Appendix C5: Results for Model 4

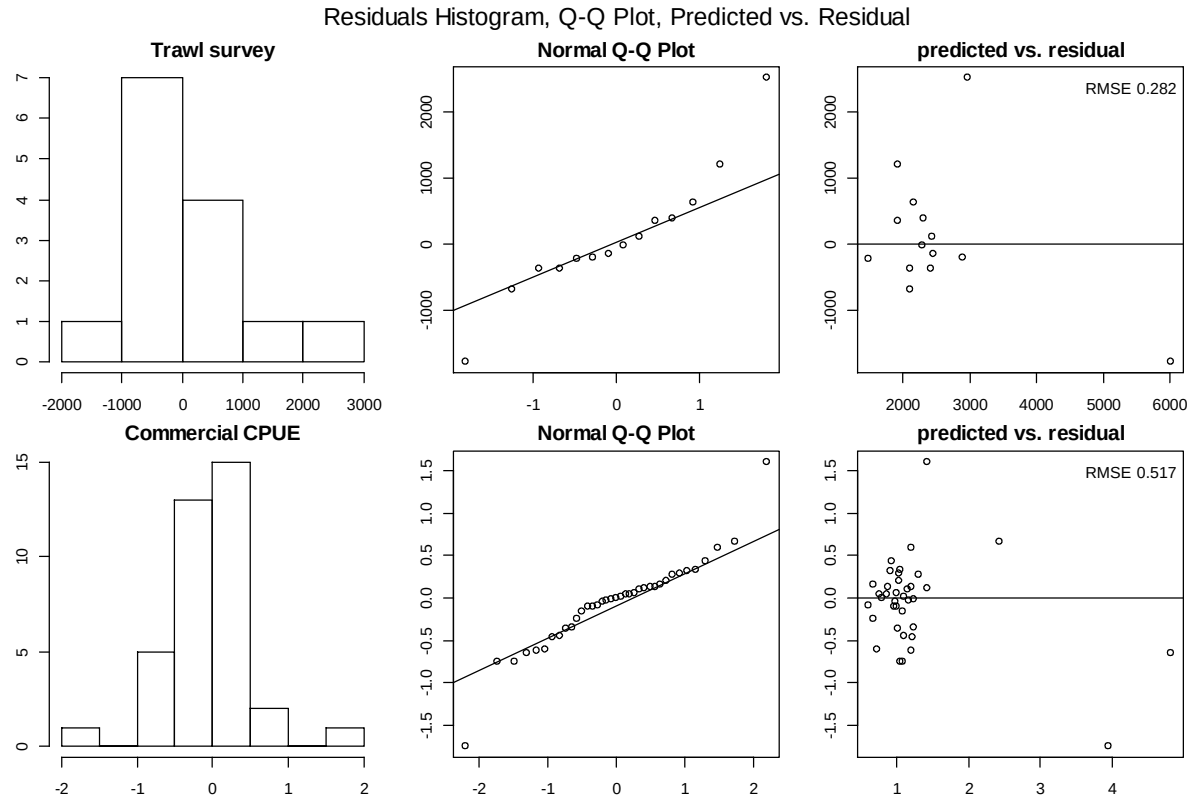


Figure C5-1. QQ plots of trawl survey abundance and commercial CPUE residuals.

