Further Updated West Coast Rock Lobster Operating Models for super-areas A1+2 and A8+

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Introduction

At the previous SWG meeting (23 March 2011) results of updated operating models for all five super-areas of the west coast rock lobster resource were presented (Johnston and Butterworth 2011). The SWG requested that two of the operating models be re-run following discussions at the meeting. These re-runs are:

Area 1+2: Re-run the model with the constraint that all estimable recruitment parameters must be ≤ 1.0, when expressed as a proportion of the pristine recruitment.

Area 8+: Re-run the model with updated values for both the trapboat and hoopnet CPUE series. Glazer and Butterworth (2011a,b) report updated CPUE values. These values have been updated to include Area 8 sub-areas and to take into account Areas 10-14 as recommended.

Results

Table 1 reports both the original (WCRL13) Area 1+2 and Area 8+ estimated model parameters, as well as the updated values shown in bold.

Figures 1a-c show plots of both the original (WCRL13) model fits to CPUE and F% data as well as the updated model fits. Figures 2a-c show similar fits to catch-at-length (CAL) data. Figures 3a-c show the selectivity functions. Figures 4a-d compare the updated with the original WCRL13 Egg, B75 (m+f) and recruitment trajectories for the two super-areas.

Discussion

Current biomass (m+f) values estimated for Area 1+2 remain around 2% of pristine levels, with current male biomass being estimated around 1% or pristine. Egg production levels for Area 1+2 remain 2% of pristine.

Updated estimates of current biomass for Area 8+ are lower than those reported in WCRL13. Combined m+f biomass levels are currently estimated to be around 10 300 MT whereas previously this value was larger at around 14 400 MT. Both these values are around 6% of pristine though. The updated model for A8+ shows slightly less optimistic current m+f biomass levels relative to 1996 (0.65 for updated model vs 0.79 for previous model). Updated current male biomass estimates relative to pristine are also slightly more pessimistic than the previous assessment of WCRL13, although the current male biomass level relative to the 2006 level remains close to 1.0. Current Egg production for the updated A8+ assessment is improved to 31% relative to pristine, compared with 23% for the previous assessment.

References

Glazer, J.P. and Butterworth, D.S. 2011a. The application of a Generalized Linear Mixed Model to the Area 8+ trapboat data. FISHERIES/2011/APRIL/SWG-WCRL19.

Glazer, J.P. and Butterworth, D.S. 2011b. The application of a Generalized Linear Mixed Model to the Area 8 bakkie data. FISHERIES/2011/APRIL/SWG-WCRL20.

Johnston, S.J. and D.S. Butterworth. 2011. Updated west coast rock lobster operating models. FISHERIES/2011/MAR/SWG-WCRL13.

Table 1: Comparative contributions to the –ln*L* value, sigma values, biomass and egg production estimates for super area A1+2 and A8+. Results shown in bold are the updated results. Those in italics are those reported previously in WCRL13.

Super-area	*A1+2*	**A1+2**	*A8+*	**A8+**
R_{1910} (millions)	*44.1*	**57.3**	*607.4*	**406.8**
R_{1920}/R_{1910}	*3.921*	**0.998**	*0.107*	**0.358**
R_{1950}/R_{1910}	*0.001*	**0.345**	*0.041*	**0.021**
R_{1970}/R_{1910}	*0.045*	**0.017**	*0.082*	**0.143**
R_{1975}/R_{1910}	*0.008*	**0.013**	*0.175*	**0.245**
R_{1980}/R_{1910}	*0.032*	**0.023**	*0.158*	**0.196**
R_{1985}/R_{1910}	*0.034*	**0.027**	*0.485*	**0.658**
R_{1990}/R_{1910}	*0.001*	**0.001**	*0.374*	**0.446**
R_{1995}/R_{1910}	*0.017*	**0.015**	*0.400*	**0.563**
R_{2000}/R_{1910}	*0.045*	**0.046**	*0.533*	**0.744**
R_{2003}/R_{1910}	*0.005*	**0.001**	*0.313*	**0.381**
Trap CPUE σ	-	**-**	*0.177*	**0.183**
Hoop CPUE σ	*0.165*	**0.201**	*0.233*	**0.175**
FIMS CPUE σ	-	**-**	*0.274*	**0.274**
Male Trap Size σ	-	**-**	*0.310*	**0.278**
Female Trap Size σ	-	**-**	*0.451*	**0.430**
Male Hoop Size σ	*0.293*	**0.288**	*0.222*	**0.169**
Female Hoop Size σ	*0.964*	**1.036**	*0.373*	**0.410**
Male FIMS Size σ	-	**-**	*0.150*	**0.150**
Female FIMS Size σ	-	**-**	*0.150*	**0.150**
Male Sublegal size σ	-	**-**	*0.167*	**0.159**
Female Sublegal size σ	-	**-**	*0.232*	**0.206**

