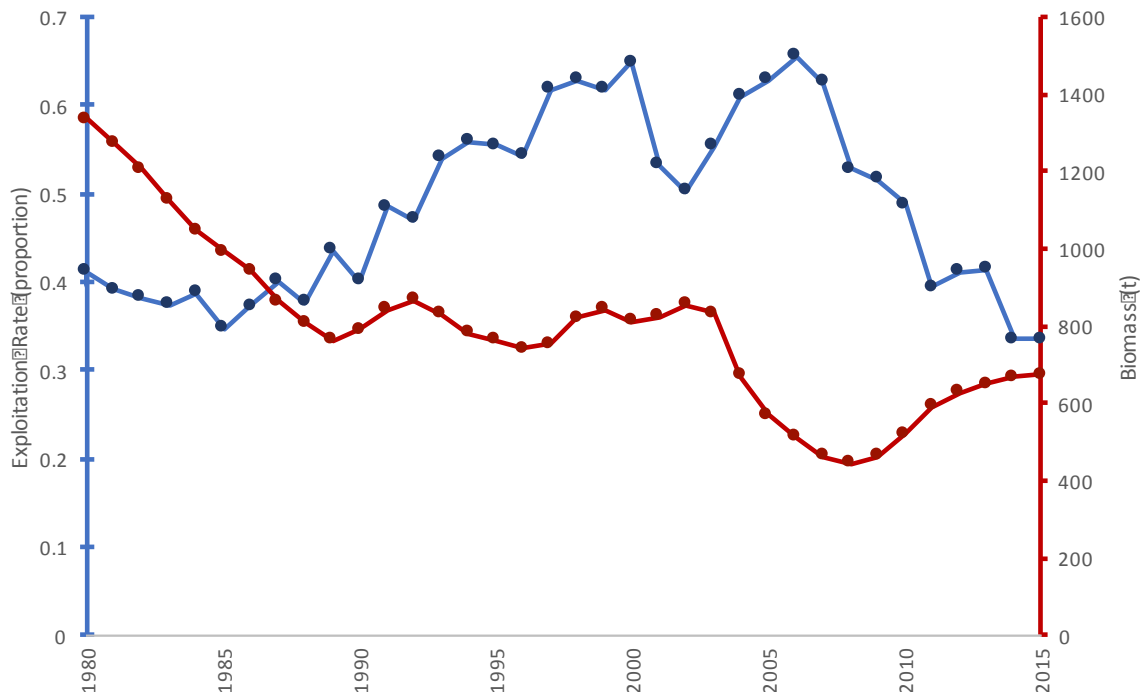


Figure 12: Model estimated levels of available biomass (red line) and associated fishing exploitation rates (blue line) in the Western Zone fishery between 1980 and 2015.

7 Eastern Zone Data

Table 4: Eastern Zone catch, fishing effort and CPUE (Fishing Year: November-September; SRL: Southern rock lobster; CPUE: Catch per unit effort).

Fishing Year	Catch (tonne)	Catch ('000)	Nominal Effort ('000 potlifts)	Nominal CPUE (kg/potlift)	Standardised CPUE (kg/potlift)	Mean Mass (kg/lob.)
1978/79	139	123	192	0.72	0.65	1.13
1979/80	115	108	171	0.67	0.66	1.07
1980/81	133	123	180	0.74	0.66	1.09
1981/82	131	120	193	0.68	0.62	1.09
1982/83	143	132	212	0.68	0.65	1.09
1983/84	136	128	230	0.59	0.55	1.06
1984/85	113	96	201	0.56	0.52	1.18
1985/86	95	81	175	0.54	0.46	1.17
1986/87	78	66	145	0.54	0.45	1.18
1987/88	70	62	130	0.54	0.40	1.13
1988/89	65	61	145	0.45	0.40	1.06
1989/90	84	85	198	0.42	0.37	0.99
1990/91	72	72	172	0.42	0.39	1.00
1991/92	65	64	175	0.37	0.35	1.02
1992/93	70	63	224	0.31	0.30	1.10
1993/94	79	68	260	0.30	0.29	1.17
1994/95	72	58	253	0.29	0.29	1.24
1995/96	57	48	220	0.26	0.28	1.19
1996/97	60	48	222	0.27	0.29	1.25
1997/98	66	54	220	0.30	0.29	1.23
1998/99	66	57	217	0.30	0.31	1.16
1999/00	73	68	228	0.32	0.31	1.07
2000/01	72	66	217	0.33	0.31	1.09
2001/02	54	50	151	0.36	0.34	1.08
2002/03	52	47	133	0.39	0.38	1.10
2003/04	56	52	133	0.42	0.41	1.09
2004/05	54	47	136	0.40	0.40	1.14
2005/06	52	46	122	0.43	0.41	1.14
2006/07	54	48	136	0.40	0.40	1.13
2007/08	46	39	123	0.38	0.39	1.19
2008/09	40	32	108	0.37	0.37	1.25
2009/10	55	49	145	0.38	0.41	1.11
2010/11	66	62	150	0.44	0.47	1.05
2011/12	62	55	114	0.54	0.55	1.13
2012/13	48	43	94	0.51	0.63	1.12
2013/14	59	48	114	0.52	0.61	1.22
2014/15	58	45	110	0.52	0.56	1.28
2015/16	46	37	109	0.43	0.48	1.26
2016/17	N/A	N/A	N/A	N/A	0.43*	N/A

* Indicative CPUE using data from the partial 2016/17 season (to February 2017).

Table 5: Eastern Zone history of TACCs for each quota period from 2001-02 to 2015-16 (TACC: Total Allowable Commercial Catch).

