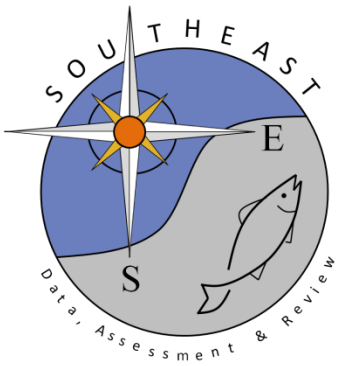
Diagnostics of the SEDAR68 Operational Assessment model of scamp/yellowmouth grouper

Provided by NMFS/SEFSC/SFD/Atlantic Fisheries Branch

Received: 12/21/2022



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Please cite this document as:
NMFS/SEFSC/SFD/Atlantic Fisheries Branch. 2022. Diagnostics of the SEDAR68 Operational Assessment model of scamp/yellowmouth grouper. SEDAR68OA-WP06. SEDAR, North Charleston, SC. 29 pp.

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This document contains additional diagnostic plots created during the SEDAR68 Operational Assessment that are not in the final report. These diagnostics were run either during model development or on the base model configuation. The plots do not have any particular order to them, other than that the first set are diagnostics run on the base model configuration described in the SEDAR68OA report, and the second set are diagnostices made during the model development phase and were used to inform decisions about model structure.. The distinction is flagged in the Figure number as either "B" for base or "D" for development.

Contents include the following:

Table B1. Parameter estimates and asymptotic standard errors.

index	name	value	std.dev
1	len_cv_val	0.1205	0.0079
2	len_cv_val_L	0.0885	0.0158
3	log_R0	12.3290	0.0281
4	rec_sigma	0.7100	0.0667
5	log_rec_dev	-0.4046	0.2301
6	log_rec_dev	0.1080	0.1684
7	log_rec_dev	-0.0358	0.1906
8	log_rec_dev	0.0331	0.1996
9	log_rec_dev	0.1664	0.1955
10	log_rec_dev	0.0850	0.2124
11	log_rec_dev	0.7629	0.1453
12	log_rec_dev	0.7882	0.1460
13	log_rec_dev	1.1428	0.1124
14	log_rec_dev	0.9007	0.1274
15	log_rec_dev	0.2873	0.1614
16	log_rec_dev	1.0230	0.1035
17	log_rec_dev	0.1801	0.1528
18	log_rec_dev	0.5367	0.1298
19	log_rec_dev	0.9286	0.1104
20	log_rec_dev	0.9387	0.1081
21	log_rec_dev	0.7264	0.1151
22	log_rec_dev	0.3950	0.1254
23	log_rec_dev	0.5824	0.1047
24	log_rec_dev	0.4648	0.1010
25	log_rec_dev	0.3607	0.0968
26	log_rec_dev	0.8077	0.0726
27	log_rec_dev	0.7787	0.0682
28	log_rec_dev	0.6937	0.0673
29	log_rec_dev	0.3092	0.0762
30	log_rec_dev	-0.0743	0.0900
31	log_rec_dev	-0.2714	0.0940
32	log_rec_dev	-0.2152	0.0896
33	log_rec_dev	-0.1537	0.0868
34	log_rec_dev	-0.4245	0.0965
35	log_rec_dev	-0.9946	0.1253
36	log_rec_dev	-1.1237	0.1309
37	log_rec_dev	-0.8210	0.1178
38	log_rec_dev	-0.7179	0.1183
39	log_rec_dev	-0.9427	0.1399

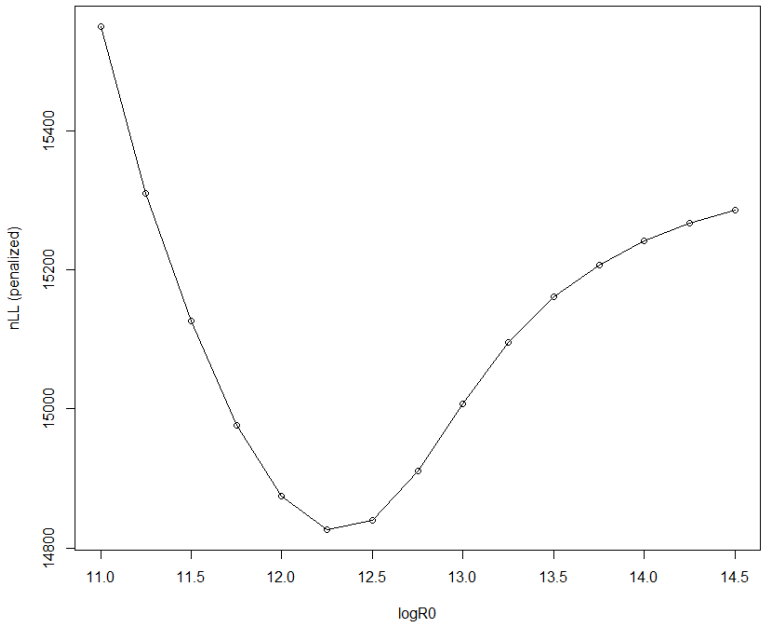
40	log_rec_dev	-1.4838	0.2044
41	log_rec_dev	-1.2967	0.2313
42	log_rec_dev	-1.8371	0.3410
43	log_rec_dev	-1.4014	0.3795
44	log_rec_dev	-0.8017	0.4413
45	log_dm_COM_lc	2.6585	0.5292
46	log_dm_REC_lc	0.5935	0.4665
47	log_dm_COM_ac	-0.1723	0.1876
48	log_dm_REC_ac	2.2806	0.4817
49	log_dm_CVT_ac	0.5827	0.2098
50	selpar_A50_COM1	3.9898	0.1662
51	selpar_slope_COM1	1.7926	0.1776
52	selpar_A50_COM2	4.9119	0.0865
53	selpar_slope_COM2	1.9234	0.1170
54	selpar_A50_REC1	3.5345	0.2175
55	selpar_slope_REC1	1.3710	0.1909
56	selpar_A50_REC2	4.1818	0.1205
57	selpar_slope_REC2	2.1464	0.2445
58	selpar_A50_CVT	3.5822	0.1270
59	selpar_slope_CVT	1.5928	0.1303
60	log_q_COM	-7.4971	0.0678
61	log_q_REC	-12.7910	0.0578
62	log_q_CVT	-12.8910	0.0674
63	log_avg_F_COM	-2.0982	0.0444
64	log_F_dev_COM	-2.3557	0.0653
65	log_F_dev_COM	-2.0754	0.0651
66	log_F_dev_COM	-1.9606	0.0649
67	log_F_dev_COM	-2.2712	0.0642
68	log_F_dev_COM	-1.9849	0.0642
69	log_F_dev_COM	-1.6543	0.0644
70	log_F_dev_COM	-1.6270	0.0647
71	log_F_dev_COM	-1.3637	0.0651
72	log_F_dev_COM	-0.9516	0.0657
73	log_F_dev_COM	-0.0896	0.0671
74	log_F_dev_COM	-0.0588	0.0694
75	log_F_dev_COM	-0.0174	0.0719
76	log_F_dev_COM	0.0207	0.0742
77	log_F_dev_COM	0.5647	0.0765
78	log_F_dev_COM	0.5470	0.0800
79	log_F_dev_COM	0.6558	0.0857
80	log_F_dev_COM	0.5153	0.0902

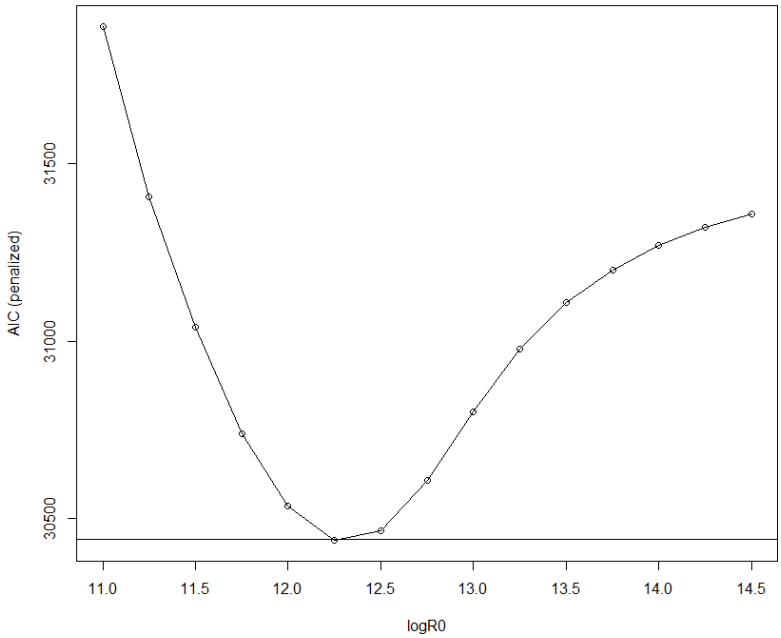
81	log_F_dev_COM	0.6733	0.0922
82	log_F_dev_COM	0.8501	0.0937
83	log_F_dev_COM	0.9516	0.0957
84	log_F_dev_COM	0.9826	0.0975
85	log_F_dev_COM	1.1247	0.0953
86	log_F_dev_COM	0.7654	0.0912
87	log_F_dev_COM	0.6596	0.0840
88	log_F_dev_COM	0.5894	0.0801
89	log_F_dev_COM	0.5448	0.0775
90	log_F_dev_COM	0.5935	0.0765
91	log_F_dev_COM	0.3580	0.0771
92	log_F_dev_COM	0.3116	0.0768
93	log_F_dev_COM	0.1073	0.0746
94	log_F_dev_COM	0.3697	0.0718
95	log_F_dev_COM	0.0994	0.0700
96	log_F_dev_COM	-0.1692	0.0688
97	log_F_dev_COM	-0.0904	0.0676
98	log_F_dev_COM	0.0827	0.0674
99	log_F_dev_COM	0.1243	0.0674
100	log_F_dev_COM	0.1934	0.0676
101	log_F_dev_COM	0.3529	0.0672
102	log_F_dev_COM	0.4996	0.0666
103	log_F_dev_COM	0.3286	0.0663
104	log_F_dev_COM	0.4532	0.0658
105	log_F_dev_COM	0.2093	0.0667
106	log_F_dev_COM	0.1160	0.0668
107	log_F_dev_COM	0.1683	0.0667
108	log_F_dev_COM	0.1031	0.0674
109	log_F_dev_COM	0.3866	0.0695
110	log_F_dev_COM	0.3022	0.0742
111	log_F_dev_COM	0.2950	0.0797
112	log_F_dev_COM	0.3835	0.0866
113	log_F_dev_COM	0.3391	0.0957
114	log_F_dev_COM	0.7014	0.1123
115	log_F_dev_COM	0.2236	0.1352
116	log_F_dev_COM	0.1227	0.1582
117	log_avg_F_REC	-2.7422	0.0449
118	log_F_dev_REC	-1.0089	0.0645
119	log_F_dev_REC	-1.0044	0.0642
120	log_F_dev_REC	-0.9073	0.0640
121	log_F_dev_REC	-0.8196	0.0632

122	log_F_dev_REC	-0.7354	0.0632
123	log_F_dev_REC	-0.6523	0.0634
124	log_F_dev_REC	-0.5708	0.0637
125	log_F_dev_REC	-0.5436	0.0640
126	log_F_dev_REC	-0.5105	0.0645
127	log_F_dev_REC	-0.4508	0.0657
128	log_F_dev_REC	-0.3754	0.0676
129	log_F_dev_REC	-0.3035	0.0692
130	log_F_dev_REC	-0.4432	0.0690
131	log_F_dev_REC	-0.0791	0.0678
132	log_F_dev_REC	-0.6457	0.0695
133	log_F_dev_REC	0.0349	0.0716
134	log_F_dev_REC	-0.1345	0.0724
135	log_F_dev_REC	-0.4404	0.0715
136	log_F_dev_REC	-0.1036	0.0715
137	log_F_dev_REC	0.5386	0.0747
138	log_F_dev_REC	0.3437	0.0790
139	log_F_dev_REC	0.5598	0.0830
140	log_F_dev_REC	0.2195	0.0824
141	log_F_dev_REC	0.3664	0.0791
142	log_F_dev_REC	0.3489	0.0726
143	log_F_dev_REC	0.7546	0.0707
144	log_F_dev_REC	-0.1544	0.0707
145	log_F_dev_REC	-0.1411	0.0705
146	log_F_dev_REC	-0.1720	0.0686
147	log_F_dev_REC	-0.1685	0.0667
148	log_F_dev_REC	0.0173	0.0650
149	log_F_dev_REC	0.5037	0.0642
150	log_F_dev_REC	0.0912	0.0637
151	log_F_dev_REC	0.8764	0.0627
152	log_F_dev_REC	0.7269	0.0629
153	log_F_dev_REC	0.6510	0.0629
154	log_F_dev_REC	0.7239	0.0627
155	log_F_dev_REC	0.8410	0.0622
156	log_F_dev_REC	1.0716	0.0614
157	log_F_dev_REC	0.6855	0.0618
158	log_F_dev_REC	0.3716	0.0627
159	log_F_dev_REC	0.0996	0.0633
160	log_F_dev_REC	-0.2541	0.0636
161	log_F_dev_REC	-0.0701	0.0639
162	log_F_dev_REC	0.1224	0.0654

163	log_F_dev_REC	0.1360	0.0683
164	log_F_dev_REC	0.0913	0.0711
165	log_F_dev_REC	0.2542	0.0751
166	log_F_dev_REC	0.0268	0.0821
167	log_F_dev_REC	-0.2724	0.0922
168	log_F_dev_REC	0.1659	0.1092
169	log_F_dev_REC	0.0618	0.1326
170	log_F_dev_REC	0.2770	0.1534
171	logit_earlyrec_mult	-0.0125	0.0889

Figure B1A-C. Likelihood profiling on R0.