Trap F% σ	-	**-**	*0.150**	**0.150***
Hoop F% σ	*0.150**	**0.150***	*0.150**	**0.150***
FIMS F% σ	-	**-**	*0.150**	**0.150***
Total –*lnL*	*-19.64*	**-9.86**	*-62.67*	**-70.77**
B_{75}(1910) MT	*56 090*	**73 059**	*242 311*	**161 875**
B_{75}(2010) MT	*1 064*	**1 305**	*14 437*	**10 272**
B_{75}(2010)/B_{75}(1910)	*0.019*	**0.018**	*0.060*	**0.063**
B_{75}(2010)/B_{75}(1996)	*0.807*	**0.968**	*0.790*	**0.648**
B_{75}^{m}(1910) MT	*39 386*	**51 302**	*210 670*	**140 737**
B_{75}^{m}(2010) MT	*425*	**591**	*13 640*	**9 469**
B_{75}^{m}(2010)/ B_{75}^{m} (1910)	*0.011*	**0.012**	*0.065*	**0.067**
B_{75}^{m}(2010)/ B_{75}^{m}(1996)	*1.821*	**1.984**	*0.886*	**0.734**
B_{75}^{m}(2010)/ B_{75}^{m}(2006)	*1.160*	**1.192**	*0.988*	**0.979**
Egg (2010)/Egg (1910)	*0.025*	**0.022**	*0.225*	**0.305**

*these result from hitting the lower bounded constraint of 0.150

Figure 1a: Area 1+2 fit to CPUE and F% - comparison between original fit reported in WCRL13 and the updated fit reported in this document.

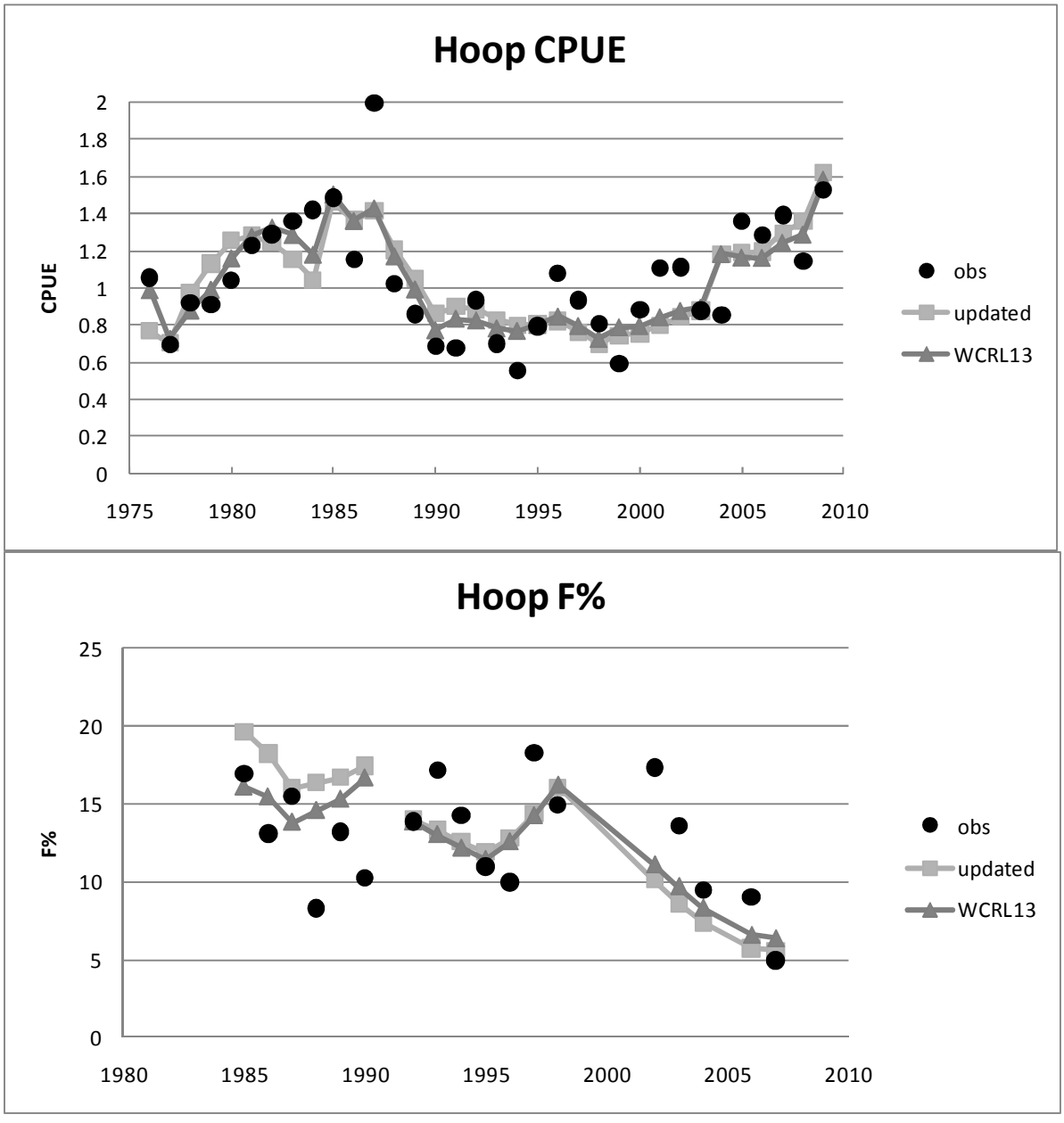


Figure 1b: Original Area 8+ fit to CPUE and F% as reported in WCRL13.

