

Further projections of the west coast rock lobster resource for a range of future constant catch and poaching scenarios

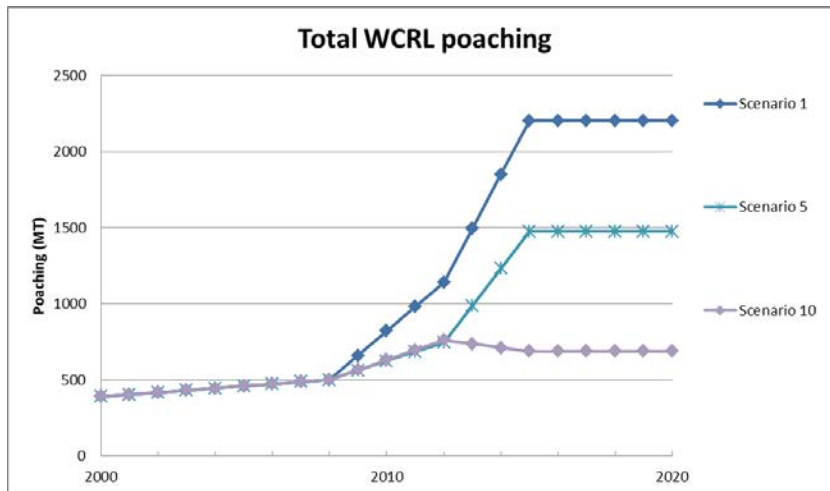
S.J. Johnston and D. S. Butterworth

MARAM (Marine Resource Assessment and Management Group)
 Department of Mathematics and Applied Mathematics
 University of Cape Town
 Rondebosch, 7701

Four future constant catch **TAC scenarios** are reported here. These are:

TAC Projection	A1+2	A3+4	A5+6	A7	A8+
TP1 (1270 MT)	30	150	100	150	840
TP2 (790 MT)	20	100	100	150	420
TP3 (370 MT)	20	100	100	150	0
TP4 (890 MT)	20	200	150	100	420

These TAC projections are all run for **four poaching scenarios**: Scenario 1, Scenario 5, Scenario 10 and Scenario 5 with P(2008)=350 (the plot below indicates the total poaching for each of Scenarios 1, 5 and 10).



A1+2 assessment update

The 2016 assessment for super-area A1+2 has been further improved. The results in a recent document produced unexpectedly poor performance in the future even under a zero catch. Further time has now been spent on improving the assessment, primarily by exploring alternative starting points for recruitment parameters in the estimation procedure. The updated results are shown in the Appendix and show a greatly improved $-\ln L$, indicating a much better fit to the available data. Future projections are now more optimistic with $B_{75}^m(2021)/B_{75}^m(2006)$ for a future $CC=TAC(2015)$ at 0.923, whereas previously this value was only 0.446. Figure A1 shows the updated fit to the Hoopnet CPUE.

Sensitivity to catch being moved from A5+6 to A3+4 over the 2014 and 2015 seasons (“Danie” sensitivity)

A3+4: Trap catch and CPUE decreased by 20% for the 2014 and 2015 seasons.

A5+6: A5+6 Hoop catches are increased by the amount equal to “20% of A34 Trap catches” and the A5+6 trap CPUEs increased in same proportion (for 2014 and 2015).

This sensitivity involved refitting the assessment models for A3+4 and A5+6. Projections are reported for Scenario 5 and all four TAC projections.

Sensitivity to future trap:hoop gear ratios

For Scenario 5 and TP1, biomass trajectories are calculated assuming:

- 1) Default = current 2015 trap:hoop ratios apply for 2016+
- 2) All 2016+ catches are made with traps
- 3) All 2016+ catches are made with hoops.

Note however A1+2 is assumed to remain all hoops and Area 7 all traps.

Results

Tables 1a-5a report the B75m(2021/2015) statistic for each super-area for each of the four poaching scenarios and a range of constant future TACs. Tables 1b-5b similarly report the B75m(2021/2006) statistics for each super-area. Tables 6a and b report statistics for each of the four TAC projections (TP1-TP4) for the resource as a whole.

Figures 1a-4a compare plots for each super-area and the various poaching scenarios and TAC options. Figures 1b-4b show biomass trajectories for the resource as a whole.

Results for A3+4 and A5+6 where adjustments have been made to the catches and CPUEs for the last two seasons (the “Danie” sensitivity) are shown in Tables 2 and 3 for scenario 5 in parentheses.

Sensitivity results for assuming all future catches are either all trap or all hoop are reported in Tables 7a and b.