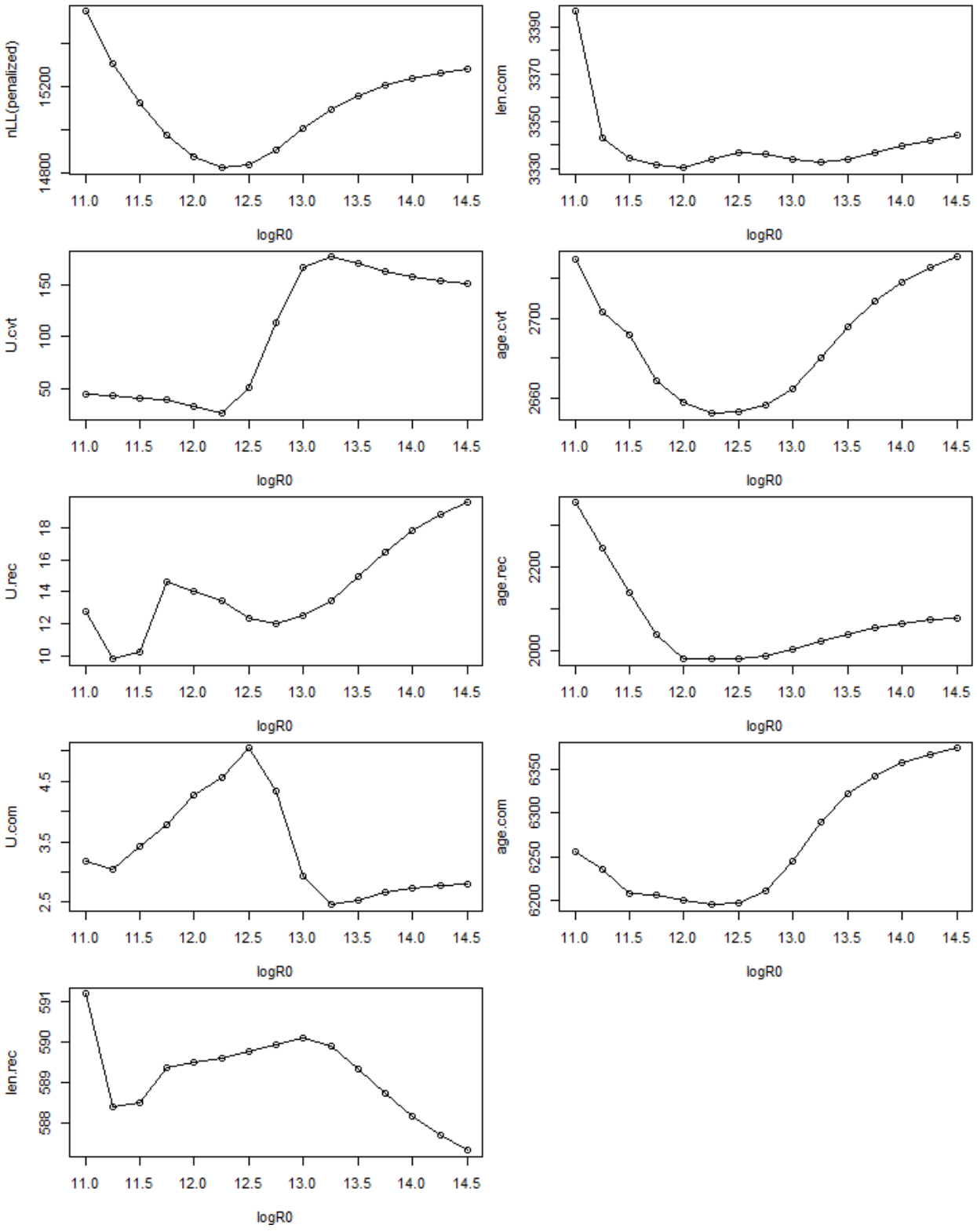
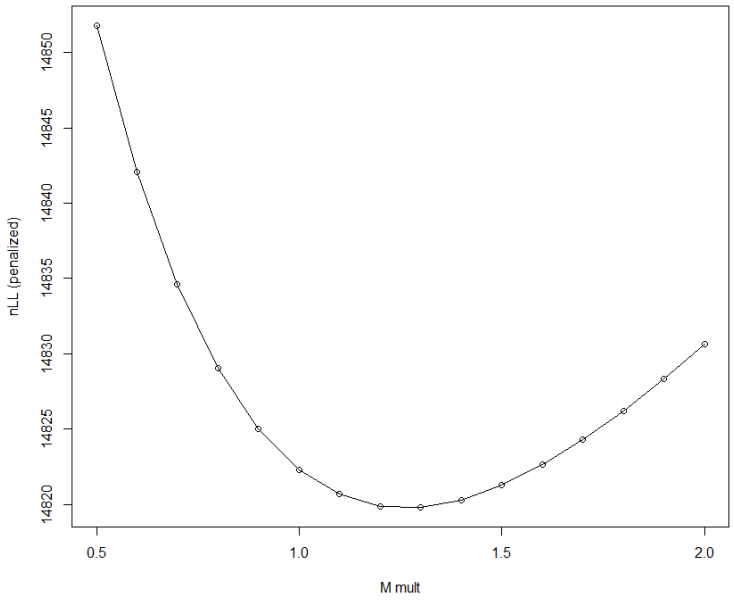
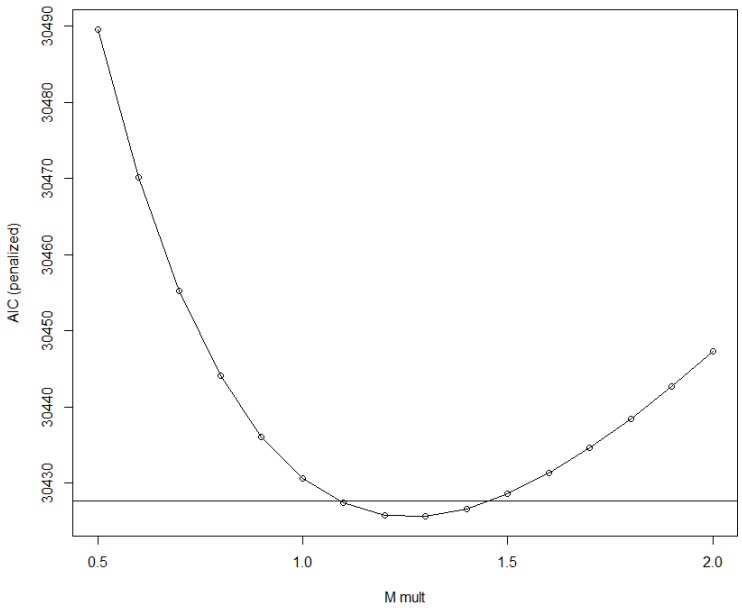

nLL(penalized)
14800
15200
11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5
logR0
len.com
3330 3350 3370 3390
11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5
logR0
U.cvt
50 100 150
11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5
logR0
age.cvt
2660 2700
11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5
logR0
U.rec
10 12 14 16 18
11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5
logR0
age.rec
2000 2200
11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5
logR0
U.com
2.5 3.5 4.5
11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5
logR0
age.com
6200 6250 6300 6350
11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5
logR0
len.rec
588 589 590 591
11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5
logR0

Figure B2A-C. Likelihood profiling on the scaling of natural mortality. M mult is a multiplier on the age-dependent vector used in the base run.