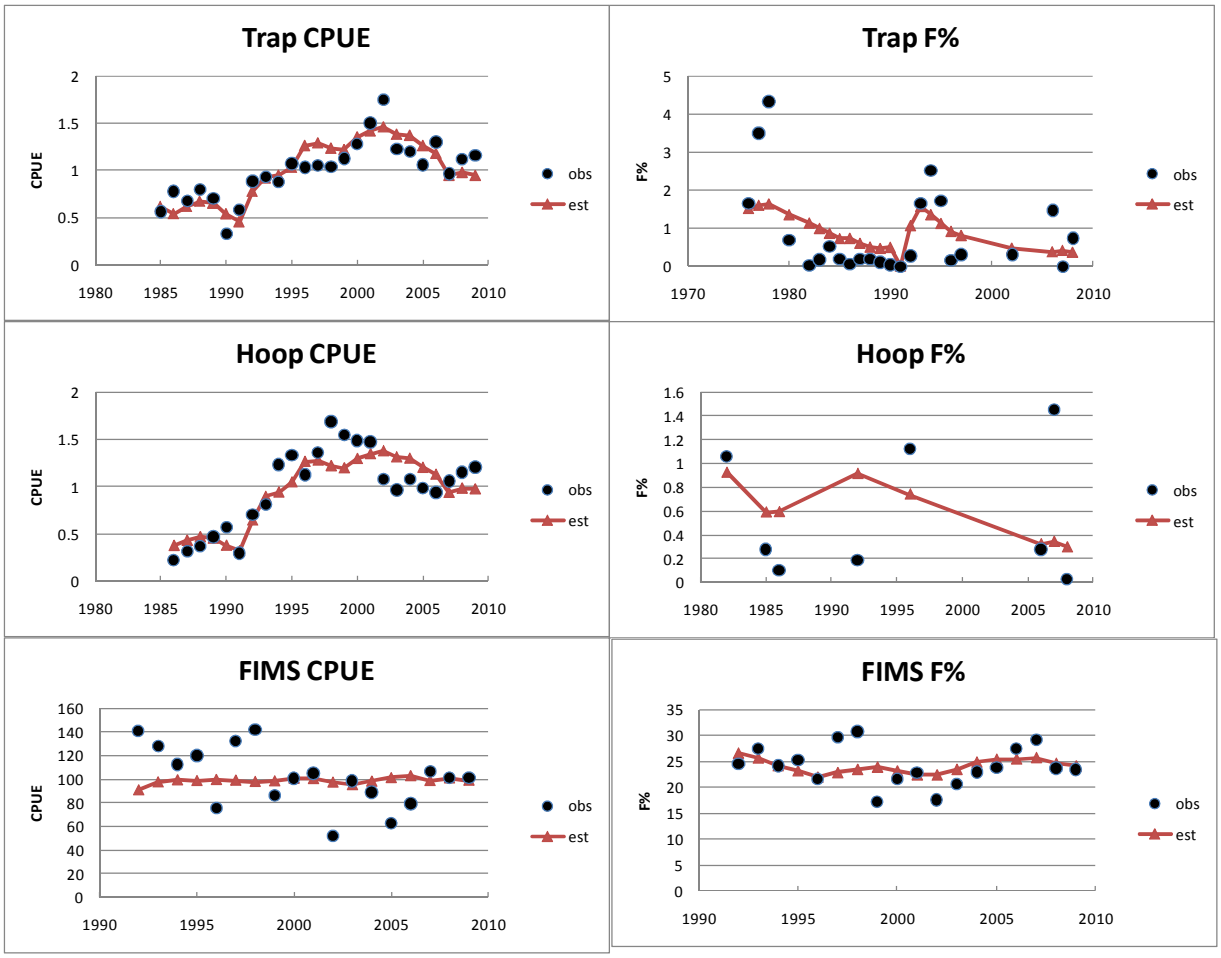


Figure 1c: Updated Area 8+ fit to CPUE and F% as reported in this document.