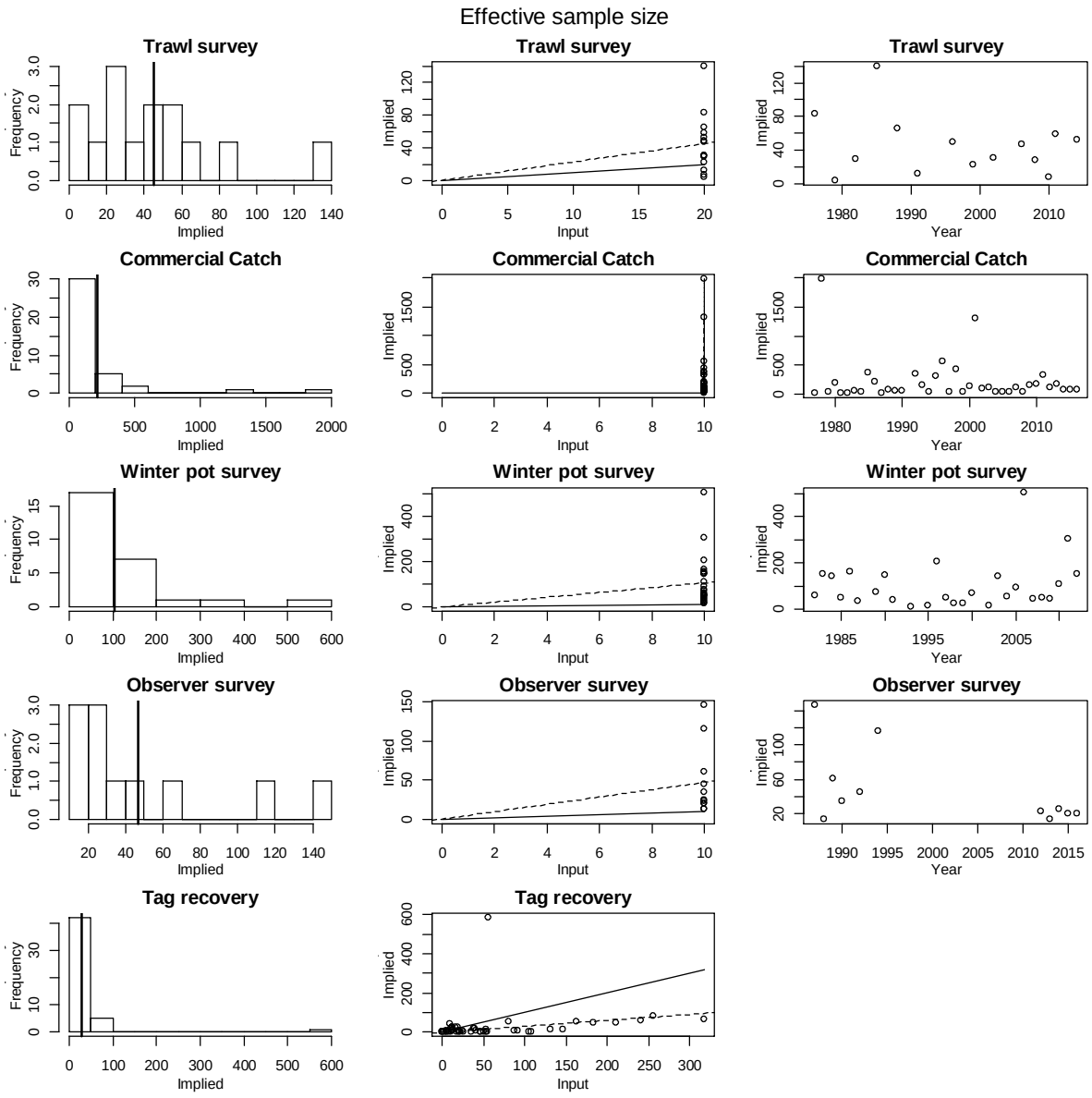
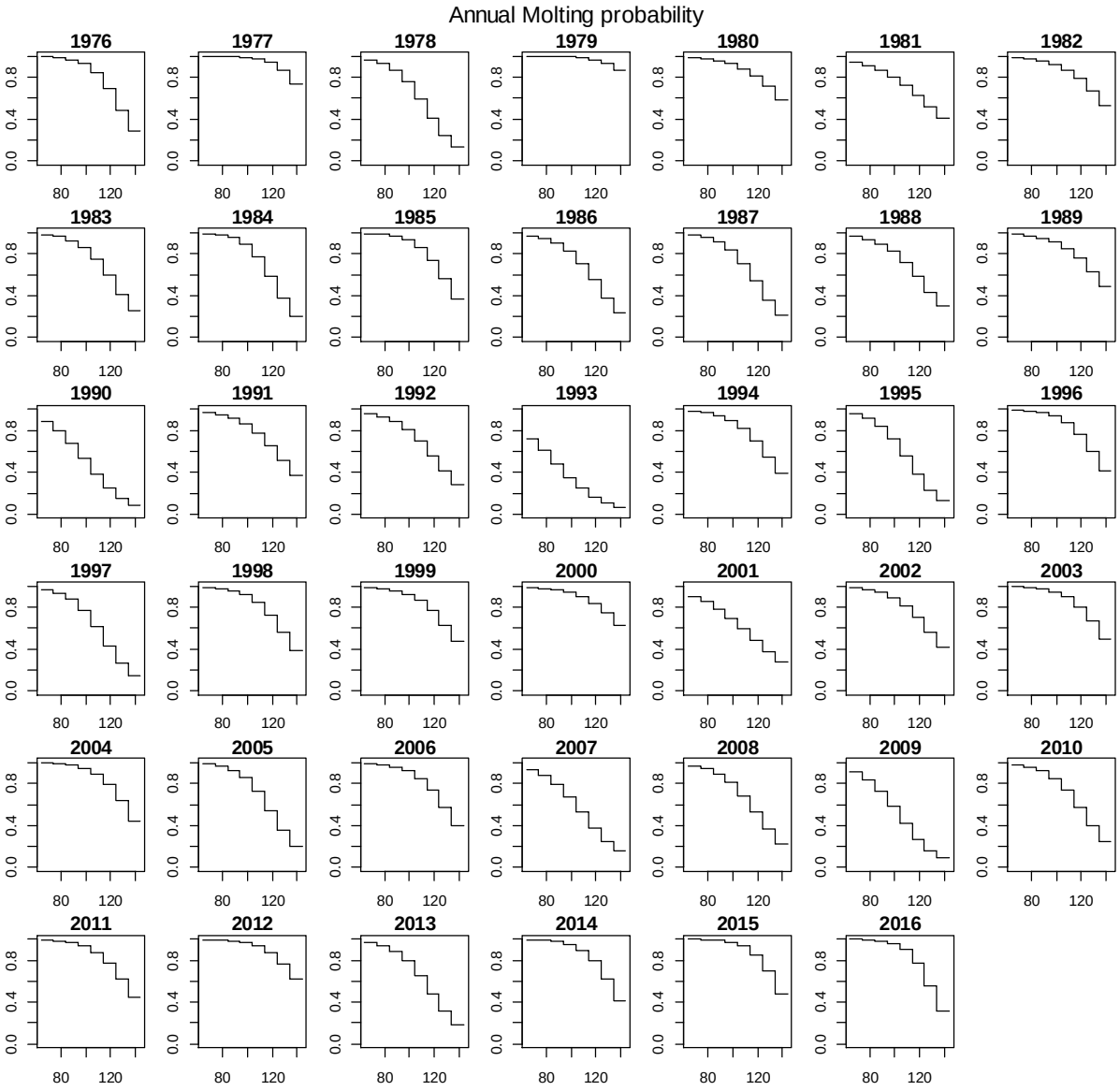


Figure C5-2: Implied effective sample sizes. Figures in the first column show implied effective sample size (x-axis) vs. frequency (y-axis). Vertical solid line is the mean implied effective sample size. The second column shows input sample sizes (x-axis) vs. implied effective sample sizes (y-axis). Dashed line indicates the linear regression slope, and solid line is 1:1 line. The third column shows years (x-axis) vs. implied effective sample sizes (y-axis).


Annual Molting probability
1976
1977
1978
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2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
0.0
0.4
0.8
80
120

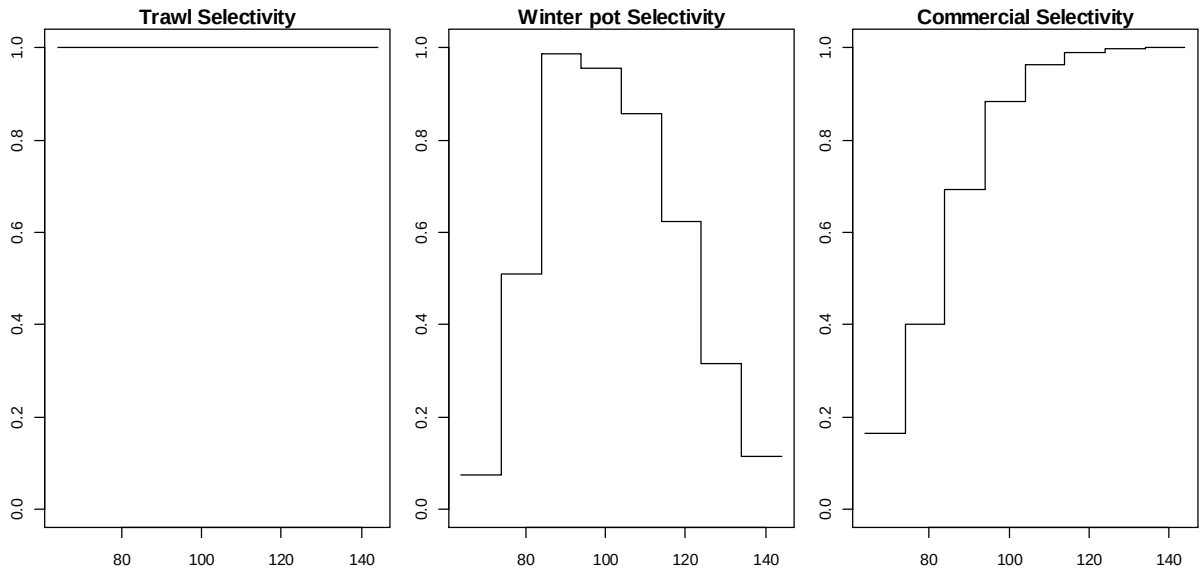

Figure C5-3. Model estimated annual molting probability, trawl survey selectivity, winter pot survey selectivity, and summer commercial fishery selectivity. X-axis is carapace length (mm).

