

Victorian Rock Lobster Fishery Stock Assessment 2013

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Summary

- The logbook estimated 2011/12 Fishing Year (Nov-Sept) catch for the Victorian Western and Eastern zone rock lobster fisheries were 233 and 62 t respectively. In 2011/12, the Total Allowable Commercial Catch (TACC) was fully taken in both zones for the second consecutive season.
- Nominal catch per unit effort (CPUE) has increased in both zones over the last 2-3 seasons. In 2011/12, the Western Zone CPUE was 0.49 kg/potlift, reflecting a 32% increase from 2009/10 (0.37 kg/potlift). In the Eastern Zone, the 2011/12 CPUE was 0.54 kg/potlift, an increase of 46% from 2008/09 (0.37 kg/potlift).
- Current increases in CPUE reflect the high model estimated recruitment to 60 mm carapace length (CL) in 2007 and 2008 now entering the fishery. These increases are confirmed by results from fixed site surveys in both zones which highlight high pre-recruit indices from 2008-2010. However, while commercial CPUEs are currently increasing, it is important to note that recruitment to 60 mm CL decreased from 2009-2011 suggesting that fishery recruitment after 2013 may be reduced.
- Western Zone egg production in 2011/12 was 74% of the egg production in the reference year 2001/02 (well above the 35% limit). Available biomass was 75% of the available biomass at 2001/02 (well below the 173% target). To rebuild to the 2020/21 target, the model estimates that a TACC of 259 t is required, based on a 50% probability.
- Eastern zone egg production in 2011/12 was 148% of the egg production in the reference year 2001/02 (above the limit of 104%). Available biomass in 2011/12 was 126% of available biomass in 2001/02 (well below the 219% target). To rebuild to the 2020/21 target, the model estimates that a TACC of 51 t is required, based on a 50% probability.
- In both the Western and Eastern Zones, the model biomass trajectory is consistent with the upward trend observed in nominal CPUE from 2009/10 to 2011/12.
- The observed trends are consistent with previous advice in relation to the resource. The fishery is currently experiencing an increase in CPUE resulting from above average recruitment to 60 mm CL in 2007 and 2008. This recruitment is expected to continue into 2012/13 before weakening as evidenced by reduced recruitment estimates post 2008. As a result, existing TACCs should protect current recruitment to ensure that biomass rebuilding continues to occur.

Key Fishery Statistics

1) Catch, Effort and CPUE

Western Zone

The logbook estimated Fishing Year (Nov-Sept) catch for 2011/12 was 233 t (Table 1). Effort in 2011/12 was 475,000 potlifts, reflecting a 27% decrease since 2009/10 (650,000 potlifts). As a result of decreasing effort, catch rate has increased (Figure 1). In 2011/12, nominal CPUE was 0.49 kg/potlift reflecting a 32% increase since 2009/10 (0.37 kg/potlift) and the highest estimate since 2005/06 (0.51 kg/potlift). The 2011/12 season represents the second consecutive year that the TACC (240 t) was fully taken (Table 2).

Eastern Zone

The logbook estimated Fishing Year (Nov-Sept) catch for 2011/12 was 62 t (Table 3). Effort in 2011/12 was 114,000 potlifts, reflecting a 24% decrease since 2010/11 (150,000 potlifts). Over the last three seasons, catch rate has increased by 46% from 0.37 kg/potlift in 2008/09 to 0.54 kg/potlift in 2011/12 (Figure 2). The 2011/12 season also represents the second consecutive year that the TACC (66 t) 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 increased in both zones in 2007 and 2008 (Figure 3). Pre-recruit indices from fixed sites survey (no escape gaps) increased from 2008-2010 (Figure 4). Recruitment to 60 mm CL subsequently entered the fishery 3-4 years later and reflects the current increases to legal size CPUE observed in both zones over the last 2-3 seasons. However, it is important to note that recruitment to 60 mm CL decreases from 2009-2011 suggesting that fishery recruitment after 2013 may be reduced.

3) Puerulus Settlement

Trends in puerulus settlement support current recruitment estimates (Figure 5). Increases to recruitment (at 60 mm CL) in 2007 and 2008 correlate with high levels of puerulus settlement observed across south-eastern Australia in 2005 and 2006 (2 year lag). Further correlations suggest that the period from 60 mm CL to the minimum legal size is a further 3-4 years (Figure 6). In total, this indicates a period of 5-6 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 2011/12 at 74% of the egg production in the reference year 2001/02 (well above the 35% limit) (Figure 7). Available biomass was 75% of the available biomass at 2001/02 (well below the 173% target). The model 50% probability forward projection indicates that for a fully taken Total Allowable Commercial Catch (TACC) of 259 t, the available biomass would rebuild to the target within 9 years (by 2020/21) (Figure 8).

Eastern Zone

Eastern zone egg production in 2011/12 was 148% of the egg production in the reference year 2001/02 (above the limit of 104%) (Figure 9). Available biomass in 2011/12 was 126% of available biomass in 2001/02 (well below the 219% target). The model 50% probability forward projection indicates that for a fully taken TACC of 51 t, the available biomass would rebuild to the target within 9 years (by 2020/21) (Figure 10).