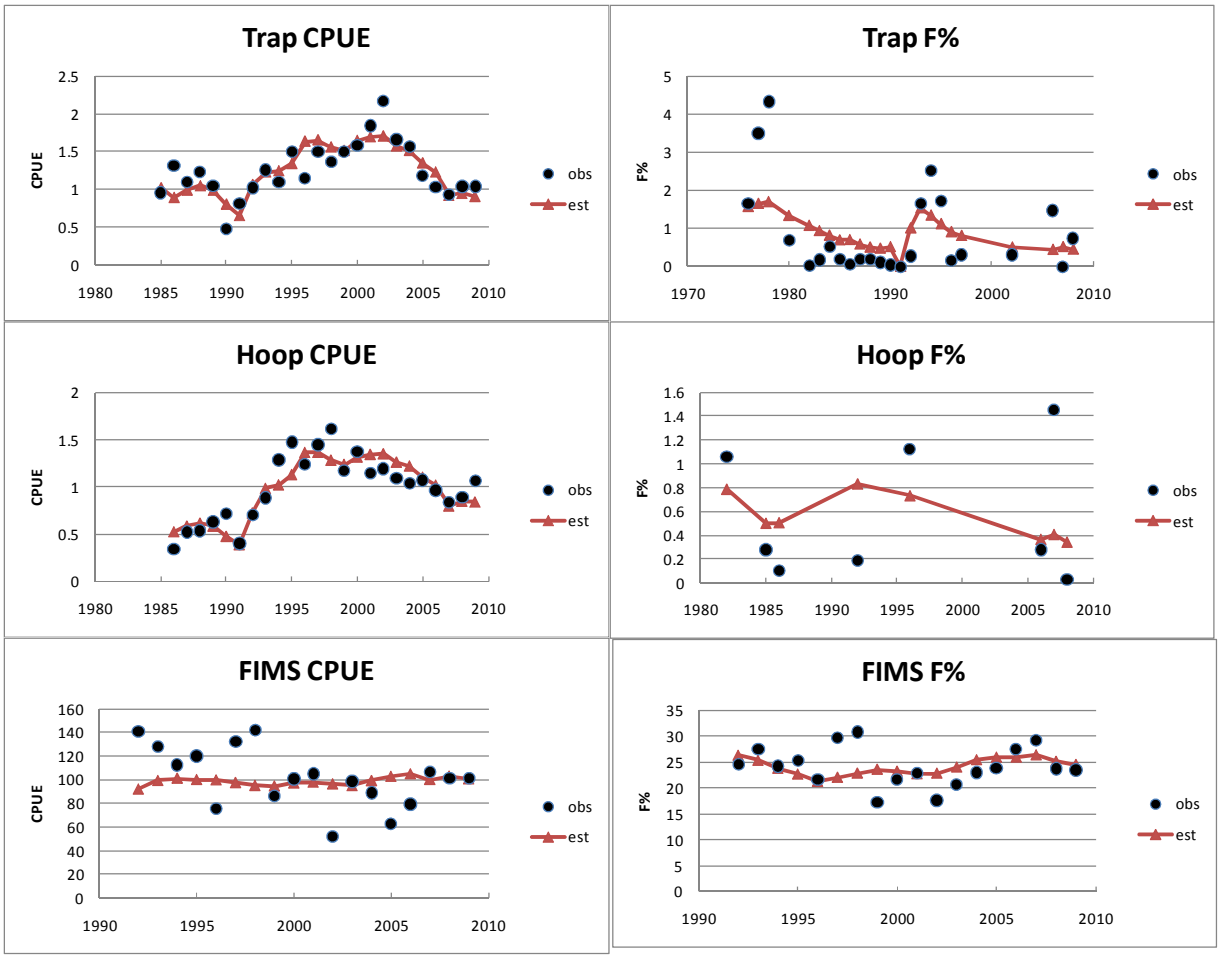
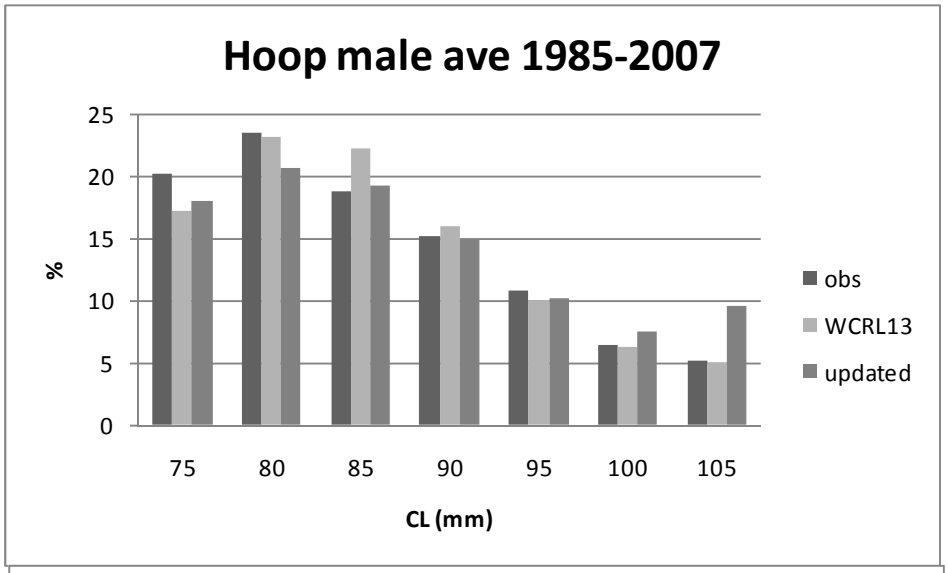


Figure 2a: Area 1+2 fits to CAL data (averages shown) - comparison between original fit reported in WCRL13 and the updated fit reported in this document.



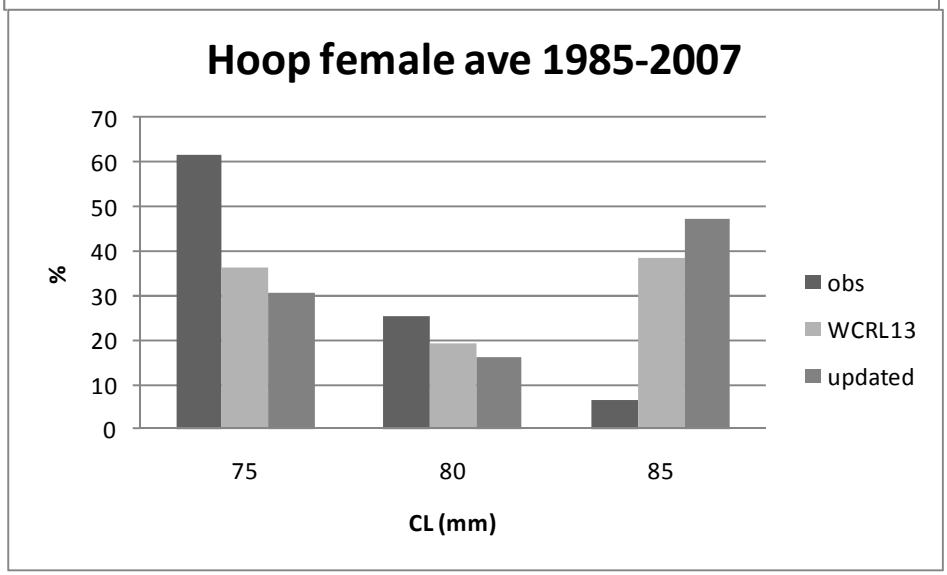


Figure 2b: Original WCRL13 Area 8+ fits to CAL data – averages shown.