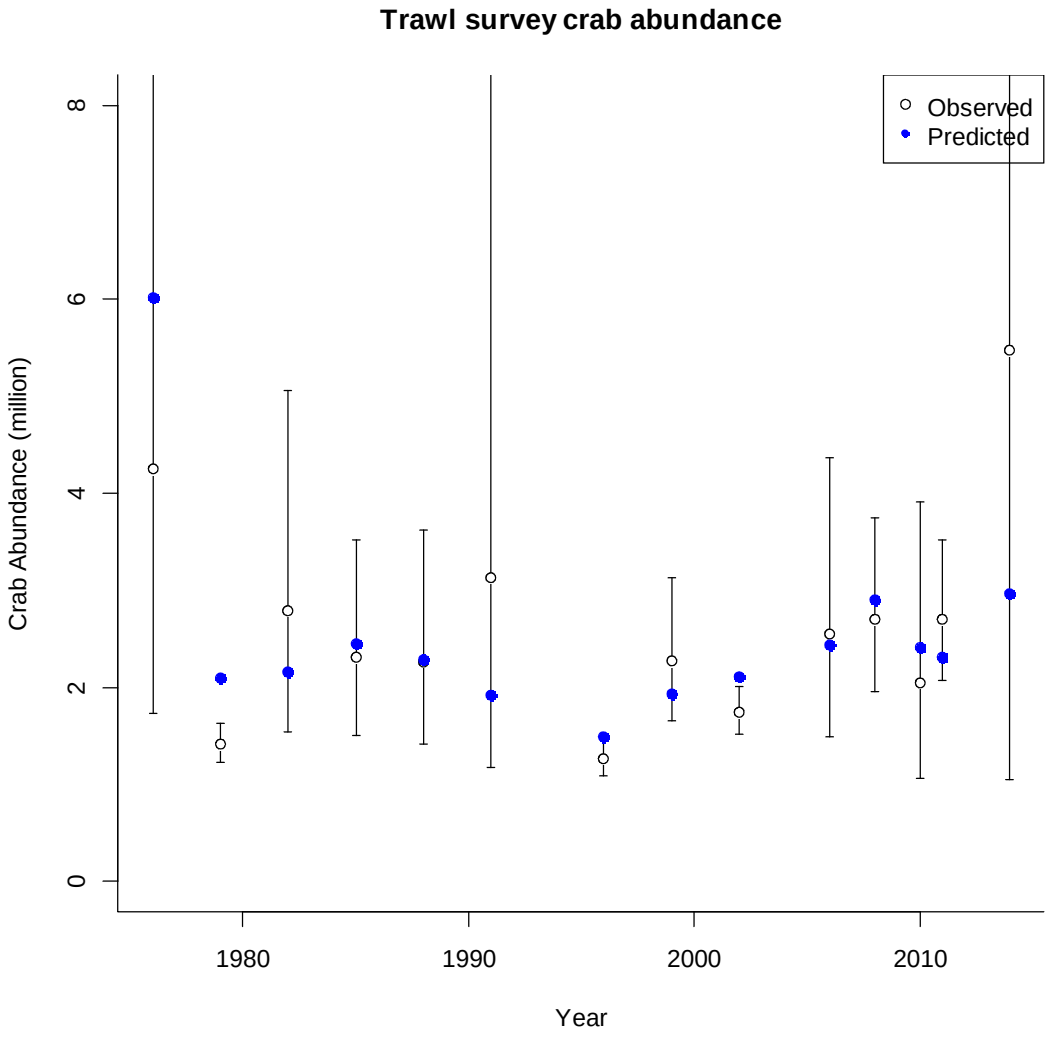

Figure C5-4. Observed and model estimated trawl survey male abundances over time with 95% confidence intervals (crab ≥ 74 mm CL).

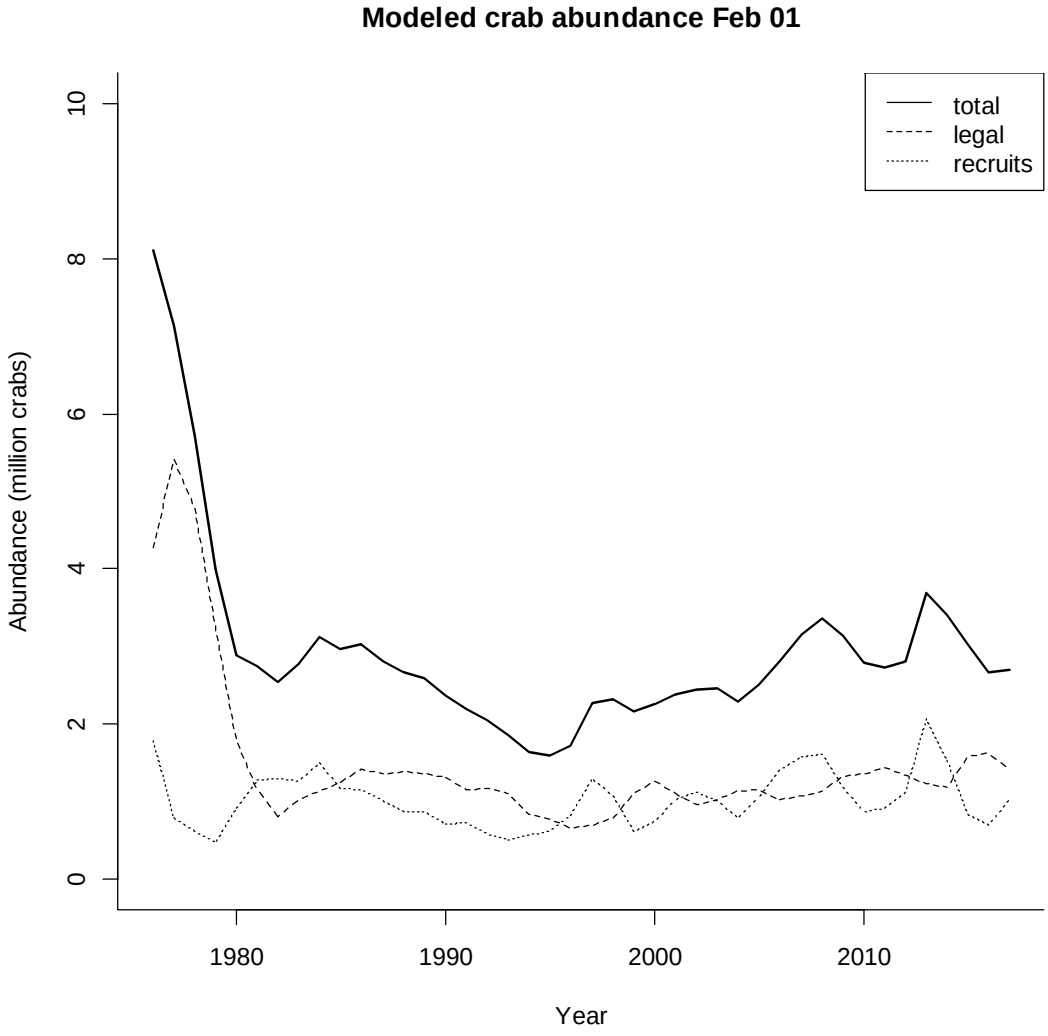

Figure C5-5. Estimated abundance of total, legal, and recruit males during 1976-2016.