Table 1a: B75m(2021/2015) for **A1+2** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.140	1.140	1.140	1.140
20 MT	1.046	1.046	1.046	1.046
30 MT	1.000	1.000	1.000	1.000

Table 1b: B75m(2021/2006) for **A1+2** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.113	1.113	1.113	1.113
20 MT	1.022	1.022	1.022	1.022
30 MT	0.976	0.976	0.976	0.976

Table 2a: B75m(2021/2015) for **A3+4** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5 (Danie)	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.439	1.203	1.278	1.140
100 MT	1.332	1.096 (1.109)	1.173	1.049
150 MT	1.279	1.042 (1.051)	1.120	1.003
200 MT	1.225	0.989 (0.994)	0.068	0.957

Table 2b: B75m(2021/2006) for **A3+4** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5 (Danie)	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.519	1.276	1.346	1.287
100 MT	1.406	1.163 (1.102)	1.235	1.000
150 MT	1.350	1.106 (1.044)	1.179	0.957
200 MT	1.293	1.049 (0.987)	1.124	0.913

Table 3a: B75m(2021/2015) for **A5+6** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5 (Danie)	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.600	1.660	1.681	1.619
100 MT	1.530	1.532 (1.524)	1.558	1.490
150 MT	1.465	1.467(1.460)	1.497	1.425

Table 3b: B75m(2021/2006) for **A5+6** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5 (Danie)	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	3.773	3.714	3.736	3.743
100 MT	3.055	3.426 (3.443)	3.463	2.795
150 MT	2.925	3.282 (3.299)	3.326	2.673

Table 4a: B75m(2021/2015) for **A7** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.383	1.408	1.416	1.406
100 MT	1.203	1.223	1.230	1.225
150 MT	1.114	1.130	1.137	1.135

Table 4b: B75m(2021/2006) for **A7** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.089	1.068	1.072	1.078
100 MT	0.916	0.927	0.931	0.917
150 MT	0.847	0.847	0.861	0.849

Table 5a: B75m(2021/2015) for **A8+** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.623	2.195	3.009	2.114
420 MT	1.150	1.707	2.542	1.791
840 MT	0.676	1.213	2.070	1.467

Table 5b: B75m(2021/2006) for **A8+** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	0.682	0.955	1.376	1.209
420 MT	0.483	0.743	1.163	1.025
840 MT	0.284	0.528	0.947	0.839

Table 6a: B75m(2021/2015) for the **TOTAL resource** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.497	1.589	1.979	1.651
TP1 (1270 MT)	1.134	1.216	1.477	1.274
TP2 (790 MT)	1.277	1.364	1.621	1.521
TP3 (370 MT)	1.402	1.492	1.746	1.639
TP4 (890 MT)	1.247	1.333	1.591	1.494

Table 6b: B75m(2021/2006) for the **TOTAL resource** for various poaching scenarios and future TAC options.

	Scenario 1	Scenario 5	Scenario 10	Scenario 5 P ₂₀₀₈ =350
0 MT	1.153	1.263	1.605	1.287
TP1 (1270 MT)	0.883	0.976	1.210	1.047
TP2 (790 MT)	0.994	1.095	1.328	1.148
TP3 (370 MT)	1.091	1.198	1.430	1.237
TP4 (890 MT)	0.970	1.070	1.303	1.127

Table 7a: Sensitivity of **B75m(2021)/B75m(2015)** for different trap:hoop ratios – results shown for Scenario 5 and TP1 CC projections for either the default (i.e. 2015) trap:hoop ratios, or assuming all trap or all hoop (from 2016+). Note A1+2 remains only “all hoop” and A7 “all trap”.

	Default ratio	All trap	All Hoop
A1+2	1.000	1.000	1.000
A3+4	1.042	1.042	1.042
A5+6	1.532	1.529	1.532
A7	1.130	1.130	1.130
A8	1.213	1.218	1.185
Total	1.216	1.216	1.209

Table 7b: Sensitivity of **B75m(2021)/B75m(2006)** for different trap:hoop ratios – results shown for Scenario 5 and TP1 CC projections for either the default (ie 2015) trap:hoop ratios, or assuming all trap or all hoop (from 2016+). Note A1+2 remains only “all hoop” and A7 “all trap”.

	Default ratio	All trap	All Hoop
A1+2	0.976	0.976	0.976
A3+4	1.106	1.105	1.106
A5+6	3.426	3.419	3.426
A7	0.857	0.857	0.858
A8	0.528	0.530	0.516
Total	0.976	0.977	0.970

Figure 1a: Scenario 1.