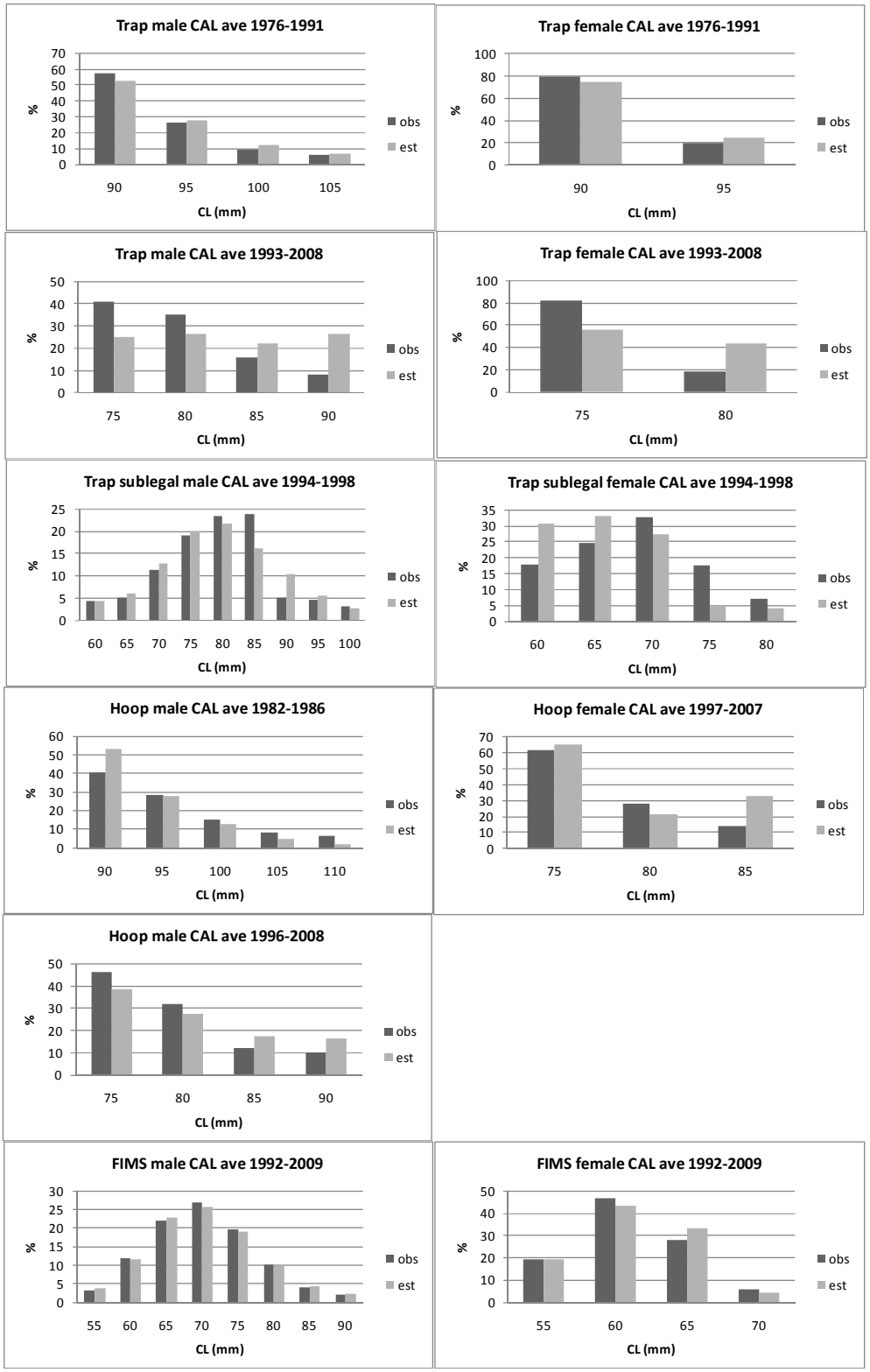


Figure 2c: Updated Area 8+ fits to CAL data – averages shown.

