Appendix L: Results from the CPT-Recommended Model Scenario

William T. Stockhausen
Alaska Fisheries Science Center
15 September 2018

THIS INFORMATION IS DISTRIBUTED SOLELY FOR THE PURPOSE OF PREDISSEMINATION PEER REVIEW UNDER APPLICABLE INFORMATION QUALITY GUIDELINES. IT HAS NOT BEEN FORMALLY DISSEMINATED BY NOAA FISHERIES/ALASKA FISHERIES SCIENCE CENTER AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY

Introduction

The CPT rejected all "18" model scenarios put forward by the assessment author. These scenarios were based on revised fishery data which had a substantial impact on estimates of survey catchability and, as a consequence, stock biomass levels. Given the substantial impact the change in data had, the CPT rejected the scenarios based on the revised data because the mechanisms for changes in the results were not fully understood and the data had not been previously reviewed and vetted by the CPT. Consequently, the CPT requested that the assessment author run the 2017 assessment model (17AM) using the data used in that assessment but updated with only the new data for 2017/18 (NMFS survey, retained catch biomass and size compositions from the directed fishery, and total catch biomass and size compositions from the directed fishery and bycatch fisheries). The assessment author was able to comply with this request to the extent of providing results for the maximum likelihood solution; MCMC results for the model scenario were not possible given the time constraints. This model scenario was designated 18AM17. A subset of results from this model scenario are presented in this appendix.

Management performance

Historical status and catch specifications for eastern Bering Sea Tanner crab from the CPT-recommended model scenario 18AM17.

(a) in 1000's t.

Year	MSST	Biomass (MMB)	TAC (East + West)	Retained Catch	Total Catch Mortality	OFL	ABC
2014/15	13.40	71.57 [A]	6.85	6.16	9.16	31.48	25.18
2015/16	12.82	73.93 [A]	8.92	8.91	11.38	27.19	21.75
2016/17	14.58	77.96 [A]	0.00	0.00	1.14	25.61	20.49
2017/18	15.15[C]	64.09[A]	1.13	1.13	2.39[C]	25.42	20.33
2018/19		35.95[B,C]				20.87[C]	16.70[C]

(b) in millions lbs.

Year	MSST	Biomass (MMB)	TAC (East + West)	Retained Catch	Total Catch Mortality	OFL	ABC
2014/15	29.53	157.78 [A]	15.10	13.58	20.19	69.40	55.51
2015/16	28.27	162.99 [A]	19.67	19.64	25.09	59.94	47.95
2016/17	32.15	171.87 [A]	0.00	0.00	2.52	56.46	45.17

2017/18	33.39 [C]	141.29 [A]	2.50	2.50	5.27 [C]	56.03	44.83
2018/19		79.26 [B,C]				46.01 [C]	36.81 [C]

A—Estimated at time of mating for the year concerned. This is a revised estimate, based on the subsequent assessment.
B—Projected biomass from the current stock assessment. This value will be updated next year.
C—Based on the CPT's recommended model scenario (Scenario 1817AM).

Basis for the OFL

a) in 1000's t.

Year	Tier[A]	B_{MSY}[A]	Current MMB[A]	B/B_{MSY}[A]	F_{OFL}[A] (yr^{-1})	Years to define B_{MSY}[A]	Natural Mortality[A,B] (yr^{-1})
2014/15	3a	29.82	63.80	2.14	0.61	1982-2014	0.23
2015/16	3a	26.79	53.70	2.00	0.58	1982-2015	0.23
2016/17	3a	25.65	45.34	1.77	0.79	1982-2016	0.23
2017/18	3a	29.17	64.09	2.12	0.75	1982-2017	0.23
2018/19	3a	30.29	35.95	1.19	0.74	1982-2018	0.23

b) in millions lbs.

Year	Tier[A]	B_{MSY}[A]	Current MMB[A]	B/B_{MSY}[A]	F_{OFL}[A] (yr^{-1})	Years to define B_{MSY}[A]	Natural Mortality[A,B] (yr^{-1})
2014/15	3a	65.74	140.66	2.14	0.61	1982-2014	0.23
2015/16	3a	59.06	118.38	2.00	0.58	1982-2015	0.23
2016/17	3a	56.54	99.95	1.77	0.79	1982-2016	0.23
2017/18	3a	64.30		2.12	0.75	1982-2017	0.23
2018/19	3a	66.78	79.26	1.08	0.74	1982-2018	0.23

A—Calculated from the assessment reviewed by the Crab Plan Team in 20XX of 20XX/(XX+1) or based on the CPT's recommended model for 2018/19.
B—Nominal rate of natural mortality. Actual rates used in the assessment are estimated and may be different.