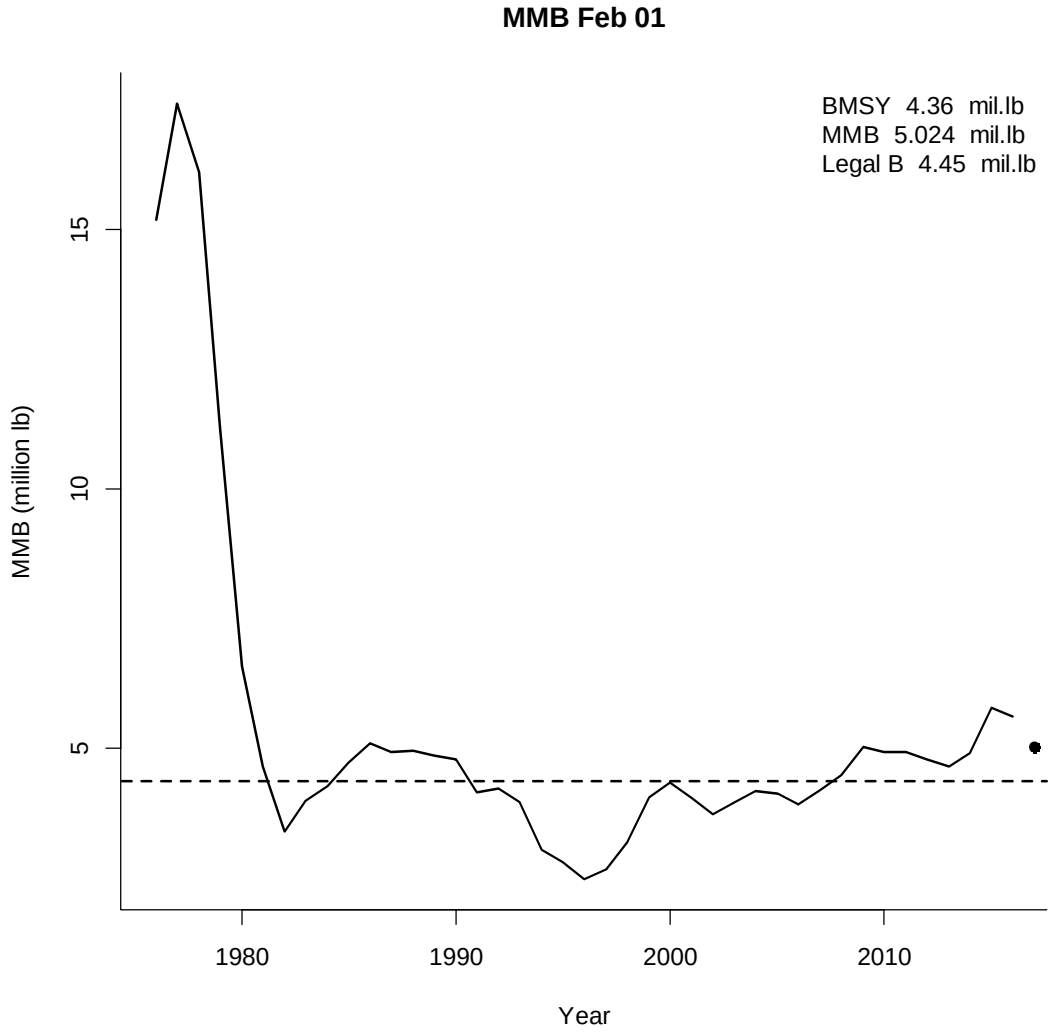

Figure C5-6. Estimated abundance of leg recruits from 1976-2016. Dash line shows B_{msy} (Average MMB of 1980-2016).

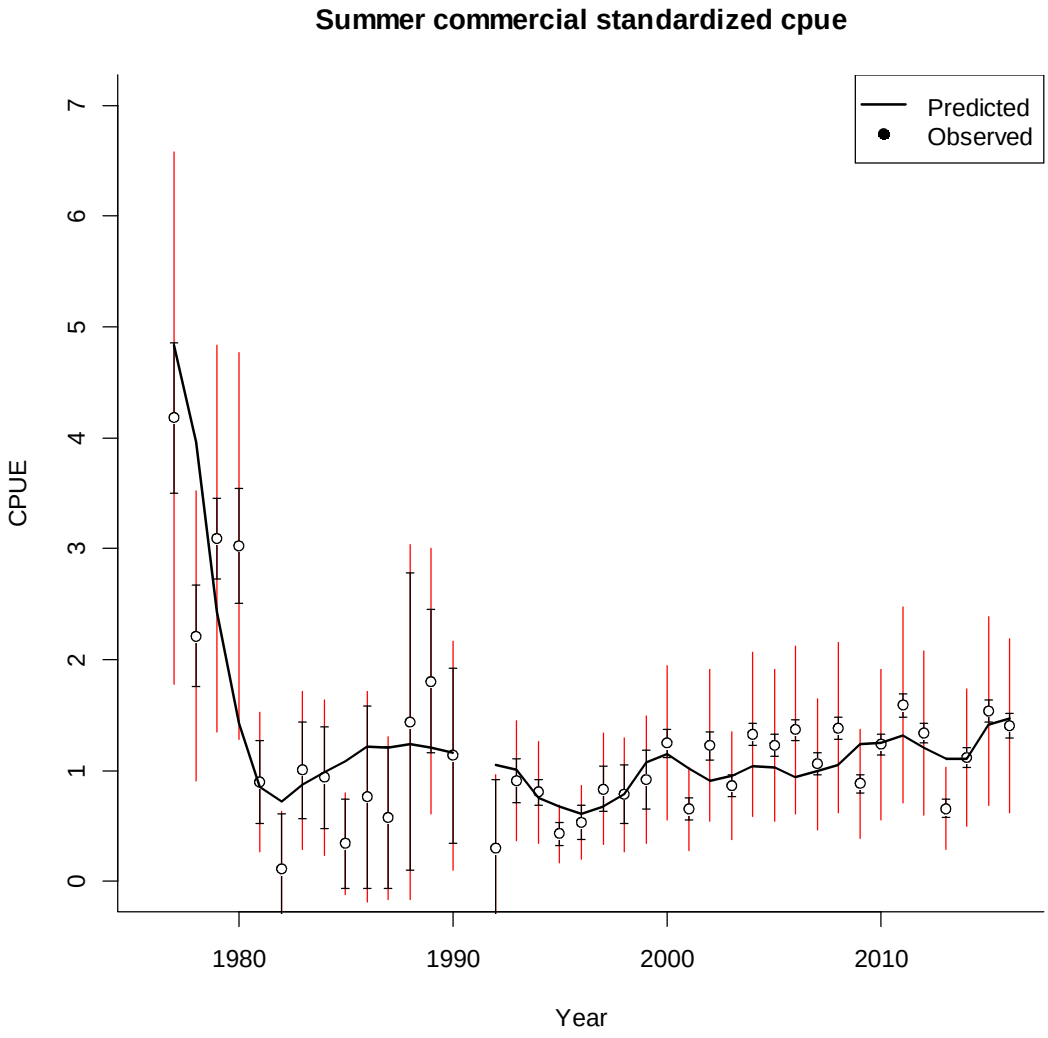

Figure C5-7. Summer commercial fishery standardized cpue during 1977-2016.