Tables and Figures

Table 1. Western Zone catch, fishing effort and CPUE

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)	Recreational catch (t)
1951-52	102		42	2.41			2.1
1952-53	132		54	2.43			2.8
1953-54	177		69	2.56			3.7
1954-55	292		115	2.54			6.1
1955-56	177		87	2.03			3.7
1956-57	134		75	1.79			2.8
1957-58	152		93	1.64			3.2
1958-59	147		84	1.75			3.1
1959-60	182		104	1.75			3.8
1960-61	268		138	1.95			5.6
1961-62	396		202	1.96			8.3
1962-63	326		226	1.44			6.9
1963-64	279		201	1.39			5.9
1964-65	233		175	1.33			4.9
1965-66	325		250	1.30			6.8
1966-67	308		288	1.07			6.5
1967-68	372		373	1.00			7.8
1968-69	413		455	0.91			8.7
1969-70	430		495	0.87			9.0
1970-71	441		497	0.89			9.3
1971-72	458		583	0.79			9.6
1972-73	463		638	0.73			9.7
1973-74	429		555	0.77			9.0
1974-75	286		430	0.67			6.0
1975-76	303		406	0.75			6.4
1976-77	339		464	0.73			7.1
1977-78	309		433	0.71			6.5
1978-79	486	485	622	0.78	0.82	1.00	10.2
1979-80	453	444	576	0.79	0.85	1.02	9.5
1980-81	549	548	680	0.81	0.86	1.00	11.5
1981-82	499	499	637	0.78	0.82	1.00	10.5
1982-83	460	455	608	0.76	0.83	1.01	9.7
1983-84	421	414	571	0.74	0.75	1.02	8.8
1984-85	406	394	578	0.70	0.70	1.03	8.5
1985-86	345	346	569	0.61	0.61	1.00	7.2
1986-87	351	353	595	0.59	0.60	0.99	7.4
1987-88	345	349	557	0.62	0.60	0.99	7.3
1988-89	304	322	577	0.53	0.53	0.94	6.4
1989-90	331	355	613	0.54	0.53	0.93	7.0
1990-91	317	337	650	0.49	0.49	0.94	6.6
1991-92	408	439	712	0.57	0.59	0.93	8.6
1992-93	408	433	779	0.52	0.55	0.94	8.6
1993-94	448	456	754	0.59	0.56	0.98	9.4
1994-95	435	444	789	0.55	0.50	0.98	9.1
1995-96	423	442	761	0.56	0.49	0.96	8.9
1996-97	402	414	787	0.51	0.45	0.97	8.4
1997-98	466	492	841	0.55	0.49	0.95	9.8
1998-99	516	568	861	0.60	0.53	0.91	10.8
1999-00	521	592	897	0.58	0.51	0.88	10.9
2000-01	525	598	895	0.59	0.49	0.88	11.0
2001-02	438	510	704	0.62	0.54	0.86	9.2
2002-03	430	495	630	0.68	0.56	0.87	9.0
2003-04	461	515	659	0.70	0.56	0.89	9.7
2004-05	408	451	667	0.61	0.49	0.90	8.6
2005-06	358	405	705	0.51	0.41	0.88	7.5
2006-07	336	392	698	0.48	0.41	0.86	7.1
2007-08	289	338	668	0.43	0.36	0.85	6.1
2008-09	235	268	606	0.39	0.33	0.88	4.9
2009-10	239	277	650	0.37	0.33	0.86	5.0
2010-11	254	307	590	0.43	0.39	0.83	5.3
2011-12	233	279	475	0.49	0.43	0.83	4.9

Data source: Fisheries Victoria CandE Database (11 January 2013) for period from 1978-79 to 2011-12.

Table 2. Western Zone history of TACCs for each quota period from 2002-03 to present

Present quota year (1 July 2012-30 June 2013) is incomplete; TACC is Total Allowable Commercial Catch; na, not available.

	TACC set		TACC caught		Number of months fished	Number of active		Number of vessels
	(tonne)	(tonne)	(tonne)	per cent		licences	vessels	
2002-03		450	440	98	12	79	83	
2003-04		450	436	97	12	80	79	
2004-05		450	421	94	12	79	86	
2005-06		450	405	90	12	75	77	
2006-07		450	329	73	12	71	68	
2007-08		380	319	84	12	68	64	
2008-09		320	244	76	12	61	60	
2009		55.2	36	64	3	54	53	
2009-10		240	230	96	12	54	55	
2010-11		240	237	99	12	55	55	
2011-12		240	237	99	12	53	na	
2012-13		260	173	67	7	48	na	

Data source: Fisheries Victoria, FELS Database (1 February 2013).