Current male spawning stock biomass (MMB), as projected for 2018/19, is estimated at 35.95 thousand t. B_{MSY} for this stock is calculated to be 30.29 thousand t, so MSST is 15.15 thousand t. Because current MMB > MSST, **the stock is not overfished**. Total catch mortality (retained + discard mortality in all fisheries, using a discard mortality rate of 0.321 for pot gear and 0.8 for trawl gear) in 2017/18 was 2.39 thousand t, which was less than the OFL for 2016/17 (25.42 thousand t); consequently **overfishing did not occur**. The OFL for 2018/19 based on the CPT's recommended scenario (Scenario 18AM17) is 20.87 thousand t. Because there was not time to make MCMC runs, the P* ABC could not be evaluated and thus maxABC could not be determined. In 2014, the SSC adopted a 20% buffer to calculate ABC for Tanner crab to incorporate concerns regarding model uncertainty for this stock. Based on this buffer, the ABC would be 16.70 thousand t.

Tables and Figures

Selected tables and figures from the original assessment have been updated below for the CPT's recommended scenario 18AM17. The table and figure numbers below do not correspond to those in the original assessment.

List of Table Captions

Table 1. Comparison of fits to mature survey biomass by sex (in 1000's t) from the 2017 assessment model (17AM) and the CPT's recommended scenario (18AM17). 6
Table 2. Comparison of estimates of mature biomass-at-mating by sex (in 1000's t) from the 2017 assessment model (17AM) and the CPT's recommended scenario (18AM17). 7
Table 3. Estimated population size (millions) for females on July 1 of year. from the CPT's recommended scenario (18AM17). 8
Table 4. Estimated population size (millions) for males on July 1 of year. from the CPT's recommended scenario (18AM17). 8
Table 5. Comparison of estimates of recruitment (in millions) from the 2017 assessment model (17AM) and the CPT's recommended scenario (18AM17). 9
Table 6. Comparison of exploitation rates (i.e., catch divided by biomass) from the 2017 assessment model 17AM) and the CPT's recommended scenario (18AM17). 10
Table 7. Values required to determine Tier level and OFL for selected model scenarios. These values are presented only to illustrate the effect of incremental changes in the model scenarios. Results from the CPT's recommended model (18AM17) are highlighted in green. Note: the 2017/18 MMB is for July 1, 2018, not at the time of mating. 11

List of Figure Captions

Figure 1. Comparison of estimated population quantities from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a). 12
Figure 2. Comparison of estimated population quantities from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a). 13
Figure 3. Comparison of estimated population processes from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a). 14
Figure 4. Comparison of estimated survey characteristics from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a). 15
Figure 5. Comparison of estimated fully-selected catchability in the directed and bycatch fisheries from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a)..... 16
Figure 6. Comparison of estimated selectivity in the directed fishery from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).. 17
Figure 7. Comparison of estimated selectivities in the bycatch fisheries from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).. 18
Figure 8. Comparison of fits to survey biomass from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a). 19
Figure 9. Comparison of fits to male catch biomass in the directed fishery from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).. 20
Figure 10. Comparison of fits to total male bycatch in the snow crab and groundfish fisheries from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a). 21
Figure 11. Comparison of fits to total male bycatch in the BBRKC fishery from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).. 22
Figure 12. Comparison of mean fits to survey size compositions and residuals from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a). 23
Figure 13. Comparison of mean fits to fishery size compositions from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a). 24
Figure 14. Comparison of mean fits to fishery size compositions from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a). 25

Tables

Table 1. Comparison of fits to mature survey biomass by sex (in 1000's t) from the 2017 assessment model (17AM) and the CPT's recommended scenario (18AM17).