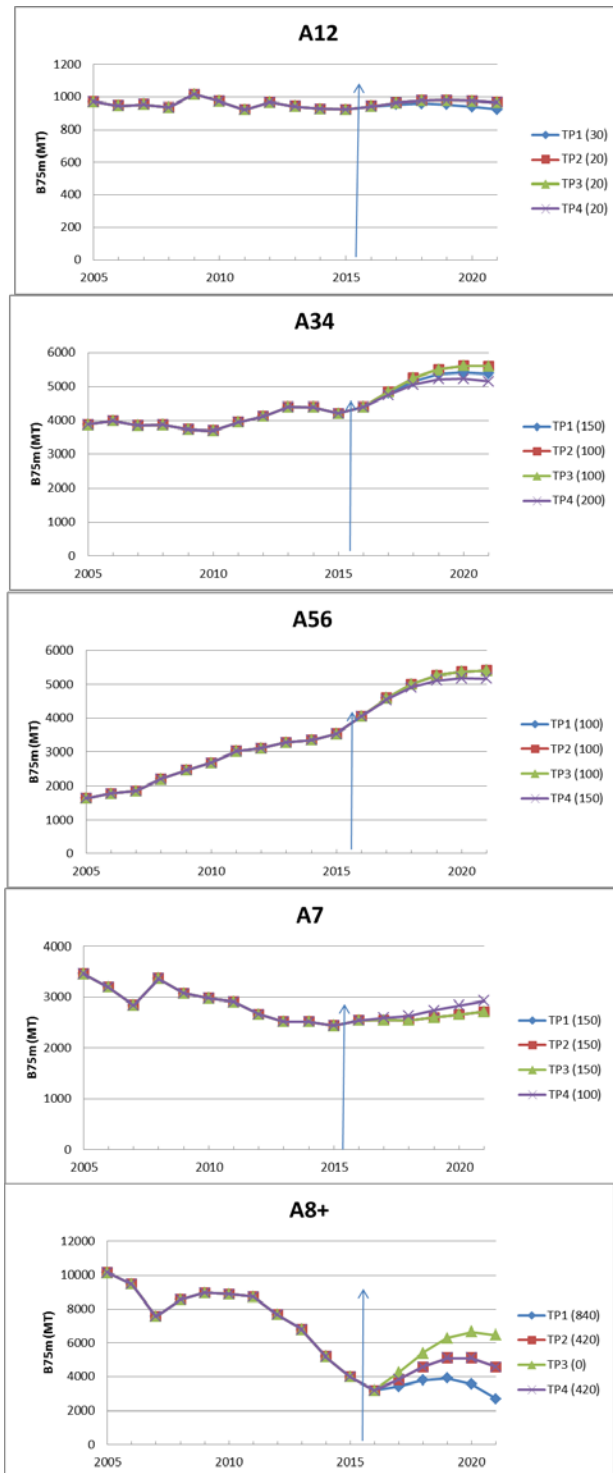


Figure 1b: Scenario 1 – resource as a whole.

