

# **Victorian Rock Lobster Fishery Stock Assessment: 2012/13 Fishing Season**

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## Victorian Rock Lobster Fishery Report: 2012/13 Season.

### Summary

- In 2012/13, the total allowable commercial catch (TACC) was fully taken in both zones. The logbook estimated catches for the Western and Eastern Zone rock lobster fisheries were 258 t of the 260 t TACC and 48 t of the 51 t TACC respectively for the 2012/13 fishing year, which is considered to be fully caught.
- Nominal catch per unit effort (CPUE) has increased in both zones over the last three to four seasons. In 2012/13, the Western Zone CPUE was 0.53 kg/pot-lift, reflecting a 43% increase from the historical low in 2009/10 of 0.37 kg/pot-lift. In the Eastern Zone, the 2012/13 CPUE was 0.51 kg/pot-lift, an increase of 38% from 0.37 kg/pot-lift in 2008/09..
- Current increases in CPUE reflect the above average model estimated recruitment to 60 mm carapace length (CL) in 2007/08 and 2008/09. These increases are confirmed by results from fixed-site surveys in both zones that highlight increases in pre-recruit indices from 2007/08 to 2010/11.
- While commercial CPUEs are currently increasing in the Western Zone, it is important to note that recruitment to 60 mm CL was considerably below average in 2009/10. The time period from recruitment to legal size is approximately four years, suggesting that fishery recruitment in 2013/14 may be reduced. The pre-recruit index from fixed-site surveys has also decreased in this zone over the last two seasons.
- Western Zone egg production in 2012/13 was 74% of the egg production in the reference year 2001/02 (above the 35% limit). Available biomass was 75% of the available biomass at 2001/02 (below the 159% target).
- A 230 t Western Zone TACC is required for the 2014/15 quota year to maintain biomass rebuilding on the target trajectory to 2020/21 based on a 50% probability forward projection.
- Eastern Zone egg production in 2012/13 was 152% of the egg production in the reference year 2001/02 (above the limit of 104%). Available biomass in 2012/13 was 136% of available biomass in 2001/02 (below the 184% target).
- The model 50% probability forward projection indicates that for a fully taken Eastern Zone TACC of 59 t, the available biomass would rebuild to the target by 2020/21.
- In the Western Zone the model biomass trajectory is consistent with the upward trend observed in nominal CPUE from 2010/11 to 2012/13. In the Eastern Zone, the model biomass trajectory has also continued to increase despite a marginal decrease in nominal CPUE from 2011/12 to 2012/13.
- The observed trends are consistent with previous advice in relation to the resource. The fishery has experienced an increase in CPUE resulting from above average recruitment to 60 mm CL in 2007/08 and 2008/09. In the Western Zone, recruitment declined to below average levels in 2009/10 indicating that the available biomass will not maintain its rebuild to the 2020/21 target at the current TACC of 260 tonnes. In the Eastern Zone, recruitment is consistent with the long-term average indicating that a TACC increase to 59 tonnes may be considered for 2014/15 whilst maintaining the biomass trajectory to the target.

## *Key Fishery Statistics*

### **1) Catch, Effort and CPUE**

#### ***Western Zone***

The logbook estimated catch for the 2012/13 fishing year (Nov-Sept) was 258 t (Table 1). Effort in 2012/13 was 483,000 potlifts, reflecting a 26% decrease since 2009/10 (650,000 potlifts). As a result of decreasing effort, catch rate has increased (Figure 1). In 2012/13, nominal CPUE was 0.53 kg/potlift reflecting a 43% increase since 2009/10 (0.37 kg/potlift) and the highest estimate since 2004/05 (0.61 kg/potlift). The 2012/13 season represents the fourth consecutive year that the TACC was fully taken (Table 2).

#### ***Eastern Zone***

The logbook estimated catch for the 2012/13 fishing year (Nov-Sept) was 48 t (Table 3). Effort was 94,000 potlifts, reflecting a 37% decrease from 2010/11 (150,000 potlifts). Nominal CPUE has increased by 38% from 0.37 kg/potlift in 2008/09 to 0.51 kg/potlift in 2012/13 (Figure 2). The 2012/13 season also represents the third consecutive year that the TACC was fully taken (Table 4).

### **2) Pre-recruit indices and recruitment**

Current CPUE trends reflect recent increases in both model estimated recruitment and pre-recruit indices. Model estimated recruitment to 60 mm CL was above average in both zones in 2007/08 and 2008/09 (Figure 3). Pre-recruit indices from fixed-site surveys increased from 2007/08 to 2010/11 (Figure 4). Recruitment to 60 mm CL subsequently entered the fishery three to four years later and reflects the current legal size CPUE increases observed in both zones over the last three to four seasons.

While CPUEs are currently increasing in the Western Zone, it is important to note that recruitment to 60 mm CL was considerably below average in 2009/10 (Figure 3). The time period from recruitment to legal size is approximately four years, suggesting that fishery recruitment in 2013/14 may be reduced. The pre-recruit index from fixed-site surveys has also decreased in this zone over the last two seasons (Figure 4).

### **3) Puerulus Settlement**

Trends in puerulus settlement support current recruitment estimates (Figure 5). Increases to recruitment (at 60 mm CL) in 2007/08 and 2008/09 correlate with high levels of puerulus settlement observed across south-eastern Australia in 2005/06 and 2006/07 (two year lag). Further correlations suggest that the period from 60 mm CL to the minimum legal size is a further three to four years (Figure 6). In total, this indicates a period of five to six years from settlement to legal size within Victoria.

### **4) Model outputs**

#### ***Western Zone***

The latest stock assessment model outputs estimate Western Zone egg production in 2012/13 to be at 74% of the egg production in the reference year 2001/02, and is therefore above the 35% limit (Figure 7). Available biomass in 2012/13 was 75% of the available biomass at 2001/02 and is below the 159% target (Figure 8). A 230 t TACC is required for the 2014/15 quota year to maintain biomass rebuilding on the target trajectory based on a 50% probability forward projection (Figure 9).

### ***Eastern Zone***

Eastern Zone egg production in 2012/13 was 152% of the egg production in the reference year 2001/02, which is above the limit of 104% (Figure 10). Available biomass in 2012/13 was 136% of available biomass in 2001/02 and is below the 184% target (Figure 11). The model 50% probability forward projection indicates that for a fully taken TACC of 59 t, the available biomass would rebuild to the target by 2020/21 (Figure 12).