Table 3. 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 per potlifts)	Standardised CPUE (kg per potlifts)	Mean mass of SRL (kg)	Recreational catch (t)
1951–52	92		34	2.70			9.2
1952–53	141		68	2.07			14.2
1953–54	166		77	2.16			16.8
1954–55	182		66	2.75			18.4
1955–56	116		51	2.27			11.7
1956–57	116		57	2.01			11.6
1957–58	147		76	1.93			14.8
1958–59	123		82	1.50			12.4
1959–60	135		73	1.84			13.6
1960–61	147		86	1.70			14.8
1961–62	177		92	1.92			17.8
1962–63	158		84	1.88			15.9
1963–64	139		91	1.52			14.0
1964–65	121		99	1.22			12.2
1965–66	131		105	1.25			13.2
1966–67	120		109	1.10			12.1
1967–68	77		77	1.01			7.8
1968–69	107		93	1.15			10.8
1969–70	174		159	1.10			17.6
1970–71	160		176	0.91			16.1
1971–72	123		183	0.67			12.4
1972–73	118		169	0.70			11.9
1973–74	128		152	0.84			12.9
1974–75	93		114	0.81			9.3
1975–76	104		123	0.84			10.5
1976–77	108		130	0.83			10.9
1977–78	102		122	0.83			10.2
1978–79	139	123	192	0.72	0.66	1.13	14.0
1979–80	116	108	171	0.67	0.65	1.07	11.6
1980–81	133	123	180	0.74	0.67	1.09	13.4
1981–82	131	120	193	0.68	0.58	1.09	13.2
1982–83	143	132	212	0.68	0.64	1.09	14.4
1983–84	136	128	230	0.59	0.59	1.06	13.7
1984–85	113	96	201	0.56	0.48	1.17	11.4
1985–86	95	81	175	0.54	0.41	1.17	9.5
1986–87	78	66	145	0.54	0.43	1.18	7.8
1987–88	70	62	130	0.54	0.37	1.13	7.0
1988–89	64	60	145	0.44	0.34	1.06	6.4
1989–90	83	85	198	0.42	0.36	0.99	8.4
1990–91	72	72	172	0.42	0.38	1.00	7.2
1991–92	65	64	175	0.37	0.34	1.02	6.5
1992–93	69	63	224	0.31	0.28	1.10	7.0
1993–94	79	68	260	0.30	0.25	1.16	7.9
1994–95	72	58	253	0.28	0.23	1.24	7.3
1995–96	57	48	220	0.26	0.22	1.19	5.7
1996–97	60	48	222	0.27	0.21	1.25	6.0
1997–98	66	54	221	0.30	0.23	1.23	6.7
1998–99	67	58	220	0.31	0.26	1.16	6.8
1999–00	75	71	232	0.32	0.27	1.05	7.5
2000–01	73	67	219	0.33	0.28	1.08	7.3
2001–02	53	50	151	0.35	0.31	1.08	5.4
2002–03	52	48	134	0.39	0.33	1.09	5.3
2003–04	56	51	133	0.42	0.36	1.09	5.6
2004–05	55	49	136	0.40	0.36	1.13	5.5
2005–06	52	46	122	0.43	0.36	1.14	5.3
2006–07	54	48	136	0.40	0.37	1.13	5.4
2007–08	46	39	123	0.37	0.35	1.19	4.6
2008–09	39	32	108	0.37	0.33	1.24	4.0
2009–10	55	50	146	0.38	0.35	1.11	5.6
2010–11	66	62	150	0.44	0.42	1.05	6.6
2011–12	62	55	114	0.54	0.49	1.13	6.2

Data source: Fisheries Victoria CandE Database (11 January 2013) for period from 1978–79 to 2011–12.

Table 4 Eastern Zone history of TACs for each quota period from 2002-03 to 2012-13

Present quota year (1 July 2012-30 June 2013) is incomplete; TACC is Total Allowable Commercial Catch; na, not available.

	TACC set		TACC caught		Number of months fished	Number of active licences	Number of vessels
	(tonne)	(tonne)	(tonne)	Per cent			
2002-03		60	49.9	83	12	39	34
2003-04		60	54.4	91	12	41	37
2004-05		60	53.2	89	12	39	38
2005-06		60	55.7	93	12	33	32
2006-07		60	53.5	89	12	30	30
2007-08		66	50.1	76	12	31	31
2008-09		66	41.3	63	12	25	23
2009-09s		6.9	5.8	84	3	18	19
2009-10		66	43.9	67	12	22	21
2010-11		66	64.8	98	12	26	25
2011-12		66	65.3	99	12	25	21
2012-13		48	35.3	74	7	24	na

Data source: Fisheries Victoria FILS Database (1 February 2013).