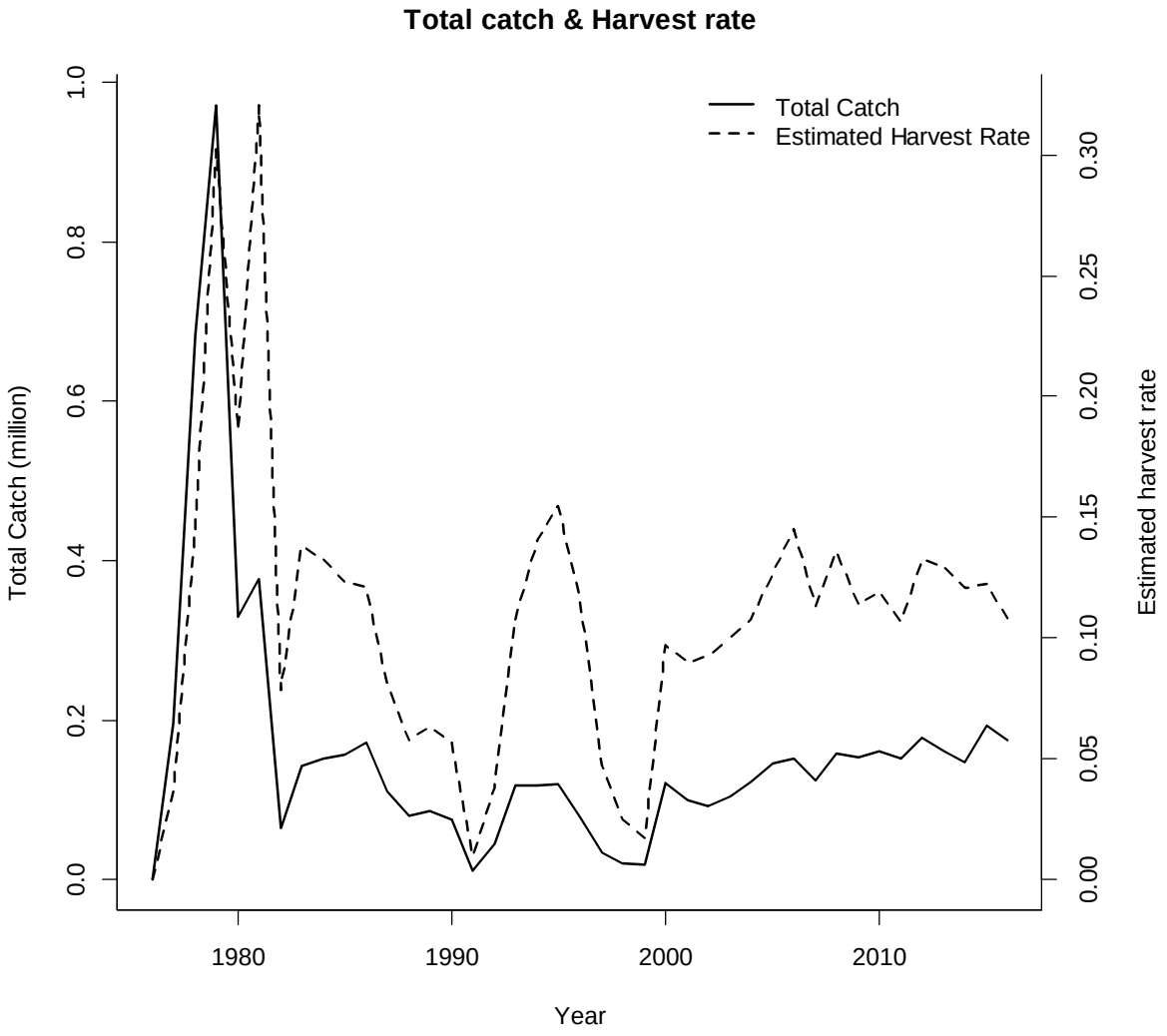

Figure C5-8. Total catch and estimated harvest rates during 1976-2016.