## *Tables and Figures*

Fishing Year	Catch (tonne)	Catch ('000)	Nominal effort ('000 potlifts)	Nominal CPUE (kg per potlifts)	Standardised CPUE (kg per potlifts)	Mean mass of SRL (kg)
1951-52	102		42	2.41		
1952-53	132		54	2.43		
1953-54	177		69	2.56		
1954-55	292		115	2.54		
1955-56	177		87	2.03		
1956-57	134		75	1.79		
1957-58	152		93	1.64		
1958-59	147		84	1.75		
1959-60	182		104	1.75		
1960-61	268		138	1.95		
1961-62	396		202	1.96		
1962-63	326		226	1.44		
1963-64	279		201	1.39		
1964-65	233		175	1.33		
1965-66	325		250	1.30		
1966-67	308		288	1.07		
1967-68	372		373	1.00		
1968-69	413		455	0.91		
1969-70	430		495	0.87		
1970-71	441		497	0.89		
1971-72	458		583	0.79		
1972-73	463		638	0.73		
1973-74	429		555	0.77		
1974-75	286		430	0.67		
1975-76	303		406	0.75		
1976-77	339		464	0.73		
1977-78	309		433	0.71		
1978-79	486	485	622	0.78	0.83	1.00
1979-80	453	444	576	0.79	0.86	1.02
1980-81	549	548	680	0.81	0.87	1.00
1981-82	499	499	637	0.78	0.82	1.00
1982-83	460	455	608	0.76	0.85	1.01
1983-84	421	414	571	0.74	0.77	1.02
1984-85	406	394	578	0.70	0.70	1.03
1985-86	345	346	569	0.61	0.61	1.00
1986-87	351	353	595	0.59	0.60	0.99
1987-88	345	349	557	0.62	0.60	0.99
1988-89	304	322	577	0.53	0.53	0.94
1989-90	331	355	613	0.54	0.53	0.93
1990-91	317	337	650	0.49	0.49	0.94
1991-92	408	439	712	0.57	0.59	0.93
1992-93	408	433	779	0.52	0.54	0.94
1993-94	448	456	754	0.59	0.56	0.98
1994-95	435	444	789	0.55	0.50	0.98
1995-96	423	442	761	0.56	0.49	0.96
1996-97	402	414	787	0.51	0.44	0.97
1997-98	466	492	841	0.55	0.48	0.95
1998-99	516	568	861	0.60	0.53	0.91
1999-00	521	592	897	0.58	0.51	0.88
2000-01	525	598	895	0.59	0.49	0.88
2001-02	438	510	704	0.62	0.54	0.86
2002-03	430	495	630	0.68	0.56	0.87
2003-04	461	515	659	0.70	0.56	0.89
2004-05	408	451	667	0.61	0.48	0.90
2005-06	358	405	705	0.51	0.41	0.88
2006-07	336	392	698	0.48	0.41	0.86
2007-08	289	338	668	0.43	0.36	0.85
2008-09	235	268	606	0.39	0.32	0.88
2009-10	239	277	650	0.37	0.33	0.86
2010-11	254	307	590	0.43	0.39	0.83
2011-12	233	279	475	0.49	0.42	0.83
2012-13	258	296	483	0.53	0.43	0.87

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

		TACC set	TACC Caught		Number of months fished	Number of active licenses	Number of vessels
		(tonne)	(tonne)	per cent			
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

Table 2. Western Zone history of TACCs for each quota period from 2002-03 to 2012-13 (TACC: Total Allowable Commercial Catch).

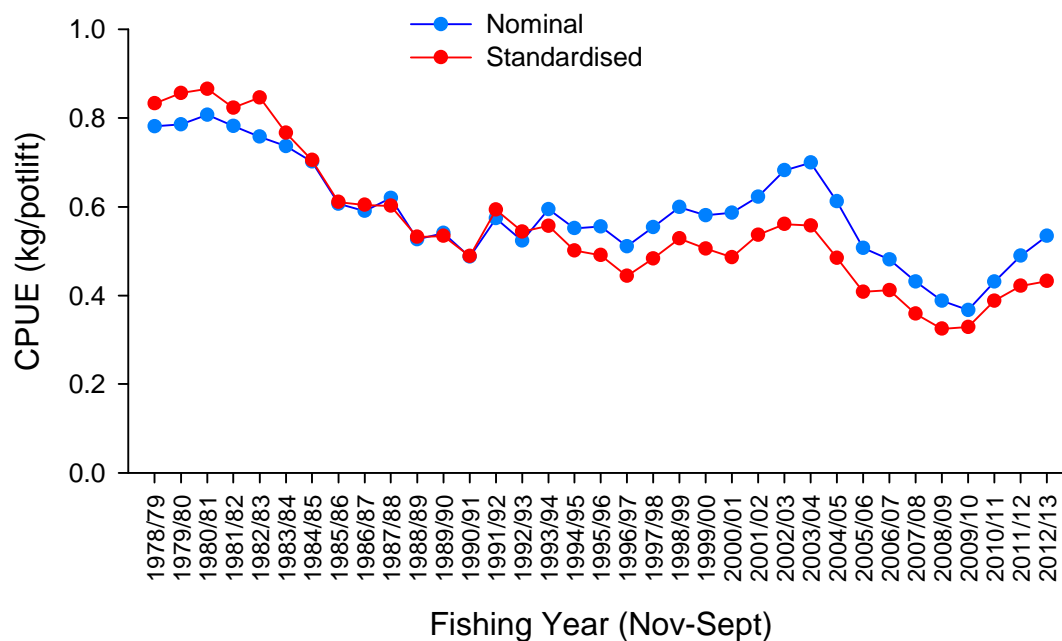


Figure 1. Western Zone CPUE from 1978-79 to 2012-13.