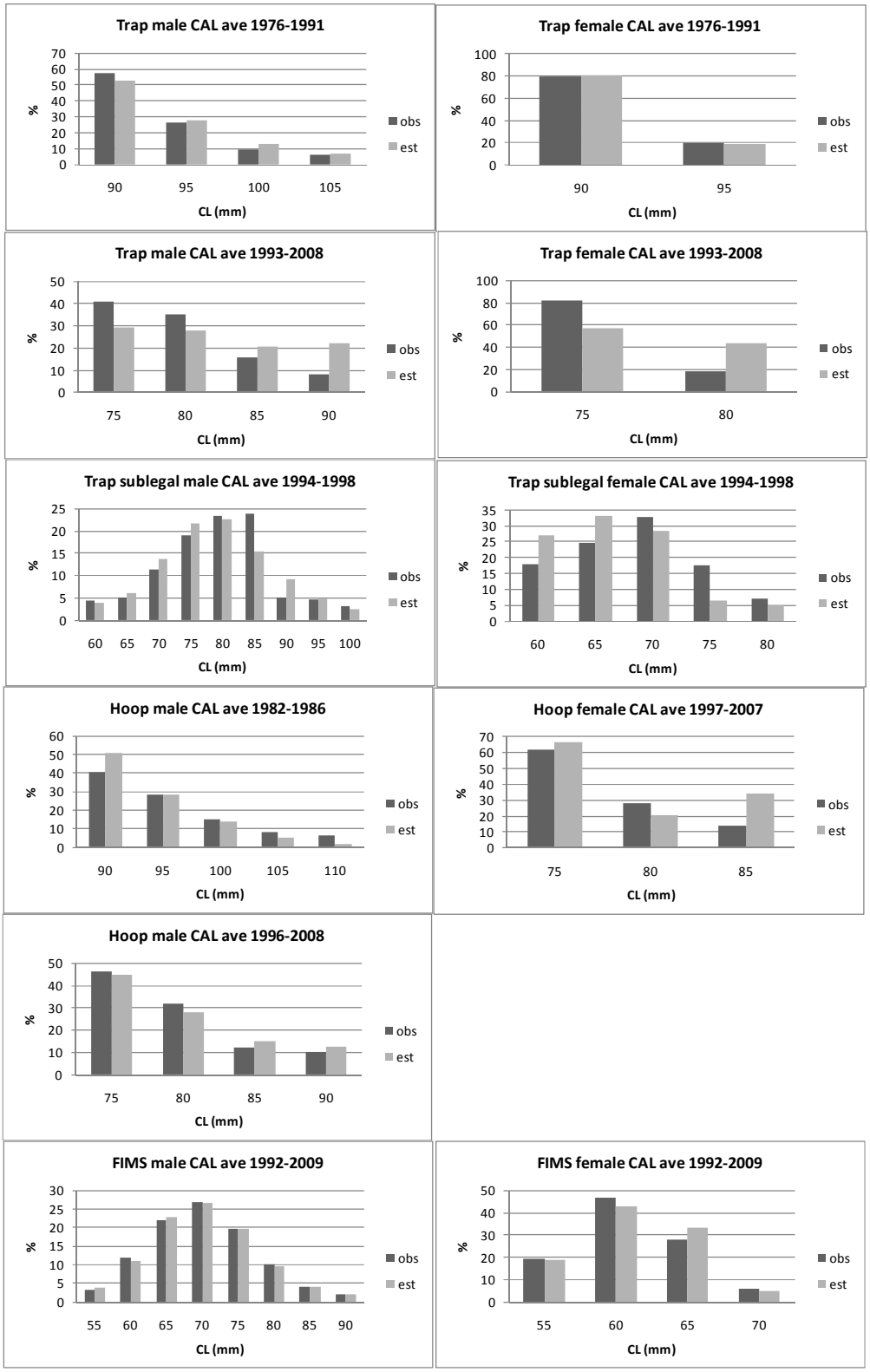


Figure 3a: WCRL13 and updated Area 1+2 hoop selectivity functions. [Note the hoop sublegal selectivity function values are scaled to be equal to those estimated for Area 8.]

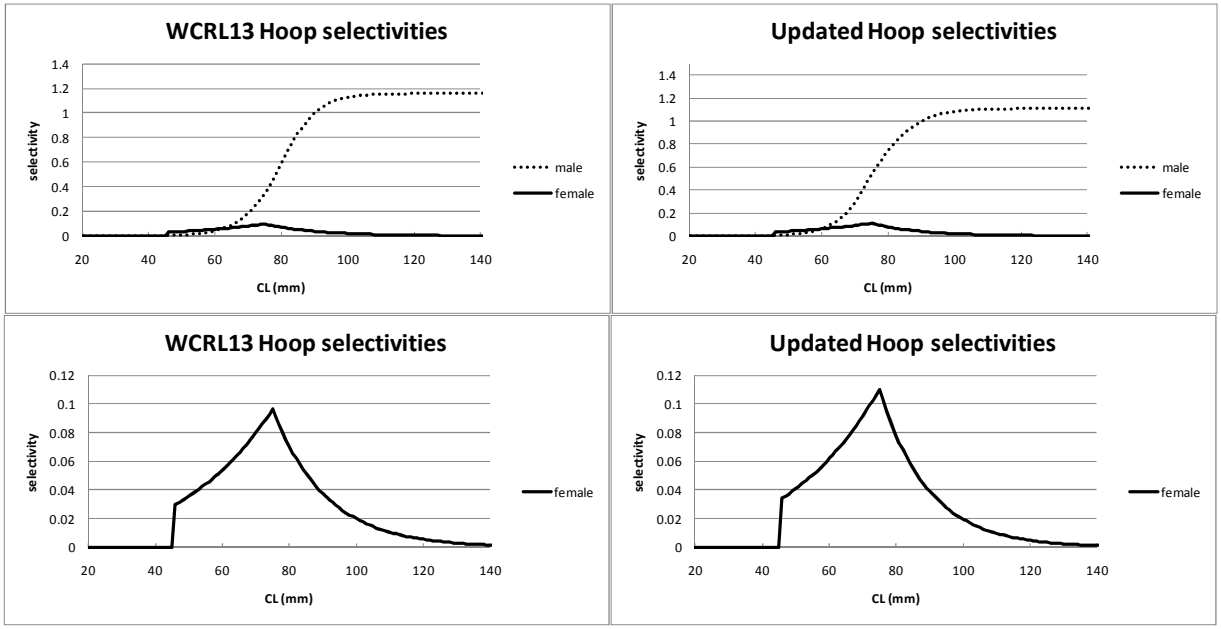


Figure 3b: Original WCRL13 Area 8+ selectivity functions.