Year	Season	TACC (t)	Catch (t)	% TACC Caught	Months Fished	Active Licenses	Vessels
2001-02	1 Nov - 31 Mar	42					
2002-03	1 Apr - 31 Mar	60	49.9	83	12	39	34
2003-04	1 Apr - 31 Mar	60	54.4	91	12	41	36
2004-05	1 Apr - 31 Mar	60	53.2	89	12	41	39
2005-06	1 Apr - 31 Mar	60	55.7	93	12	30	29
2006-07	1 Apr - 31 Mar	60	53.5	89	12	30	30
2007-08	1 Apr - 31 Mar	66	50.1	76	12	31	31
2008-09	1 Apr - 31 Mar	66	41.3	63	12	26	24
2009-09	1 Apr - 30 Jun	6.9	5.8	84	3	19	20
2009-10	1 Jul - 30 Jun	66	43.9	67	12	22	21
2010-11	1 Jul - 30 Jun	66	64.8	98	12	29	28
2011-12	1 Jul - 30 Jun	66	65.3	99	12	25	26
2012-13	1 Jul - 30 Jun	48	47.3	99	12	26	25
2013-14	1 Jul - 30 Jun	51	50.8	100	12	27	27
2014-15	1 Jul - 30 Jun	59	59	100	12	25	23
2015-16	1 Jul - 30 Jun	59	58	98	12	23	22

Table 6: CPUE thresholds and corresponding TACC levels for the Eastern Zone.

EASTERN ZONE	
CPUE band	TACC Levels - with 70t cap
<0.25	0
0.25 - <0.275	4
0.275 - <0.3	8
0.3 - <0.325	14
0.325 - <0.35	20
0.35 - <0.375	26
0.375 - <0.4	33
0.4 - <0.45	42
0.45 - <0.5	47
0.5 - <0.55	51
0.55 - <0.6	56
0.6 - <0.65	60
0.65 - <0.7	65
0.7 - <0.75	69
0.75 - <0.8	70

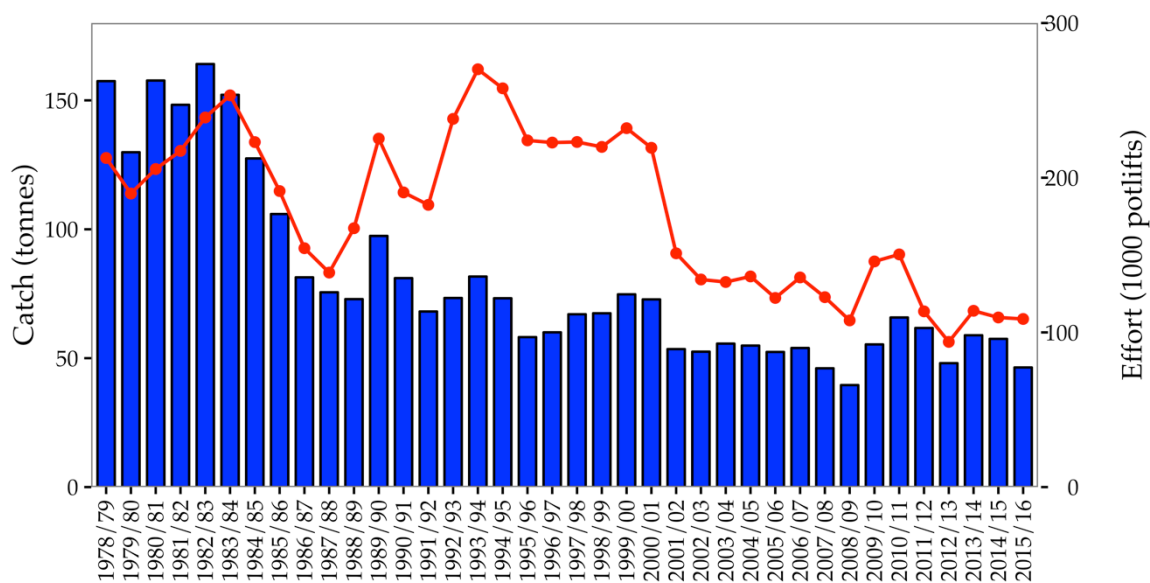


Figure 13: Total catch (blue bars; tonnes) and nominal effort (red line; x1000 potlifts) in the Eastern Zone from 1978/79–2015/16.