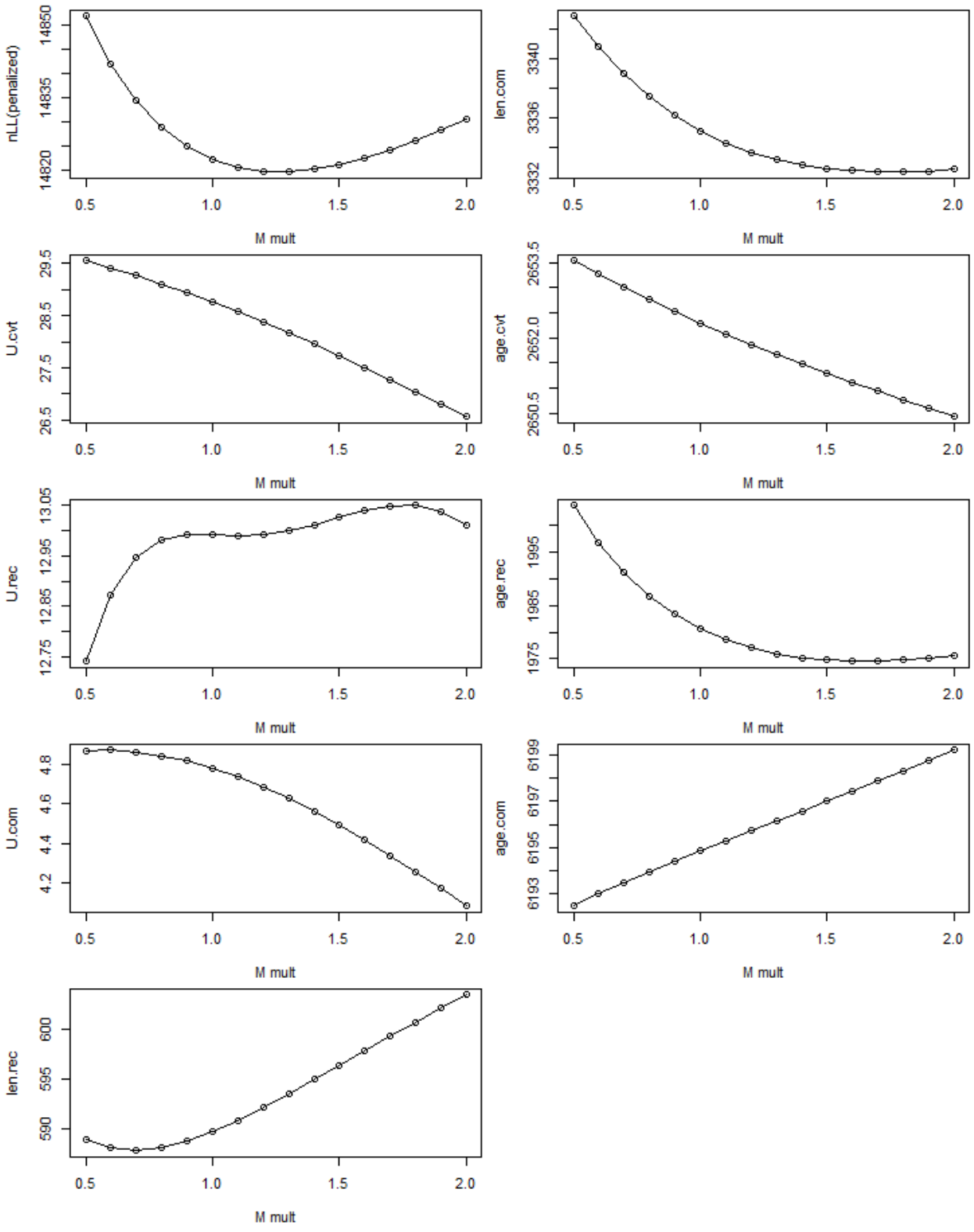
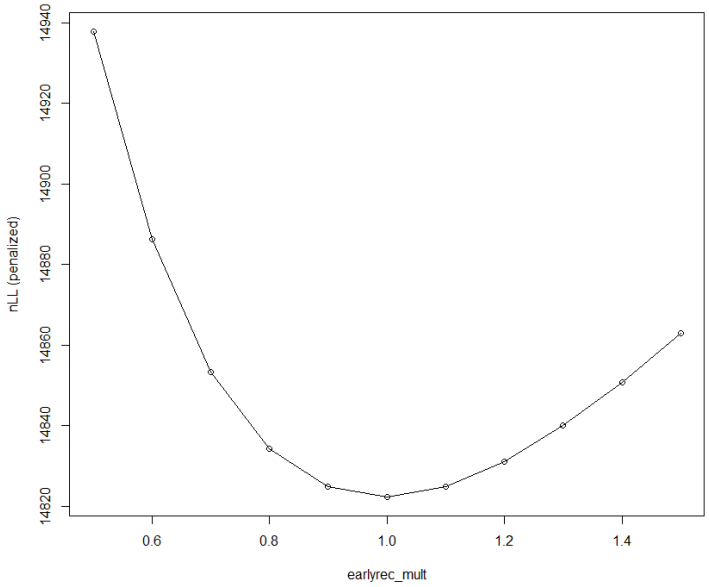
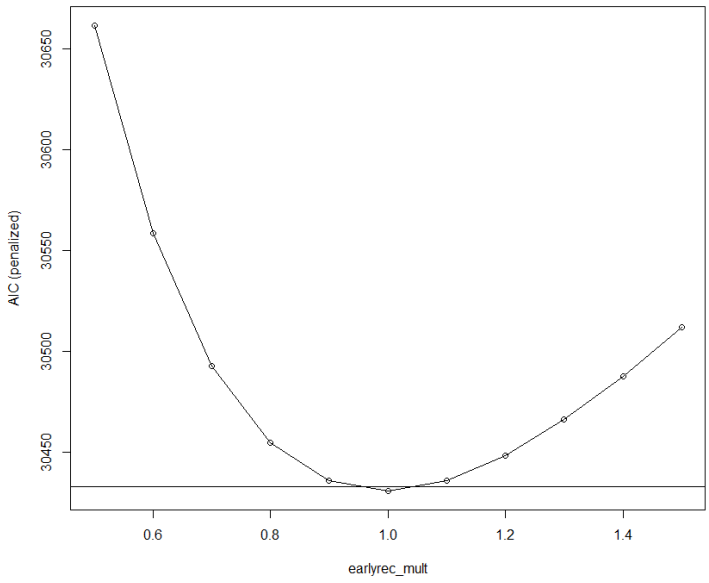

nLL(penalized)
14820
14835
14850
0.5
1.0
1.5
2.0
M mult
len.com
3332
3336
3340
M mult
U.cvt
26.5
27.5
28.5
29.5
M mult
age.cvt
2650.5
2652.0
2653.5
M mult
U.rec
12.75
12.85
12.95
13.05
M mult
age.rec
1975
1985
1995
M mult
U.com
4.2
4.4
4.6
4.8
M mult
age.com
6193
6195
6197
6199
M mult
len.rec
590
595
600
M mult

Figure B3A-C. Likelihood profling on the early recruitment multiplier





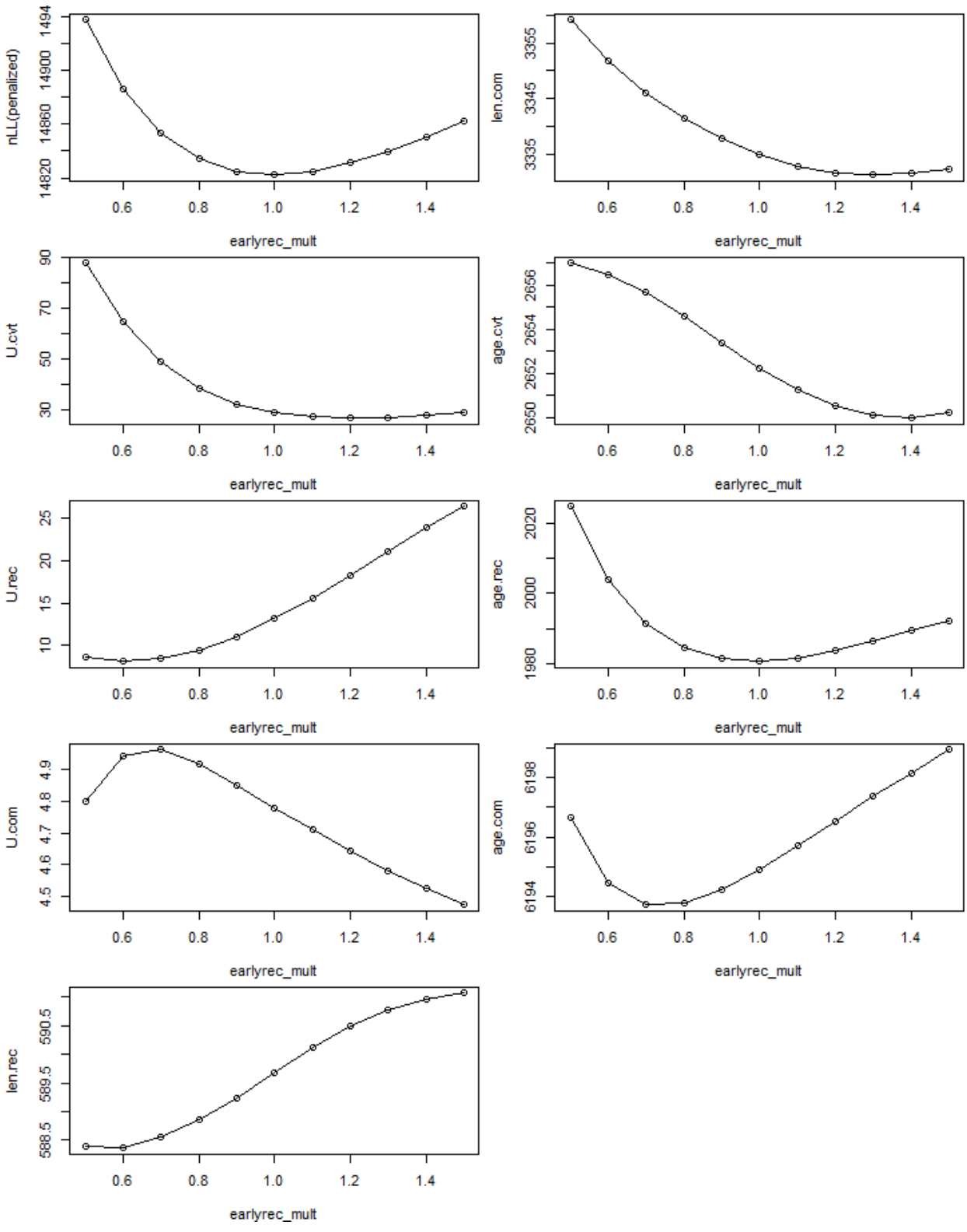
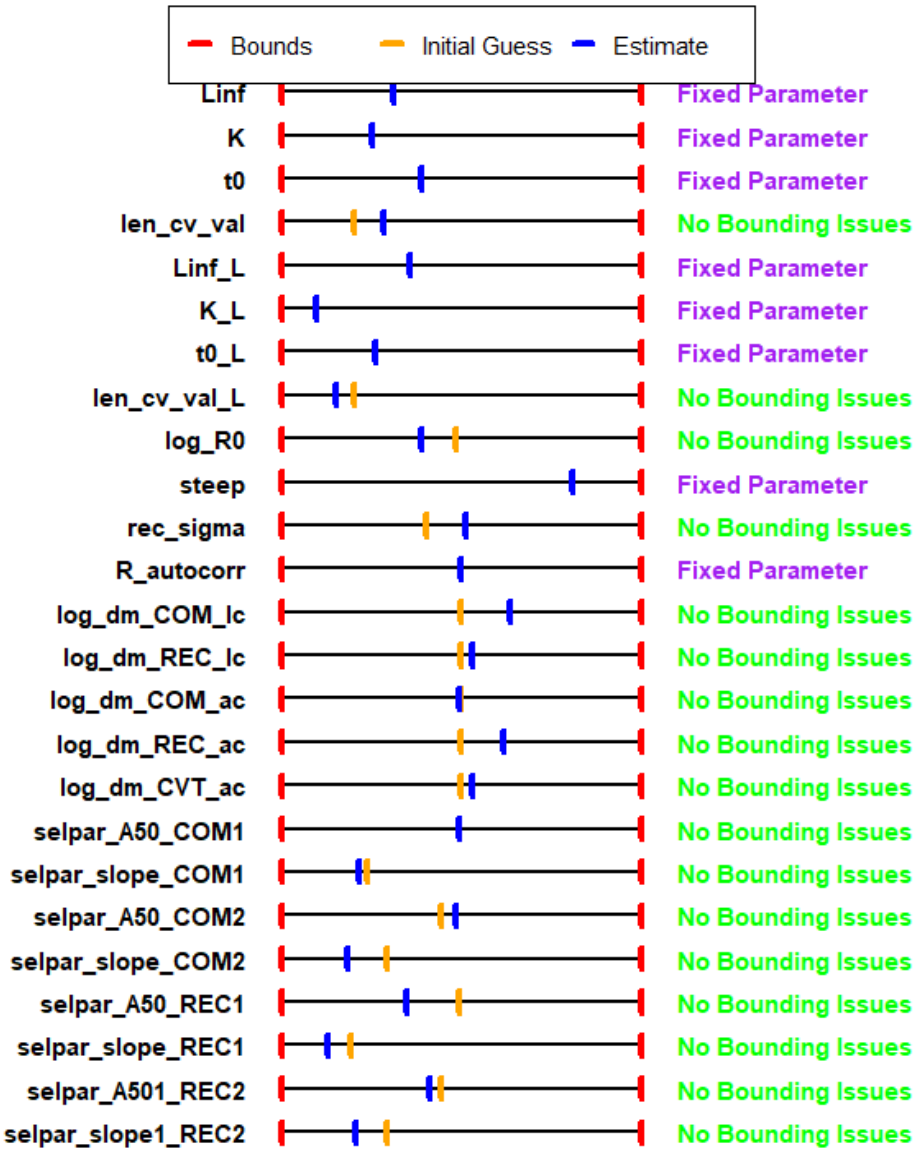

nLL(penalized)
14820
14860
14900
1494
0.6
0.8
1.0
1.2
1.4
earlyrec_mult
len.com
3335
3345
3355
earlyrec_mult
U.cvt
30
50
70
90
earlyrec_mult
age.cvt
2650
2652
2654
2656
earlyrec_mult
U.rec
10
15
20
25
earlyrec_mult
age.rec
1980
2000
2020
earlyrec_mult
U.com
4.5
4.6
4.7
4.8
4.9
earlyrec_mult
age.com
6194
6196
6198
earlyrec_mult
len.rec
588.5
589.5
590.5
earlyrec_mult

