Recommended TAC 2009 for the South Coast Rock Lobster Resource using OMP 2008

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Introduction

OMP 2008 (Johnston *et al.* (2008)) is used here to calculate the TAC for the South Coast Rock Lobster resource for the 2009 season. (Note the convention that 2009 is used to refer to the 2009/2010 season.)

OMP 2008:

1. has a 5% maximum TAC change constraint, and
2. has a median anticipated B^{sp} (2025/2006) of 1.20 under operating Model 3 (MARAM TVS).

TAC 2009 recommendation from OMP 2008

Table 1 and Figure 1 report the recently updated CPUE series for the South Coast rock lobster (Glazer 2009). These input CPUE used in conjunction with OMP 2008 (Johnston *et al.* 2008) produce a TAC recommendation for the 2009 season of **345 MT**. Appendix 1 provides the detailed calculation of TAC 2009.

The recommended TAC is less than the current TAC of 363 MT. The OMP reduces the TAC both because of the downward trend in CPUE over the last five years in two of the three Areas, and because the average CPUE over the last three seasons is less than the average over 2003 to 2005. The inter-annual TAC constraint rule limits the decrease in the TAC to 5%. The TAC recommendation of 345 MT corresponds to the median prediction made one year ago in the core OMP trials – see Table 1 and Figure 1 of Appendix 2.

References

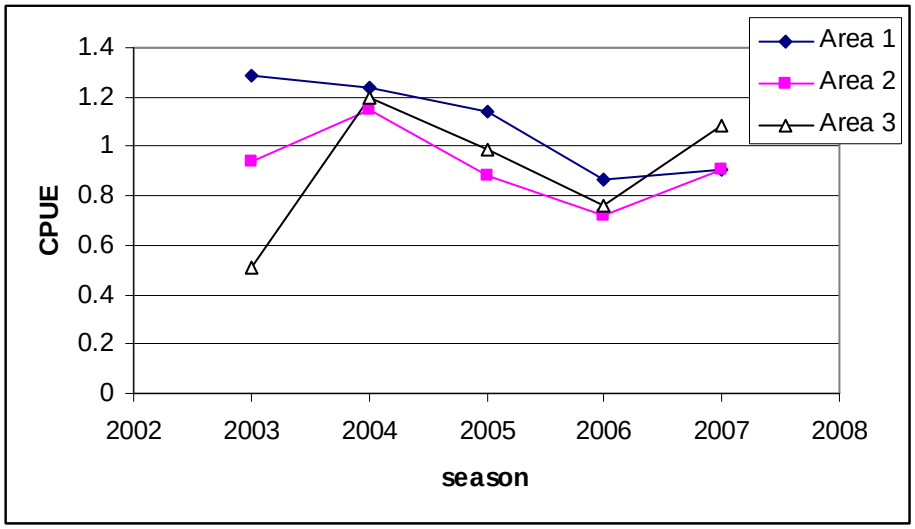
Glazer, J.P. 2009. A generalized linear model applied to the South Coast rock lobster CPUE data to obtain area-specific indices of abundance. MCM document, MCM/2009/JUL/SWG-SCRL/02.

Johnston, S.J., Butterworth, D.S. and J.P. Glazer. 2008. OMP 2008 for the South Coast Rock Lobster Resource. MCM document, MCM/2008/AUG/SWG-SCRL/29.

Table 1: CPUE input data into OMP 2008 (Glazer 2009a).

Season	Area 1	Area 2	Area 3
2003	1.2847	0.9379	0.5106
2004	1.2416	1.1469	1.2004
2005	1.1408	0.8836	0.9850
2006	0.8652	0.7206	0.7598
2007	0.9053	0.9055	1.0811

Figure 1: CPUE input data into OMP 2008 (Glazer 2009a).



Appendix 1: Detailed calculation of TAC 2009 using OMP 2008

Johnston *et al.* (2008) provides the details of OMP 2008. We reproduce the key OMP equations below showing how the new TAC 2009 is calculated.