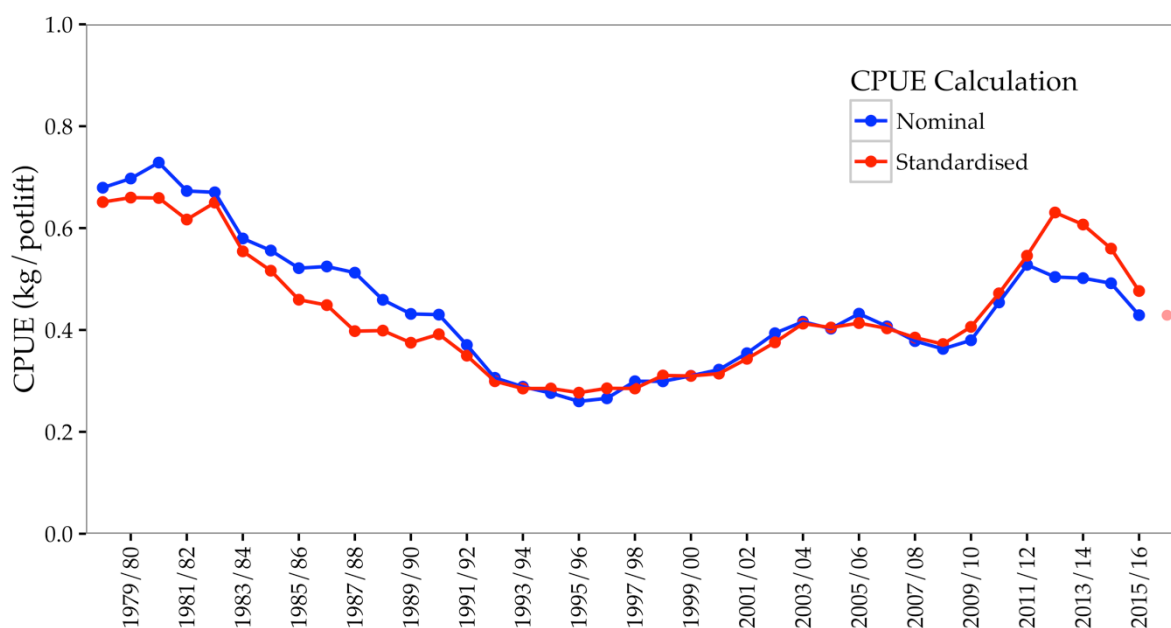
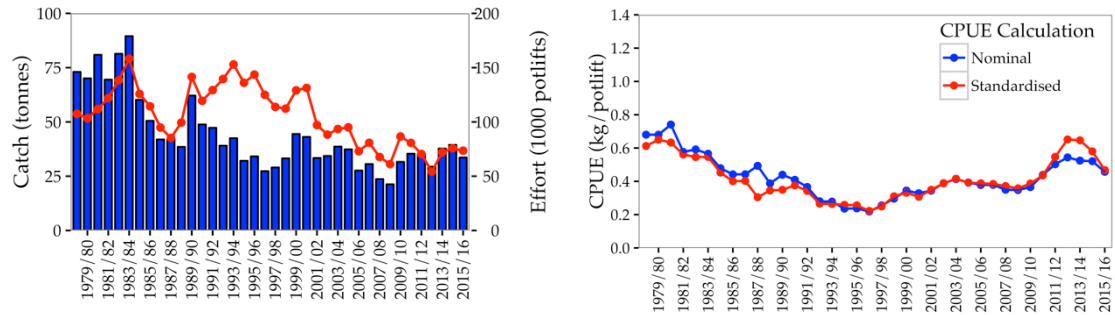
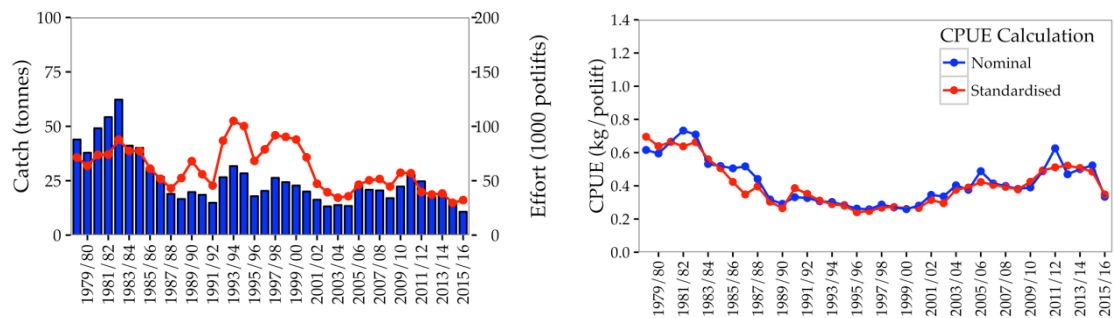


Figure 14: Standardised versus nominal CPUE (kg/potlift) in the Eastern Zone from 1978/79–2015/16. The standardised CPUE for the partially completed 2016/17 year has been calculated from catch and effort data through to February 2017. Note that standardised CPUE values differ slightly from one assessment to the next as the depth, seasonal and fisher coefficients are shared across years and are re-estimated including the new data.

QUEENSLIFF



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LAKES ENTRANCE

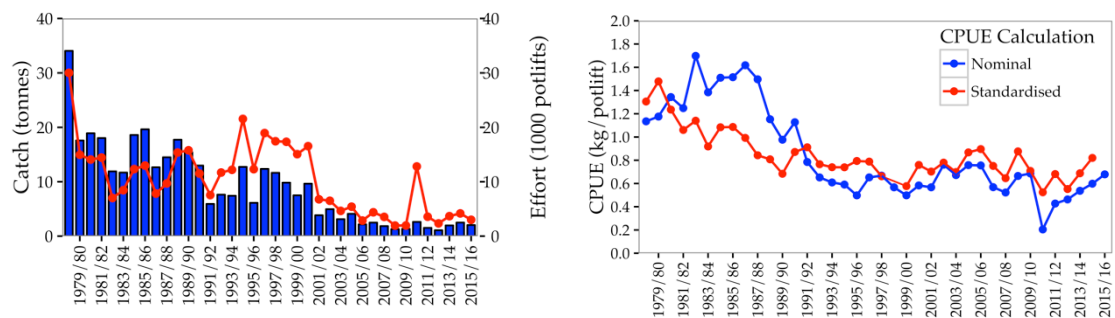


Figure 15: Regional catch (blue bars), effort (red line), and standardised CPUE (kg/potlift) in the Eastern Zone from 1978/79-2015/16.