	17AM				18AM17			
	male		female		male		female	
year	observed	predicted	observed	predicted	observed	predicted	observed	predicted
1975	246.0	151.3	31.4	47.6	246.0	153.3	31.4	47.8
1976	126.2	135.6	31.2	42.2	126.2	137.2	31.2	42.3
1977	111.3	108.3	38.6	36.8	111.3	109.5	38.6	36.9
1978	77.9	79.5	25.8	34.1	77.9	80.2	25.8	34.2
1979	32.6	71.3	19.3	35.8	32.6	71.8	19.3	36.0
1980	86.8	74.2	63.8	38.8	86.8	74.5	63.8	39.0
1981	50.3	65.6	42.6	35.7	50.3	66.0	42.6	36.1
1982	51.7	71.8	64.1	26.1	51.7	71.9	64.1	26.2
1983	29.9	53.0	20.4	19.9	29.9	53.2	20.4	20.1
1984	25.8	36.0	14.9	15.1	25.8	36.2	14.9	15.2
1985	11.9	24.9	5.6	12.1	11.9	25.1	5.6	12.2
1986	13.3	30.2	3.4	12.3	13.3	30.4	3.4	12.4
1987	24.6	40.8	5.1	14.0	24.6	41.0	5.1	14.1
1988	61.0	55.2	25.4	16.2	61.0	55.5	25.4	16.3
1989	93.3	68.3	19.4	18.4	93.3	68.6	19.4	18.5
1990	97.8	73.2	37.7	19.8	97.8	73.5	37.7	19.8
1991	112.6	67.4	44.8	19.7	112.6	67.6	44.8	19.7
1992	105.5	60.5	26.2	17.8	105.5	60.8	26.2	17.8
1993	62.0	46.5	11.6	14.6	62.0	46.7	11.6	14.5
1994	43.8	34.9	9.8	11.3	43.8	34.9	9.8	11.2
1995	32.7	25.7	12.4	8.6	32.7	25.7	12.4	8.5
1996	27.5	19.1	9.6	6.7	27.5	19.1	9.6	6.6
1997	11.3	15.8	3.4	5.3	11.3	15.8	3.4	5.2
1998	10.9	13.9	2.3	4.5	10.9	14.1	2.3	4.4
1999	13.0	13.3	3.8	4.1	13.0	13.5	3.8	4.1
2000	16.9	14.3	4.1	4.2	16.9	14.6	4.1	4.2
2001	18.7	17.2	4.6	4.6	18.7	17.4	4.6	4.6
2002	19.0	20.8	4.5	5.2	19.0	20.9	4.5	5.2
2003	24.6	25.1	8.4	6.1	24.6	25.2	8.4	6.1
2004	27.0	31.2	4.7	7.4	27.0	31.2	4.7	7.4
2005	45.2	38.6	11.6	8.7	45.2	38.7	11.6	8.7
2006	67.9	45.7	14.9	9.9	67.9	45.6	14.9	9.9
2007	69.5	51.3	13.4	11.1	69.5	51.2	13.4	11.0
2008	65.1	57.4	11.7	11.3	65.1	57.3	11.7	11.2
2009	38.2	57.6	8.5	10.1	38.2	57.5	8.5	10.0
2010	39.1	51.0	5.5	8.6	39.1	50.8	5.5	8.5
2011	43.3	44.4	5.4	8.0	43.3	44.1	5.4	7.9
2012	42.2	42.9	12.4	9.5	42.2	42.6	12.4	9.4
2013	67.0	53.5	17.8	12.4	67.0	52.9	17.8	12.2
2014	82.4	68.9	14.9	13.9	82.4	67.7	14.9	13.6
2015	62.9	70.1	11.2	12.9	62.9	68.3	11.2	12.5
2016	61.6	58.4	7.6	10.9	61.6	56.6	7.6	10.5
2017	50.2	50.4	7.1	9.1	50.3	48.6	7.1	8.7
2018	--	--	--	--	39.7	41.4	5.0	7.3

Table 2. Comparison of estimates of mature biomass-at-mating by sex (in 1000's t) from the 2017 assessment model (17AM) and the CPT's recommended scenario (18AM17).