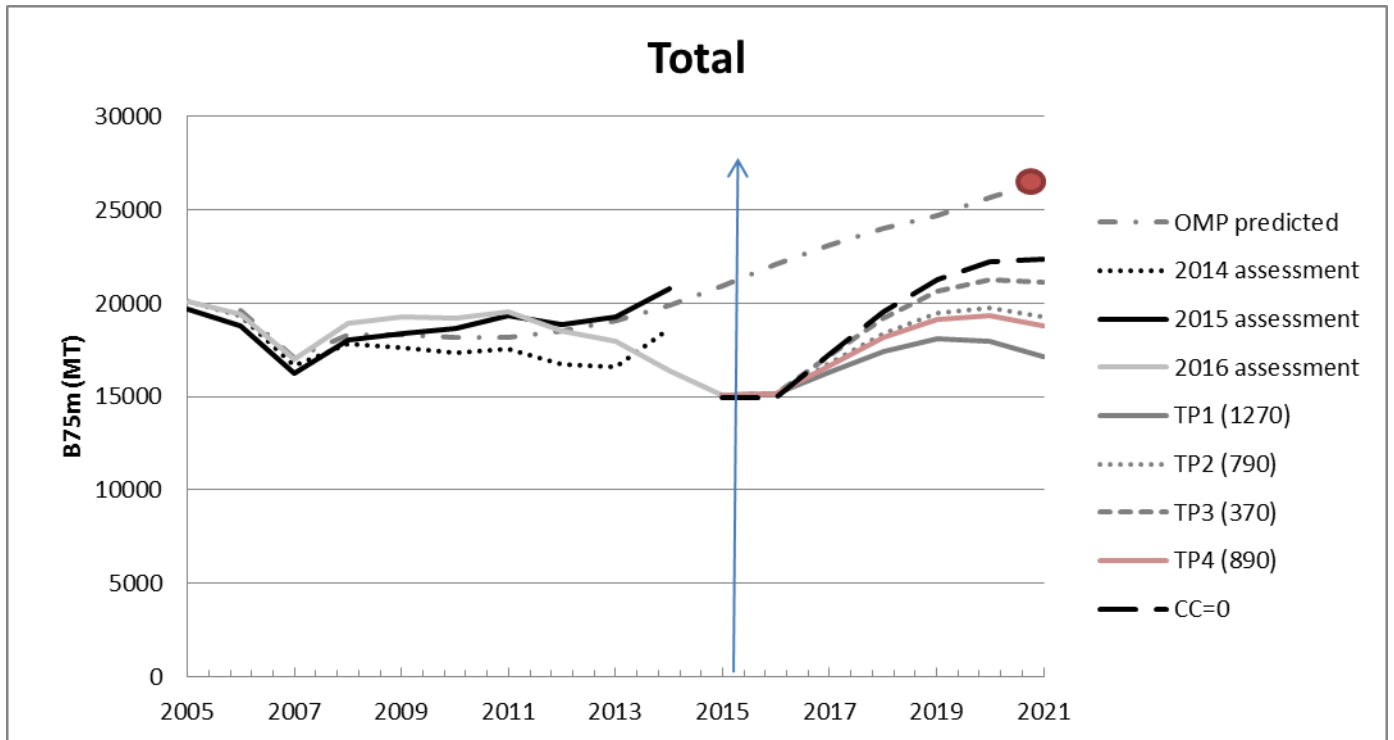


Figure 2a: Scenario 5.