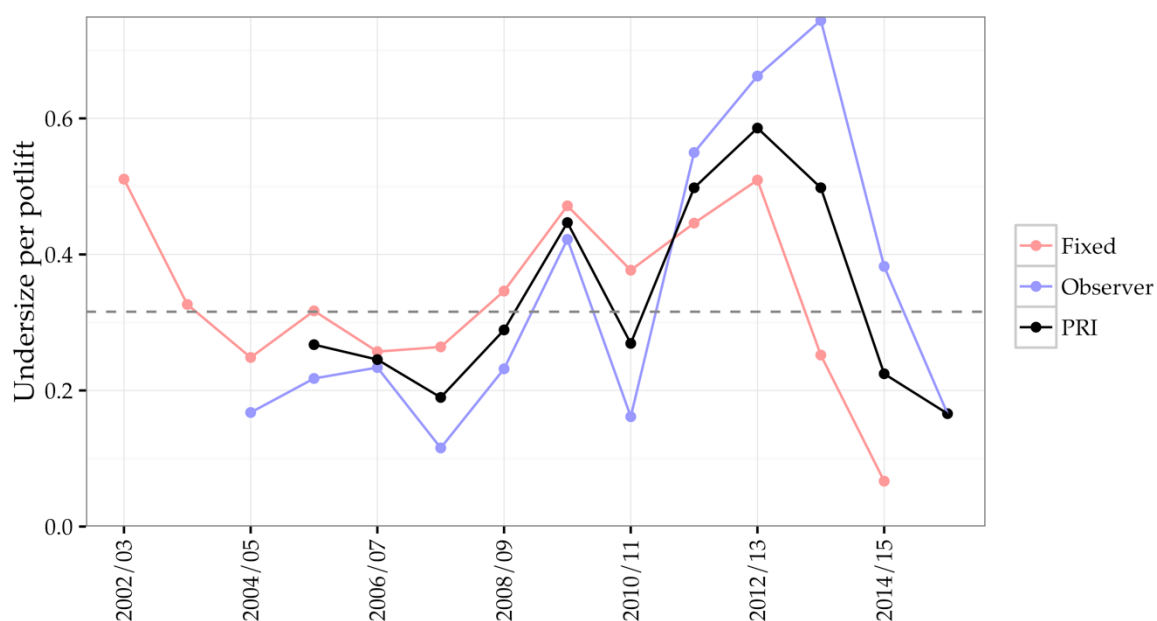


Figure 16: The undersize catch rate (kg/potlift) for the Eastern Zone as calculated from fixed sites, observer coverage and the final combined PRI. The dashed lines shows the trigger point (0.32 undersize/potlift).

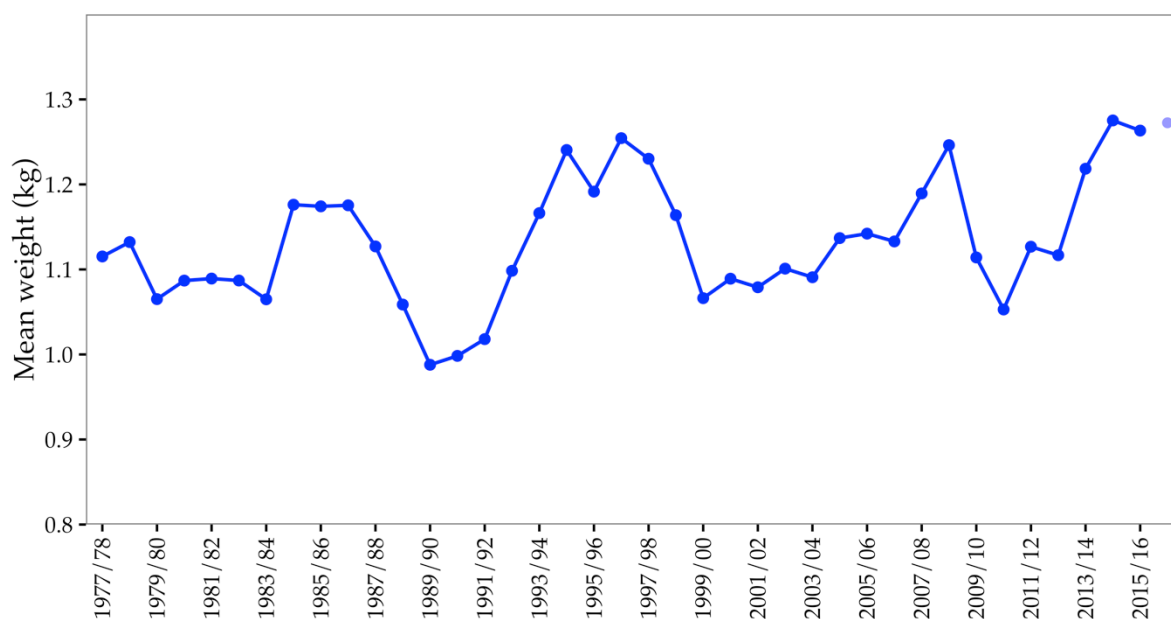


Figure 17: Mean weight of legal sized lobster in the Eastern Zone fishery from 1978/79 to 2015/16. The mean weight for the partially completed 2016/17 year has been calculated from catch and effort data through to February 2017.