	17AM		18AM17	
year	male	female	male	female
1948	0.00	0.00	0.00	0.00
1949	0.00	0.00	0.00	0.00
1950	0.01	0.03	0.01	0.03
1951	0.13	0.23	0.14	0.25
1952	0.95	0.96	1.00	1.01
1953	3.61	2.16	3.80	2.27
1954	7.71	3.36	8.11	3.53
1955	11.36	4.29	11.95	4.51
1956	14.13	4.98	14.86	5.23
1957	16.23	5.52	17.08	5.79
1958	17.89	5.95	18.84	6.25
1959	19.30	6.36	20.34	6.68
1960	20.67	6.82	21.80	7.17
1961	22.21	7.45	23.46	7.84
1962	24.36	8.50	25.76	8.95
1963	28.04	10.62	29.68	11.21
1964	35.73	15.50	37.83	16.37
1965	51.93	26.24	55.00	27.66
1966	88.92	45.30	93.90	47.58
1967	140.50	69.41	148.28	72.62
1968	203.76	90.07	214.53	93.83
1969	243.21	101.15	255.76	104.91
1970	258.71	103.80	271.41	107.11
1971	260.13	102.68	271.66	105.27
1972	258.15	101.30	267.64	103.08
1973	254.69	99.15	261.58	100.18
1974	242.27	94.64	246.85	95.19
1975	227.19	87.70	230.32	87.99
1976	186.47	77.66	188.56	77.83
1977	129.97	67.55	130.97	67.71
1978	95.81	62.74	96.16	63.01
1979	74.51	65.26	74.33	65.72
1980	70.19	67.03	70.16	67.71
1981	75.02	61.86	75.57	62.61
1982	70.13	51.22	70.87	51.88
1983	53.39	39.19	54.04	39.72
1984	34.57	29.54	35.06	29.98
1985	32.59	25.26	33.03	25.61
1986	39.34	25.72	39.81	26.03
1987	51.54	29.25	52.15	29.58
1988	68.27	33.92	69.07	34.25
1989	74.35	38.16	75.18	38.49
1990	68.63	40.65	69.26	40.93
1991	65.90	40.25	66.70	40.45
1992	56.57	35.95	57.41	36.03
1993	48.77	29.72	49.31	29.65
1994	39.41	23.18	39.76	23.06
1995	29.66	17.72	29.98	17.60
1996	23.90	13.73	24.15	13.61
1997	20.05	10.99	20.44	10.90
1998	17.68	9.29	18.20	9.24
1999	17.50	8.58	17.99	8.54
2000	19.06	8.85	19.52	8.84
2001	22.76	9.70	23.13	9.69
2002	27.79	11.02	28.07	11.03
2003	33.81	12.93	34.13	12.96
2004	41.87	15.57	42.27	15.62
2005	51.23	18.29	51.63	18.33
2006	59.78	20.81	60.09	20.83
2007	66.97	23.28	67.37	23.30
2008	75.94	23.68	76.38	23.65
2009	76.55	21.19	76.87	21.09
2010	68.34	18.01	68.49	17.87
2011	59.11	16.79	59.24	16.63
2012	57.83	20.06	57.81	19.86
2013	70.61	26.14	70.27	25.76
2014	84.81	29.20	83.75	28.58
2015	83.78	27.13	82.01	26.38
2016	77.97	22.91	76.00	22.16
2017	--	--	64.09	18.40

Table 3. Estimated population size (millions) for females on July 1 of year. from the CPT's recommended scenario (18AM17).
<<Table too large: available online as a csv file in the zip file "TannerCrab.PopSizeStructure.18AM17.csvs.zip".>>

Table 4. Estimated population size (millions) for males on July 1 of year. from the CPT's recommended scenario (18AM17).
<<Table too large: available online as a csv file in the zip file "TannerCrab.PopSizeStructure.18AM17.csvs.zip".>>

Table 5. Comparison of estimates of recruitment (in millions) from the 2017 assessment model (17AM) and the CPT's recommended scenario (18AM17).

year	17AM	18AM17	year	17AM	18AM17
1948	66.59	70.09	1986	519.28	525.85
1949	66.58	70.10	1987	355.29	356.09
1950	66.64	70.20	1988	170.75	171.15
1951	66.90	70.54	1989	52.30	52.29
1952	67.56	71.30	1990	41.79	41.83
1953	68.86	72.77	1991	36.99	37.03
1954	71.24	75.38	1992	37.07	36.89
1955	75.36	79.85	1993	48.83	48.32
1956	82.49	87.53	1994	62.53	62.36
1957	95.22	101.14	1995	57.52	57.94
1958	119.81	127.33	1996	167.46	168.96
1959	174.76	185.59	1997	67.08	67.83
1960	320.74	339.61	1998	224.50	227.57
1961	719.29	757.29	1999	116.92	118.09
1962	1397.35	1462.06	2000	382.14	385.06
1963	1665.55	1736.13	2001	122.98	123.11
1964	1398.08	1452.38	2002	369.14	372.67
1965	1095.79	1131.17	2003	359.66	362.18
1966	943.74	963.73	2004	97.76	97.12
1967	937.10	943.26	2005	74.94	74.45
1968	1014.12	1008.70	2006	57.91	57.87
1969	983.26	980.62	2007	89.13	88.83
1970	834.92	843.95	2008	580.85	576.70
1971	554.32	561.90	2009	514.37	501.35
1972	362.83	369.68	2010	210.36	200.94
1973	308.42	318.01	2011	40.96	40.78
1974	632.20	641.44	2012	112.31	108.92
1975	1239.52	1257.96	2013	84.14	73.94
1976	957.43	971.55	2014	55.17	49.09
1977	420.64	424.99	2015	77.52	69.73
1978	177.55	180.91	2016	457.92	444.72
1979	108.77	110.11	2017	0.00	588.89
1980	177.84	180.47			
1981	100.63	101.42			
1982	488.76	496.01			
1983	402.54	408.57			
1984	541.74	550.02			
1985	523.34	529.77			

Table 6. Comparison of exploitation rates (i.e., catch divided by biomass) from the 2017 assessment model 17AM) and the CPT's recommended scenario (18AM17).