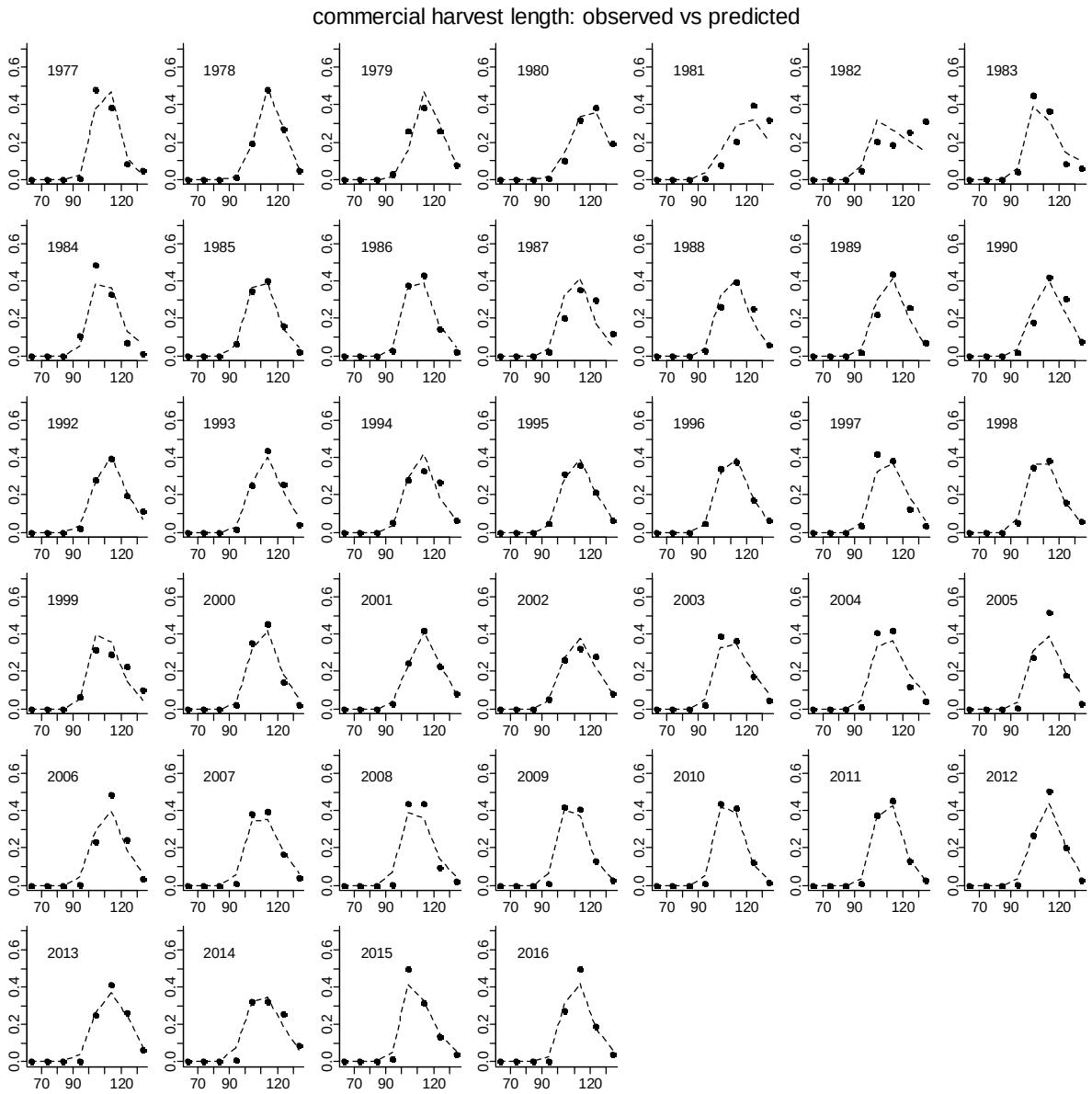

Figure C5-9. Predicted (dashed line) vs. observed (black dots) length class proportions for commercial catch.

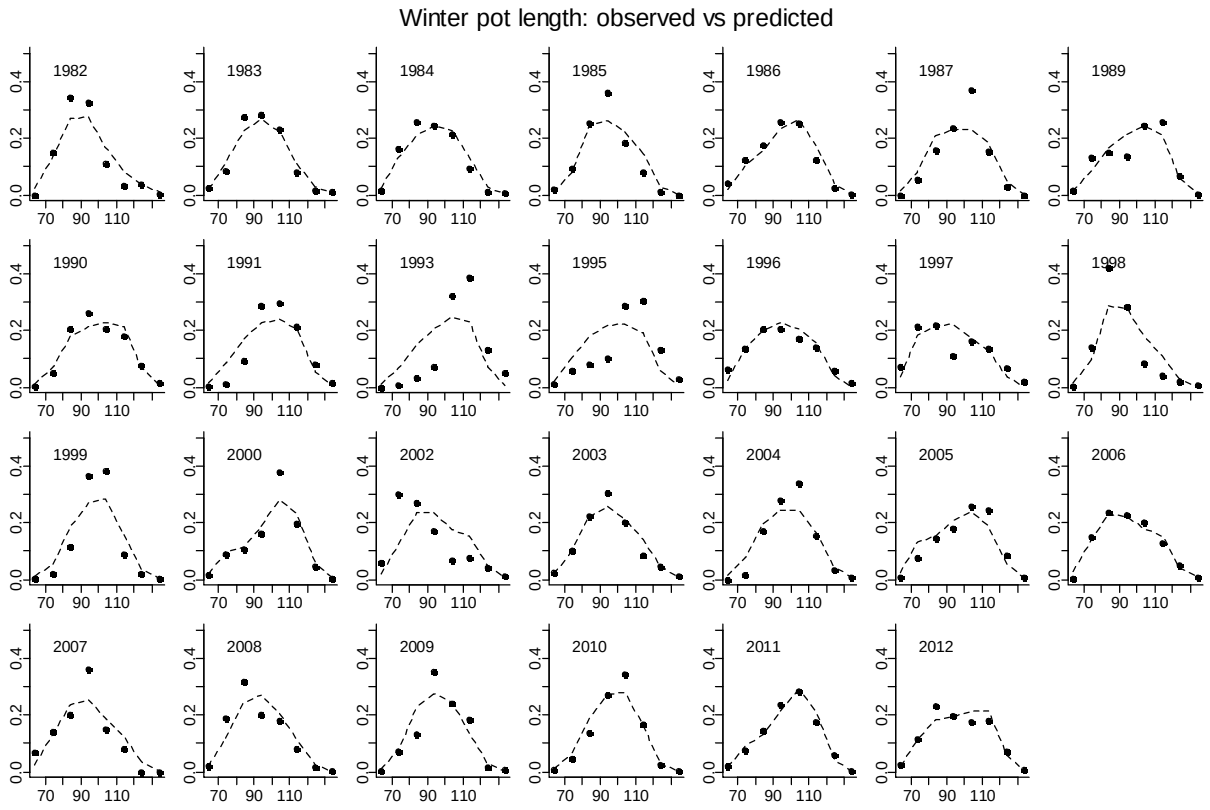

Figure C5-10. Predicted (dashed line) vs. observed (black dots) length class proportions for the winter pot survey.