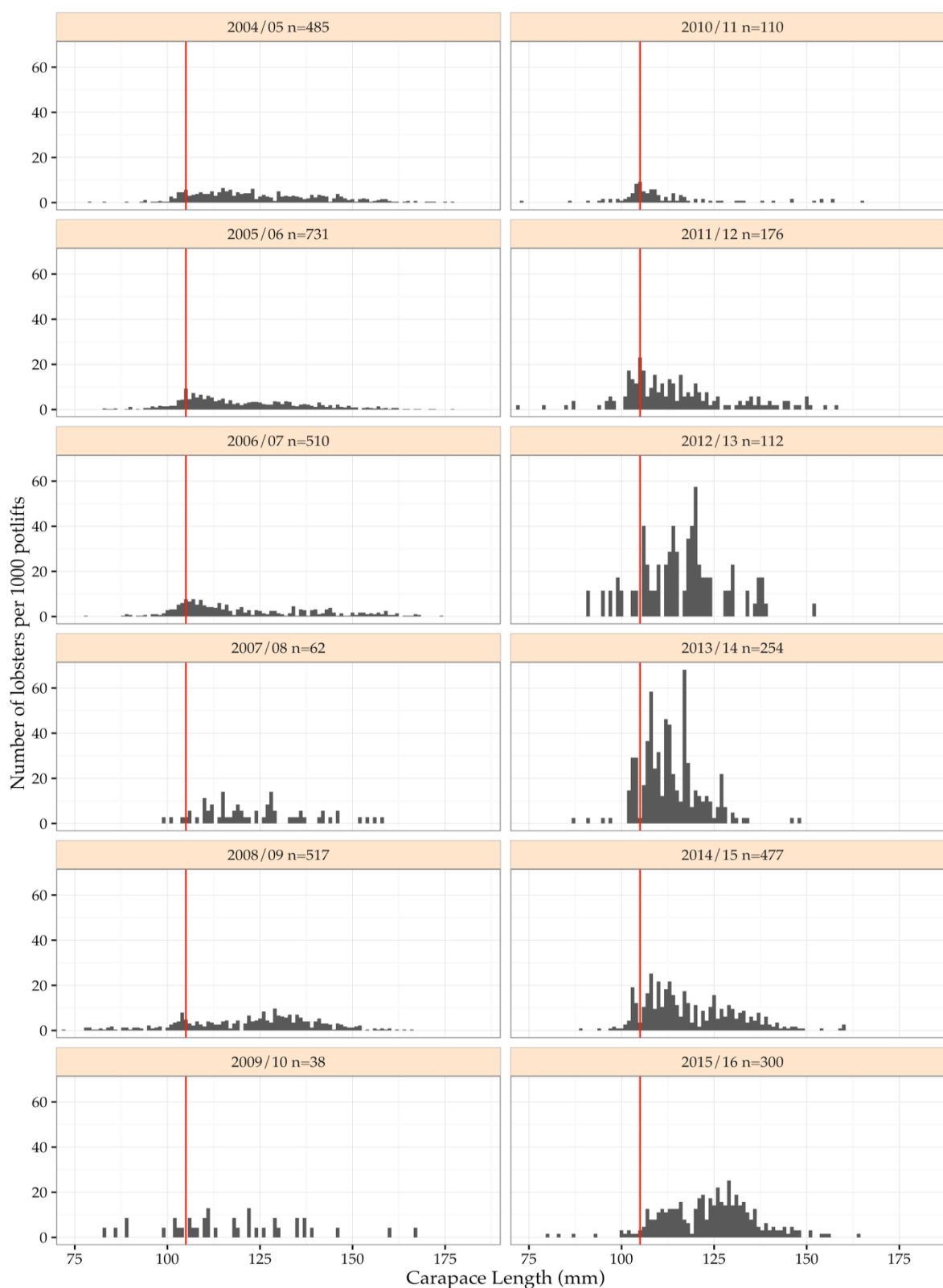


Figure 18: Length-frequency distribution of the number of female rock lobsters per 1,000 potlifts caught in the Eastern Zone onboard observer program from 2004–05 to 2015–16 fishing years (Nov–Sept). *n*, total number of lobsters measured.

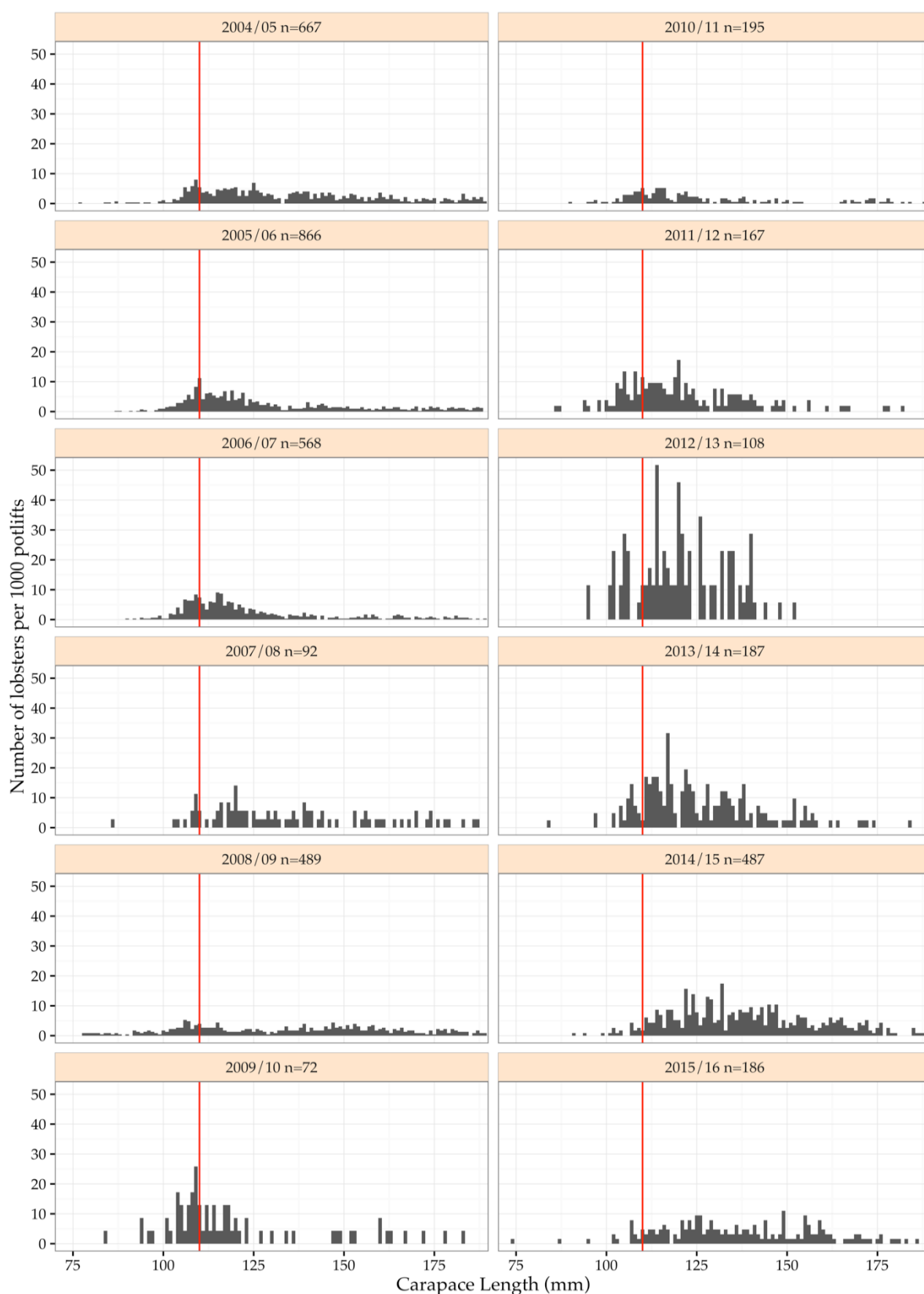


Figure 19: Length-frequency distribution of the number of male rock lobsters per 1,000 potlifts caught in the Eastern Zone onboard observer program from 2004–05 to 2015–16 fishing years (Nov–Sept). *n*, total number of lobsters measured.