Figure B4. Bound checks on parameter estimates



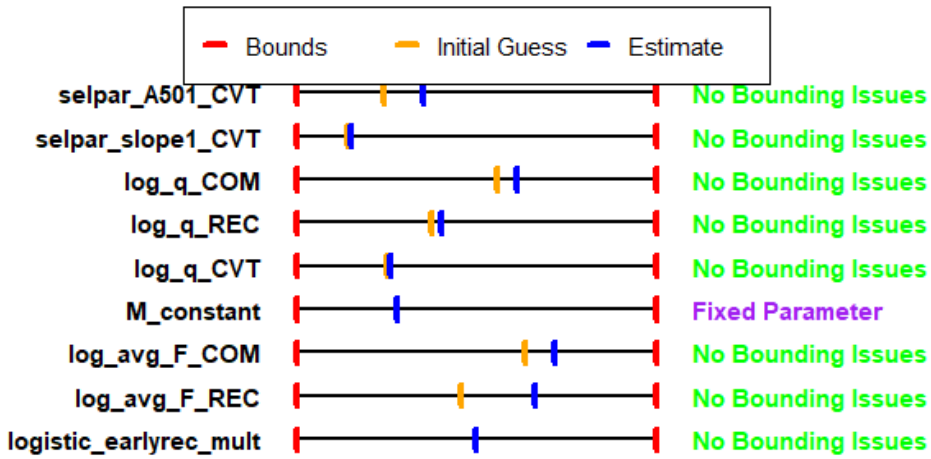
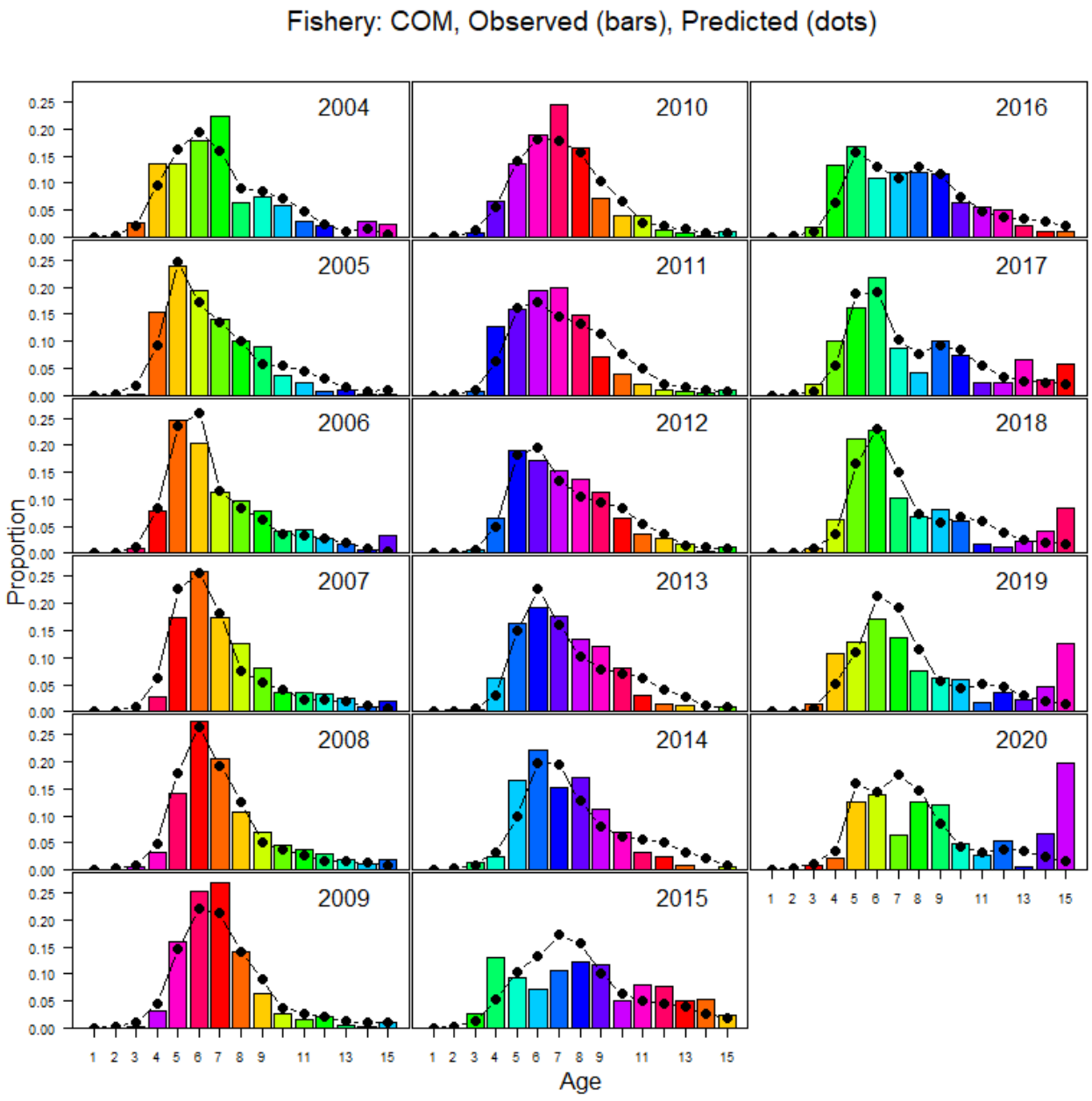
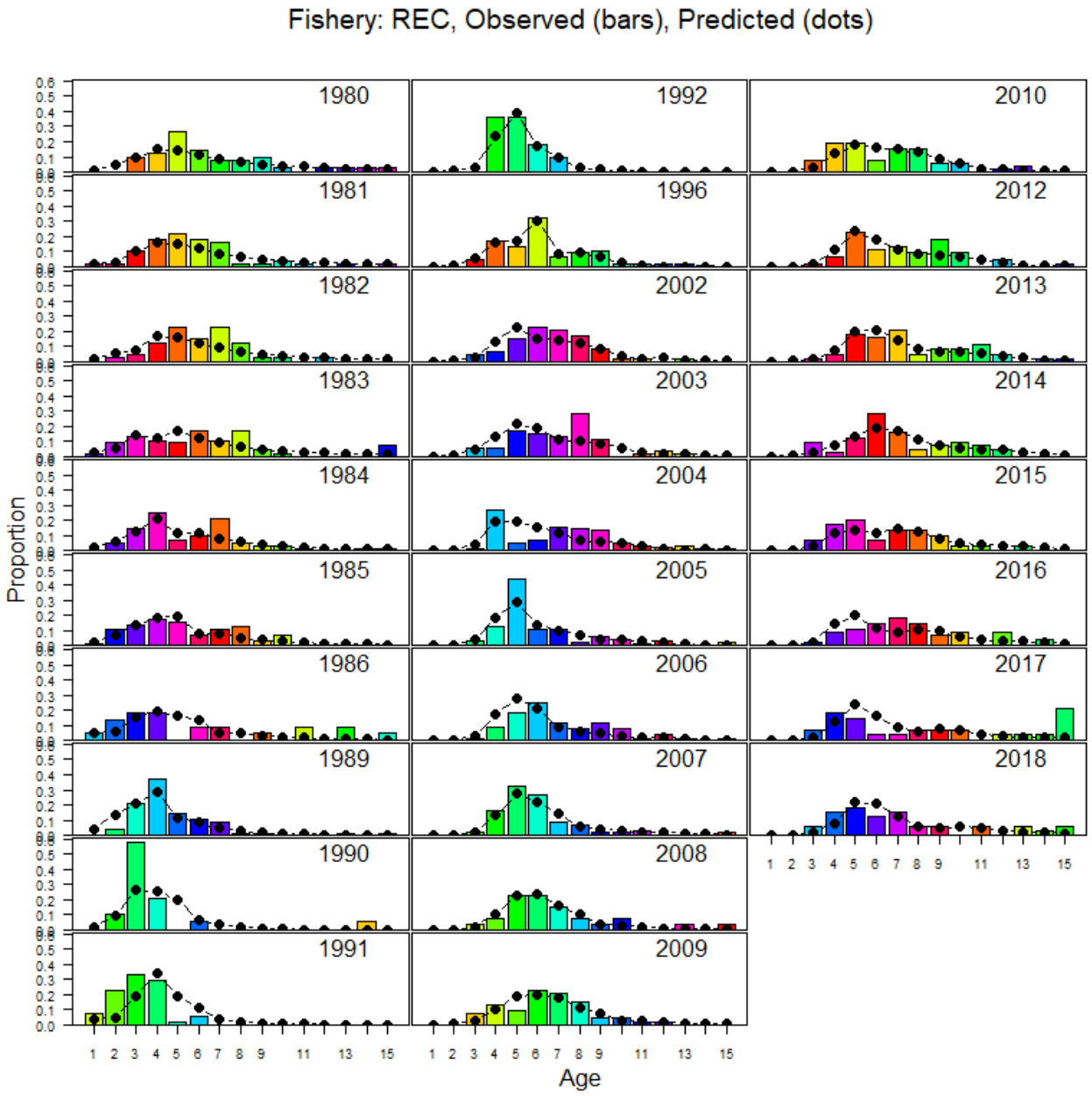

Bounds
Initial Guess
Estimate
selpar_A501_CVT
No Bounding Issues
selpar_slope1_CVT
No Bounding Issues
log_q_COM
No Bounding Issues
log_q_REC
No Bounding Issues
log_q_CVT
No Bounding Issues
M_constant
Fixed Parameter
log_avg_F_COM
No Bounding Issues
log_avg_F_REC
No Bounding Issues
logistic_earlyrec_mult
No Bounding Issues

Figure B5A-C. Cohort tracking through age compositions




Fishery: REC, Observed (bars), Predicted (dots)
Proportion
Age
1980
1981
1982
1983
1984
1985
1986
1989
1990
1991
1992
1996
2002
2003
2004
2005
2006
2007
2008
2009
2010
2012
2013
2014
2015
2016
2017
2018