Fishing year	Catch (tonne)	Catch ('000)	Nominal effort ('000 potlifts)	Nominal CPUE (kg per potlifts)	Standardised CPUE (kg per potlifts)	Mean mass of SRL (kg)
1951-52	92		34	2.70		
1952-53	141		68	2.07		
1953-54	166		77	2.16		
1954-55	182		66	2.75		
1955-56	116		51	2.27		
1956-57	116		57	2.01		
1957-58	147		76	1.93		
1958-59	123		82	1.50		
1959-60	135		73	1.84		
1960-61	147		86	1.70		
1961-62	177		92	1.92		
1962-63	158		84	1.88		
1963-64	139		91	1.52		
1964-65	121		99	1.22		
1965-66	131		105	1.25		
1966-67	120		109	1.10		
1967-68	77		77	1.01		
1968-69	107		93	1.15		
1969-70	174		159	1.10		
1970-71	160		176	0.91		
1971-72	123		183	0.97		
1972-73	118		169	0.70		
1973-74	128		152	0.84		
1974-75	93		114	0.81		
1975-76	104		123	0.84		
1976-77	108		130	0.83		
1977-78	102		122	0.83		
1978-79	139	123	192	0.72	0.68	1.13
1979-80	116	108	171	0.67	0.66	1.07
1980-81	133	123	180	0.74	0.69	1.09
1981-82	131	120	193	0.68	0.60	1.09
1982-83	143	132	212	0.68	0.65	1.09
1983-84	136	128	230	0.59	0.59	1.06
1984-85	113	96	201	0.56	0.47	1.17
1985-86	95	81	175	0.54	0.41	1.17
1986-87	78	66	145	0.54	0.43	1.18
1987-88	70	62	130	0.54	0.37	1.13
1988-89	64	60	145	0.44	0.35	1.06
1989-90	83	85	198	0.42	0.36	0.99
1990-91	72	72	172	0.42	0.38	1.00
1991-92	65	64	175	0.37	0.35	1.02
1992-93	69	63	224	0.31	0.28	1.10
1993-94	79	68	260	0.30	0.26	1.16
1994-95	72	58	253	0.28	0.23	1.24
1995-96	57	48	220	0.26	0.22	1.19
1996-97	60	48	222	0.27	0.21	1.25
1997-98	66	54	221	0.30	0.23	1.23
1998-99	67	58	220	0.31	0.26	1.16
1999-00	75	71	232	0.32	0.27	1.05
2000-01	73	67	219	0.33	0.27	1.08
2001-02	53	50	151	0.35	0.31	1.08
2002-03	52	48	134	0.39	0.33	1.09
2003-04	56	51	133	0.42	0.37	1.09
2004-05	55	49	136	0.40	0.36	1.13
2005-06	52	46	122	0.43	0.36	1.14
2006-07	54	48	136	0.40	0.36	1.13
2007-08	46	39	123	0.37	0.35	1.19
2008-09	39	32	108	0.37	0.34	1.24
2009-10	55	50	146	0.38	0.35	1.11
2010-11	66	62	150	0.44	0.43	1.05
2011-12	62	55	114	0.54	0.50	1.13
2012-13	48	43	94	0.51	0.53	1.11

Table 3. Eastern Zone catch, fishing effort and CPUE (Fishing Year: November-September; SRL: southern rock lobster, CPUE: catch per unit effort).



		TACC set	TACC Caught		Number of months fished	Number of active licenses	Number of vessels
		(tonne)	(tonne)	Per cent			
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	37
2004-05	1 Apr - 31 Mar	60	53.2	89	12	39	38
2005-06	1 Apr - 31 Mar	60	55.7	93	12	33	32
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	25	23
2009-09	1 Apr - 30 Jun	6.9	5.8	84	3	18	19
2009-10	1 Jul - 30 Jun	66	43.9	67	12	22	21
2010-11	1 Jul - 30 Jun	66	64.8	98	12	26	25
2011-12	1 Jul - 30 Jun	66	65.3	99	12	25	21
2012-13	1 Jul - 30 Jun	48	47.3	99	12	24	na

Table 4. Eastern Zone history of TACCs for each quota period from 2002-03 to 2012-13 (TACC: Total Allowable Commercial Catch).

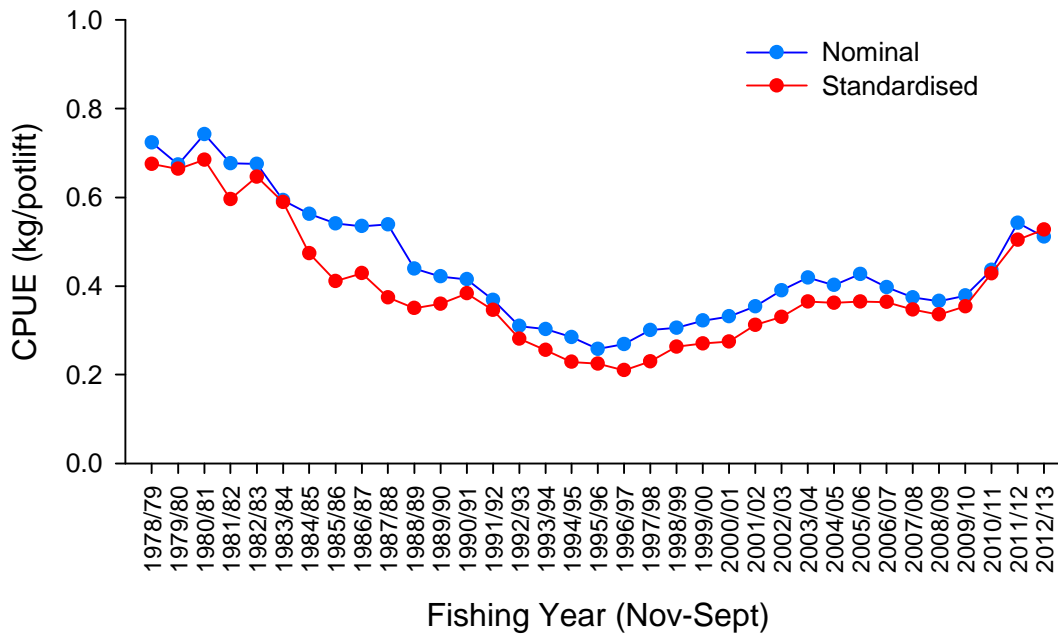


Figure 2. Eastern Zone CPUE from 1978-79 to 2012-13.