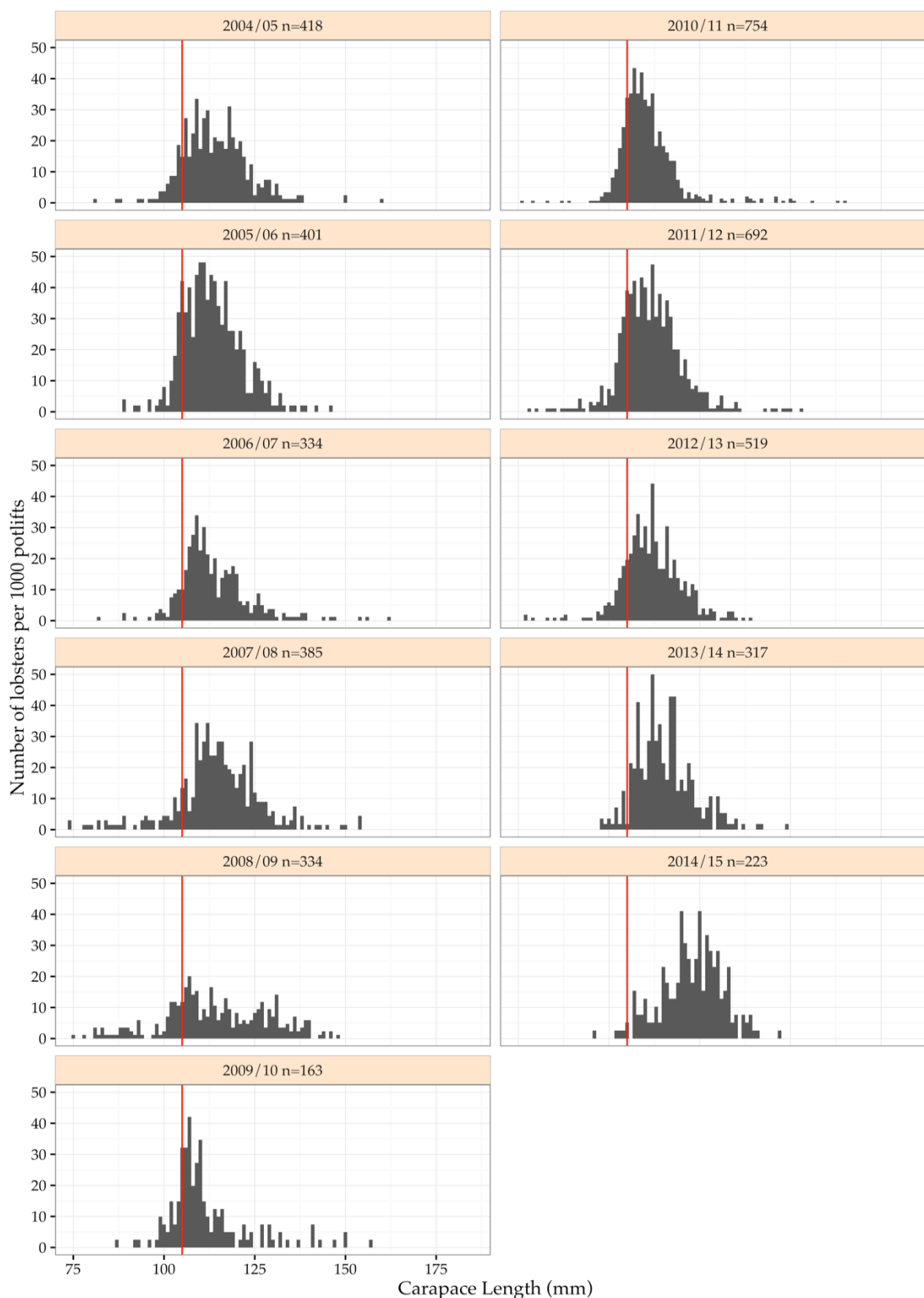


Figure 20: Length-frequency distribution of the number of female rock lobsters per 1,000 potlifts caught in the Eastern Zone fixed-site survey program from 1995–96 to 2014–15 fishing years (Nov–Sept), no new measurements were available from 2015–16.. *n*, total number of lobsters measured.