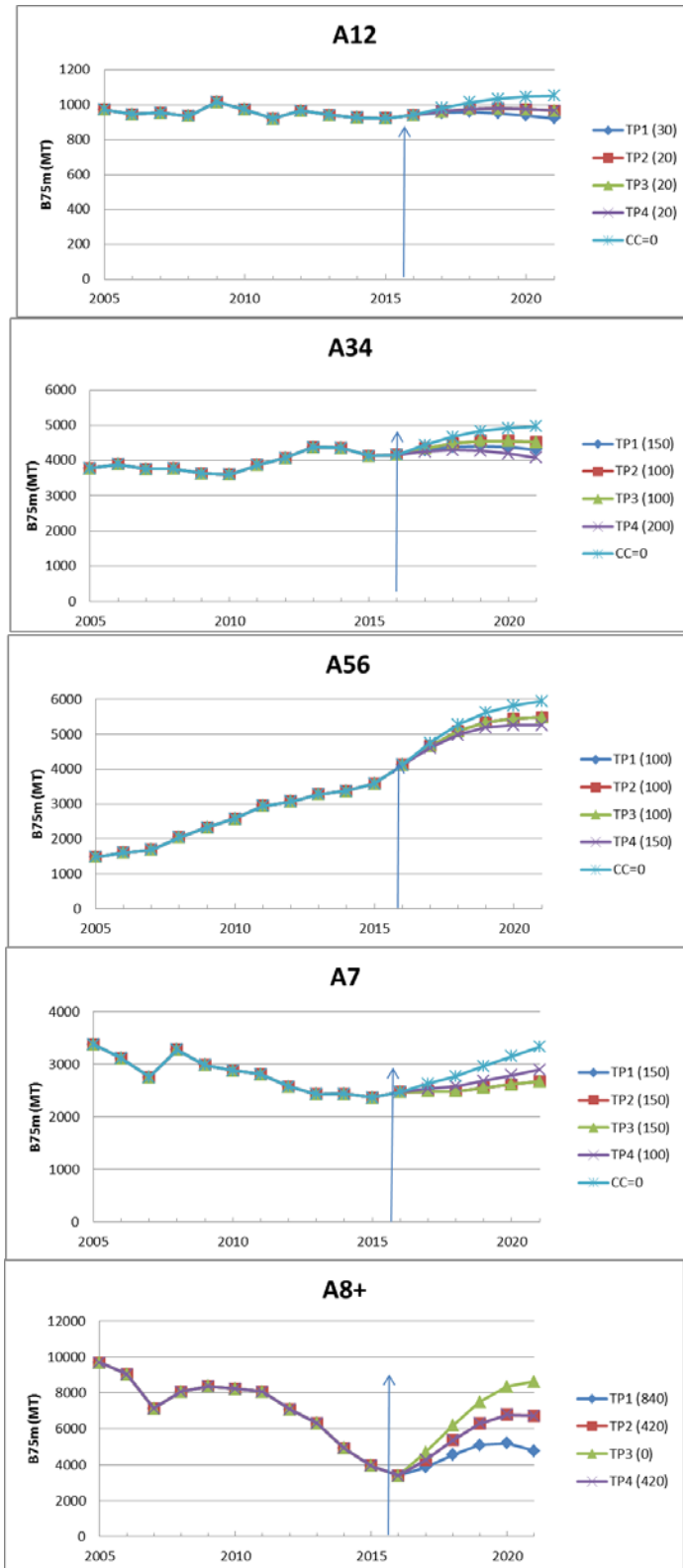


Figure 2b: Scenario 5 – resource as a whole.

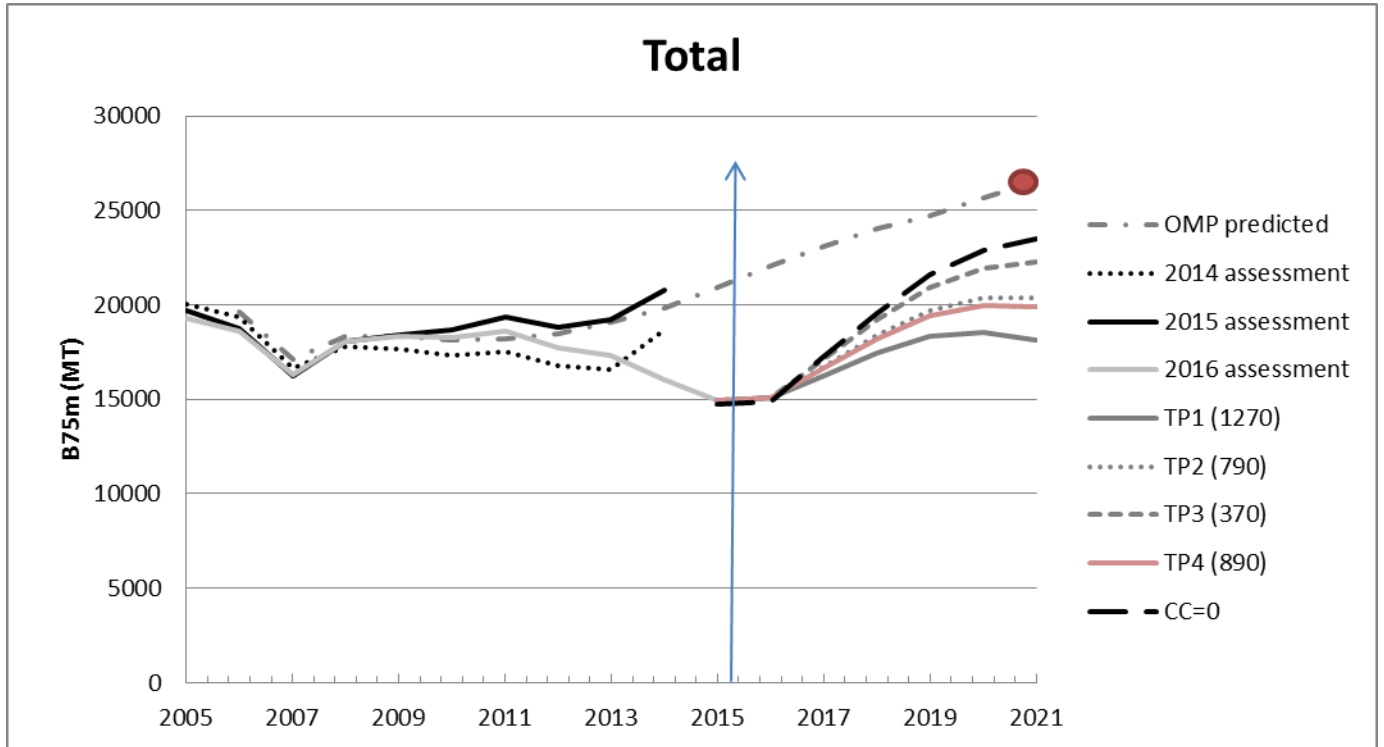


Figure 3a: Scenario 10.

