Projections under constant catches for each West Coast rock lobster super-area (excluding Dassen)

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Results

A set of constant catch projections for each super-area has been run, under the future assumptions detailed in the Appendix. Note that an additional variant for future poaching levels has been defined (VAR2). The original (VAR1) assumes poaching remains constant from 2012 onwards. VAR2 assumes that poaching doubles compared to its 2012 level in 2015 (and remains at that level for the future).

For simplicity at this stage future recreational have been kept unchanged at 83 MT (the amount allocated for the 2013 season). Three sets of future constant catches (CCs) for the other three sectors combined (Offshore, Nearshore and Subsistence) have been run. It must be emphasized that these three choices carry no implication for the coming recommendation itself; they are provided to illustrate the trade-offs between future catch levels and stock recovery possibilities. For super-areas A34, A56 and A8:

- CC_TAC2013: 2014+ catches are set equal to the 2013[1] TACs
- CC_Rec: CCs that would achieve the same (or very similar) biomass recovery by 2017 as had been indicated for the 35% rebuilding OMP.
- CC_Half: CCs that are half way between the 2013 TACs and the CC_Rec set of catches.

For super-area A12, the three options explored were:

- CC_TAC2013: 2014+ catches are set equal to the 2013 TACs (NS=24 + Sub=16 = 40)
- CC_Rec: CCs that would achieve the same (or very similar) biomass recovery by 2017 as had been indicated for the 35% rebuilding OMP (NS = 30 + Sub=16 = 46).
- CC_Half: Here the further run explored a CC of 56 (so not half way CC between the 2013 TACs and the CC_Rec values, but to satisfy SWG request to show sensitivity).

Table 1 reports the TACs set for each super-area and sector for the 2013 season. Table 2 reports the catches provided in van Zyl (2014).

Tables 3a-c report median B(17/06) values for each of the three CC scenarios described above. Table 4 report median B(17/06) values area by area, for different CC values. These two tables also report the median B(17/14) values to indicate whether the population concerned is forecast to increase or decrease over the next three years.

[1] The convention used in this document is that 2013 refers to the 2013/14 season.

Figure 1 shows plots of biomass recovery median trajectories for each super-area (except A7) and for the resource as a whole (excluding A7). Male biomass (above 75mm CL) relative to the 2006 levels are shown for the three illustrative constant catch options. The open squares shows the median expected value under OMP 2011, as evaluated in January 2013, which yielded the 35% median recovery target by 2021.

Immediate implications and comments

It is clear from the results in Tables 3 and 4 and Figure 1 that (aside from the small A12, and A7 now treated separately) maintaining the current TAC will lead to a decline in abundance in all super-areas over the next three years. Furthermore, achieving a return to the 35% recovery in 2021 trajectory by 2017 would require a substantial reduction in the TAC (by some 60%).

Care should be taken in drawing inferences concerning the failure at this time to achieve the 35% recovery trajectory. This recovery target corresponded to a **MEDIAN** projection, whose 90% probability interval ranged from a decrease of some 30% to more than doubling – the associated OMP with its TAC change constraints could not **guarantee** the 35% recovery in the event of worse than expected recruitment (for example). Given the further information now available, it is not necessarily appropriate to radically change the TAC immediately to attempt to return to that precise trajectory.

Nevertheless, were the OMP still in operation, it would certainly have indicated a large TAC reduction in the current circumstances, in particular to head off further declines in abundance in some super-areas, though it would also have phased in those reductions in the socio-economic interests of enhanced fishery stability.

Given that A7 remains the only super-area to have dropped below the Exceptional Circumstances threshold, and this super-area is being treated differently, some guidance remains provided by the original OMP TAC maximum annual TAC change constraints as these still have relevance to the rest of the super-areas. These constraints were 10% each year for offshore commercial, and larger changes (typically by some 20%) for the other sectors, but only on occasions when the overall TAC dropped below a percentage of a previous baseline level.

Reference

Van Zyl, D. 2014. West coast rock lobster annual TAC, Effort and CPUE per area. DADD document, FISHERIES/2014/JUL/SWG_WCRL/12.

Table 1: Summary of SWG TAC recommendations and final DAFF TAC allocations (in tons) for the 2013 season.