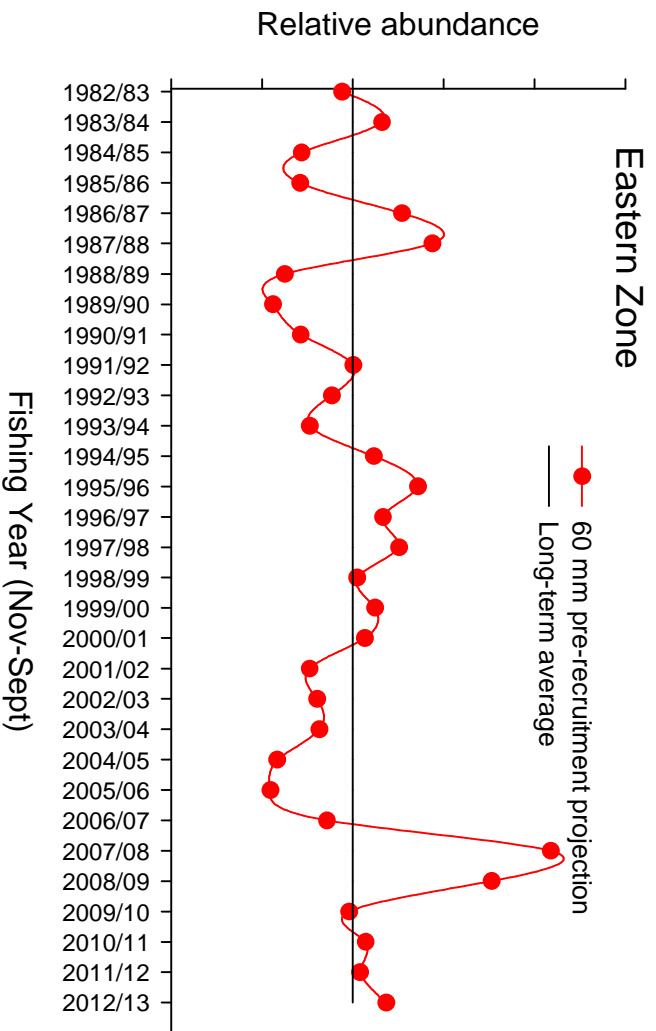
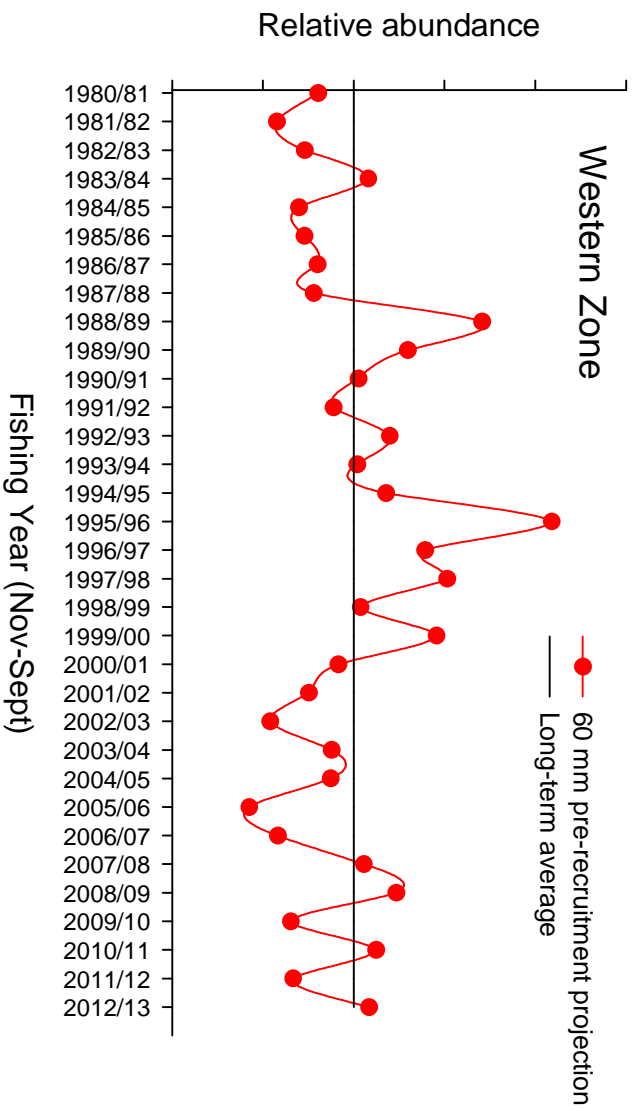


Figure 3. Recruitment to 60 mm CL for Western Zone (top) and Eastern Zone (bottom) fisheries as used in the length-frequency model. Long-term historical average (solid black line) also indicated.

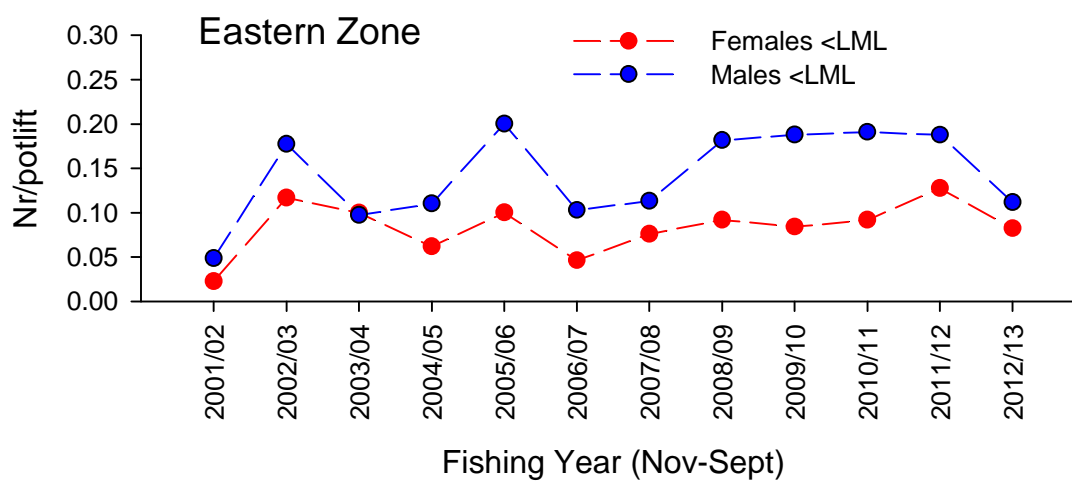
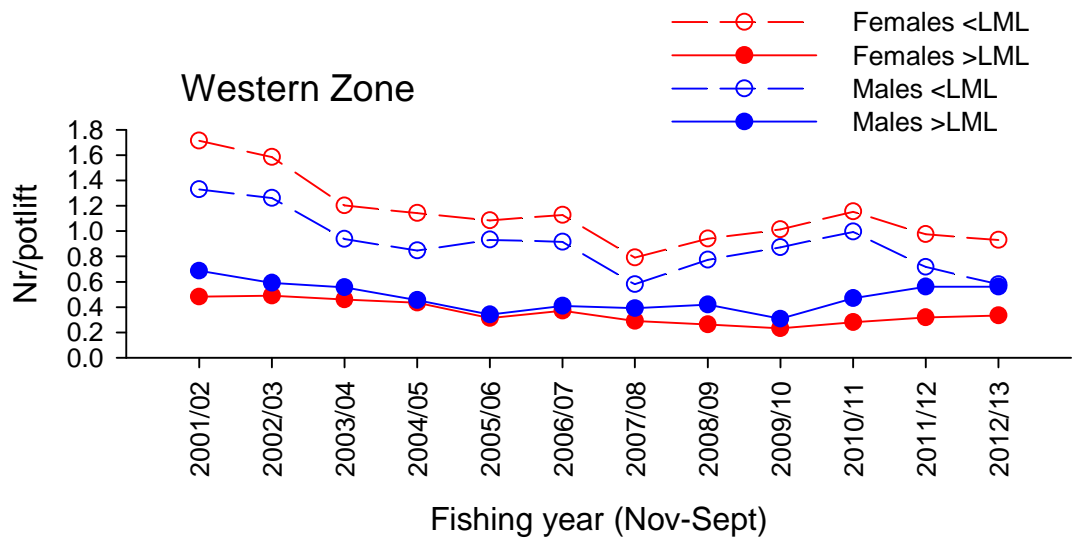


