Snow crab for January 2016 CPT meeting.

From CPT meeting Sept 2015:

CPT Recommendations
1. Model 0 changed dramatically in this iteration – explore the convergence to a global minimum by starting at different parameter values.
2. The CPT requests that any steps between Models 0 and 1 be evaluated in individual model scenarios.
3. Provide both the potlift data and the protocol used to extrapolate post-1991 discard data to pre-1992 historical female discards.
4. Explore potential conflicts of trawl likelihood weighting (Model 2) with other data sources.
5. Explore the dramatic differences in sequential survey estimates and why the models do not split the difference between the last two survey years.
6. Models 4 and 5 use an F penalty vector that is not broken out over time; evaluate a vector broken over time.
7. Explore a scenario in which the weight of the trawl discard likelihood is increased.
The CPT recommends that these changes to the extent possible be evaluated for the January 2016 CPT meeting in order to resolve outstanding issues prior to model review in May 2016.

List of model changes from Model 0 (accepted in Sept. 2015) to Model 5 (#18) with one change per step. This would require 18 model scenarios including Model 0.

1. Model 0
2. Change 95% parameter to offset from 50% survey selectivity 1
3. Change 95% parameter to offset from 50% survey selectivity 2
4. Change 95% parameter to offset from 50% survey selectivity 3
5. Change 95% parameter to offset from 50% survey selectivity 4
6. Change q to probit scale survey selectivity 1
7. Change q to probit scale survey selectivity 2
8. Remove prior constraint on maturity probability males
9. Remove prior constraint on maturity probability females
10. Increase weight on smoothness of female maturity probability
11. Increase weight on trawl discard catch
12. Size at 50% selected for female discard changed form 4.2 to 4.4 (log scale). Fixed in model.
13. Increase weight on fitting growth data from 2 to 3 males
14. Increase weight on fitting growth data from 2 to 3 females
15. Take off Fishing mortality penalties for 1992 to present male crab on average F
16. Take off Fishing mortality penalties for 1992 to present male crab on F deviations
17. Take off fishing mortality penalties for 1992 to present for female crab
18. Use potlifts to estimate fishing mortality for 1978 to 1991 for female crab

Suggested runs for May 2016 – only do Model 0 and removal of fishing mortality penalties.

1. Model 0
2. Take off Fishing mortality penalties for 1992 to present male crab on average F
3. Take off Fishing mortality penalties for 1992 to present male crab on F deviations
4. Split fishing mortality vector at 1992 using model at previous step
5. Take off fishing mortality penalties for 1992 to present for female crab
6. Use potlifts to estimate fishing mortality for 1978 to 1991 for female crab

If changes in growth or other likelihoods weights needed do as separate step.

Model 0 checks on convergence – run with +- 10% change in converged values of estimated parameters. Natural mortality, growth and selectivity parameters (not recruitment or fishing mortality parameters. Other information needed for check on model convergence?

Model runs stepping between model 1 and model 2 from Sept. 2015 assessment.

Additional model runs

- Model 1a – weight 4x on fit to trawl catch
- Model 1b – weight 4x trawl catch and maturity probability constraint removed
- Model 1c – Maturity Constraint removed
- Model 1d – Increased weight on smoothness of female maturity probability
- Model 2a – Model 2 with weight on growth increased from 2 to 3.

Population Male Mature Biomass

Legend:
- Model 1
- Model 1a
- Model 1b
- Model 1c
- Model 1d
- Model 2
- Model 2a

Y-axis: Male Mature Biomass (1000 t)