	Initial Proposed TACs for 2013 season	**Final SWG Recommended TACs for 2013 season**	**Final DAFF TAC allocations for 2013 season**
Global T[#]	**2130.95 (-12.11%)**	**2165.95 (-10.67%)**	**2157**
Global A1+2	38.12	38.12	41.66
Global A3+4	272.12	272.12	264.38
Global A5+6	239.69	239.69	244.38
Global A7	80	80	80
Global A8+	1501.02	1536.02	1526.59
Offshore T	**1247.06 (-19.06%)**	**1282.06 (-16.78%)**	**1349**
Offshore A1+2	0	0	0
Offshore A3+4	124.95	124.95	132
Offshore A5+6	130	130	138
Offshore A7	80	80	80
Offshore A8+	912.11	947.11	999
Nearshore T	**450.71 (0%)**	**450.71 (0%)**	**450**
Nearshore A1+2	19.76	19.76	24
Nearshore A3+4	72.52	72.52	73
Nearshore A5+6	32.20	32.20	32
Nearshore A7	0	0	0
Nearshore A8+	326.23	326.23	321
Subsistence T	**250.17 (0%)**	**250.17 (0%)**	**275**
Subsistence A1+2	14.7	14.7	16
Subsistence A3+4	51.77	51.77	49
Subsistence A5+6	54.61	54.61	64
Subsistence A7	0	0	0
Subsistence A8+	129.00	129.00	146
Recreational T	**183 (0%)**	**183 (0%)**	**83**
Recreational A1+2	3.66	3.66	1.66
Recreational A3+4	22.88	22.88	10.38
Recreational A5+6	22.88	22.88	10.38
Recreational A7	0.00[&]	0.00	0.00[&]
Recreational A8+	133.59	133.59	60.59

[#] Global T refers to offshore+nearshore+subsistence+recreational.

Table 2: A comparison of the Offshore+Nearshore (OS+NS) TACs and reported catches for the 2013 season. Note that the first column of catches shows the A8+ catches as at 30 June 2014, and the last column differs by assuming that the full A8+ TAC is caught (this last column is used for the projections reported).

	TACs	**Catches**	**Catches**
A12	24	7	7
A34	205	198	198
A56	170	127	127
A7	80	75	75
A8	1320	835[2]	1320[3]
T	1799	1242	1727

[2] The catch as reported by 30th June 2014
[3] The catch assuming that the full TAC will be caught

Table 3a: Future (2014+) TACs set at the TAC2013 values (note: OS= Offshore; NS=Nearshore and Sub=Subsistence).

			VAR1 Poaching	35% recovery target	VAR1 Poaching
TAC2013	OS+NS+Sub	Recreational	B(17/14)	B(17/06)	B(17/06)
A12	40	1.66	1.51	**1.10**	1.14
A34	254	10.38	0.89	**1.22**	1.02
A56	234	10.38	0.99	**1.45**	1.31
A7	80	0	-	**1.56**	-
A8	1466	60.59	0.71	**0.79**	0.57
T (all areas)	2074	83.00	-	**1.15**	-
T(excl A7)	1994	83.00	0.82	**1.04**	0.79

Table 3b: Future (2014+) TACs set at the CC_Rec values which will achieve median B(17/06) values close to the 2017 values for the 35%recovery targets for 2021 for each super-area.

			VAR1 Poaching	35% recovery target	VAR1 Poaching
CC_Rec	OS+NS+Sub	Recreational	B(17/14)	B(17/06)	B(17/06)
A12	46	1.66	1.42	**1.10**	1.09
A34	0	10.38	1.05	**1.22**	1.19
A56	104	10.38	1.08	**1.45**	1.44
A7	80	0	-	**1.56**	-
A8	632	60.59	0.97	**0.79**	0.79
T (all areas)	862	83.00		**1.15**	-
T(excl A7)	782	83.00	1.01	**1.04**	0.98