year	17AM	18AM17	year	17AM	18AM17
1949	0.0018	0.0016	1986	0.0195	0.0193
1950	0.0029	0.0027	1987	0.0319	0.0317
1951	0.0045	0.0042	1988	0.0407	0.0406
1952	0.0066	0.0062	1989	0.0915	0.0915
1953	0.0097	0.0093	1990	0.1524	0.1528
1954	0.0130	0.0126	1991	0.1473	0.1458
1955	0.0152	0.0148	1992	0.1748	0.1731
1956	0.0164	0.0160	1993	0.1302	0.1308
1957	0.0167	0.0163	1994	0.0983	0.0980
1958	0.0170	0.0165	1995	0.0872	0.0853
1959	0.0168	0.0164	1996	0.0481	0.0473
1960	0.0165	0.0160	1997	0.0394	0.0336
1961	0.0160	0.0156	1998	0.0381	0.0311
1962	0.0144	0.0140	1999	0.0172	0.0151
1963	0.0123	0.0119	2000	0.0141	0.0130
1964	0.0107	0.0104	2001	0.0157	0.0168
1965	0.0167	0.0160	2002	0.0096	0.0107
1966	0.0167	0.0159	2003	0.0066	0.0060
1967	0.0452	0.0436	2004	0.0074	0.0065
1968	0.0499	0.0483	2005	0.0123	0.0123
1969	0.0656	0.0637	2006	0.0184	0.0188
1970	0.0612	0.0596	2007	0.0220	0.0209
1971	0.0521	0.0509	2008	0.0146	0.0142
1972	0.0464	0.0455	2009	0.0121	0.0120
1973	0.0561	0.0556	2010	0.0064	0.0063
1974	0.0747	0.0741	2011	0.0088	0.0078
1975	0.0648	0.0646	2012	0.0053	0.0050
1976	0.1007	0.1009	2013	0.0153	0.0151
1977	0.1398	0.1407	2014	0.0522	0.0530
1978	0.1176	0.1189	2015	0.0707	0.0724
1979	0.1509	0.1527	2016	0.0098	0.0100
1980	0.0926	0.0939	2017	0.0000	0.0200
1981	0.0468	0.0468			
1982	0.0253	0.0252			
1983	0.0132	0.0131			
1984	0.0262	0.0260			
1985	0.0156	0.0154			

Table 7. Values required to determine Tier level and OFL for selected model scenarios. These values are presented only to illustrate the effect of incremental changes in the model scenarios. Results from the CPT's recommended model (18AM17) are highlighted in green. Note: the 2017/18 MMB is for July 1, 2018, not at the time of mating.

Model scenario	objective function value	max gradient	average recruitment millions	B0 1000's t	Bmsy 1000's t	Fmsy	MSY 1000's t	Fofl	OFL 1000's t	prjB 1000's t	B/Bmsy	2017/18 MMB 1000's t
17AM	2905.84	0.00	213.96	83.34	29.17	0.75	12.26	0.75	25.42	43.32	1.49	80.58
18AM17	2962.17	0.00	223.63	86.55	30.29	0.74	12.75	0.74	20.87	35.95	1.19	66.64
18C2a	4234.40	0.01	199.49	63.01	22.05	0.91	11.54	0.91	16.76	24.06	1.09	50.12