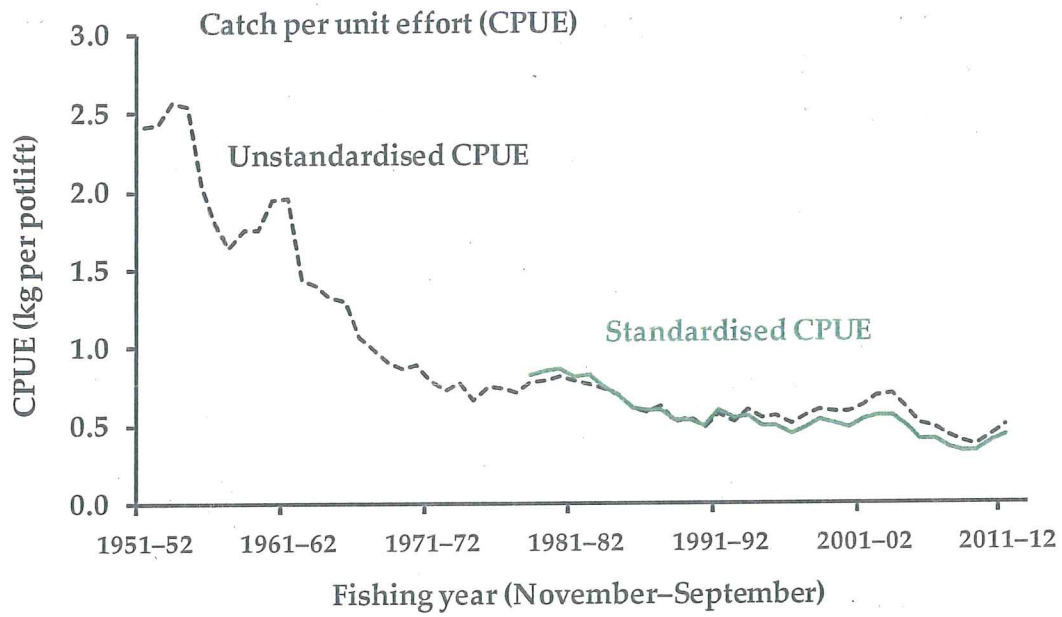


Figure 1. Western Zone CPUE from 1951-52 to 2011-12

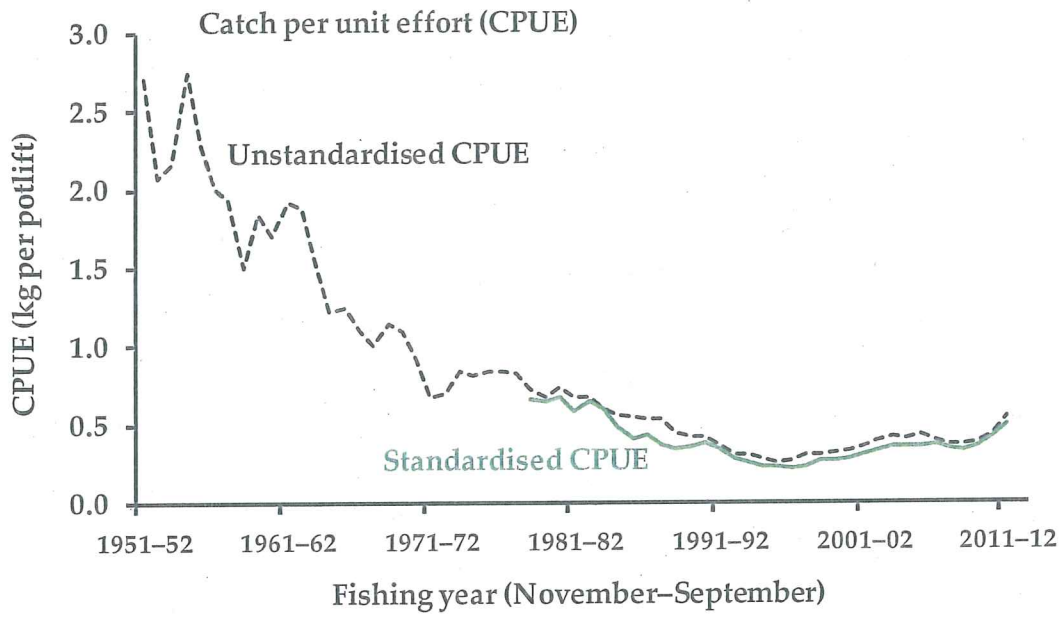


Figure 2. Eastern Zone CPUE from 1951-51 to 2011-12.

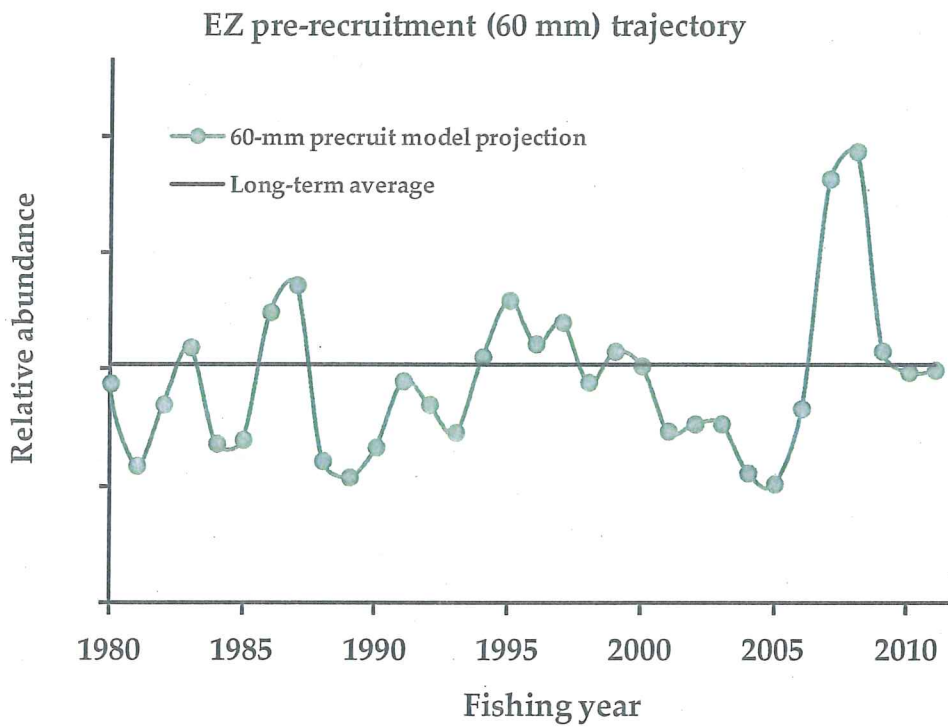
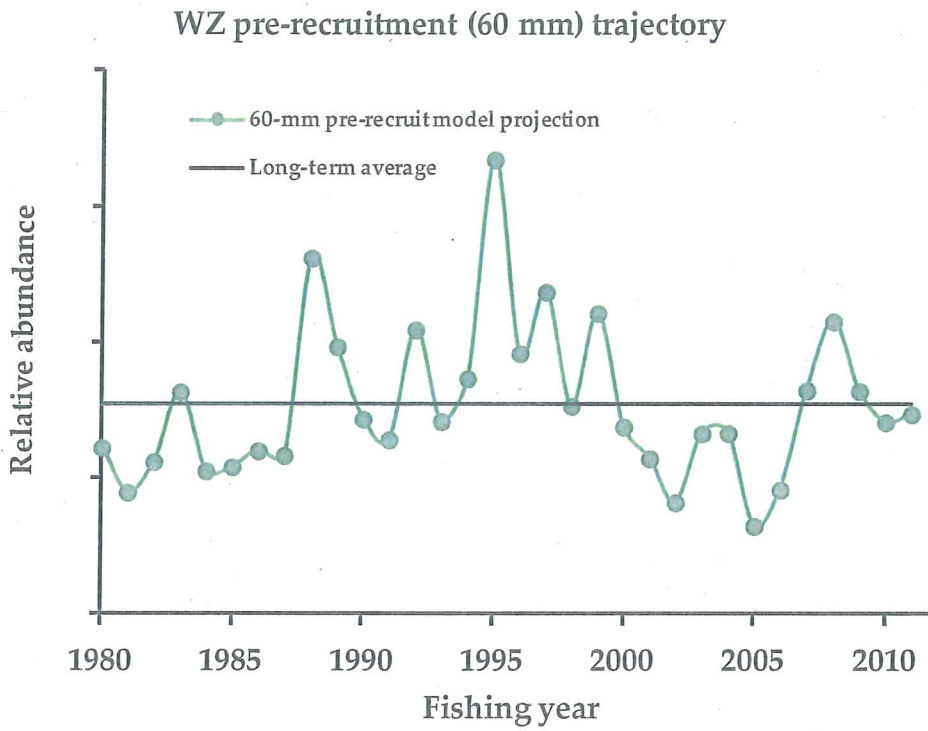