Figure 4. Western (top) and Eastern (bottom) Zone fixed-site monitoring CPUE trends.

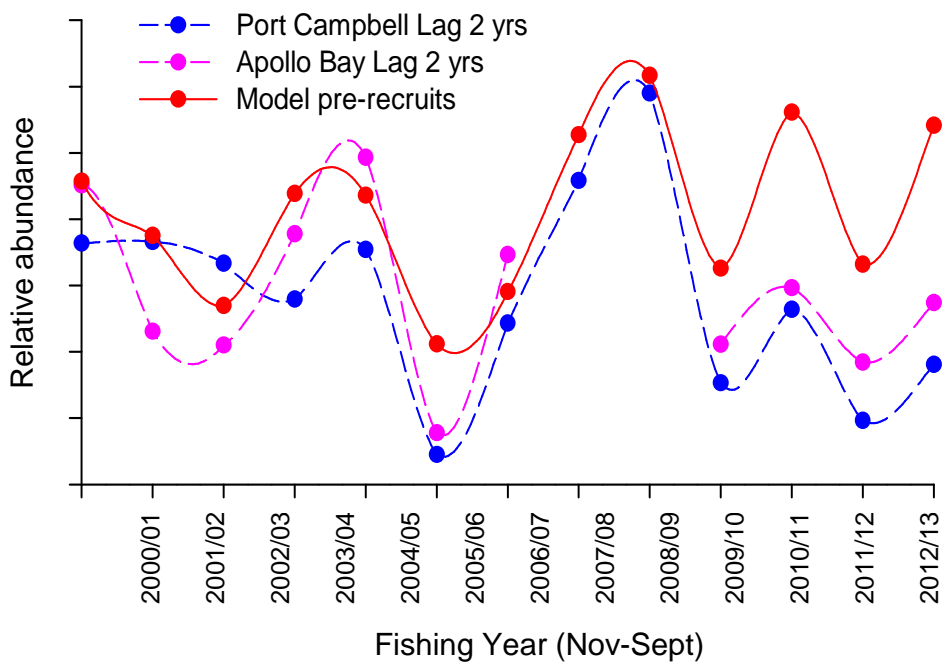


Figure 5. Model estimated recruitment to 60 mm CL in the Western Zone fishery (red line) with puerulus settlement from Port Campbell (blue line) and Apollo Bay (pink line), lagged by two years. Note: Absence of puerulus data at Apollo Bay (2007-2008) due to harbour development.

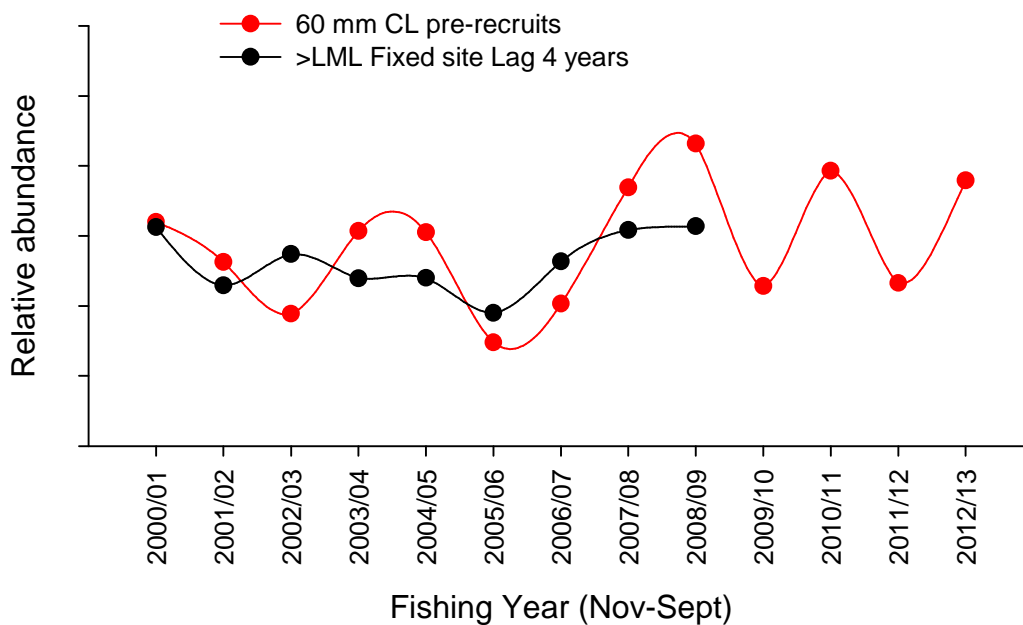


Figure 6. Comparison of model estimated recruitment to 60 mm CL in the Western Zone fishery (red line) with legal sized (black line) lagged by four years.