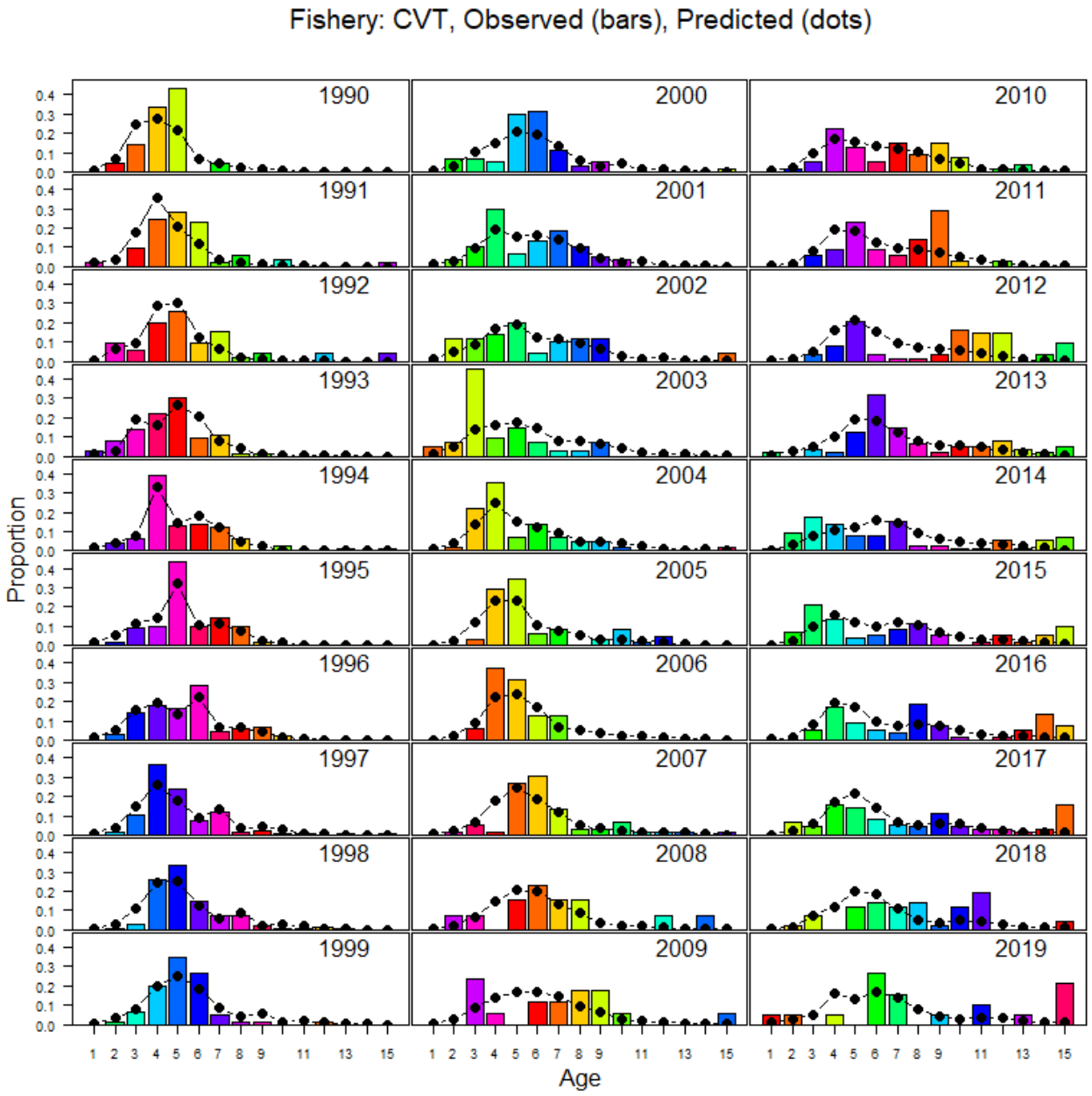
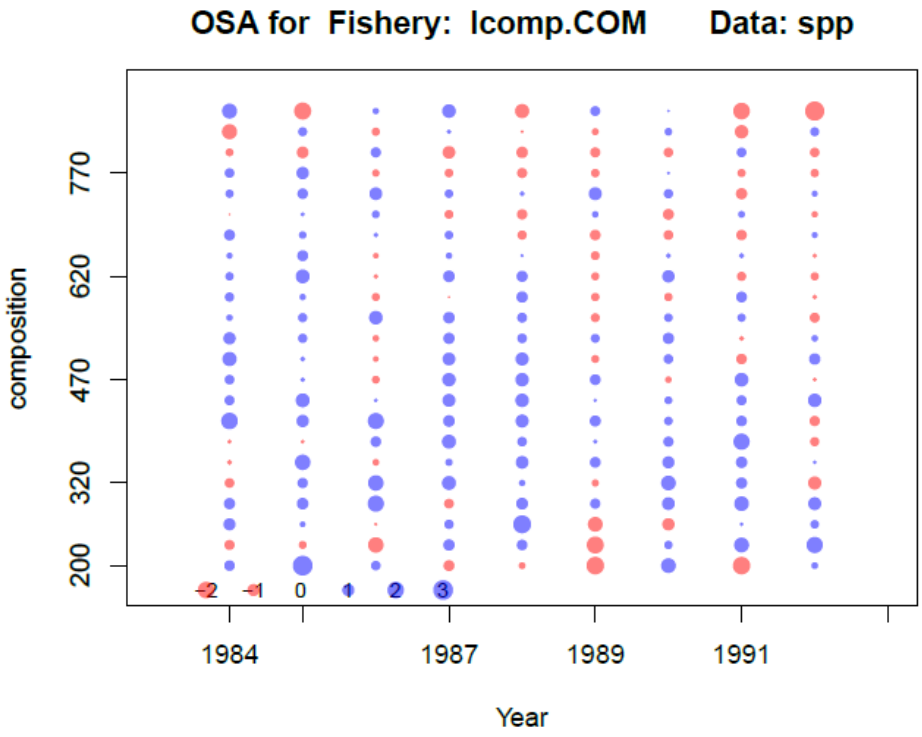
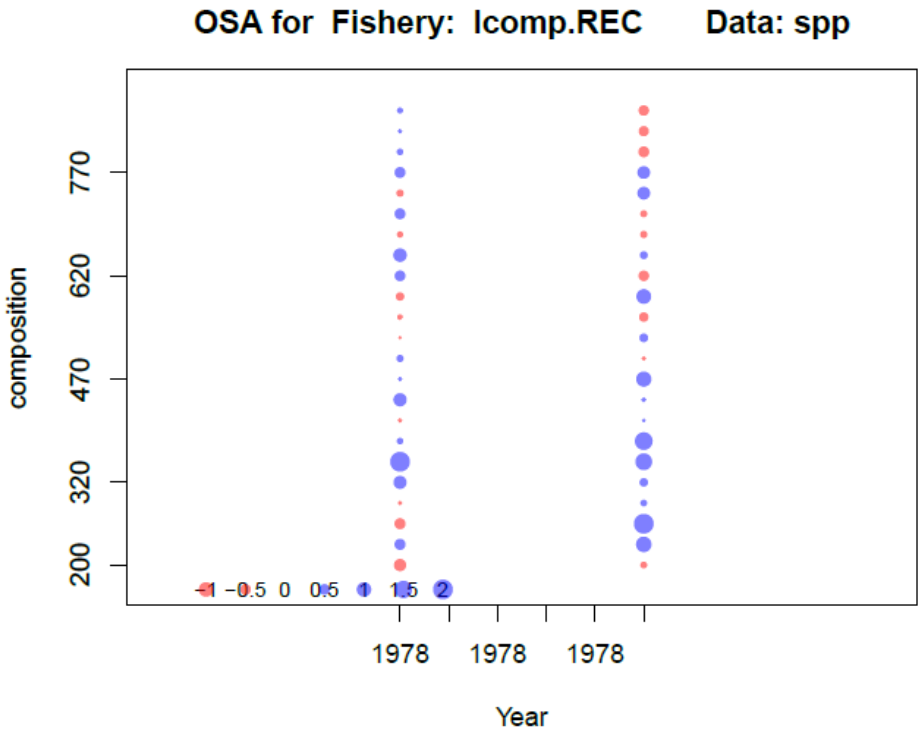
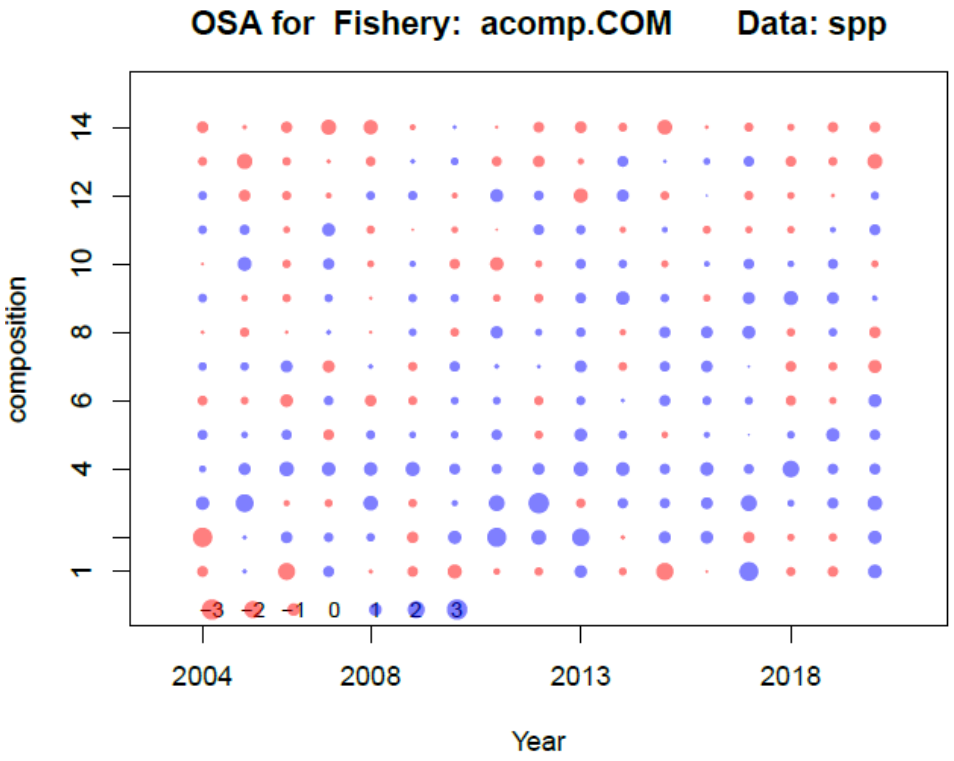
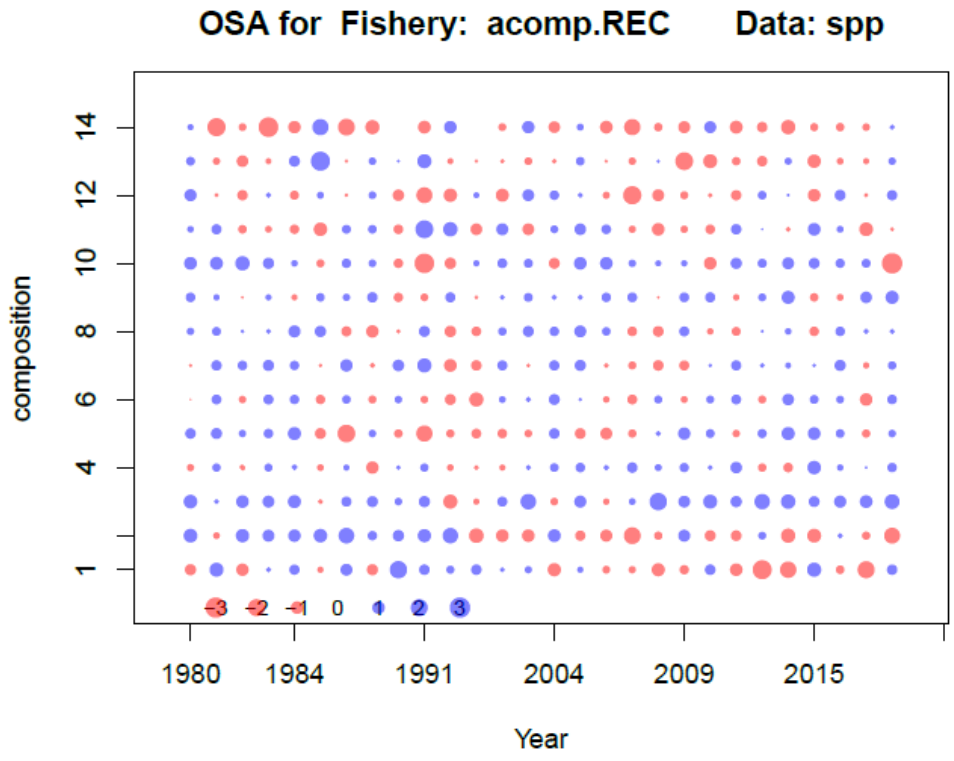

Fishery: CVT, Observed (bars), Predicted (dots)
Proportion
Age
1990
2000
2010
1991
2001
2011
1992
2002
2012
1993
2003
2013
1994
2004
2014
1995
2005
2015
1996
2006
2016
1997
2007
2017
1998
2008
2018
1999
2009
2019

Figure B6A-E. One-step ahead (OSA) residuals of composition data, as described in Trijoulet et al. 2023. Fisheries Research 257:106487.