Figure 3. Recruitment to 60 mm CL for Western Zone (WZ) and Eastern Zone (EZ) fisheries as used in the length-frequency model. Long-term historical average (solid black line) also indicated.

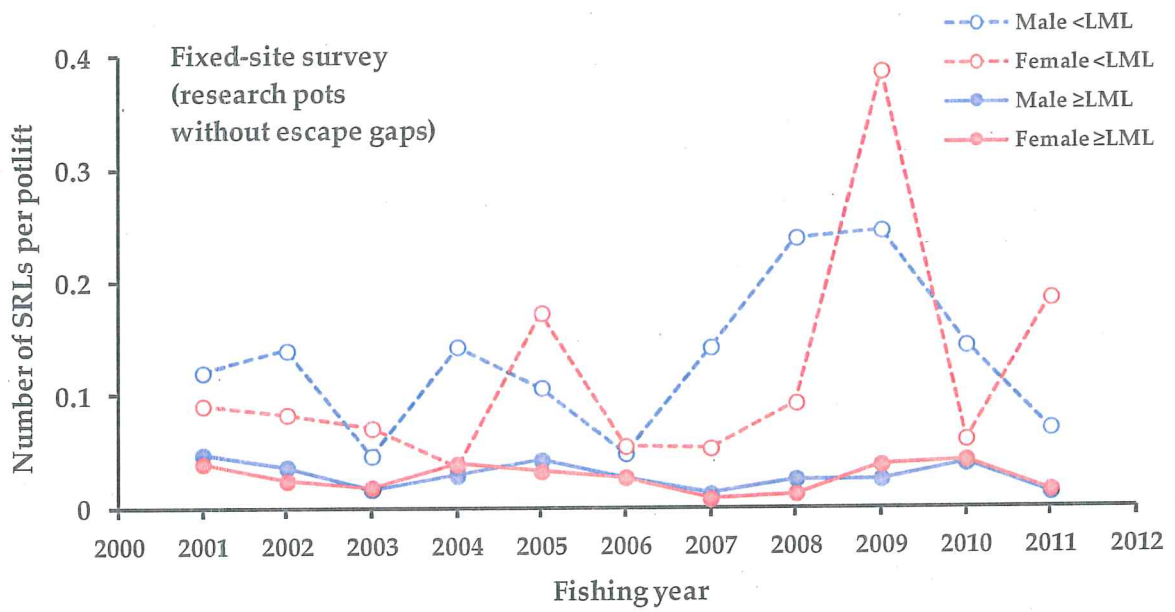
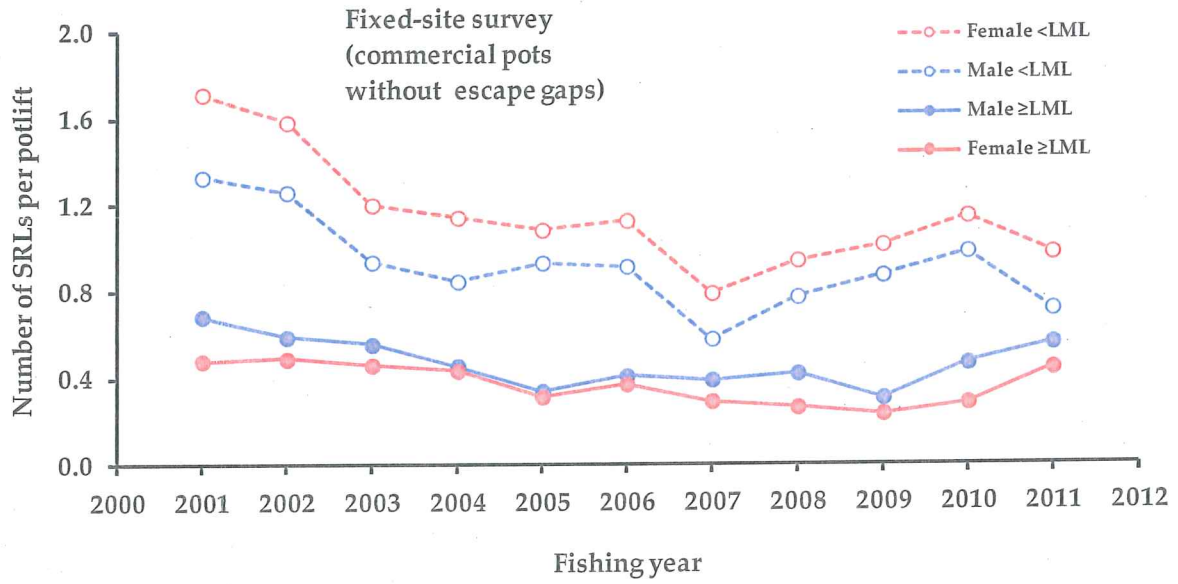


Figure 4. Western (top) and Eastern (bottom) Zone fixed site monitoring CPUE trends.