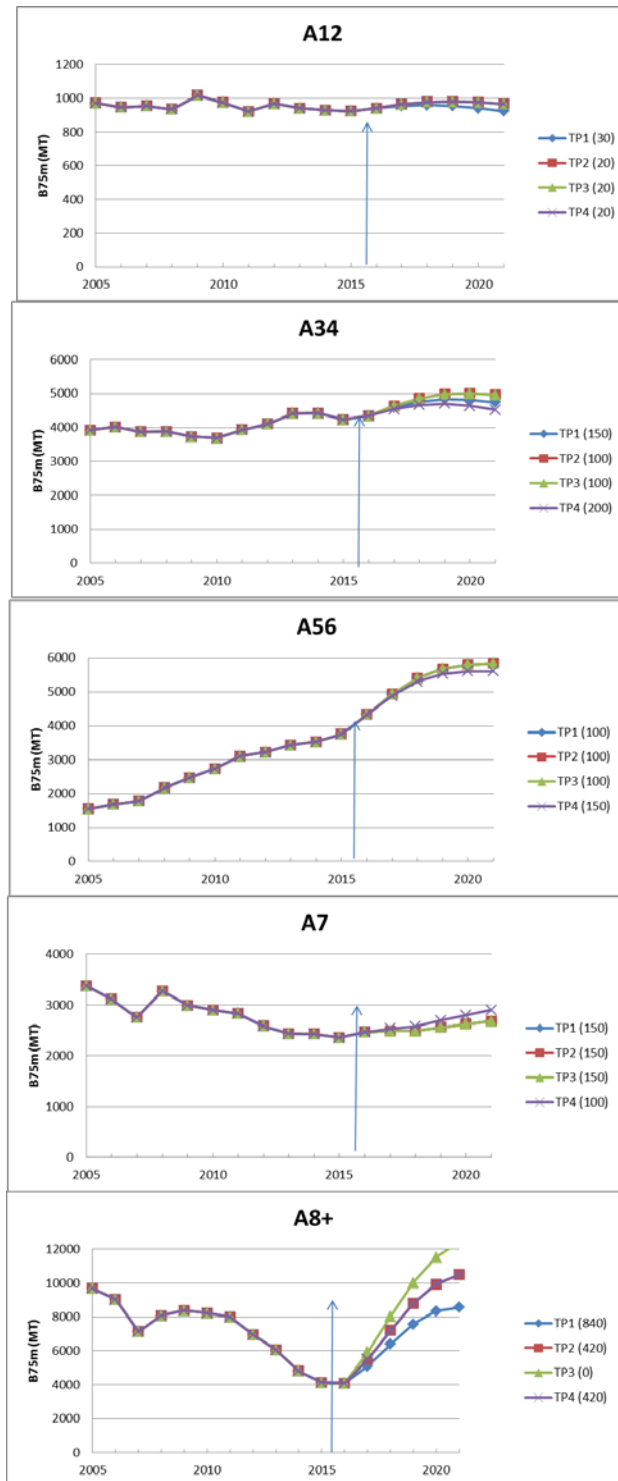


Figure 3b: Scenario 10 – resource as a whole.