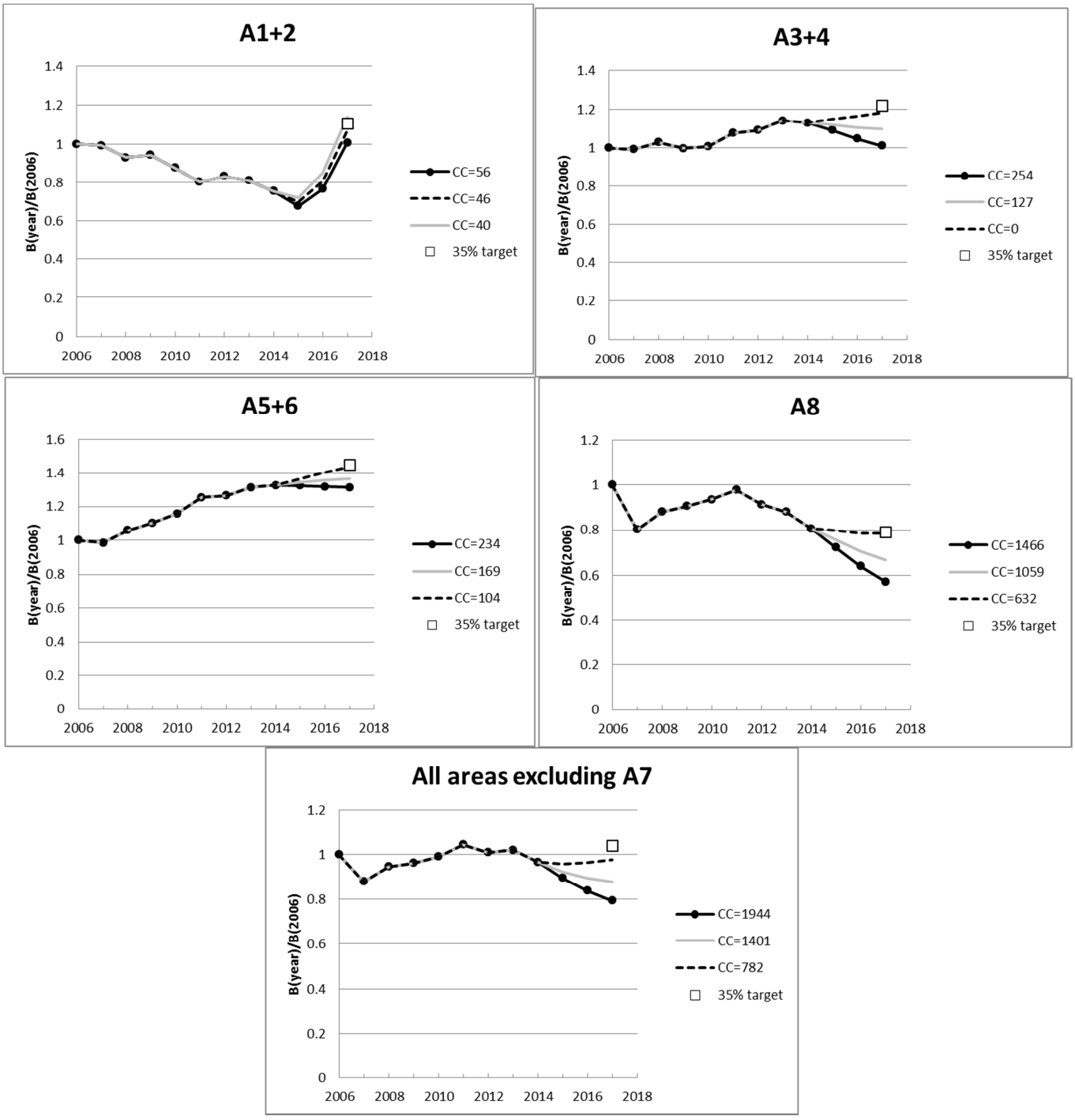
Table 3c: Future (2014+) TACs set half way between the TAC2013 values and the CC_Rec values for A34, A56 and A8. For A12 the TAC is fixed at 46 as in Table 3b above. Note that VAR2 poaching doubles the 2012 poaching level from 2015 onwards.

			VAR1 Poaching	35% recovery target	VAR1 Poaching	VAR2 Poaching
CC_Half	OS+NS+Sub	Recreational	B(17/14)	B(17/06)	B(17/06)	B(17/06)
A12	46	1.66	1.39	**1.10**	1.09	1.04
A34	127	10.38	0.97	**1.22**	1.10	1.09
A56	169	10.38	1.03	**1.45**	1.37	1.36
A7	80	0	-	**1.56**	-	-
A8	1059	60.59	0.83	**0.79**	0.67	0.59
T (all areas)	1481	83.00	-	**1.15**	-	-
T(excl A7)	1401	83.00	0.91	**1.04**	0.88	0.85

Table 4: Median B(17/06) values compared to the 2017 values for the 35%recovery targets for 2021 B(17/06) values for each super-area for a range of CC values.

			VAR1 Poaching	35% recovery target	VAR1 Poaching	VAR2 Poaching
		OS+NS+Sub	B(17/14)	B(17/06)	B(17/06)	B(17/06)
A12		56	1.43	**1.10**	1.01	
A12	CC_Rec	46	1.42	**1.10**	1.09	1.04
A12	TAC13	40	1.51	**1.10**	1.14	
A34	CC_Rec	0	1.05	**1.22**	1.19	
A34	CC_Half	127	0.97	**1.22**	1.10	1.09
A34	TAC13	254	0.89	**1.22**	1.02	
A56	CC_Rec	104	1.08	**1.45**	1.44	
A56	CC_Half	169	1.03	**1.45**	1.39	1.36
A56	TAC13	234	0.99	**1.45**	1.31	
A8	CC_Rec	632	0.97	**0.79**	0.79	
A8	CC_Half	1059	0.83	**0.79**	0.67	0.59
A8	TAC13	1466	0.71	**0.79**	0.57	

Figure 1: Median biomass recovery trajectories for each super-area (except A7) and for the resource as a whole (excluding A7). Male biomasses (above 75mm CL) relative to the 2006 levels are shown for three options for constant future catches. The open squares shows the median value expected under OMP 2011 (that yielded a median recovery of 35% by 2021), as evaluated in January 2013.