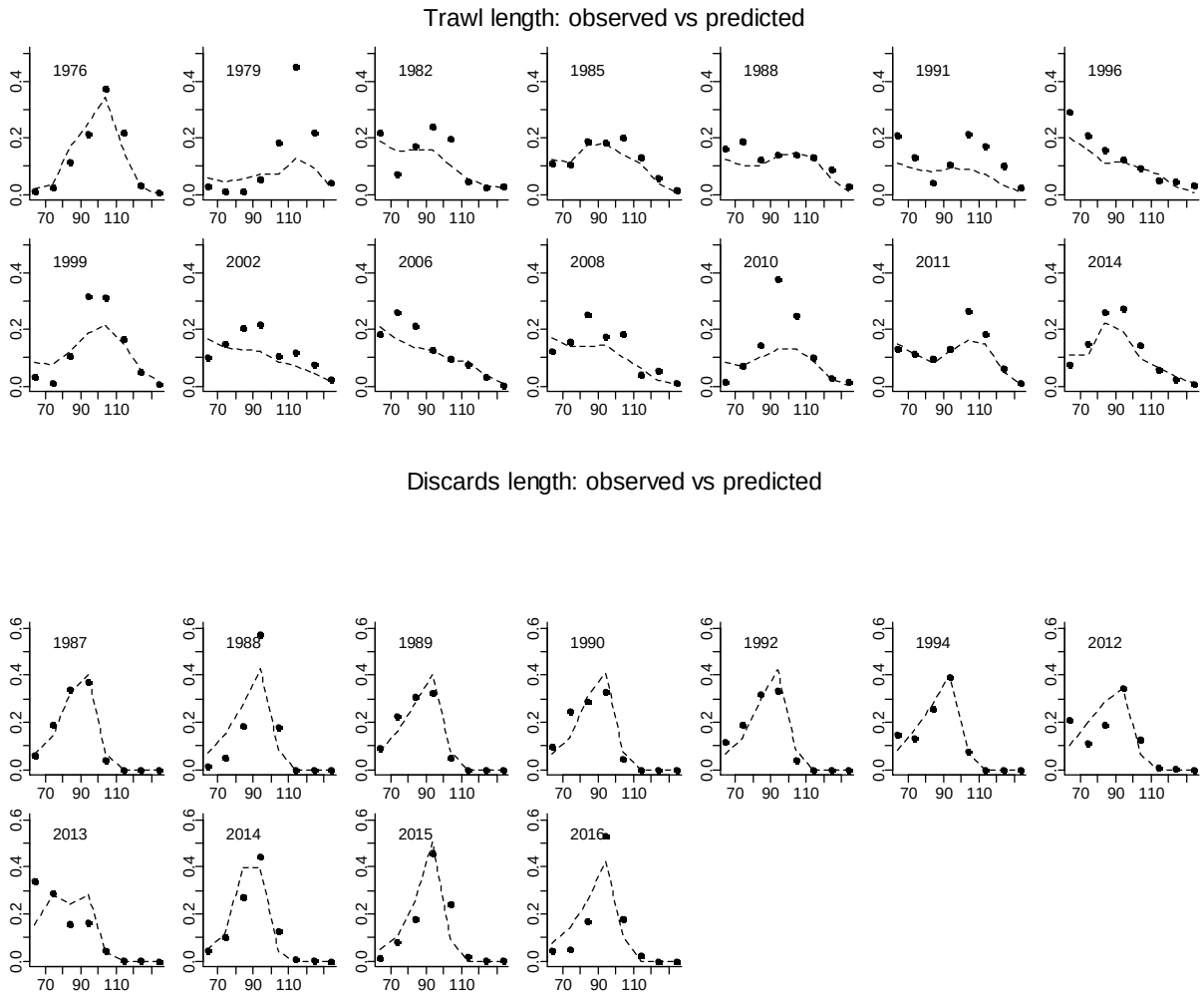

Figure C5-11. Predicted (dashed line) vs. observed (black dots) length class proportions for the trawl survey and observer survey.

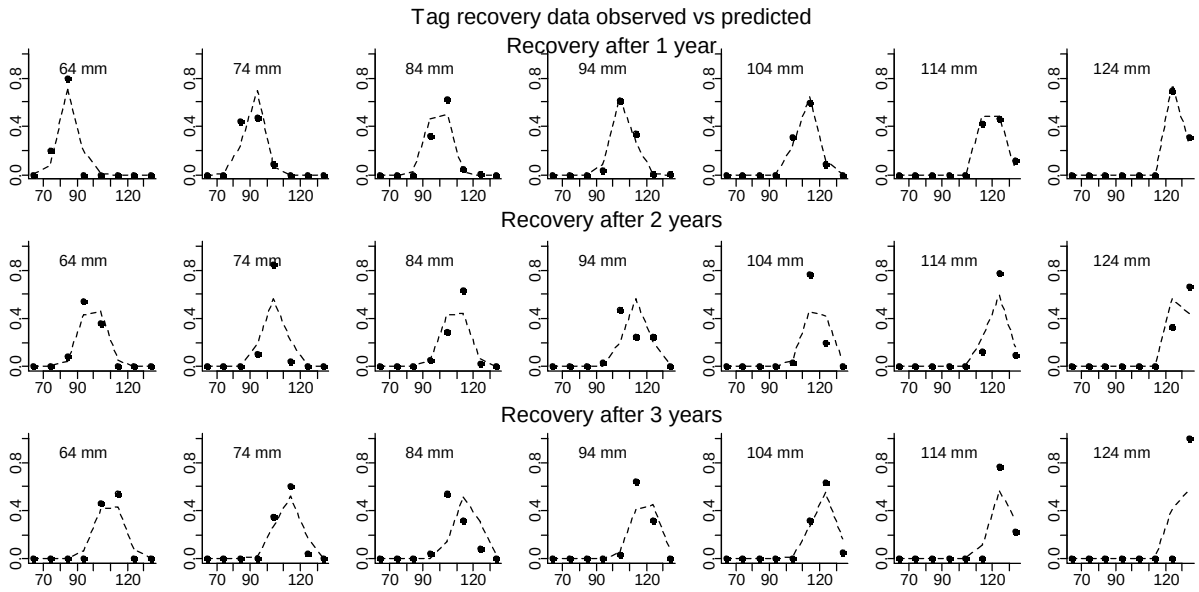

Figure C5-12. Predicted (dashed line) vs. observed (black dots) length class proportions for tag recovery data.