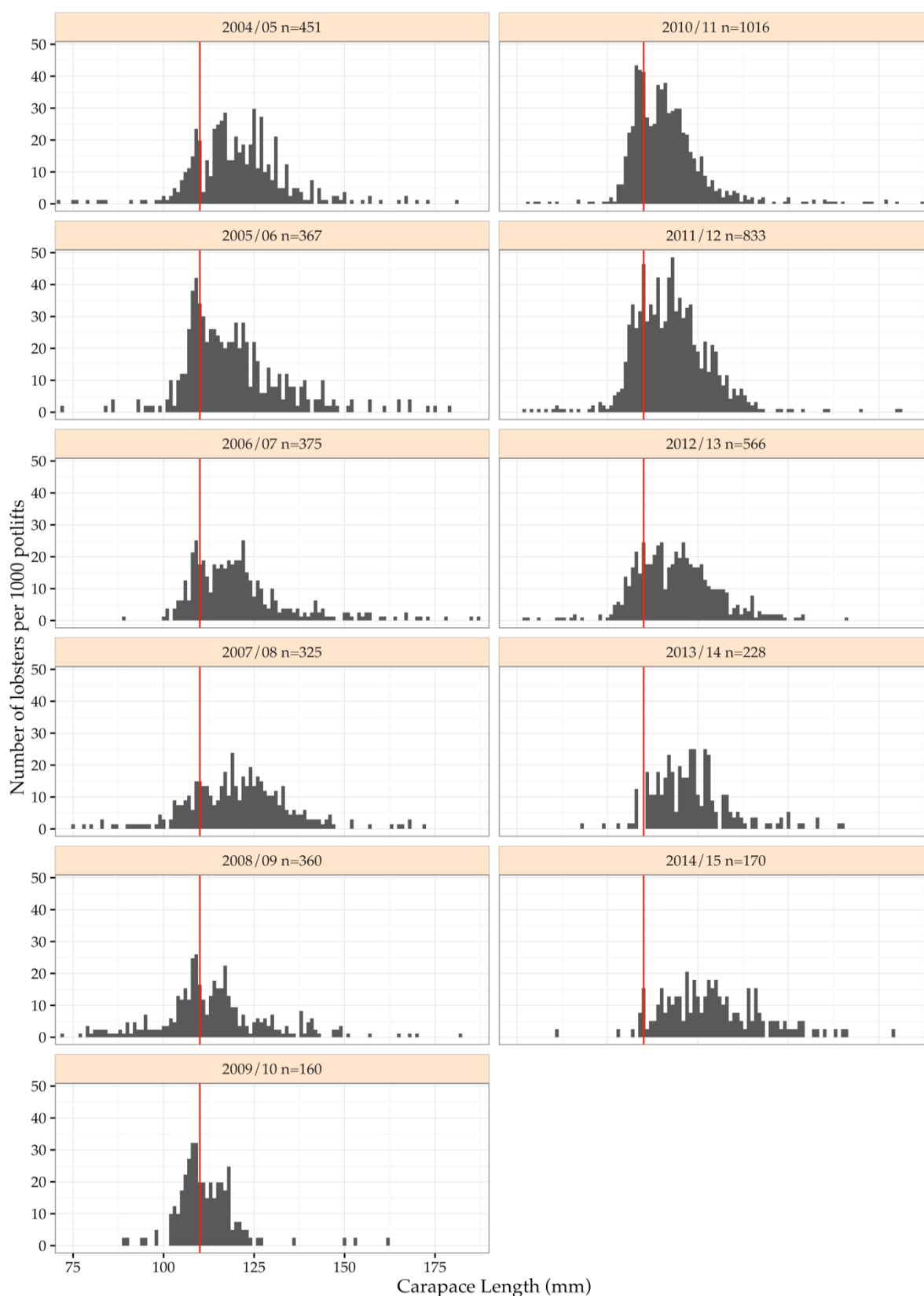


Figure 21: Length-frequency distribution of the number of male rock lobsters per 1,000 potlifts caught in the Eastern Zone fixed-site survey program from 1995–96 to 2014–15 fishing years (Nov–Sept), no new measurements were available from 2015–16.. n, total number of lobsters measured.

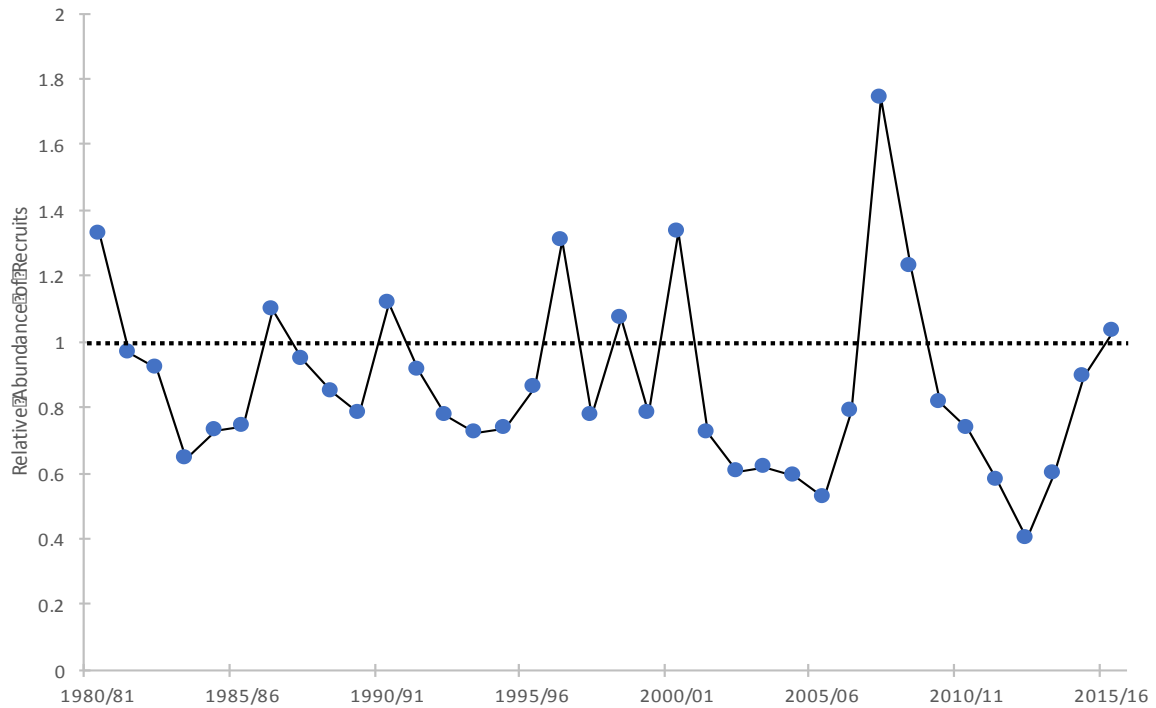


Figure 22: Relative number of recruits (to 60 mm in CL) in the Eastern Zone Fishery. These data are generated by the length-frequency model. The long-term average is indicated by the dotted black line.