TAC setting algorithm
The algorithm used to set the total TAC for the South Coast Rock Lobster fishery is:

$$TAC_{y+1} = TAC_y[1+\alpha(s_y - \delta)]h(r_y) \quad (1)$$

where

the value of α is set at 3.0;

s_y^A is the slope parameter from a regression of $\ln CPUE_y^A$ against year *y* over the last five years of available data (2003-2007) for each area *A*, and

$$s_y = \sum_{A=1}^{3} w^A s_y^A \quad (2)$$

where $w^A = \dfrac{\dfrac{1}{\sigma_S^{A^2}}}{\sum_{A'=1}^{3}(\dfrac{1}{\sigma_S^{A'^2}})}$ (3)

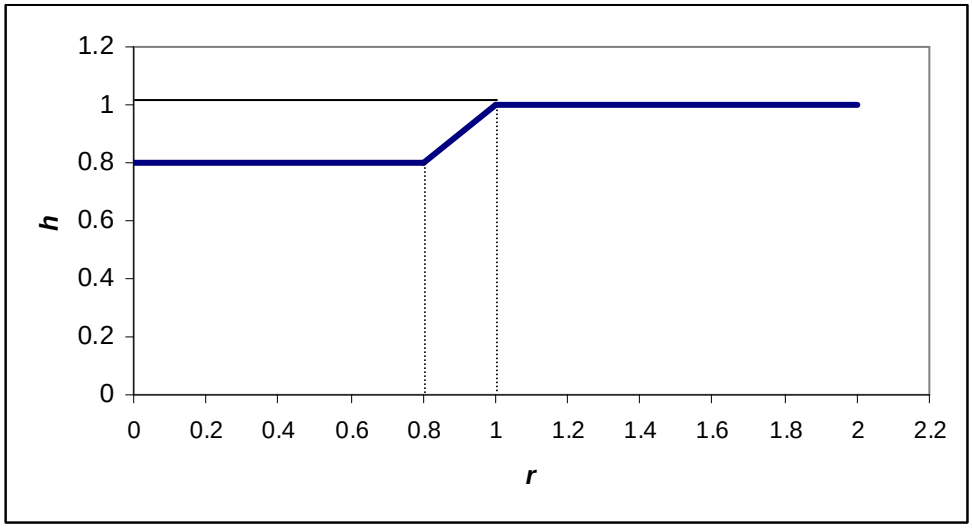
and σ_S^A is the standard error of the regression estimate of s_y^A which is bounded below at 0.15.

δ is a control parameter value and is tuned to be equal to -0.006 for the selected OMP 2008.

Also,

$$\begin{aligned} h(r) &= 0.8 \quad \text{for} \quad r \le 0.8 \\ &= r \quad \text{for} \quad 0.8 \le r \le 1.0 \\ &= 1.0 \quad \text{for} \quad r \ge 1.0 \end{aligned} \quad (4)$$

i.e.



where r is the ratio of recent CPUE to that at the time the OMP commences:

$$\overline{\overline{CPUE}}_{init} = \frac{1}{3}\sum_{y'=2003}^{2005}\sum_{A=1}^{3}\lambda_A CPUE^{A}_{y'} \quad (5)$$

$$\overline{\overline{CPUE}}_{y} = \frac{1}{3}\sum_{y'=y-3}^{y-1}\sum_{A=1}^{3}\lambda_A CPUE^{A}_{y'} \quad (6)$$

$$r_y = \frac{\overline{\overline{CPUE}}_{y}}{\overline{\overline{CPUE}}_{init}} \quad (7)$$

where

$\lambda_1 = 0.28$

$\lambda_2 = 0.55$

$\lambda_3 = 0.17$

Thus before any inter-annual constraints:

$TAC_{2009} = TAC_{2008}[1+3(-0.06427-(-0.006))](0.8584)$

$TAC_{2009} = 363[1+3(-0.06427-(-0.006))](0.8584)$ using. Eqn (1)

$TAC_{2009} = 256.5$ MT

where

$r_{2007} = \frac{\overline{\overline{CPUE}}_{2008}}{\overline{\overline{CPUE}}_{init}} = \frac{0.8921}{1.0392} = 0.8584$ …… using Eqn (7)

and hence $h(r) = 0.8584$ …….... using Eqn (4)

$s_y = \sum_{A=1}^{3} w^A s_y^A = 0.4952 * -(0.1061) + 0.4119 * (-0.0535) + 0.0929 * (0.1047)$

$= -0.06427$

The σ values of Eqn (3) which are bounded below by 0.15 are:

$\sigma_S^1 = 0.15$

$\sigma_S^2 = 0.164$

$\sigma_S^3 = 0.346$

Inter-annual TAC constraint

A rule to restrict the inter-annual TAC variation to no more than 5% up or down from year to year is applied, i.e.

$$\begin{aligned} &\text{if } TAC_{y+1} > 1.05TAC_y && TAC_{y+1} = 1.05TAC_y \\ &\text{if } TAC_{y+1} < 0.95TAC_y && TAC_{y+1} = 0.95TAC_y \end{aligned} \quad (8)$$

Thus as $TAC_{2009} < 0.95TAC_{2008}$ i.e. 256.5 < 345, the final 345 MT.

Appendix 2: MCM/2008/AUG/SWG-SCRL/28

Results for the final OMP 2008 selected for the South Coast Rock Lobster Resource

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Introduction

In Johnston and Butterworth (2008) results for a range of OMPs for the South Coast rock lobster fishery were reported. These OMPs varied with respect to the maximum extent of inter-annual TAC variability allowed (5%, 7.5% or 10%) as well as the median spawning biomass recovery anticipated over the next 20 years (B^{sp} (2025/2006) - ranges from 1.10 to 1.25 were presented).

The South Coast rock lobster SWG had previously decided that the preferred OMP should be intermediate to the OMP 4 and OMP 5 presented in Johnston and Butterworth (2008) which would:

3. have a 5% maximum TAC change constraint, and
4. have a median anticipated B^{sp} (2025/2006) of 1.20 under operating Model 3 (MARAM TVS).

Results

Table 1 reports performance statistics for this final OMP 2008 under either operating Model 3 (MARAM TVS) or Model 4 (OLRAC TVS). The tuning parameter δ for the final OMP is -0.006. Figure 1 shows the TAC, B^{sp} and V (annual TAC variability as a %) trajectories for both Model 3 and Model 4.

Johnston *et al.* (2008) provides a full description of the final OMP 2008 and the GLM analysis of the CPUE input data into the OMP.

References

Johnston, S.J. and D.S. Butterworth. 2008. Final set of OMP results for the South Coast Rock Lobster Resource OMP. MCM document, MCM/2008/JUL/SWG-SCRL/26.

Johnston, S.J., Glazer, J.P. and J. Gaylard. 2008. OMP 2008 for the South Coast Rock lobster. MCM document, MCM/2008/AUG/SWG-SCRL/ZZ.

Table 1: Model 3 (MARAM TVS) and Model 4 (OLRAC TVS) summary performance statistics for the final selected OMP. Medians with 5th and 95th percentiles are reported.

	FINAL OMP	**FINAL OMP**
	Model 3 (MARAM TVS)	Model 4 (OLRAC TVS)
δ	0.005	0.005
TAC constraint (%)	5	5
C^{7}_{ave} (2006-2012)	346 [343; 363]	347 [343; 377]
C^{10}_{ave} (2006-2015)	340 [323; 369]	351 [327; 391]
C^{20}_{ave} (2006-2025)	350 [296; 408]	364 [302; 436]
C(2008)	363 [363; 363]	363 [363; 373]
C(2009)	345 [345; 357]	345 [345; 381]
C(2010)	328 [328; 356]	328 [328; 389]
V^{7} (2006-2012)	4 [3; 4]	3 [2; 4]
V^{10} (2006-2015)	4 [3; 4]	4 [3; 4]
V^{20} (2006-2025)	4 [4; 5]	4 [4; 5]
B^{sp} (2015/2006) 90% range	1.24 [0.96; 1.68]	1.19 [0.96; 1.54]
B^{sp} (2025/2006) 90% range	1.20 [0.87; 1.70]	1.21 [0.90; 1.69]
B^{sp} (2006/K)	0.34	0.47
B^{sp} (2015/K)	0.42 [0.33; 0.57]	0.57 [0.45; 0.72]
B^{sp} (2025/K)	0.41 [0.29; 0.58]	0.57 [0.42; 0.79]
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Figure 1: Median annual TAC, B_{sp} and V (inter-annual TAC change as a %) trajectories with the 5th and 95th percentiles for the final OMP 2007 - Model 3 (left panel) and Model 4 (right panel). Note that 95th percentiles and median co-inside for V. The vertical shows the start of the projected series.