Appendix: OMP review simulation framework

Future Scenarios

Future scenarios, which result as combinations of uncertainties regarding future recruitment, future somatic growth, historic poaching, future poaching and current abundance are defined. The following are the various possible options for each scenario:

Median Future recruitment **WT**

- FRM: Geometric Mean of $R_{75}, R_{80}, R_{85}, R_{90}, R_{95}, R_{98}, R_{01}, R_{04}$ 0.60
- FRH: Maximum of $R_{75}, R_{80}, R_{85}, R_{90}, R_{95}, R_{98}, R_{01}, R_{04}$ 0.30
- FRL: Minimum of $R_{75}, R_{80}, R_{85}, R_{90}, R_{95}, R_{98}, R_{01}, R_{04}$ 0.10

Note however that the FRL excludes certain extreme estimates which are A12 R_{00}, A34 R_{98},A7 R_{95} and R_{04}.

Future recruitment

For FHM future R_y: where y = 2010, 2015 and 2020; linearity between each of these years (and between 2008 and 2010).

Stochastic: R_y randomly selected from $\overline{R}\, e^{\varepsilon_y}$, where,

$$\ln \overline{R} = \frac{1}{8}\left(\ln R_{75} \ldots \ln R_{04}\right)$$

σ = SD of $\left(\ln R_{75}, \ldots \ln R_{04}\right)$

$$\varepsilon_y \sim N(0, \sigma^2)$$

or for FRH and FRL, the $\overline{R}$ was replaced by either the maximum or minimum R between $R_{75}, R_{80}, R_{85}, R_{90}, R_{95}, R_{98}, R_{01}, R_{04}$ (with the exceptions noted above).

Future Somatic growth (2014+)

WT

- FSGL: = the 1989-2013 average 0.80
- FSGM: ↑ linearly to 1968-2013 ave over 10 yrs 0.20

[The above applied to the growth rates for Areas 3+4, 5+6, 7 and 8+. The somatic growth rate for Area 1-2 is assumed to remain constant in the future at the 1989-2013 average level for all scenarios.]

Current Abundance levels

- The two alternate models (Alt1 and Alt2) are virtually identical to each RC model, except with regards to the R_{2004} value. For the RC model R_{2004} is an estimable parameter, although it is found to be estimated with very low precision. Alt1 and Alt2 models correspond almost exactly to the RC best fit parameter values except for R_{2004} which is fixed at the (approximate) upper and lower 25%iles of this distribution as follows:

  $$\ln R_{2004}^{alt1} = \ln \hat{R}_{2004}^{RC} + \sigma\alpha \quad (1)$$

  and

  $$\ln R_{2004}^{alt2} = \ln \hat{R}_{2004}^{RC} - \sigma\alpha \quad (2)$$

  where σ is from equation (4) below, and the α value (0.741) corresponds to the 25%iles of a *t*-distribution with the appropriate number of degrees of freedom.

  $$\ln \overline{R} = \frac{1}{8} \sum_{y=1975}^{2004} \ln R_y \quad (3)$$

  $$\sigma^2 = \frac{1}{7} \sum_{y=1975}^{2004} \left(\ln \overline{R} - \ln R_y \right)^2 \quad (4)$$

	WT
• RC: Best Estimate of R_{2004}	0.50
• ALTL: Estimated lower 12.5%ile for R_{2004}	0.25
• ALTH: Estimated upper 12.5%ile for R_{2004}	0.25

Historic Poaching

	WT
• HP1: Total historic poaching levels from 1990 to 2008 are 500 MT	0.65
• HP2: Total historic poaching levels from 1990 to 2008 are 250 MT	0.35

Future poaching scenarios – relate to the % change in the poaching level for each super-area between 2008 and 2012. Poaching for 2013+ is assumed to remain at the 2012 level.

The six scenarios to cover different options (with different weights) defined are:

	Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario6**	**Weighted Average**
Weighting	40	10	20	20	5	5	100
4-yr % change for A3-6	-50	-50	-50	0	0	0	-35%
4-yr % change for A8+	+75	+25	+125	+75	+25	+125	+80
% change in total amount poached	+50	+10	+90	+60	+20	+100	+57

Note: The Super-Area breakdowns of future poaching levels are assumed to be unchanged and are:

Super-area 1+2 = 1%

Super-area 3+4 = 2.5 %

Super-area 5+6 = 2.5%

Super-area 7 = 20%

Super-area 8+ = 80%

Two variants for future poaching levels are considered:

VAR1 = as described above with the 2012+ poaching levels remaining constant.

VAR2 = as described above, but for 2015+ the poaching levels are double their values for 2012.