X-axis: Year
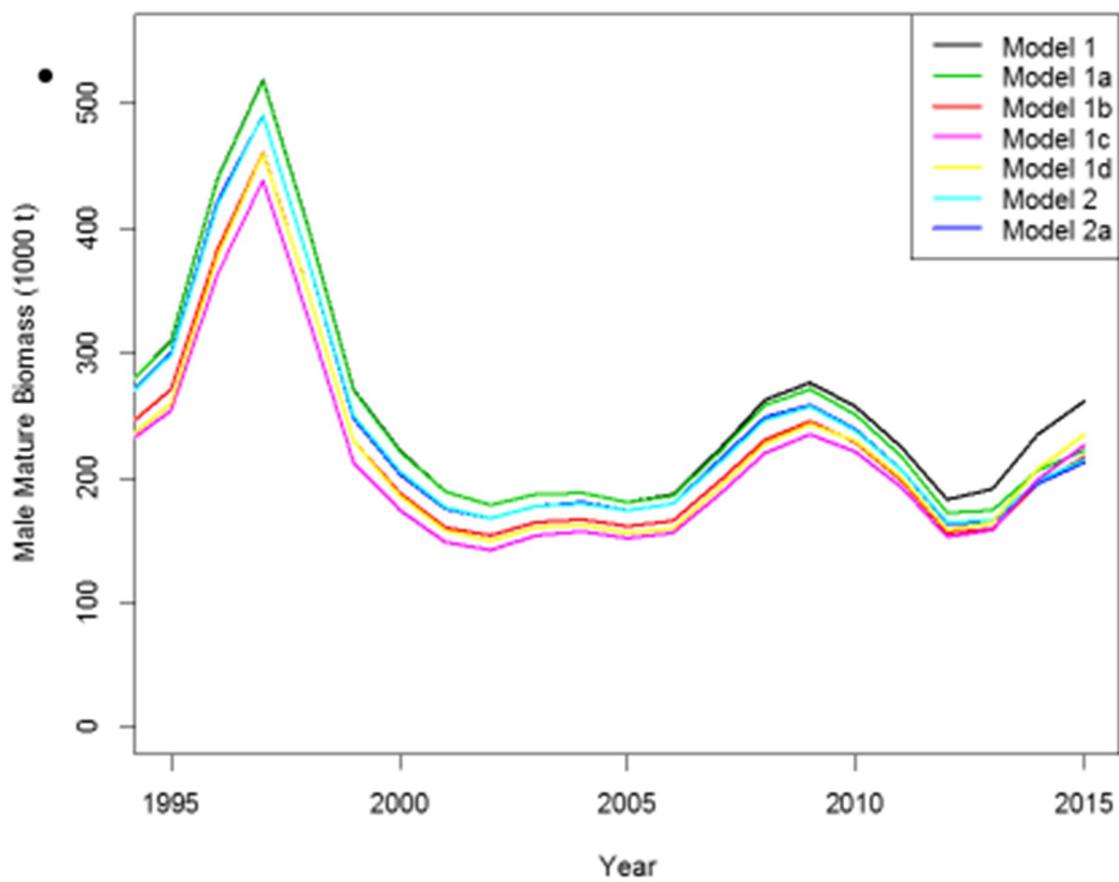
	1	1a	1b	1c	1d	2	2a
Recruitment	0.00	-0.42	1.32	-0.18	0.24	-1.09	-0.42
Initial numbers old shell males small length bins	0.00	-0.01	-0.03	0.44	0.47	-0.03	-0.02
ret fishery length	0.00	0.65	4.28	-6.61	1.14	-5.46	-2.37
total fish length	0.00	-0.68	-6.05	-7.43	-1.94	-5.54	-1.83
female fish length	0.00	-0.59	-4.77	-5.04	17.18	15.79	8.34
survey length	0.00	3.27	87.29	97.68	91.49	31.62	64.82
trawl length	0.00	2.91	3.30	3.86	0.80	3.53	4.48
2009 BSFRF length	0.00	-0.34	-1.65	-1.08	-2.84	-0.34	-0.38
2009 NMFS study area length	0.00	-0.11	-1.12	-0.93	-2.06	-0.68	-0.34
M prior	0.00	-0.17	2.88	-1.84	-0.70	0.03	-0.33
maturity smooth	0.00	-0.50	-52.78	-52.43	25.06	-23.42	-31.16
growth males	0.00	-0.27	4.11	1.12	-1.54	1.85	8.34
growth females	0.00	0.92	-4.20	-4.30	-8.07	-12.73	5.64
2009 BSFRF biomass	0.00	0.01	0.07	0.12	0.08	0.03	0.04
2009 NMFS study area biomass	0.00	0.01	0.08	0.12	0.09	0.03	0.03
retained catch	0.00	-0.01	-0.26	-0.37	-0.15	-0.25	0.12
discard catch	0.00	-3.02	-16.49	-21.24	-10.69	-13.32	6.77
trawl catch	0.00	6.65	7.31	1.09	0.85	7.73	6.89
female discard catch	0.00	-18.67	-18.74	-18.85	-18.89	-18.75	-18.75
survey biomass	0.00	4.12	0.02	-21.45	-17.24	-0.68	1.47
F penalty	0.00	3.21	2.87	-3.49	-1.66	1.93	2.64
2010 BSFRF Biomass	0.00	0.19	1.67	1.99	1.93	0.39	0.53
2010 NMFS Biomass	0.00	0.07	1.03	1.47	1.18	0.37	0.29
initial numbers fit	0.00	-0.48	-1.01	3.08	3.41	-0.76	-0.49
2010 BSFRF length	0.00	0.72	-0.25	1.12	0.93	0.09	2.53
2010 NMFS length	0.00	0.91	1.71	1.74	2.07	0.03	1.34
male survey selectivity smooth constraint	0.00	-0.01	0.23	0.37	0.15	0.20	0.45
init nos smooth constraint	0.00	0.31	1.10	8.16	6.47	1.10	1.75
Total	0.00	-1.36	11.91	-22.86	87.77	-18.33	60.34

Male Maturity Probability

Female maturity probability

Population mature male biomass estimated from the September 2014 assessment, compared to Model 0, Model 0 with 2015 catch only and the Model 0 with corrected 2013/14 discard and no 2015 data.