Figures

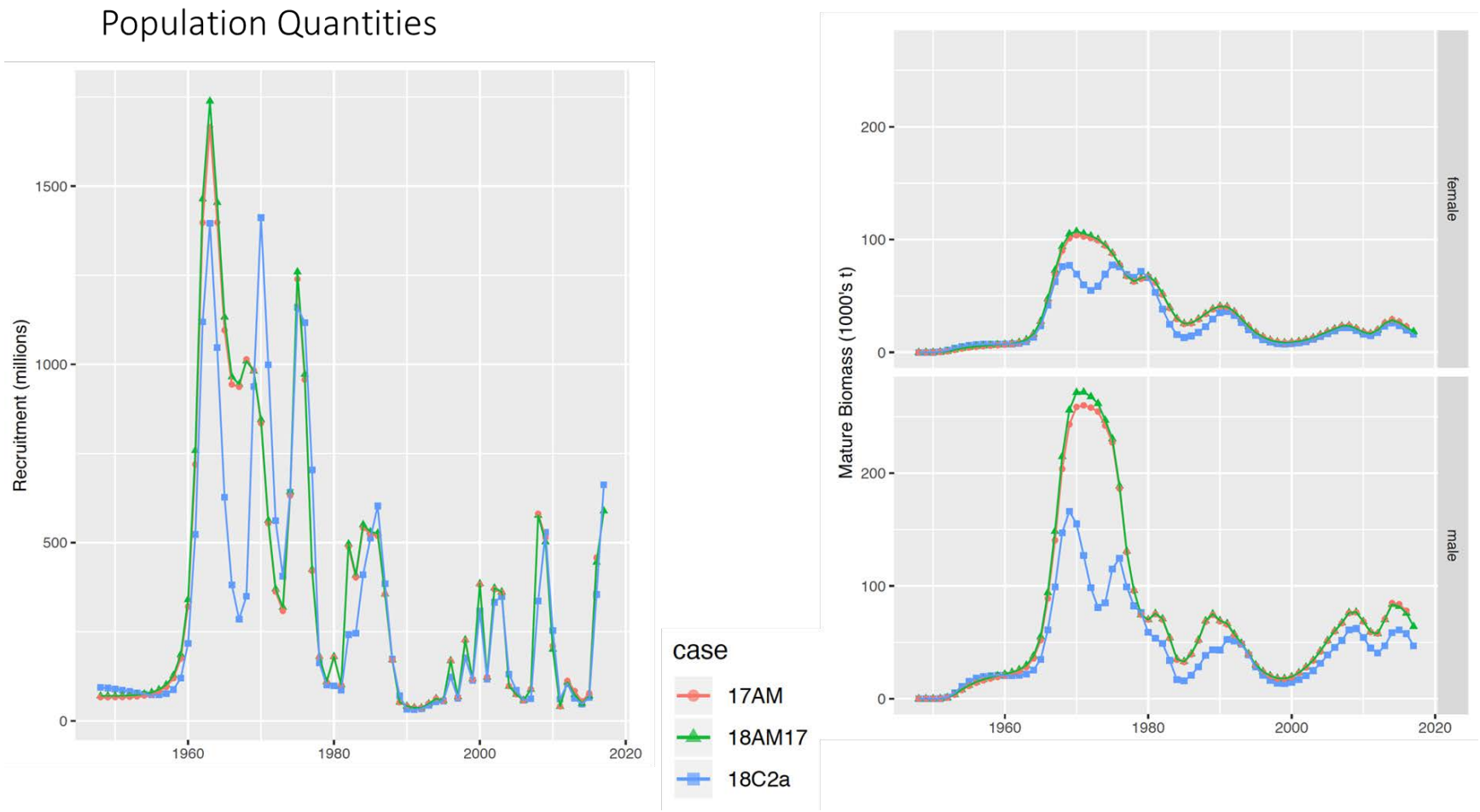

Figure 1. Comparison of estimated population quantities from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