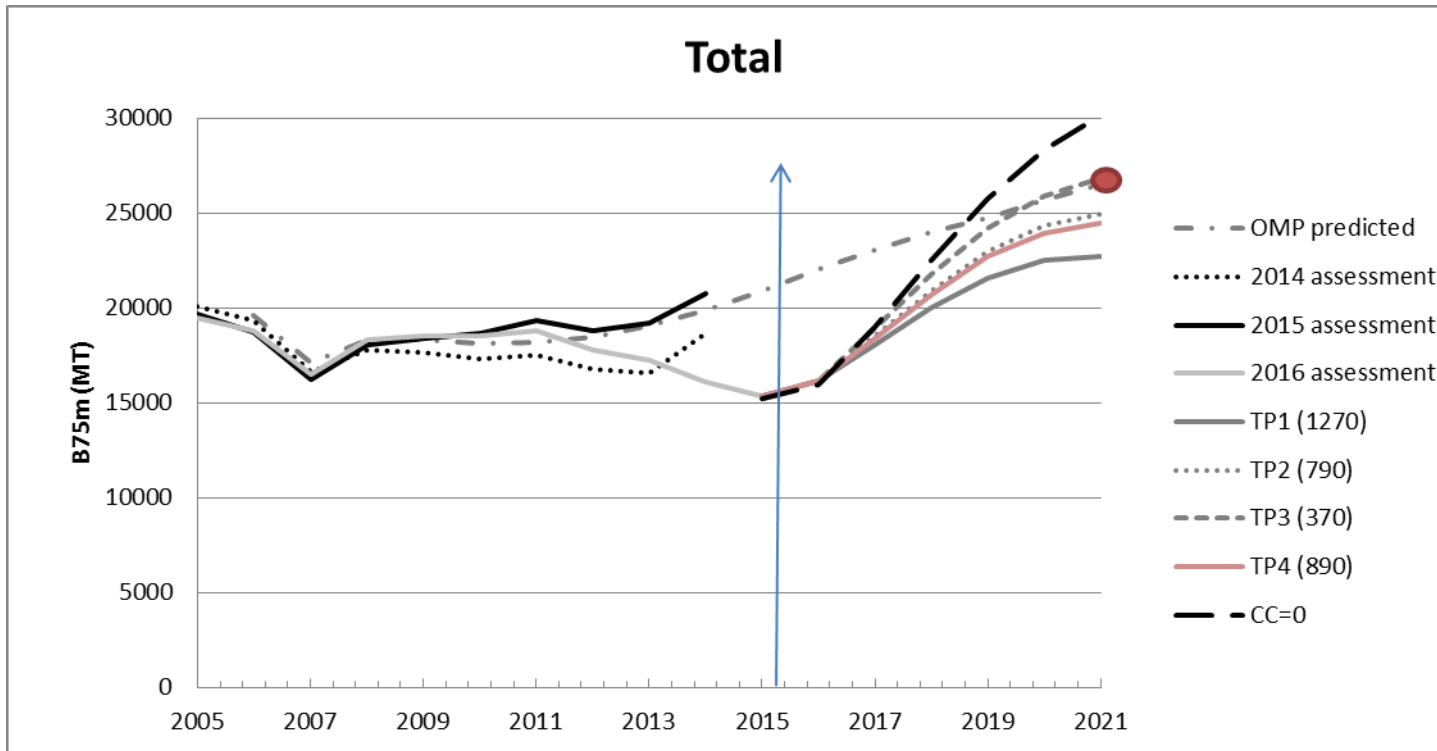


Figure 4a: Scenario 5 P2008=350.