OSA for Fishery: acomp.COM Data: spp
composition
1
4
6
8
10
12
14
-3 -2 -1 0 1 2 3
2004
2008
2013
2018
Year


OSA for Fishery: acomp.REC Data: spp
composition
1
4
6
8
10
12
14
-3 -2 -1 0 1 2 3
1980
1984
1991
2004
2009
2015
Year

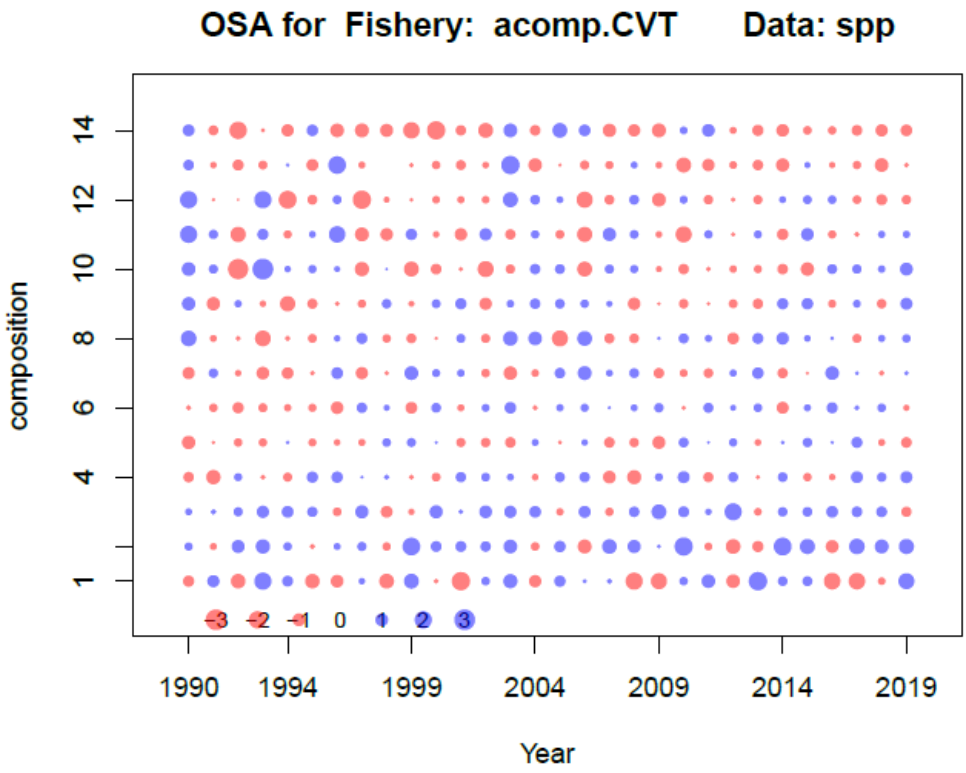

OSA for Fishery: acomp.CVT Data: spp
composition
1
4
6
8
10
12
14
−3 −2 −1 0 1 2 3
1990
1994
1999
2004
2009
2014
2019
Year

Figure B7. Jitter analysis with 100 iterations. The last value shown (filled circle) is the base run. In each iteration, initial parameter values were drawn at random from a uniform distribution that allowed plus/minus 20% deviation from the base-run value.

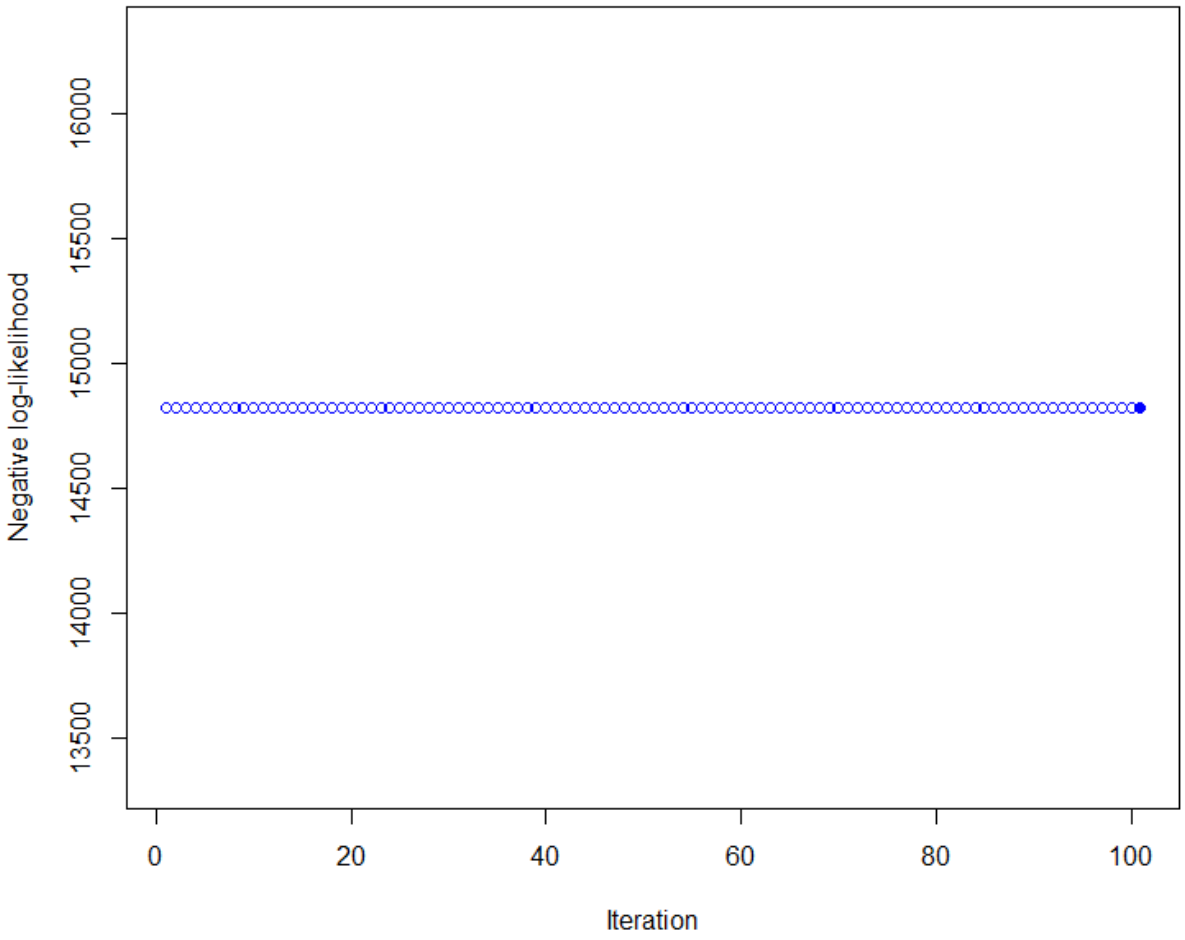
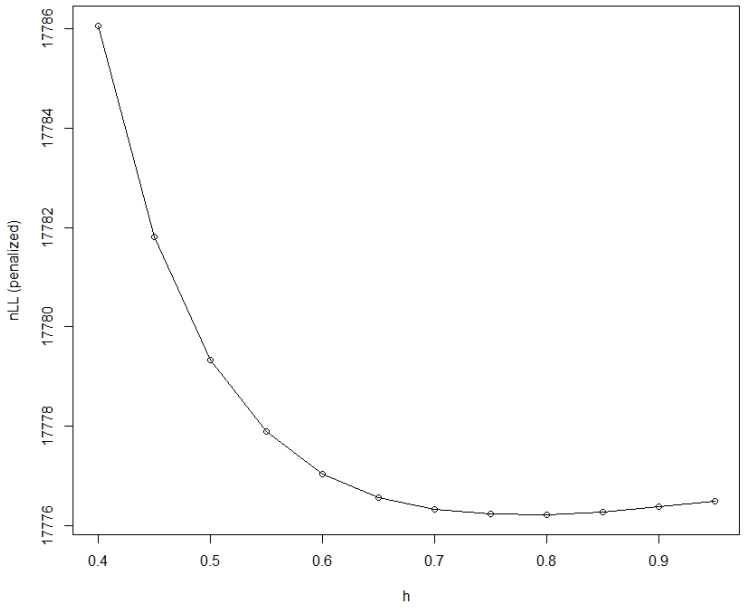
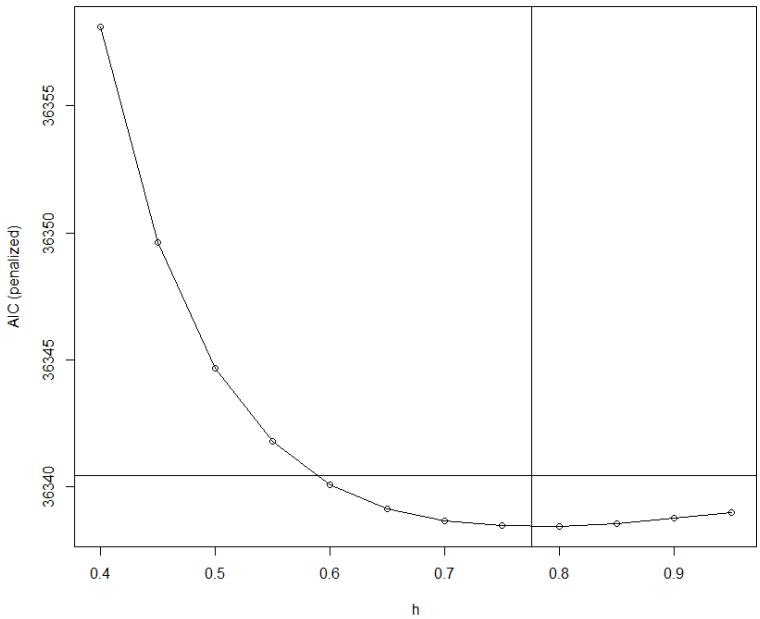


Figure D1A-C. Likelihood profiling on steepness of the Beverton Holt spawner-recruit curve.