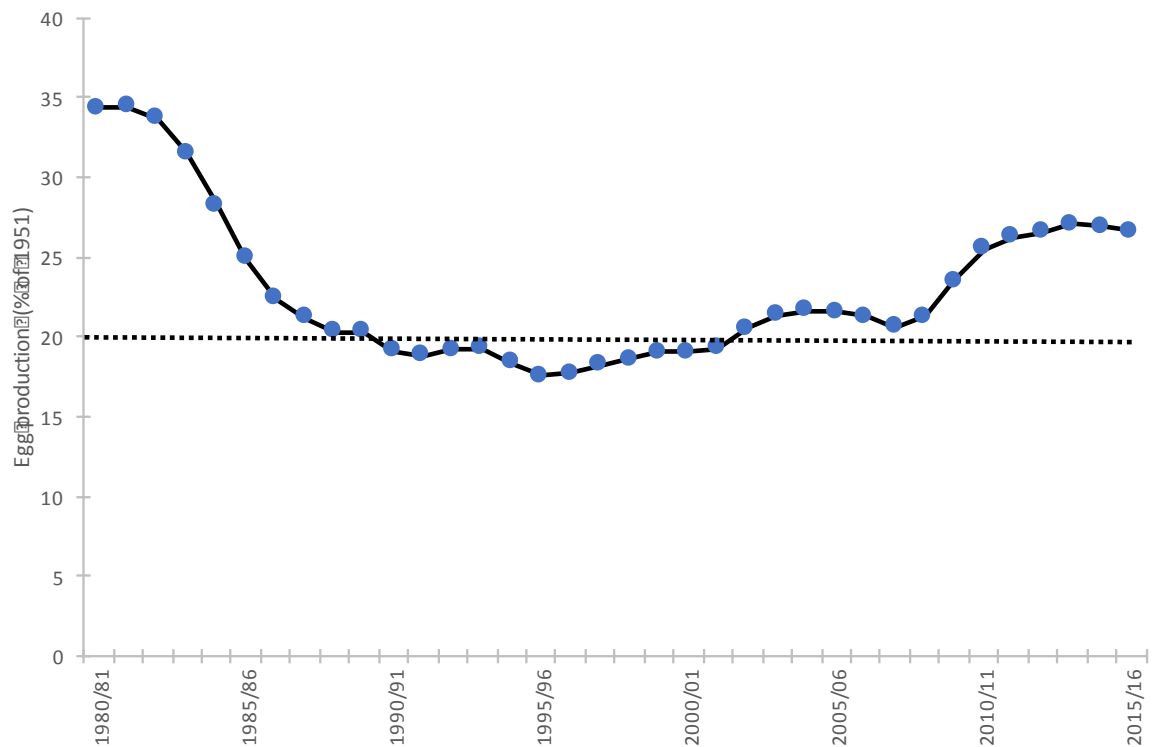


Figure 23: Model estimated level of egg production through time in the Eastern Zone fishery. The limit reference point(dotted line) is 20% of egg production estimated in 1951 (E1951) as defined under the 2016 harvest strategy.

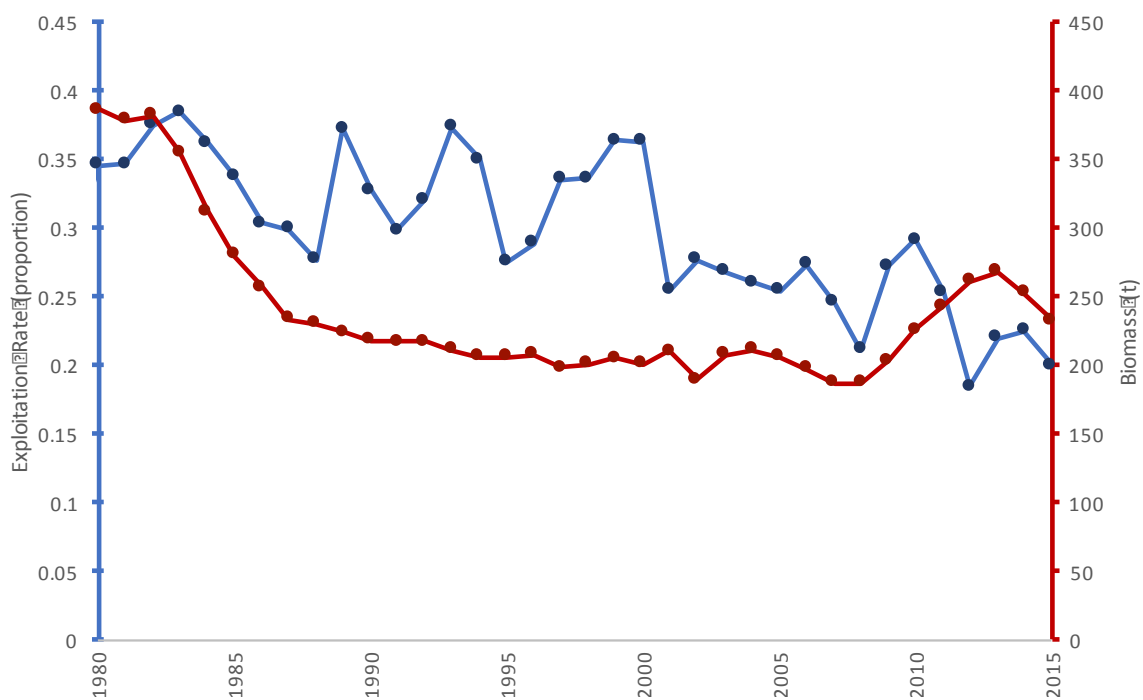


Figure 24: Model estimated levels of available biomass (solid red line) and associated fishing exploitation rates (blue line) in the Eastern Zone fishery between 1980 and 2015.