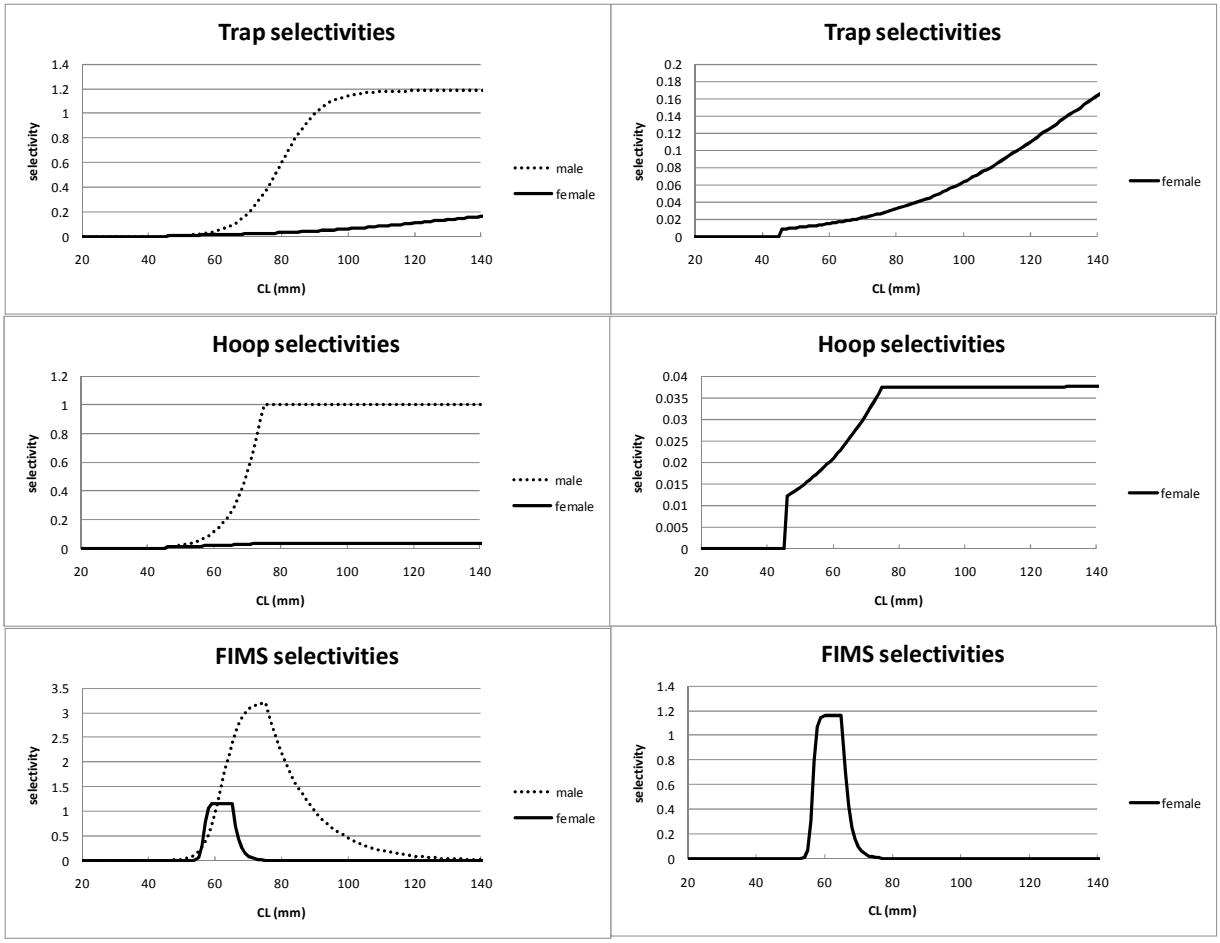


Figure 3c: Updated Area 8+ selectivity functions.