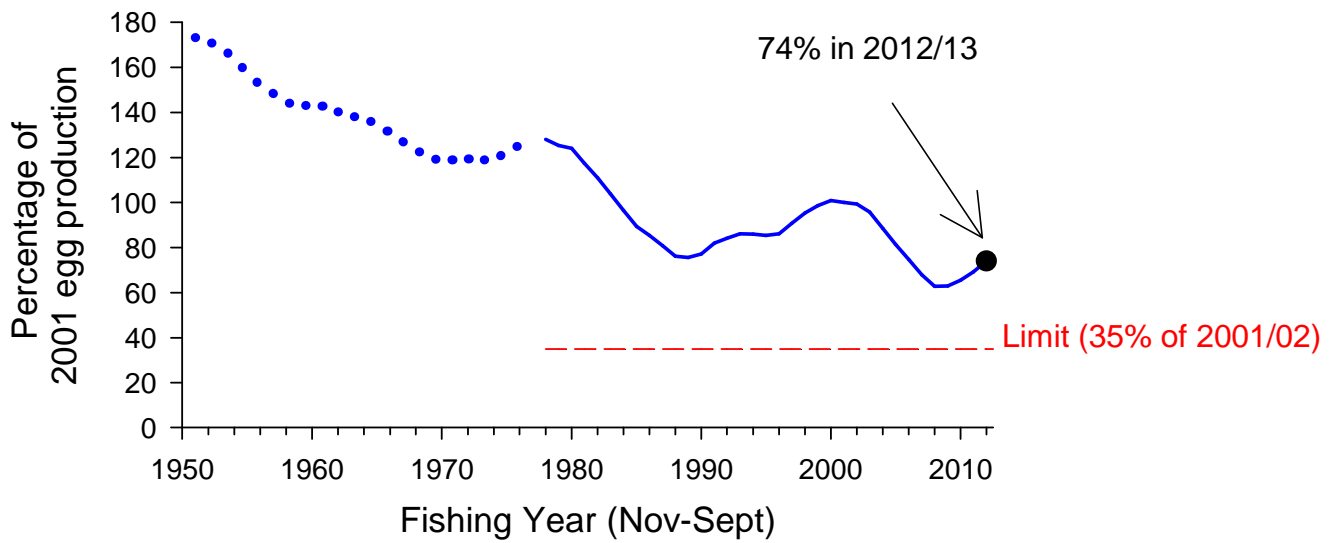


Figure 7. Model estimated level of egg production through time in the Western Zone (with 75% probability; blue line). Limit reference point (35% of egg production in 2001/02; dashed red line).

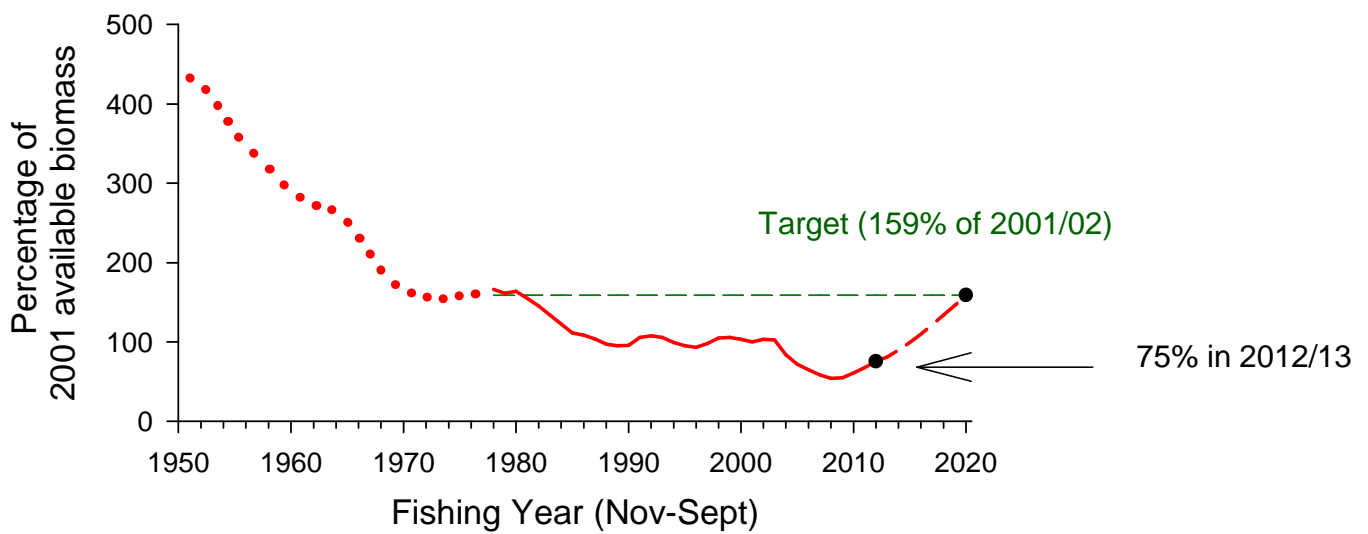


Figure 8. Model estimated levels of available biomass in the Western Zone (with 50% probability; red line). Target reference point (159% of available biomass in 2001/02; dashed green line). Projected available biomass (dashed red line) given a TACC of 230 t/yr to rebuild available biomass to the biological reference point target by 2020/21.