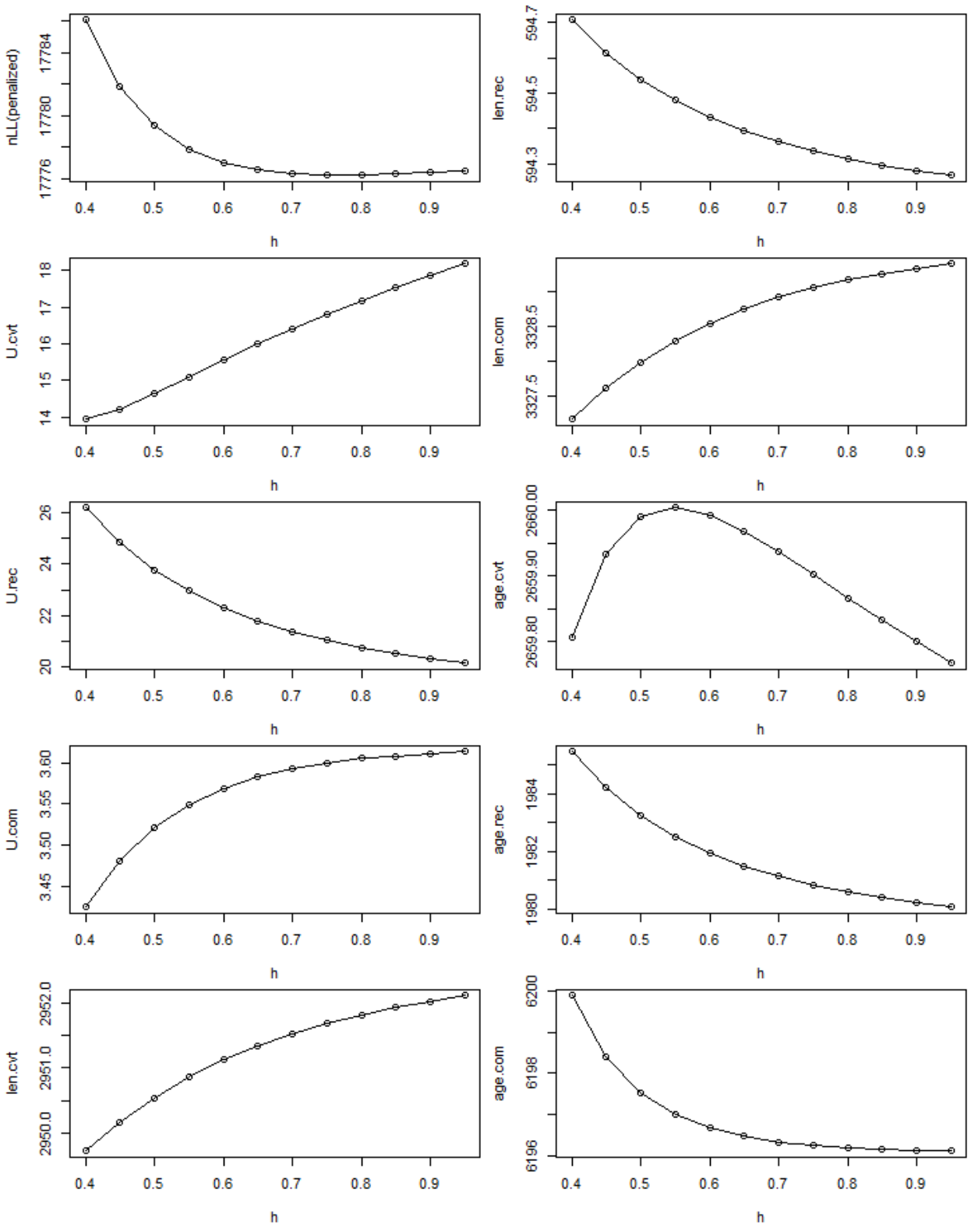
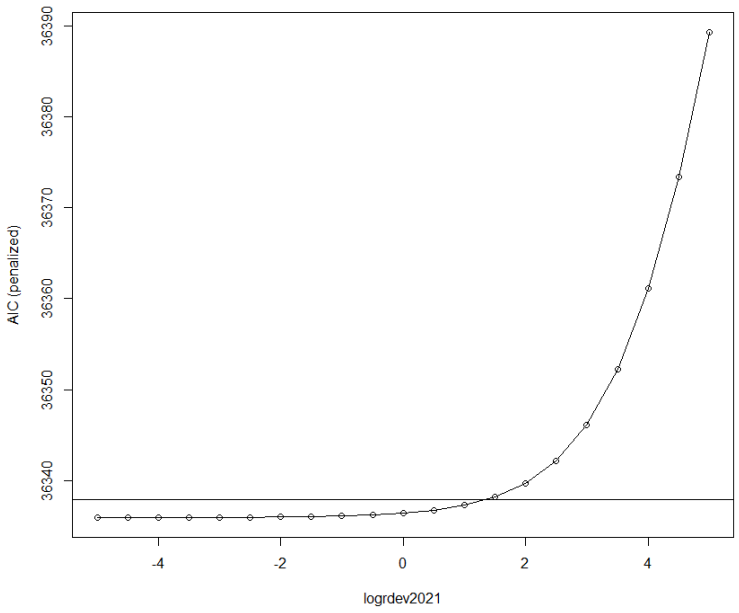
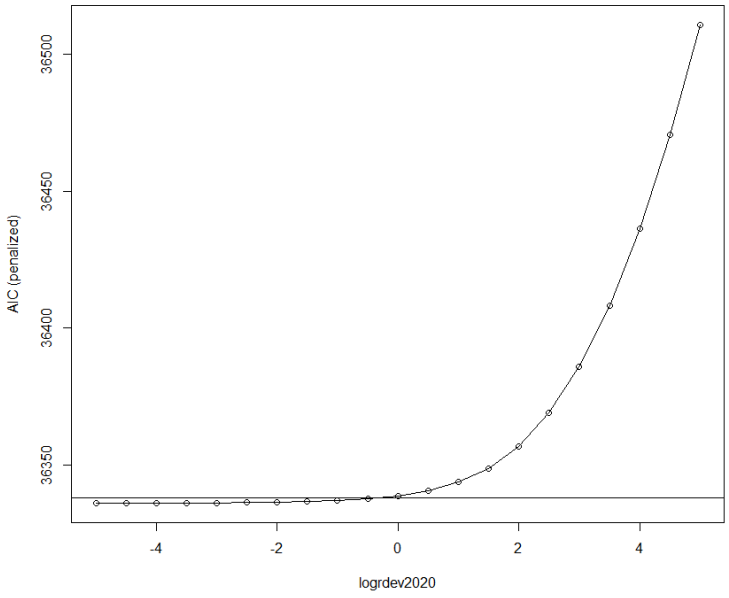
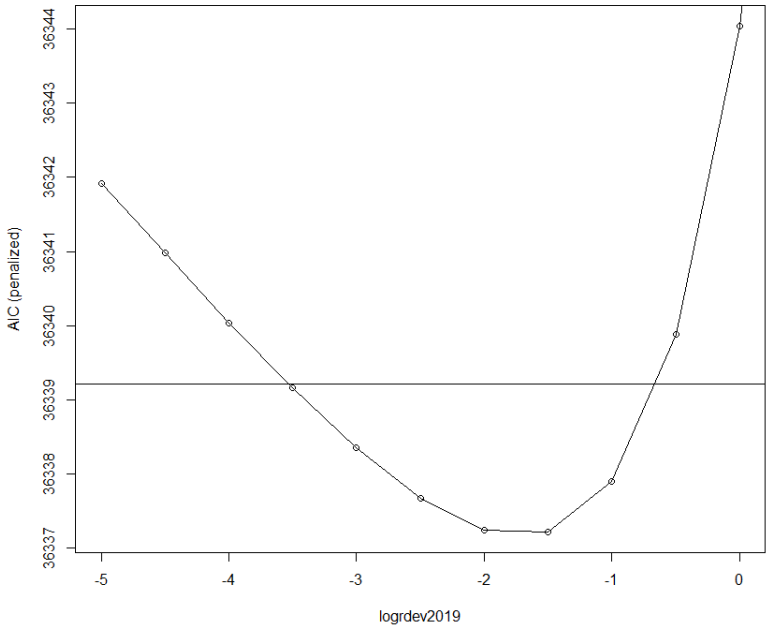

nLL(penalized)
17776
17780
17784
0.4
0.5
0.6
0.7
0.8
0.9
h
len.rec
594.3
594.5
594.7
U.cvt
14
15
16
17
18
len.com
3327.5
3328.5
U.rec
20
22
24
26
age.cvt
2659.80
2659.90
2660.00
U.com
3.45
3.50
3.55
3.60
age.rec
1980
1982
1984
len.cvt
2950.0
2951.0
2952.0
age.com
6196
6198
6200

Figure D2A-D. Likelihood profiling on recruitment deviation, peeling back from the terminal year. Note that the x- and y-axis ranges are not the same across all plots.






AIC (penalized)
36337
36338
36339
36340
36341
36342
36343
36344
-5
-4
-3
-2
-1
0
logrdev2019

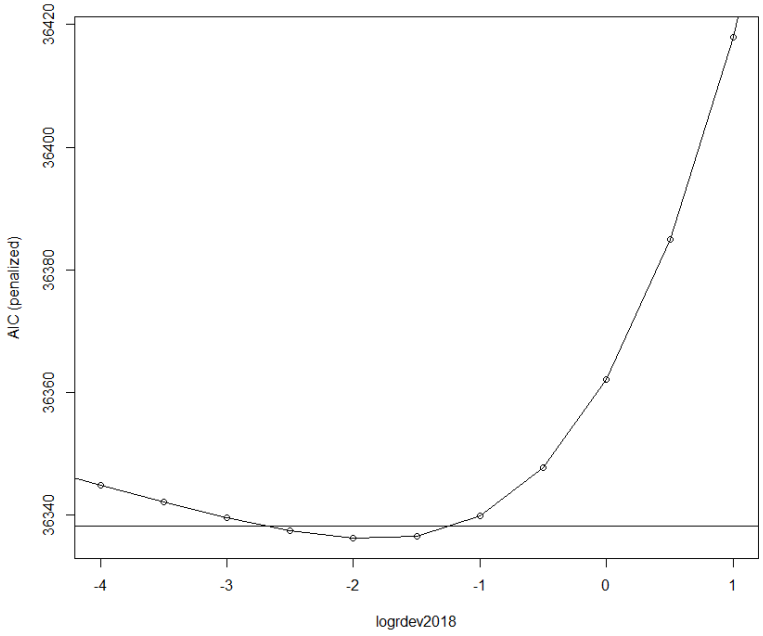
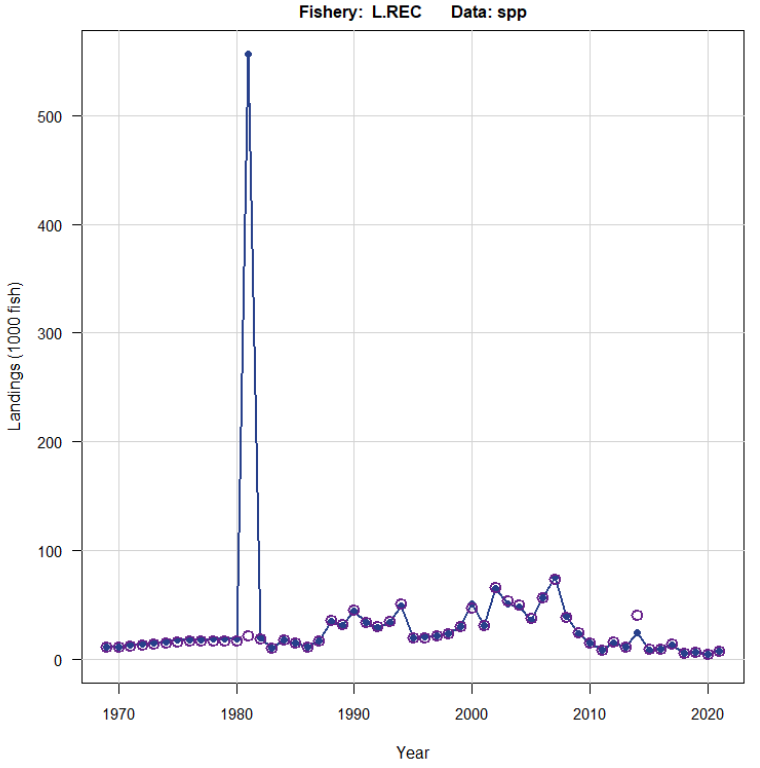

AIC (penalized)
36340
36360
36380
36400
36420
-4
-3
-2
-1
0
1
logrdev2018

Figure D3. Example of instability in fitting recreational landings when CVs used in the likelihood are large (at their native MRIP values). A) Estimates of landings. B) Corresponding estimates of F.



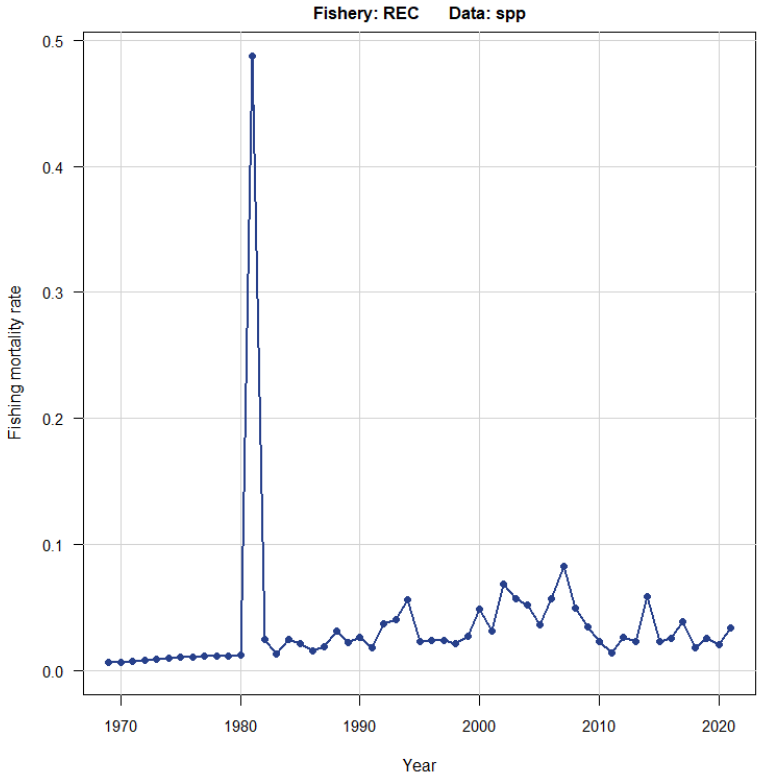
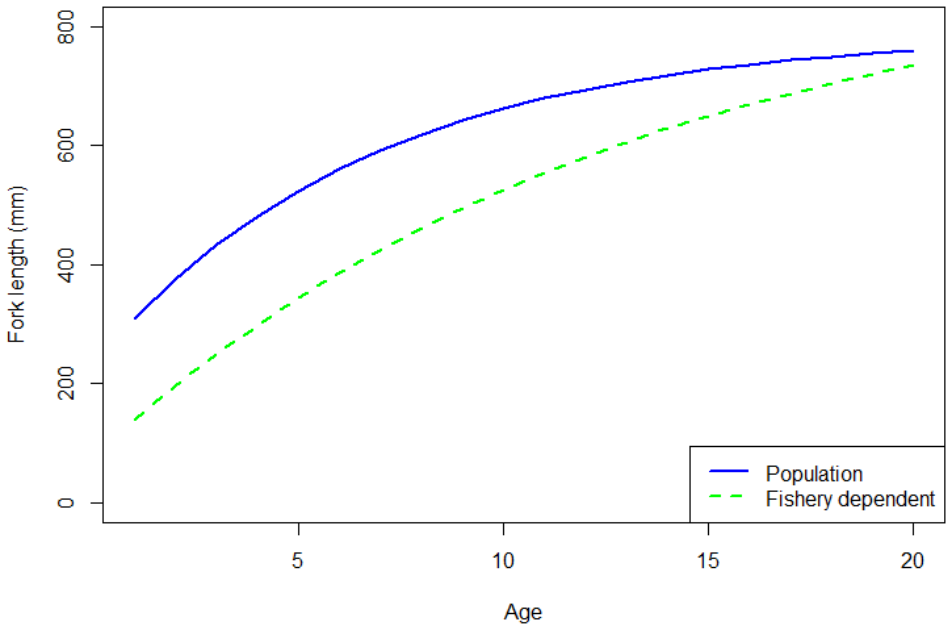


Figure D4. Update (correction) to fishery dependent growth curve. A) Research Track growth curves. B) Operational Assessment growth curves.