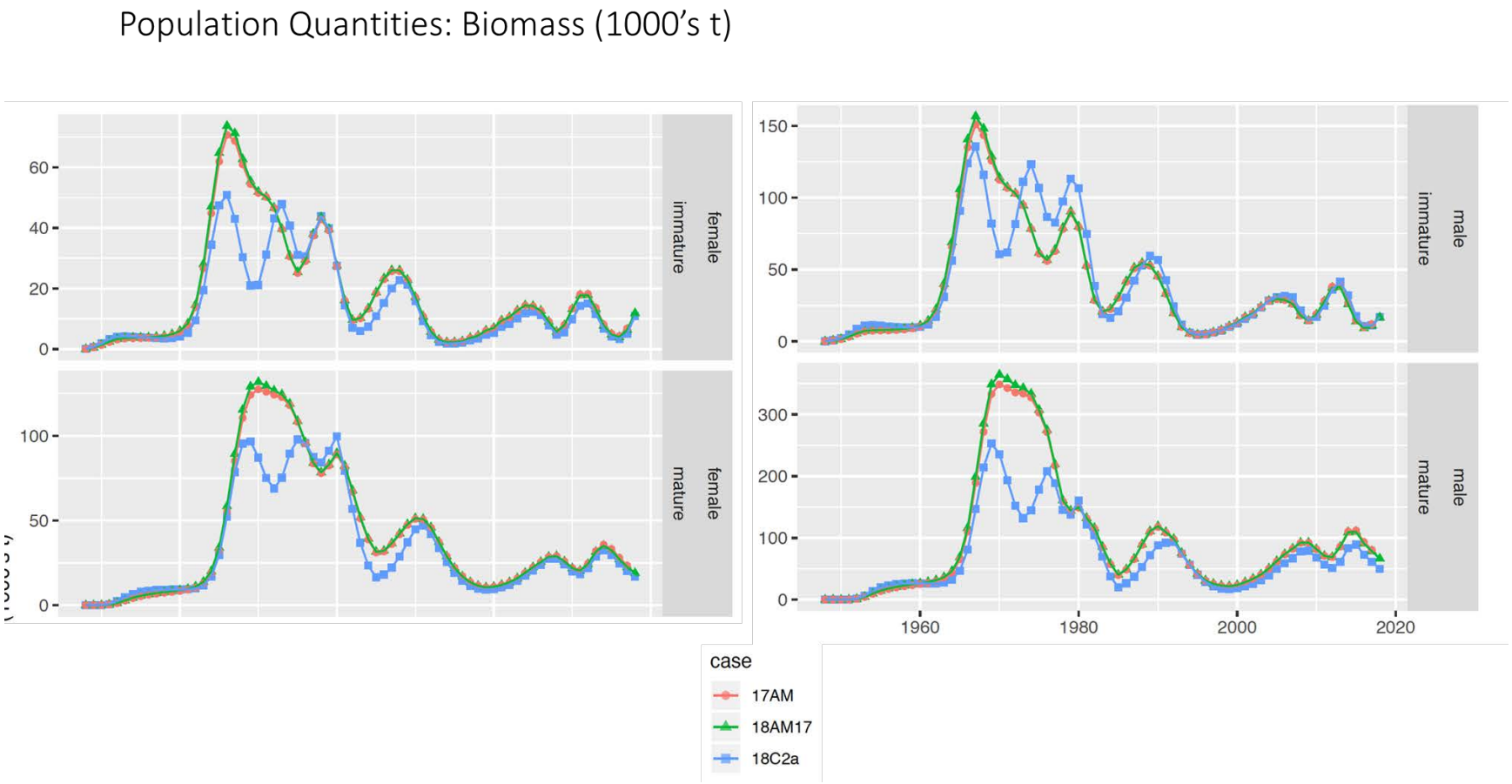

Figure 2. Comparison of estimated population quantities from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

Population processes

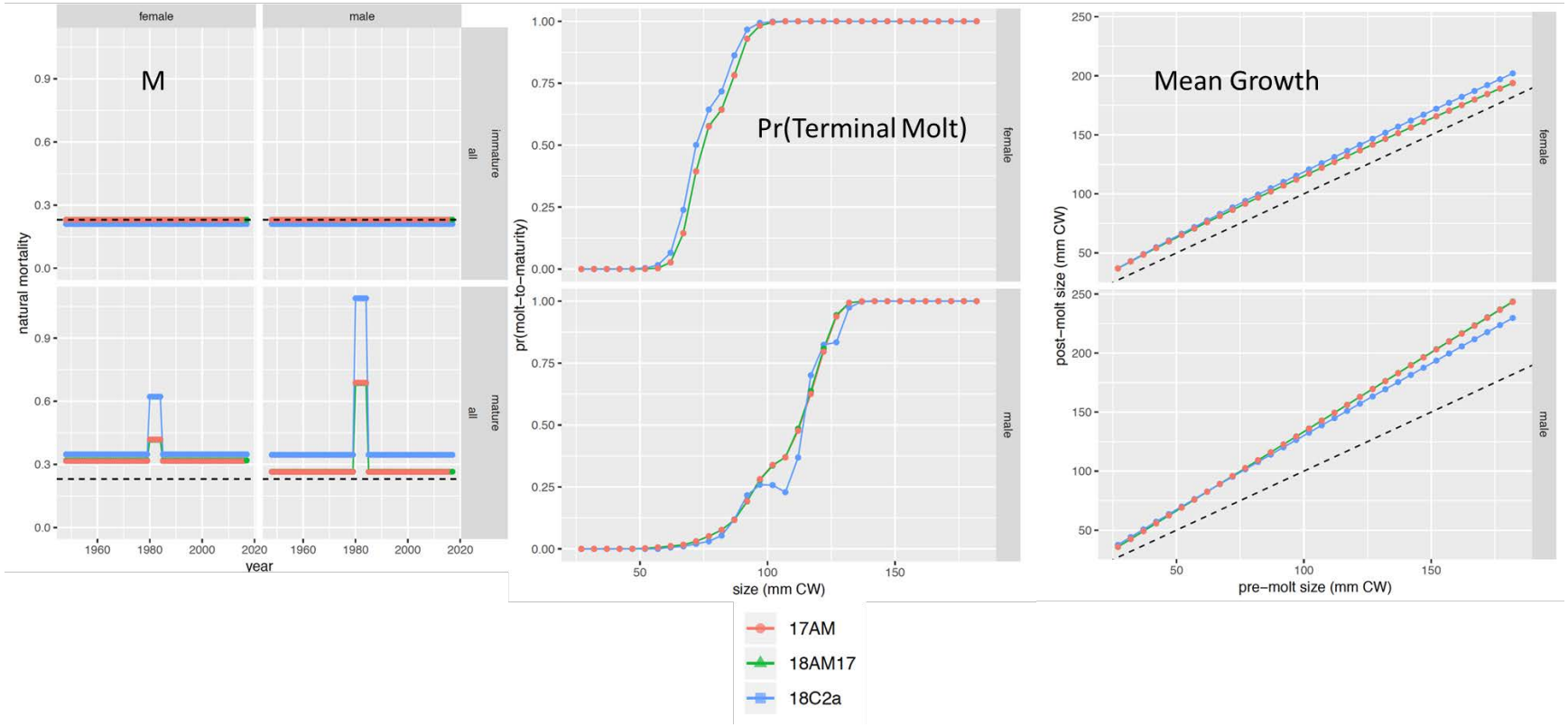

Figure 3. Comparison of estimated population processes from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

