

## West Coast rock lobster Reference Set and Initial set of Robustness Tests

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### Reference Set

In 2007 the reference set of operating models used for basic OMP testing comprised the following:

Table 1: The 27 possible scenarios, which result as combinations of uncertainties regarding future recruitment, future somatic growth and current abundance.

Scenario	Recruitment	Somatic growth	Current Abundance	R WT	G WT	A WT	Total WT	Cum WT
1	FRM	FSGL	RC	0.6	0.5	0.5	0.15	0.15
2	FRM	FSGL	ALTL	0.6	0.5	0.25	0.075	0.225
3	FRM	FSGL	ALTH	0.6	0.5	0.25	0.075	0.3
4	FRM	FSGM	RC	0.6	0.4	0.5	0.12	0.42
5	FRM	FSGM	ALTL	0.6	0.4	0.25	0.06	0.48
6	FRM	FSGM	ALTH	0.6	0.4	0.25	0.06	0.54
7	FRM	FSGH	RC	0.6	0.1	0.5	0.03	0.57
8	FRM	FSGH	ALTL	0.6	0.1	0.25	0.015	0.585
9	FRM	FSGH	ALTH	0.6	0.1	0.25	0.015	0.6
10	FRH	FSGL	RC	0.3	0.5	0.5	0.075	0.675
11	FRH	FSGL	ALTL	0.3	0.5	0.25	0.0375	0.7125
12	FRH	FSGL	ALTH	0.3	0.5	0.25	0.0375	0.75
13	FRH	FSGM	RC	0.3	0.4	0.5	0.06	0.81
14	FRH	FSGM	ALTL	0.3	0.4	0.25	0.03	0.84
15	FRH	FSGM	ALTH	0.3	0.4	0.25	0.03	0.87
16	FRH	FSGH	RC	0.3	0.1	0.5	0.015	0.885
17	FRH	FSGH	ALTL	0.3	0.1	0.25	0.0075	0.8925
18	FRH	FSGH	ALTH	0.3	0.1	0.25	0.0075	0.9
19	FRL	FSGL	RC	0.1	0.5	0.5	0.025	0.925
20	FRL	FSGL	ALTL	0.1	0.5	0.25	0.0125	0.9375
21	FRL	FSGL	ALTH	0.1	0.5	0.25	0.0125	0.95
22	FRL	FSGM	RC	0.1	0.4	0.5	0.02	0.97
23	FRL	FSGM	ALTL	0.1	0.4	0.25	0.01	0.98
24	FRL	FSGM	ALTH	0.1	0.4	0.25	0.01	0.99
25	FRL	FSGH	RC	0.1	0.1	0.5	0.005	0.995
26	FRL	FSGH	ALTL	0.1	0.1	0.25	0.0025	0.9975
27	FRL	FSGH	ALTH	0.1	0.1	0.25	0.0025	1

Where:

#### Median Future recruitment

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

#### Future Somatic growth (2005+)

- FSGL: = FSGM for 3 years (2005, 2006, 2007) then 0.50

will equal the 1989-2004 average (see Figure 1)

- FSGM:  $\uparrow$  linearly to 1968-2004 ave over 10 yrs 0.40
- FSGH:  $\uparrow$  linearly to 1968-2004 ave over 3 yrs 0.10

[The above apply to the growth rates for Areas 3-4, 5-6, 7 and 8. The somatic growth rate for Area 1-2 will be assumed to remain constant in the future at the 1989-2004 average level for all scenarios.]

<u>Current (2005) Abundance (<math>B_{75}</math>)</u>	<b>WT</b>
• RC: Best Estimate (from current RC1-like model)	0.50
• ALTL: Estimated lower 12.5%ile	0.25
• ALTH: Estimated upper 12.5%ile	0.25

For 2011, it is suggested that the following modifications be considered.

1. Drop the scenarios that assume some future increase in somatic growth towards pre-1989 levels, i.e. drop FSGM and FSGH. There has been no suggestion of this for what is now a considerable period of time. Perhaps replace these by variants of the FSGL level.
2. For future recruitment, add  $R_{2000}$  to the estimable parameters considered in each test.
3. Current abundance will now refer to 2010.

## Robustness Tests

The following table provides an initial list of proposed robustness tests which will be used to test the robustness of the underlying operating models to various model assumptions (Category A tests) and to evaluate the performance of various candidate OMPs (Category B tests). Suggested priority of each test is given, where I is the highest priority.

**CATEGORY A:** One (or several) of the assumptions of the underlying operating model itself, or the data to which it was fitted, are altered, thus requiring the model to be re-fitted to the data by maximising the likelihood function.

**CATEGORY B:** These tests examine the robustness to assumptions relating to the future of the resource and monitoring data. During the OMP testing, it is assumed that the OMP is not “aware” of these changes.

<b>CATEGORY A TESTS</b>	<b>Description</b>	<b>Suggested Priority</b>
<b>HC</b>	Examine alternate inter-areal split of historic catches	II
<b>SEL</b>	Alternate selectivity functional forms	I
<b>MOD</b>	Start model in 1970	II
<b>NS1</b>	Male natural survivorship = 0.88 (RC = 0.90)	I
<b>NS2</b>	Male natural survivorship = 0.92	I
<b>NS3</b>	Alter natural survivorship function so that maximum survivorship occurs at 80mm (not 60mm)	II
<b>D2</b>	Discard mortality = 0.2 (RC = 0.1)	II
<b>D3</b>	Discard mortality increases 5 yrs prior to min size change in 1993	II
<b>SG1</b>	Adult growth is 0.5mm more than thought	II

<b>SG2</b>	1870-1967 growth = 68-88 average (i.e. historic growth excludes low growth period in average)	I
<b>SG3</b>	Pre-1990 growth shifted down to 1990+ average level	II
<b>SG5</b>	Adult somatic growth rate smaller at large sizes	III
<b>W1</b>	1990+ 225 MT walkout each yr	III
<b>W2</b>	Once every decade 1870-1990 500 MT walkout	III
<b>P</b>	Poaching has increased linearly in the last five years by 10% p.a.	I
<b>CATEGORY B TESTS</b>		
<b>C1</b>	Future TAC levels are over caught by 5%	II
<b>E1</b>	Recruitment drops 50% for a 3 year period, once in 1995-2010	I
<b>E3</b>	25% all lobsters die once 2003-2016	II
<b>P1</b>	Poaching reduced next 5 years from 500 to 200 MT	III
<b>P2</b>	Poaching increased next 5 years from 500 to 1000 MT	I
<b>TH1</b>	Future trap:hoop 60:40 (RC: 80:20)	II
<b>B2</b>	Future adult somatic growth 0.5mm than thought	III
<b>B3</b>	Future adult somatic growth 0.5mm less than thought	II
<b>W1 future</b>	Future walkouts continue at 1990s rate	I
<b>W3</b>	W1 above, but 400 MT walk-out annually 2006+	III
<b>M1</b>	FIMS index missing	III
<b>M2</b>	Somatic growth index missing	III
<b>COMP</b>	Hard combination of tests	I
<b>RECR</b>	Recreational implementation error	I
<b>IR</b>	Interim relief error	I