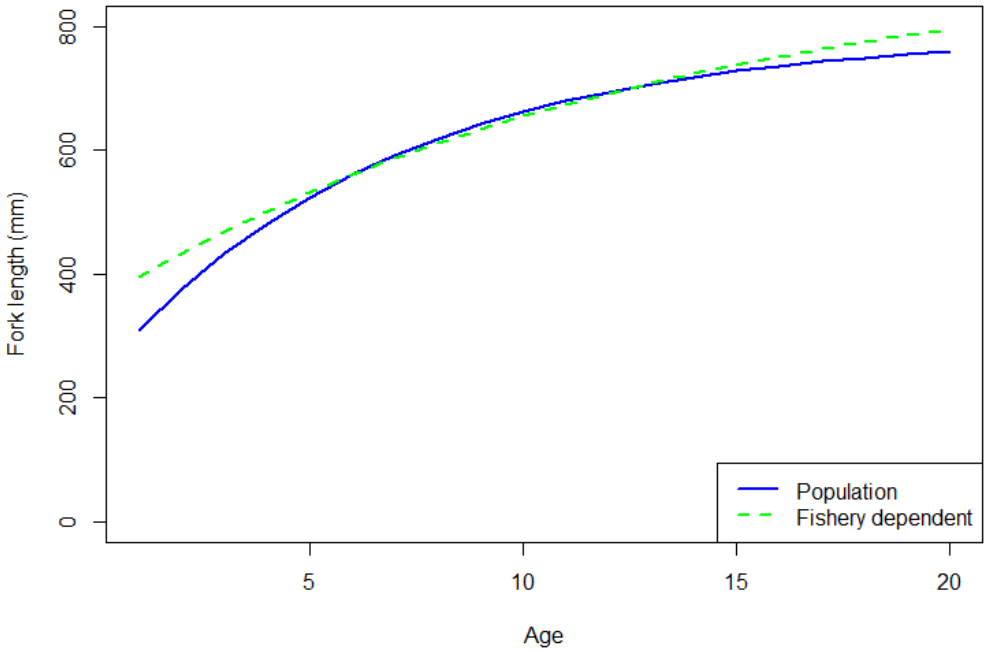
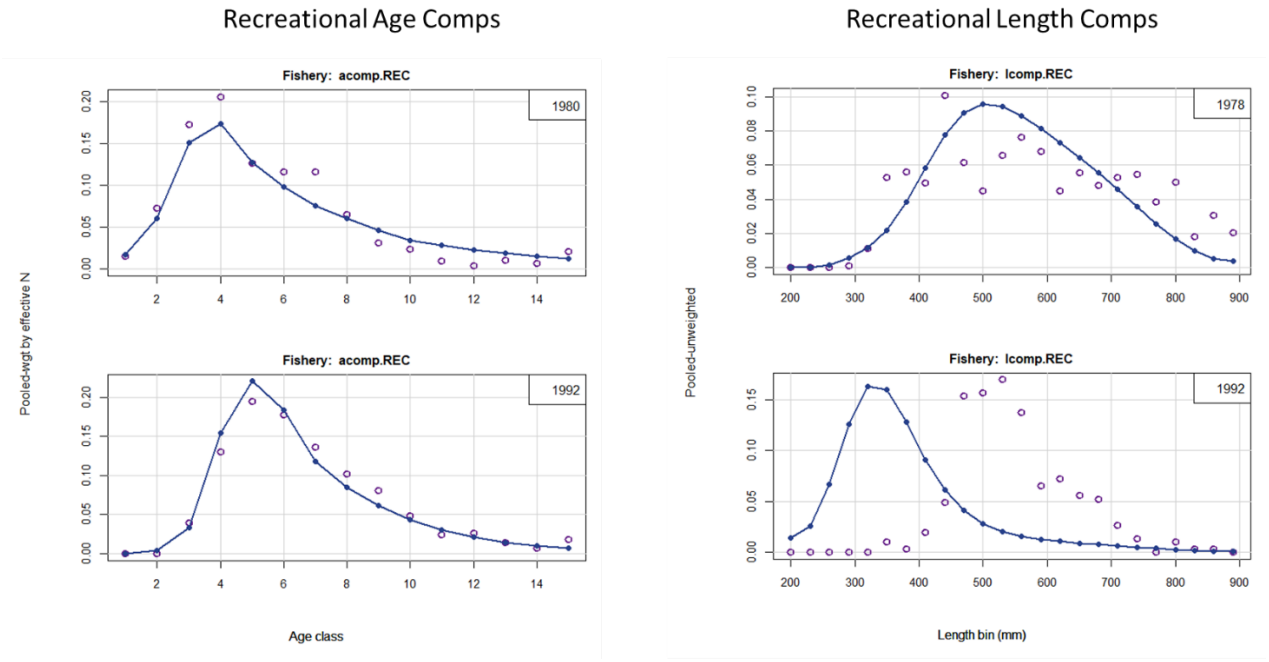


Figure D5. Recreational pooled age and length comps before (top 4 panels) and after (bottom 4 panels) the update to the fishery dependent growth curve.



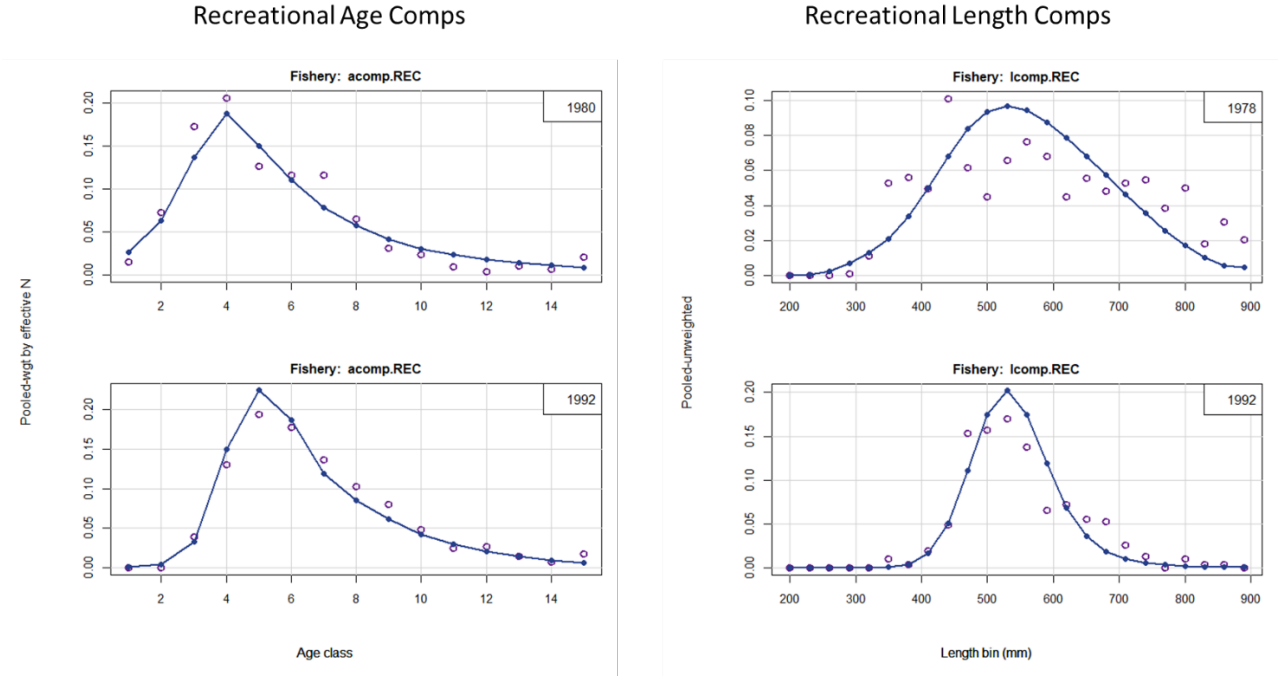
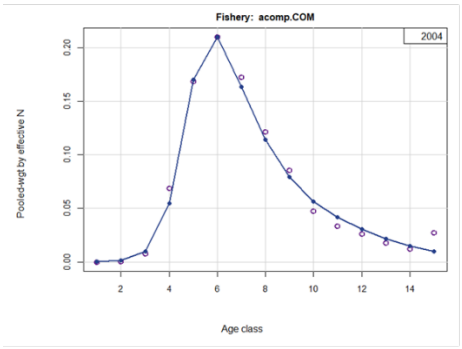
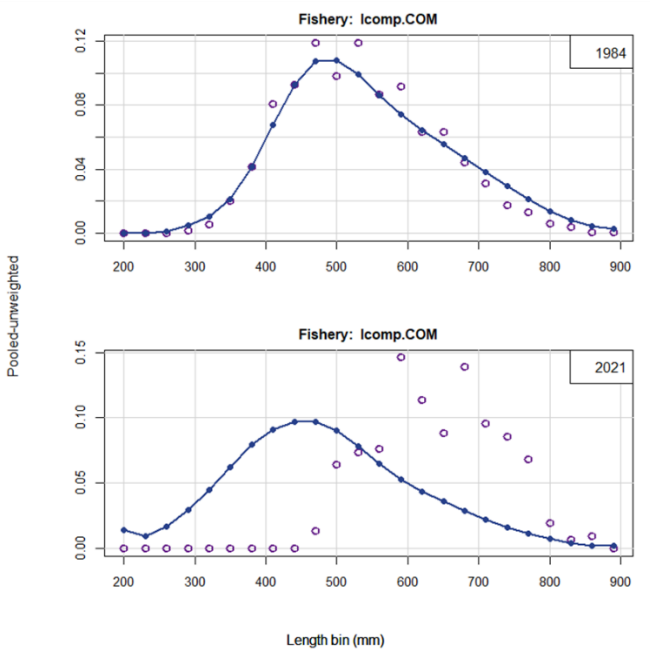


Figure D6. Commercial pooled age and length comps before (top 3 panels) and after (bottom 3 panels) the update to the fishery dependent growth curve.

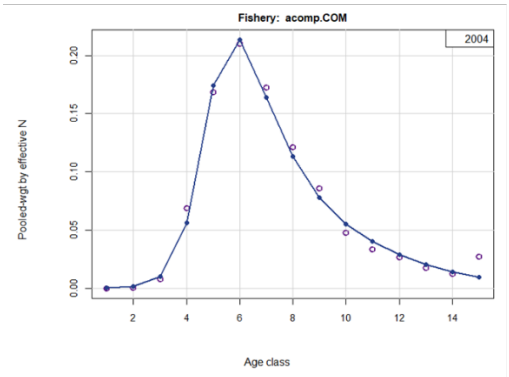
Commercial Age Comps



Commercial Length Comps



Commercial Age Comps



Commercial Length Comps