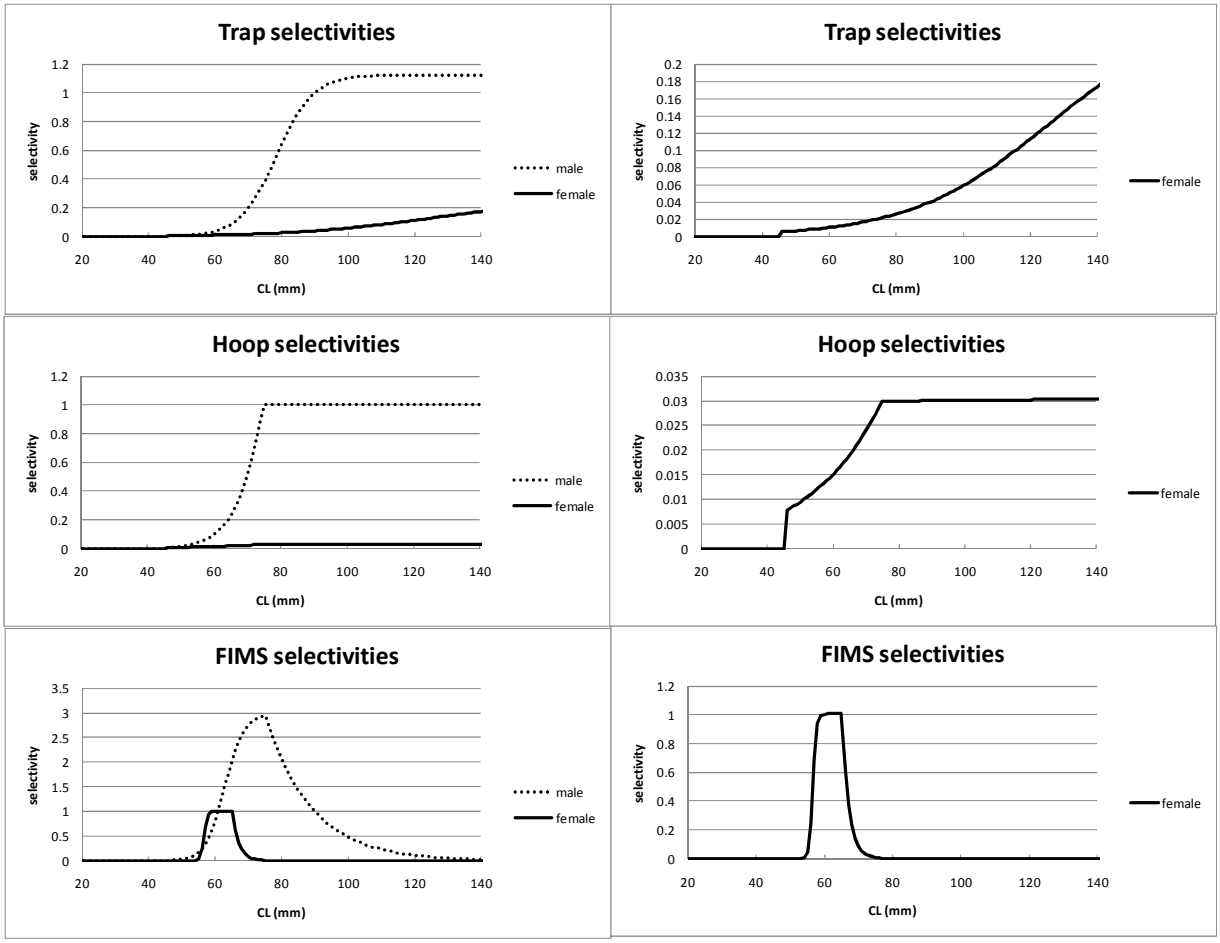


Figure 4a: Original WCRL13 (dashed line) vs updated (solid line) Area 1+2 model Egg, B75 (m+f) and recruitment trajectories.

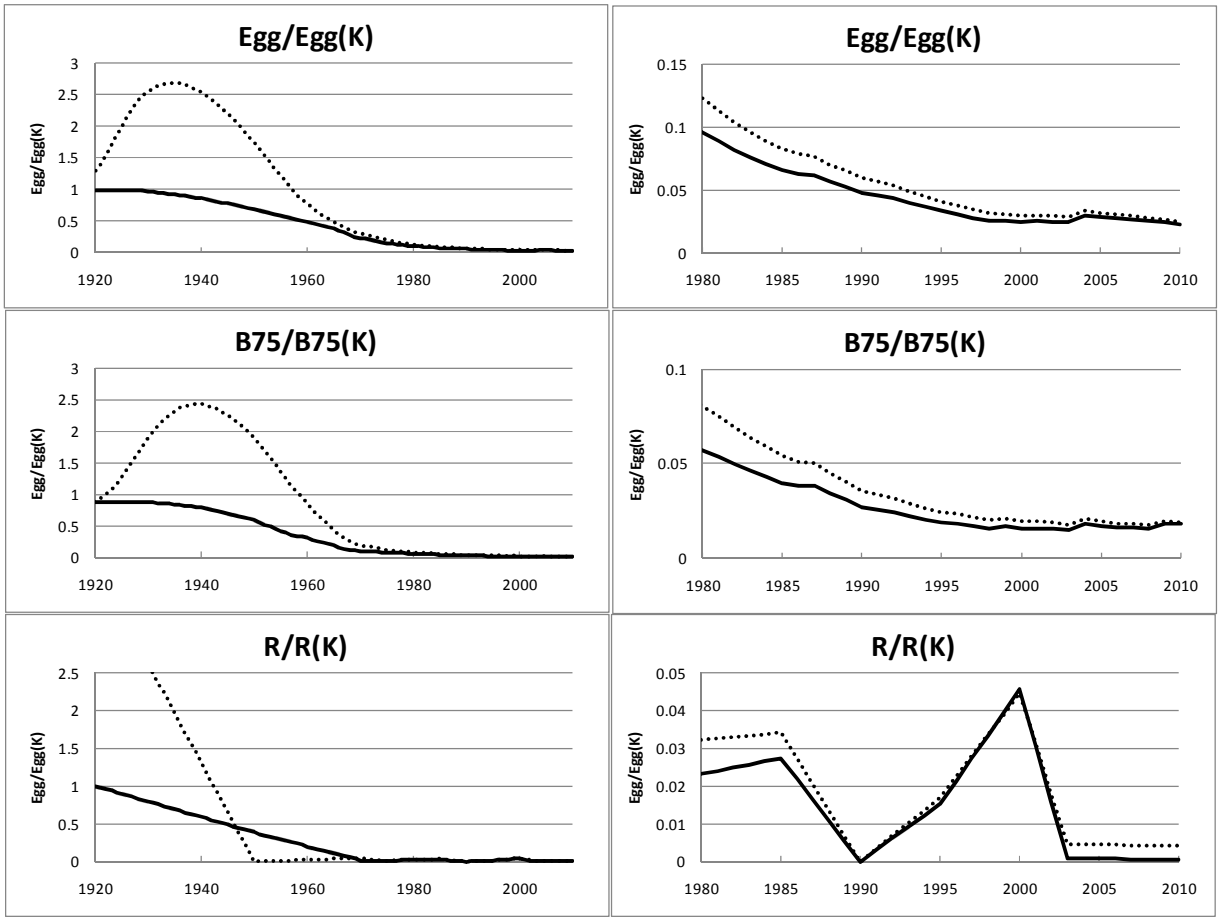


Figure 4b: Original WCRL13 (dashed line) vs updated (solid line) Area 8+ model Egg, B75 (m+f) and recruitment trajectories.