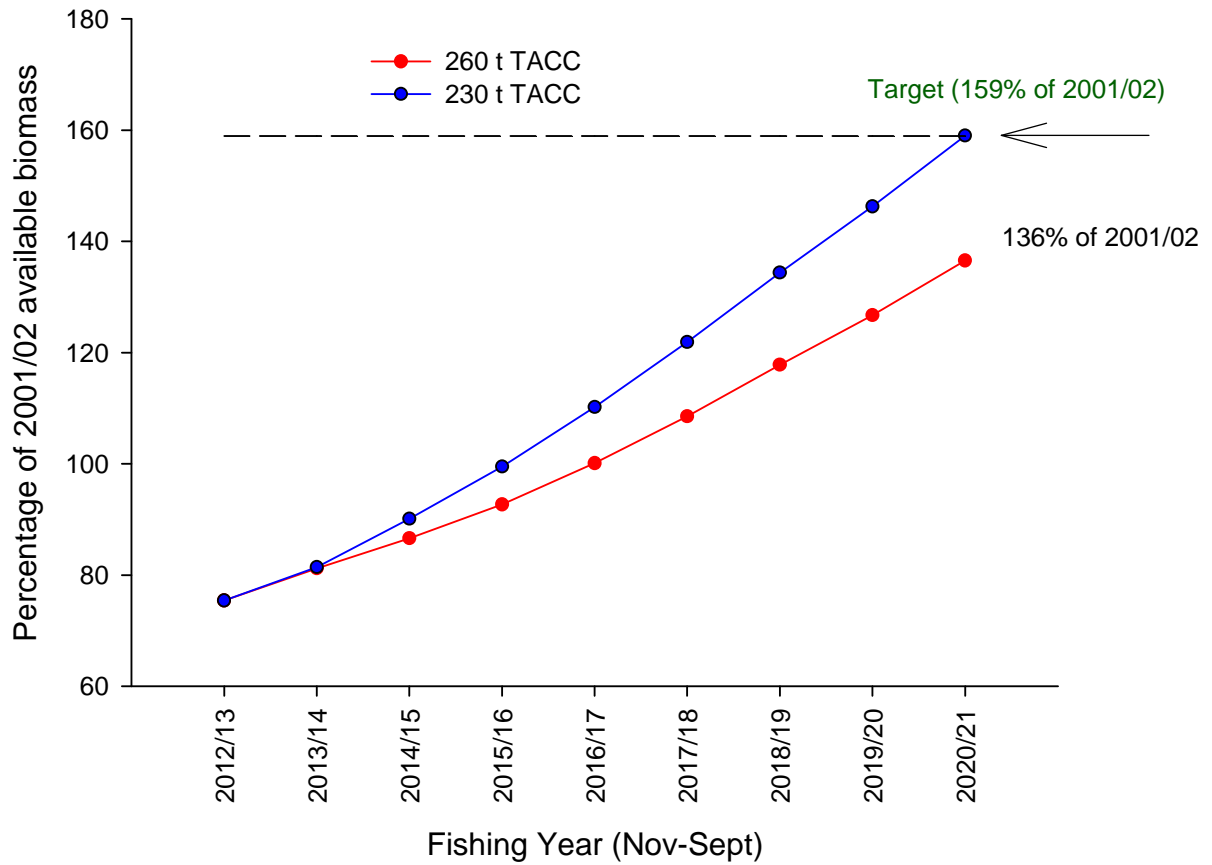


Figure 9. Western Zone projected available biomass at a TACC of 230 t (blue line) versus projection at 260 t (red line).

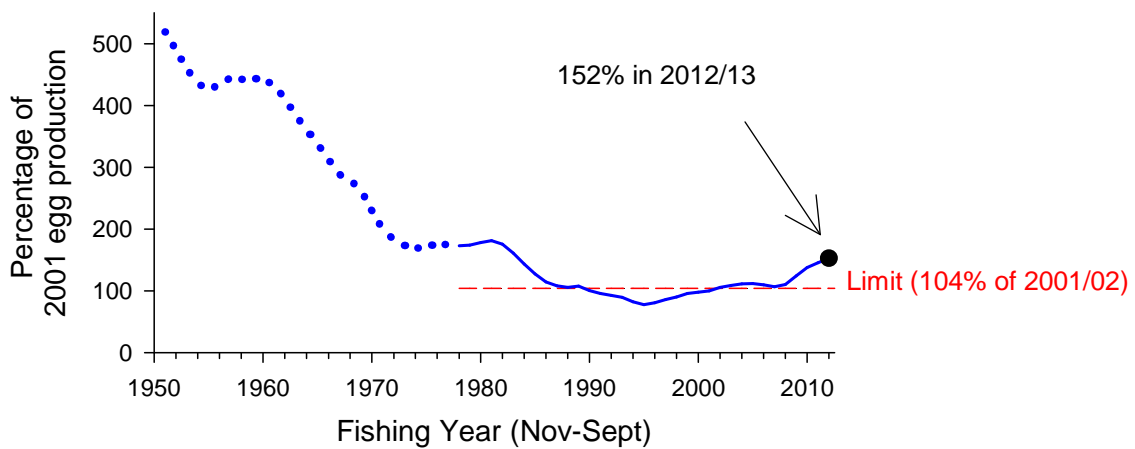


Figure 10. Model estimated level of egg production through time in the Eastern Zone (with 75% probability; blue line). Limit reference point (104% of egg production in 2001/02; dashed red line).

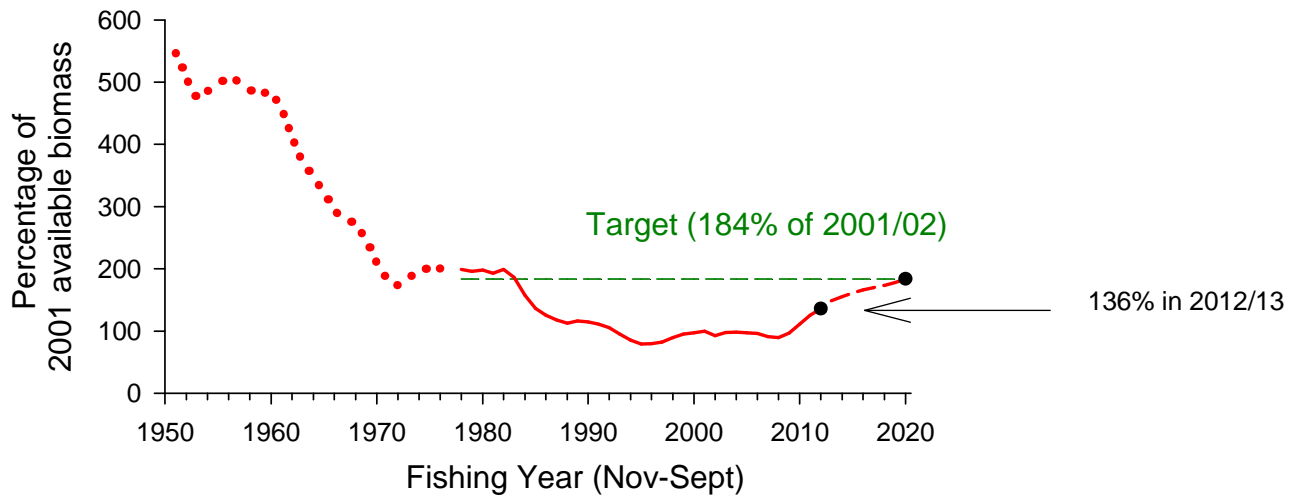


Figure 11. Model estimated levels of available biomass in the Eastern Zone (with 50% probability; red line). Target reference point (184% of available biomass in 2001/02; dashed green line). Projected available biomass (dashed red line) given a TACC of 59 t/yr to rebuild available biomass to the biological reference point target by 2020/21.