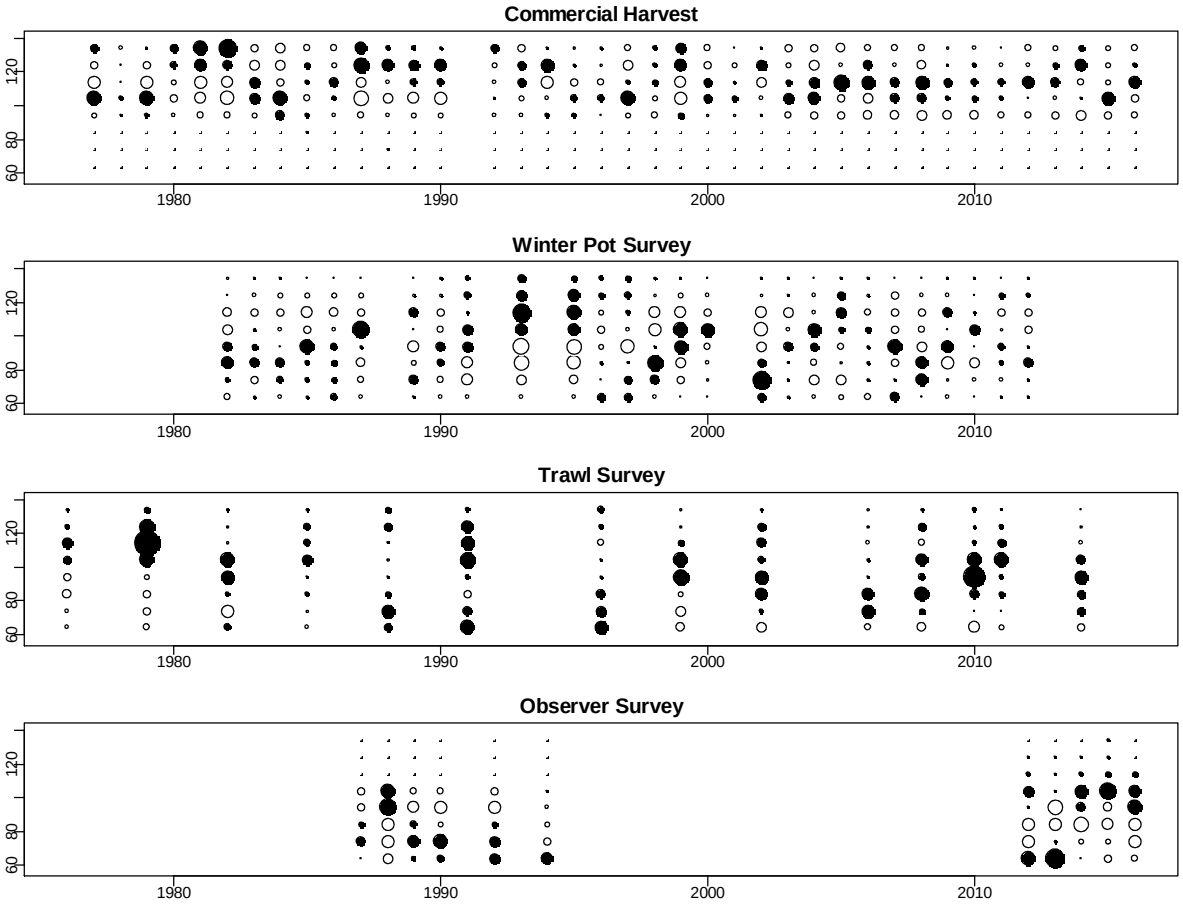

Figure C5-13. Bubble plots of predicted and observed length proportions. Black circle indicates model estimates lower than observed, white circle indicates model estimates higher than observed. Size of circle indicates degree of deviance (larger circle = larger deviance).

Table C5-1 . Summary of parameter estimates for a length-based stock synthesis population model of Norton Sound red king crab.

name	Estimate	std.dev
log_q_1	-6.859	0.181
log_q_2	-6.802	0.102
log_N_{76}	9.000	0.146
R_0	6.357	0.082
log_σ_R^2	-0.048	0.420
log_R_{77}	-0.591	0.368
log_R_{78}	-0.756	0.353
log_R_{79}	0.292	0.326
log_R_{80}	0.417	0.295
log_R_{81}	0.286	0.279
log_R_{82}	0.338	0.328
log_R_{83}	0.583	0.274
log_R_{84}	0.021	0.304
log_R_{85}	0.330	0.289
log_R_{86}	-0.065	0.297
log_R_{87}	-0.078	0.256
log_R_{88}	-0.075	0.270
log_R_{89}	-0.355	0.287
log_R_{90}	-0.361	0.271
log_R_{91}	-0.573	0.303
log_R_{92}	-0.655	0.320
log_R_{93}	-0.700	0.316
log_R_{94}	-0.350	0.278
log_R_{95}	-0.017	0.240
log_R_{96}	0.525	0.234
log_R_{97}	-0.128	0.316
log_R_{98}	-0.648	0.322
log_R_{99}	-0.037	0.315
log_R_{00}	0.219	0.274
log_R_{01}	0.117	0.257
log_R_{02}	0.050	0.314
log_R_{03}	-0.270	0.343
log_R_{04}	0.348	0.255
log_R_{05}	0.501	0.238
log_R_{06}	0.601	0.262

name	Estimate	std.dev
log_R_{07}	0.474	0.266
log_R_{08}	0.022	0.326
log_R_{09}	-0.413	0.317
log_R_{10}	0.102	0.253
log_R_{11}	0.290	0.292
log_R_{12}	1.053	0.233
log_R_{13}	0.048	0.338
log_R_{14}	-0.242	0.408
log_R_{15}	-0.257	0.433
a_1	1.498	4.218
a_2	2.038	3.972
a_3	3.582	3.725
a_4	4.003	3.699
a_5	4.304	3.689
a_6	3.511	3.724
a_7	1.834	4.026
r1	9.999	2.945
r2	9.649	2.953
log_α	-2.319	0.173
log_β	4.873	0.044
dev_log_α	-0.131	0.407
dev_log_α	-0.019	0.420
dev_log_α	-0.121	0.423
dev_log_α	-0.082	0.425
dev_log_α	-0.224	0.430
dev_log_α	-0.238	0.432
dev_log_α	0.319	0.416
dev_log_α	0.194	0.424
dev_log_α	0.171	0.422
dev_log_α	-0.090	0.411
dev_log_α	-0.163	0.406
dev_log_α	0.084	0.382
dev_log_α	-0.199	0.385
dev_log_α	-0.007	0.391
dev_log_α	0.031	0.393

name	Estimate	std.dev
dev_log_α	-0.029	0.397
dev_log_α	-0.029	0.413
dev_log_α	-0.102	0.410
dev_log_α	0.212	0.409
dev_log_α	0.106	0.407
dev_log_α	0.049	0.410
dev_log_α	-0.030	0.414
dev_log_α	-0.035	0.407
dev_log_α	-0.091	0.427
dev_log_α	-0.171	0.429
dev_log_α	-0.184	0.426
dev_log_α	0.294	0.409
dev_log_α	0.173	0.422
dev_log_α	0.082	0.426
dev_log_α	0.004	0.423
dev_log_α	-0.103	0.410
dev_log_α	-0.148	0.405
dev_log_α	0.089	0.394
dev_log_α	-0.012	0.393
dev_log_α	0.068	0.389
dev_log_α	0.011	0.412
dev_log_α	0.008	0.418
dev_log_α	-0.022	0.413
dev_log_α	0.173	0.396
dev_log_α	0.070	0.400
dev_log_α	0.089	0.376
dev_log_β	-0.024	0.109
dev_log_β	0.167	0.170
dev_log_β	-0.285	0.156
dev_log_β	0.381	0.164
dev_log_β	-0.136	0.168
dev_log_β	-0.106	0.135
dev_log_β	0.073	0.154
dev_log_β	-0.125	0.151
dev_log_β	-0.008	0.110

name	Estimate	std.dev
dev_log_β	0.071	0.107
dev_log_β	-0.082	0.111
dev_log_β	-0.007	0.089
dev_log_β	0.028	0.094
dev_log_β	0.103	0.113
dev_log_β	-0.310	0.120
dev_log_β	0.249	0.120
dev_log_β	-0.052	0.116
dev_log_β	-0.345	0.141
dev_log_β	0.413	0.146
dev_log_β	-0.160	0.101
dev_log_β	0.181	0.112
dev_log_β	-0.158	0.123
dev_log_β	0.143	0.116
dev_log_β	0.033	0.123
dev_log_β	0.078	0.159
dev_log_β	-0.236	0.155
dev_log_β	0.129	0.134
dev_log_β	0.039	0.145
dev_log_β	-0.017	0.134
dev_log_β	-0.116	0.110
dev_log_β	0.093	0.114
dev_log_β	-0.182	0.119
dev_log_β	0.082	0.111
dev_log_β	-0.149	0.104
dev_log_β	0.172	0.084
dev_log_β	0.098	0.108
dev_log_β	0.069	0.140
dev_log_β	-0.211	0.134
dev_log_β	0.135	0.122
dev_log_β	0.025	0.134
dev_log_β	-0.052	0.109
log_ϕ_{st1}	-14.588	1530
log_ϕ_w	-2.056	0.053
Sw_1	0.077	0.036

name	Estimate	std.dev
Sw_8	0.509	0.121
log_ϕ_l	-2.105	0.055
w^2_t	0.073	0.022
q	0.837	0.150
ms	2.705	0.347
σ	4.679	0.308
β_1	12.851	0.831
β_2	7.360	0.251