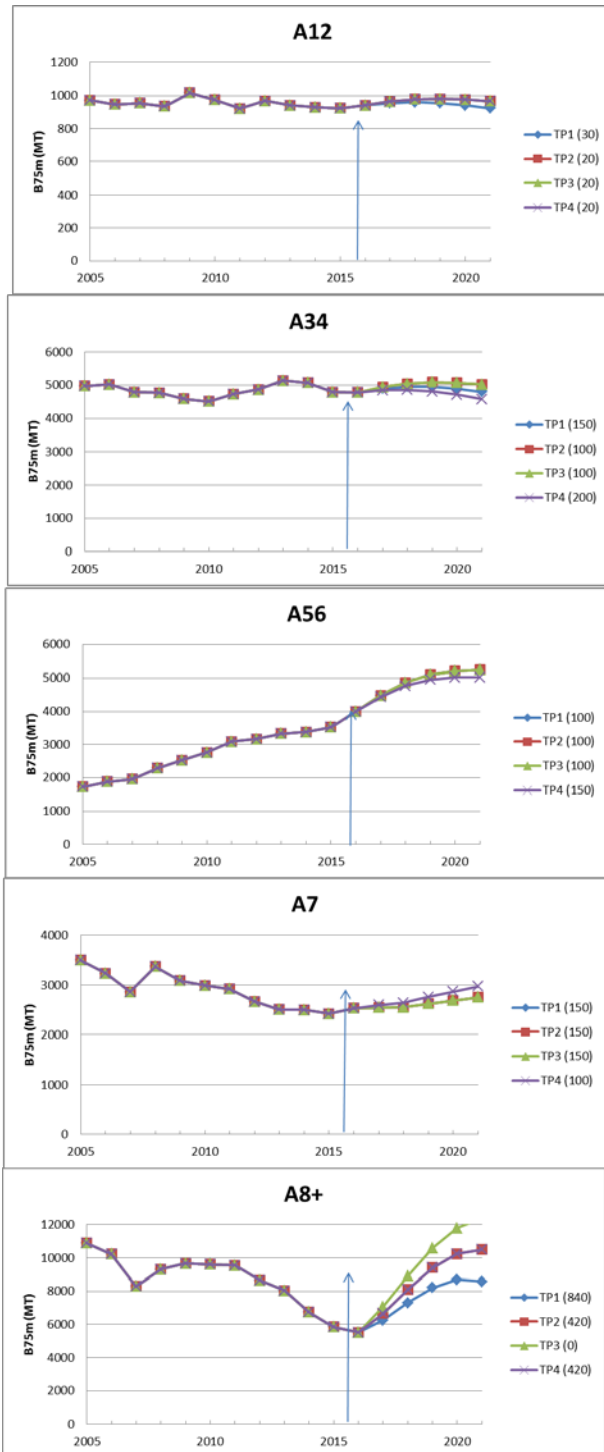
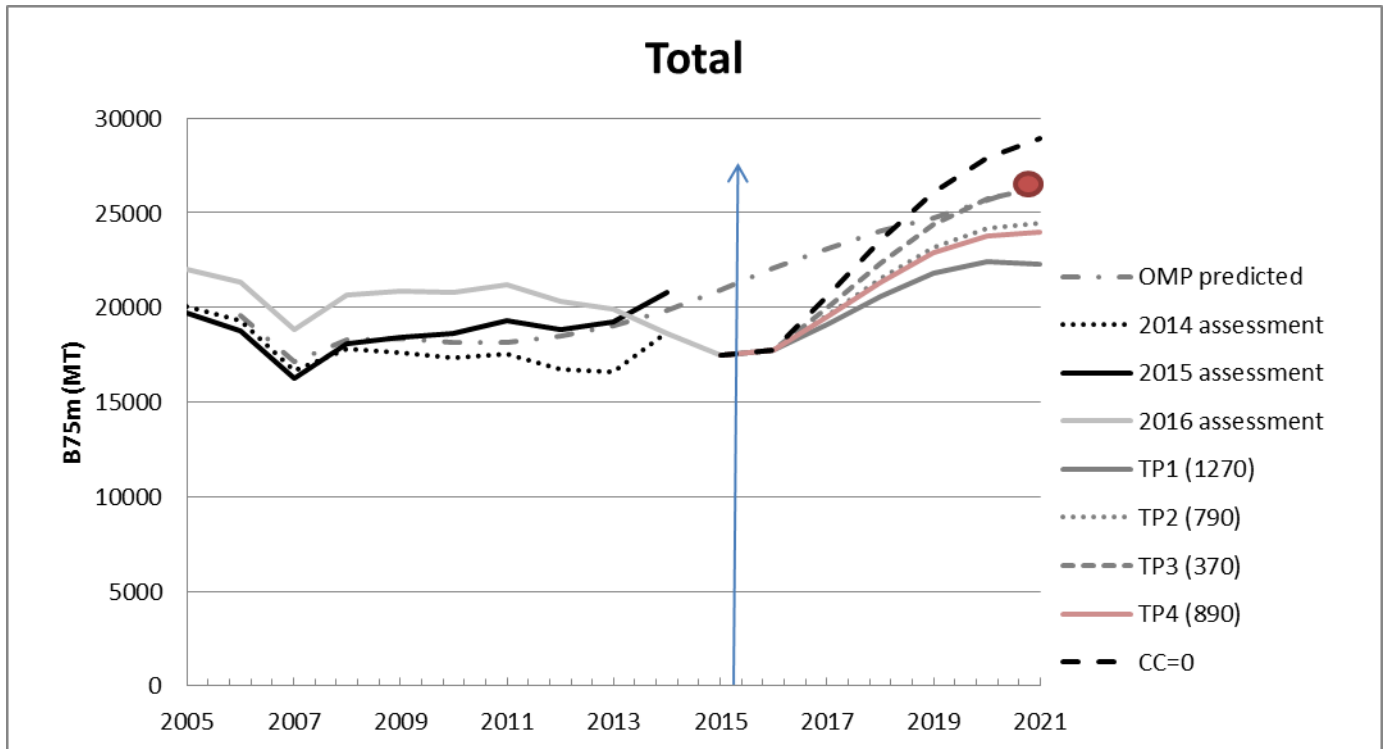


Figure 4b: Scenario 5 P2008=350 – resource as a whole.



Appendix: Further updated A1+2 assessment

Table A1: Further updated 2016 assessment results for super-area A1+2.

	2016 As reported in doc24	2016 Updated
$B_{75}^m(1910)$ MT	55 176	55 102
$B_{75}^m(2015)$ MT	736	924
$B_{75}^m(2015)/ B_{75}^m(1910)$	0.013	0.017
$B_{75}^m(2010)/ B_{75}^m(1996)$	1.409	1.574
$B_{75}^m(2014)/ B_{75}^m(1996)$	1.328	1.500
$B_{75}^m(2015)/ B_{75}^m(2006)$	0.835	0.976
2010+ R/R(1910)	0.0021	0.021
$B_{75}^m(2021)/ B_{75}^m(2006)$ for future CC=TAC(2015)	0.446	0.923
Egg (2015)/Egg (1910)	0.019	0.024
-lnL total	95.54	-10.73

Figure A1: A1+2 assessment fit to Hoopnet CPUE data.