WZ comparison of puerulus with 60-mm SRL model projections

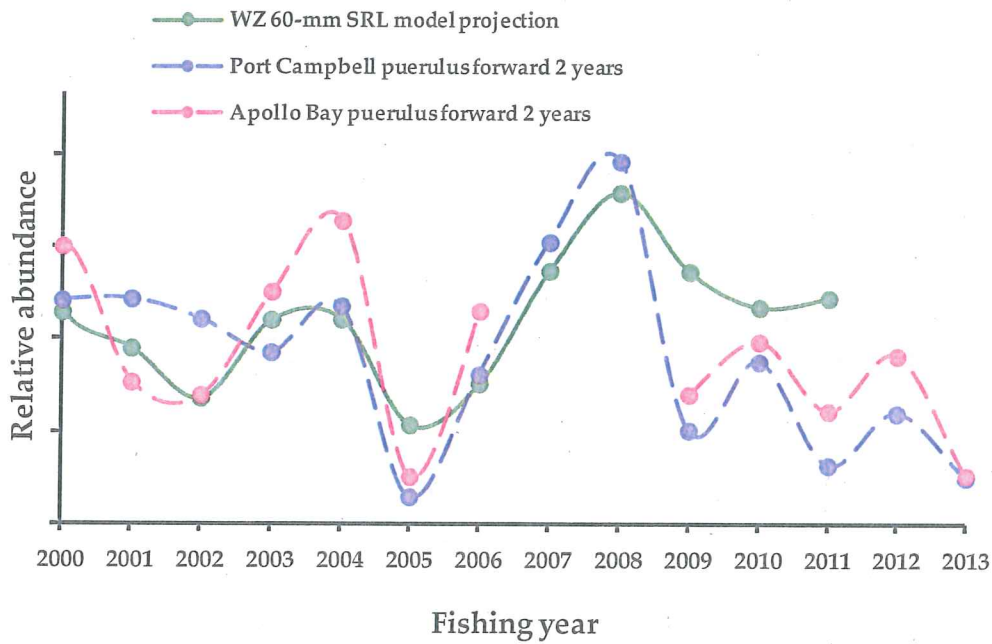


Figure 5. Model estimated recruitment to 60 mm CL in the Western Zone (WZ) fishery (green line) with puerulus settlement from Port Campbell (blue line) and Apollo Bay (pink line), lagged by two years. Note: Absence of puerulus data at Apollo Bay (2007-2008) due to harbour development.

WZ comparison of fixed-site survey with 60-mm SRL model projections

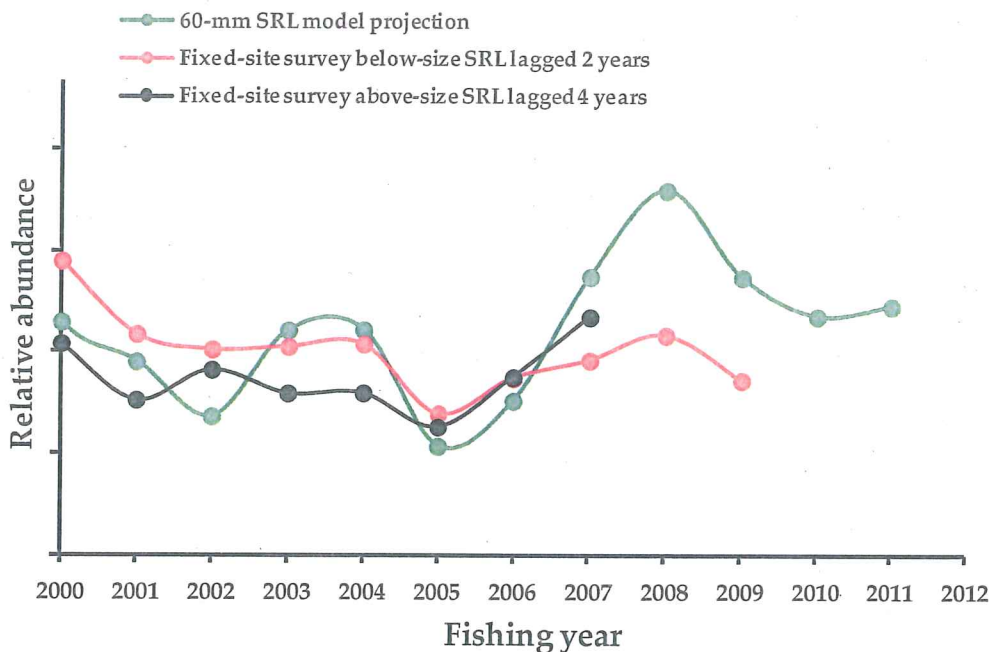


Figure 6. Comparison of model estimated recruitment to 60 mm CL in the Western Zone (WZ) (green line) with undersized (red line) lagged by two years and legal sized (black line) lagged by four years.