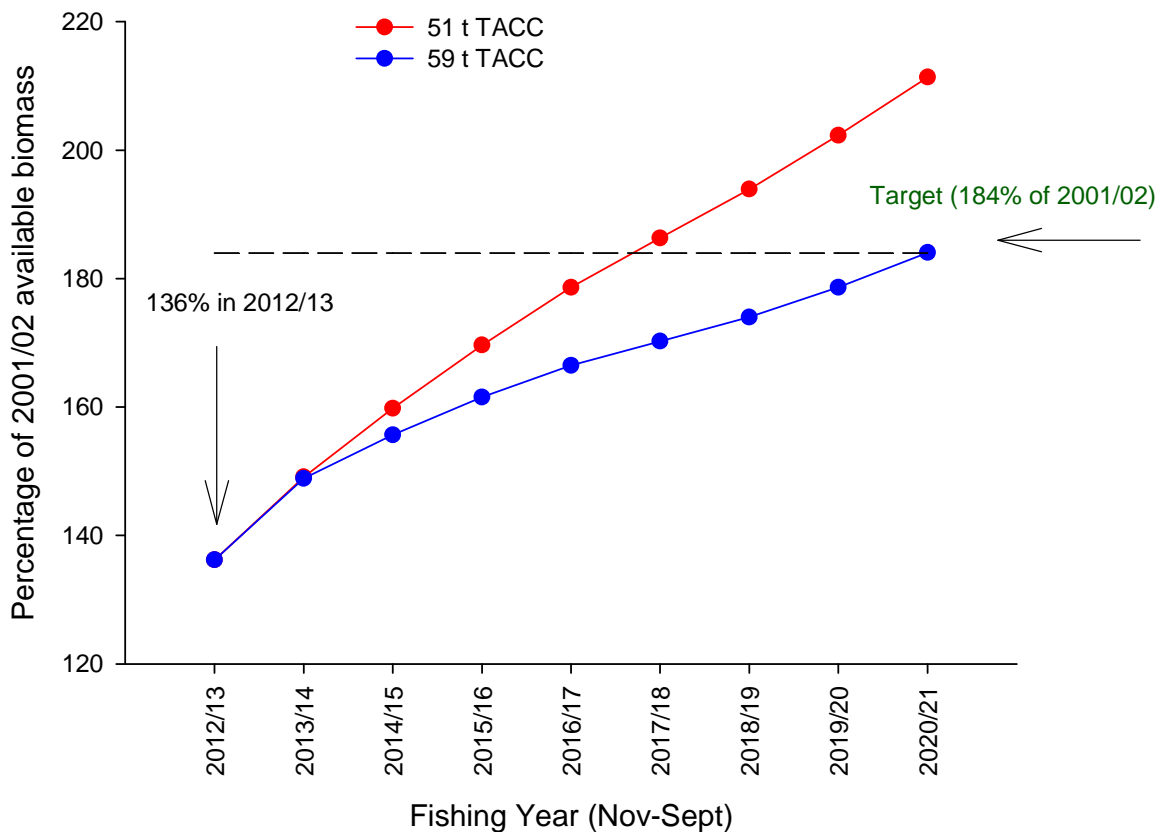


Figure 12. Eastern Zone projected available biomass at a TACC of 59 t (blue line) versus projection at 51 t (red line).

## Definitions

<b>Available biomass</b>	An estimate of the size (weight) of rock lobsters that are above legal minimum length and can be harvested.
<b>Catch per unit effort - Nominal</b>	A measure of the density or population size of rock lobsters in the fishery. It is expressed as the effort required to harvest a defined amount of catch. The data has not been altered to remove irregularities in the catch records.
<b>Catch per unit effort - Standardised</b>	A measure of the density or population size of rock lobsters in the fishery. It is expressed as the effort required to harvest a defined amount of catch. Irregularities in the data set have been removed.
<b>Egg production</b>	An estimate of the spawning size of the population.
<b>Fishery recruitment</b>	Recruitment to the fishery – rock lobsters have reached legal minimum length and are available to be harvested.
<b>Fishing year: Nov – September</b>	The period of time when the rock lobster population is considered to be at its peak due to annual recruitment to legal minimum length. It is considered the biological fishing year and the period upon which the stock assessment is based.
<b>Fixed-site surveys</b>	Surveys of rock lobster abundance using commercial rock lobster pots (combination of escape gaps open and closed) and research pots (escape gaps closed).
<b>Legal minimum length</b>	Carapace length of 105mm for female and 110mm for male rock lobsters.
<b>Limit reference point</b>	The minimum level of biomass which stock (or equivalent measure such as egg production) must not fall below.
<b>Model estimated recruitment</b>	The abundance of rock lobsters up to 60mm carapace length generated by the stock assessment model. The model uses real data from fixed-site and observer surveys.
<b>Pre-recruit indices</b>	A measure of the abundance of all rock lobsters in the population under the legal minimum length.
<b>Pre-recruits</b>	All rock lobsters under the legal minimum length.
<b>Puerulus</b>	After passing through at least 9 oceanic planktonic larval stages, the puerulus stage is an immature form resembling an adult rock lobster.
<b>Quota year</b>	1 July to 30 June.
<b>Recruitment</b>	Recruitment to the fishery – rock lobsters have reached legal minimum length and are available to be harvested.
<b>Recruits to 60mm</b>	Juvenile rock lobsters up to 60mm carapace length.
<b>Reference year: 2001-02</b>	The year against which biomass comparisons are made. In 2012, the reference year was changed from 1951 to 2001-02 to reflect the introduction of improved catch and effort data.
<b>Target</b>	The stock rebuilding strategy in the Rock Lobster Fishery Management Plan is to rebuild the available biomass to a target equivalent to 40% of the 1951 biomass by 2020-21. (In changing the reference year to 2001-02, the targets also changed: Eastern Zone target is 219% of the 2001-02 biomass, and Western Zone is 173% of the 2001-02 biomass).