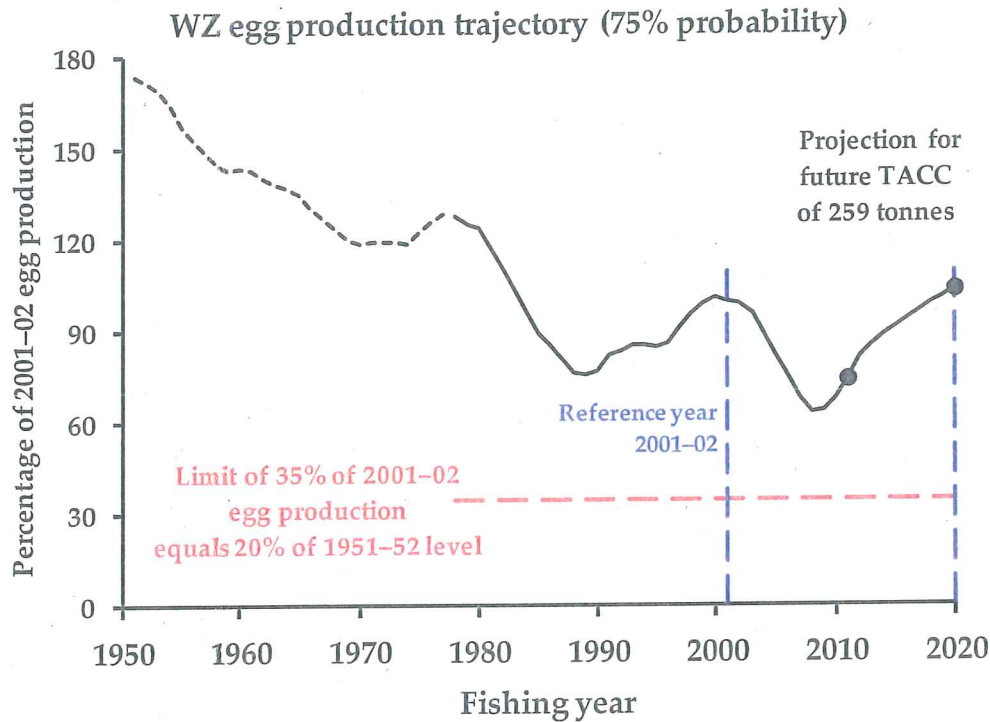


Figure 7. Model estimated level of egg production through time in the Western Zone (WZ) (with 75% probability; black line). Limit reference point (35% of egg production in 2001; dashed red line). Projected egg production (dashed blue line) given a TACC of 259 t/yr, to rebuild available biomass to the biological reference point target by 2020

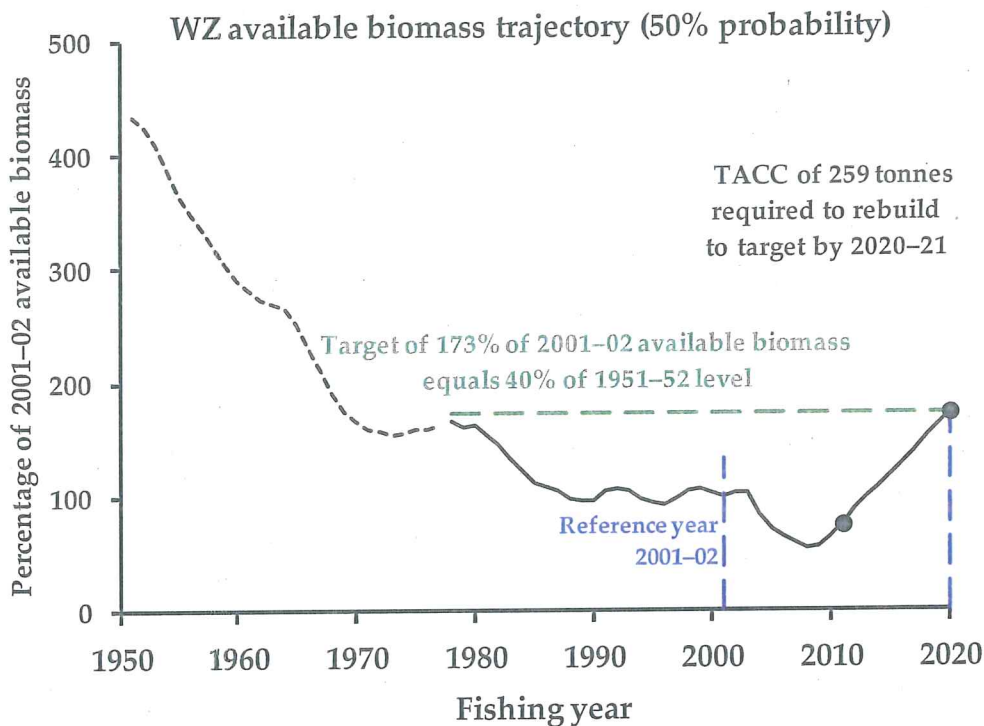


Figure 8. Model estimated levels of available biomass in the Western Zone (WZ) (with 50% probability; black line). Target reference point (173% of available biomass in 2001; dashed green line). Projected available biomass (dashed blue line) given a TACC of 259 t/yr to rebuild available biomass to the biological reference point target by 2020.

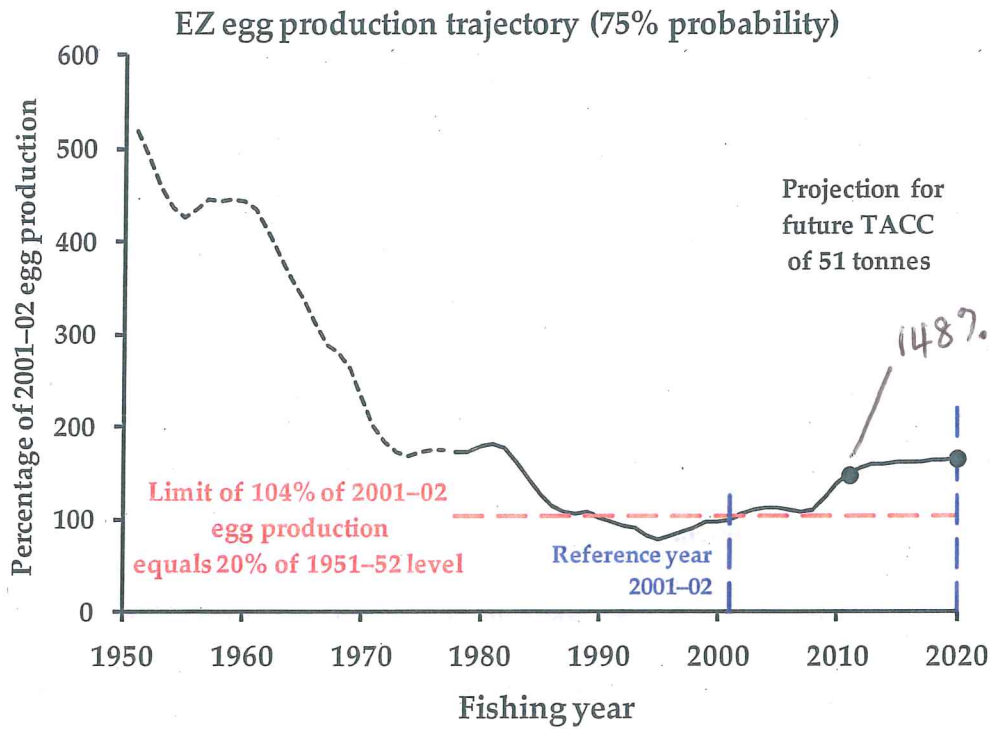


Figure 9. Model estimated level of egg production through time in the Eastern Zone (EZ) (with 75% probability; black line). Limit reference point (104% of egg production in 2001; dashed red line). Projected egg production (dashed blue line) given a TACC of 51 t/yr to rebuild available biomass to the biological reference point target by 2020.

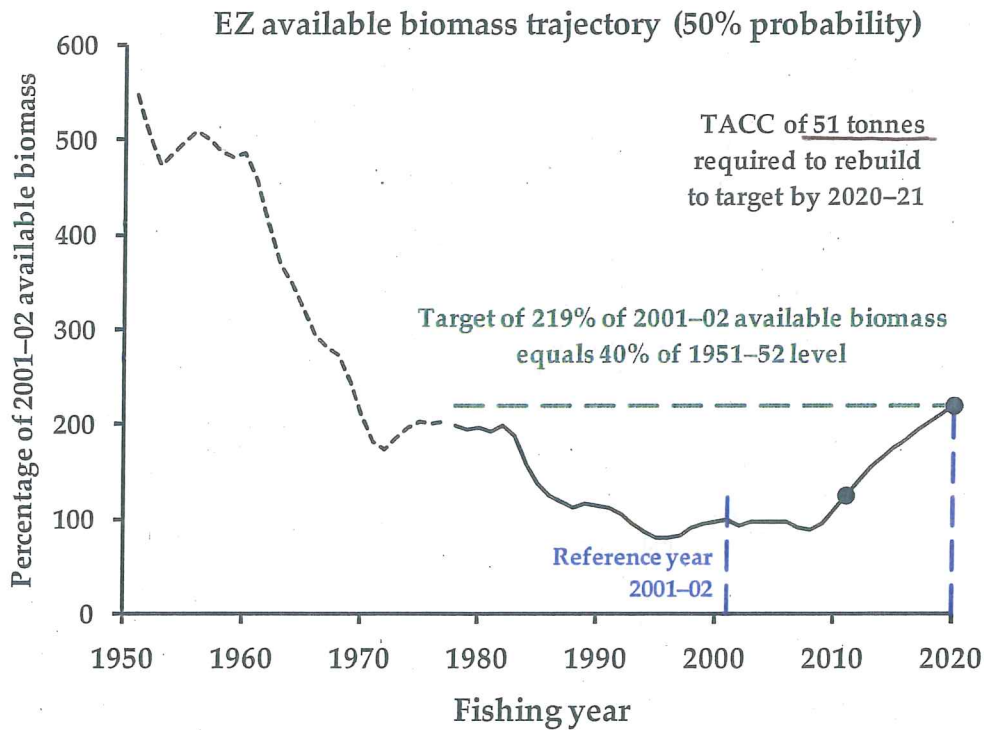


Figure 10. Model estimated levels of available biomass in the Eastern Zone (EZ) (with 50% probability; black line). Target reference point (173% of available biomass in 2001; dashed green line). Projected available biomass (dashed blue line) given a TACC of 51 t/yr to rebuild available biomass to the biological reference point target by 2020.

Definitions

Available biomass	The weight of rock lobsters in the population that are above legal minimum length.
Nominal Catch per unit effort (CPUE)	Catch per Unit of Effort (CPUE) is the catch per unit of effort over a time interval . In rock lobster and giant crab fisheries it is generally expressed as kg of legal sized rock lobster per potlift and is regarded as a proxy for lobster abundance.
Standardised Catch per unit effort	Nominal catch per unit effort that has been standardized for changes or variations in catchability.
Egg production	An estimate of the spawning biomass of the population.
Fishery recruitment	The amount of rock lobsters that have reached legal minimum length and are available to be harvested.
Fishing year:	Nov – September: The period upon which the stock assessment is based.
Fixed-site surveys	Surveys of rock lobster abundance using commercial rock lobster pots (combination of escape gaps open and closed) and research pots (escape gaps closed).
Legal minimum length	Carapace length of 105mm for male and 110mm for female rock lobsters.
Limit reference point	Indicates the limit beyond which the state of a fishery and/or a resource is not considered desirable. In rock lobster fisheries this relates to levels of biomass and egg production).
Model estimated recruitment	The abundance of rock lobsters at 60mm carapace length generated by the stock assessment model.
Pre-recruit indices	A measure of the abundance of all rock lobsters in the population that are under the legal minimum length.
Pre-recruits	Rock lobsters under the legal minimum length.
Puerulus	The first benthic phase of the rock lobster lifecycle.
Quota year	1 July to 30 June the following year.
Recruitment	The amount of rock lobsters that have reached legal minimum length and are available to be harvested.
Reference year: 2001-02	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.
Target	The stock rebuilding strategy in the <i>Rock Lobster Fishery Management Plan</i> 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).