Survey Characteristics

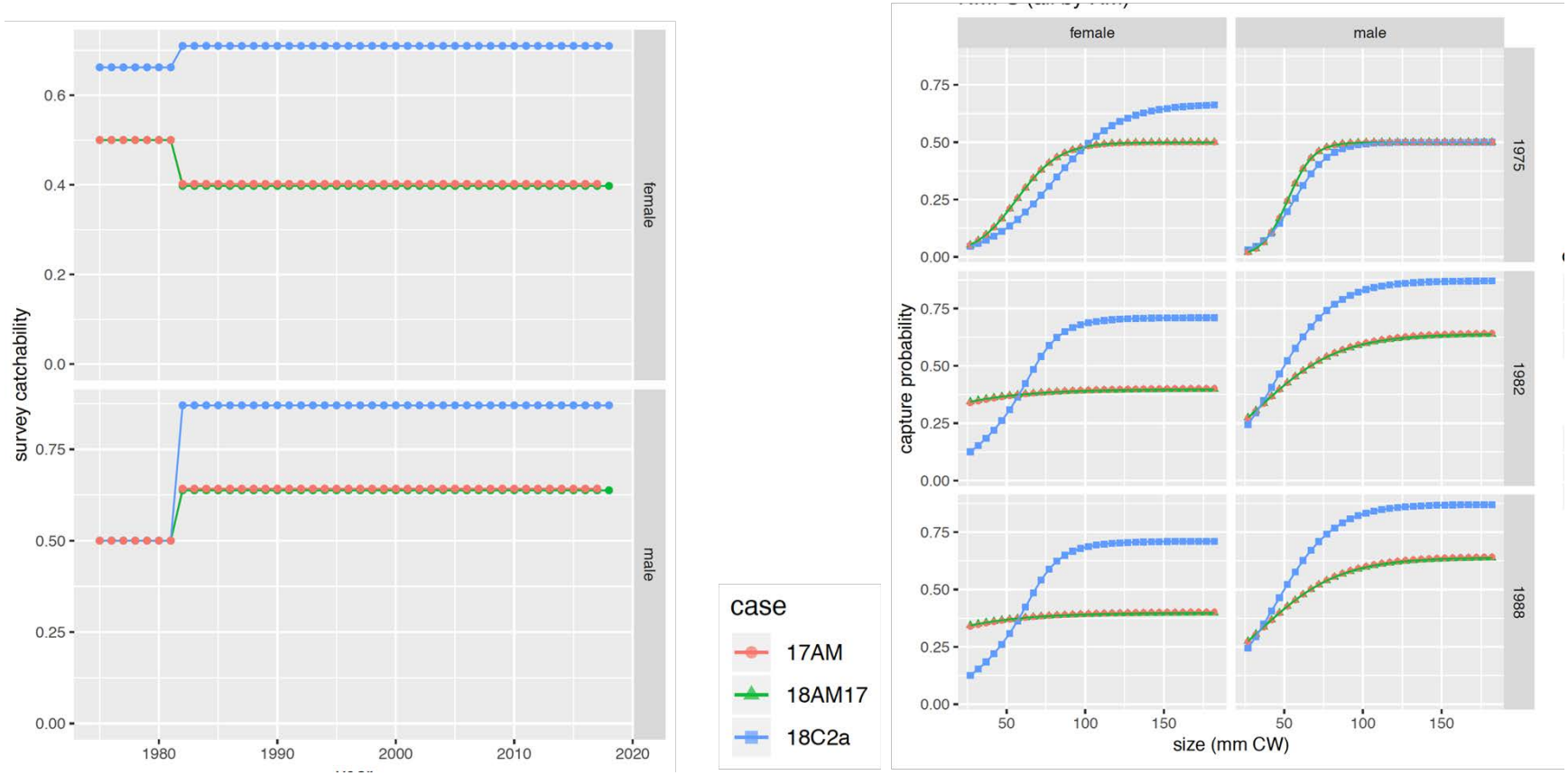

Figure 4. Comparison of estimated survey characteristics from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

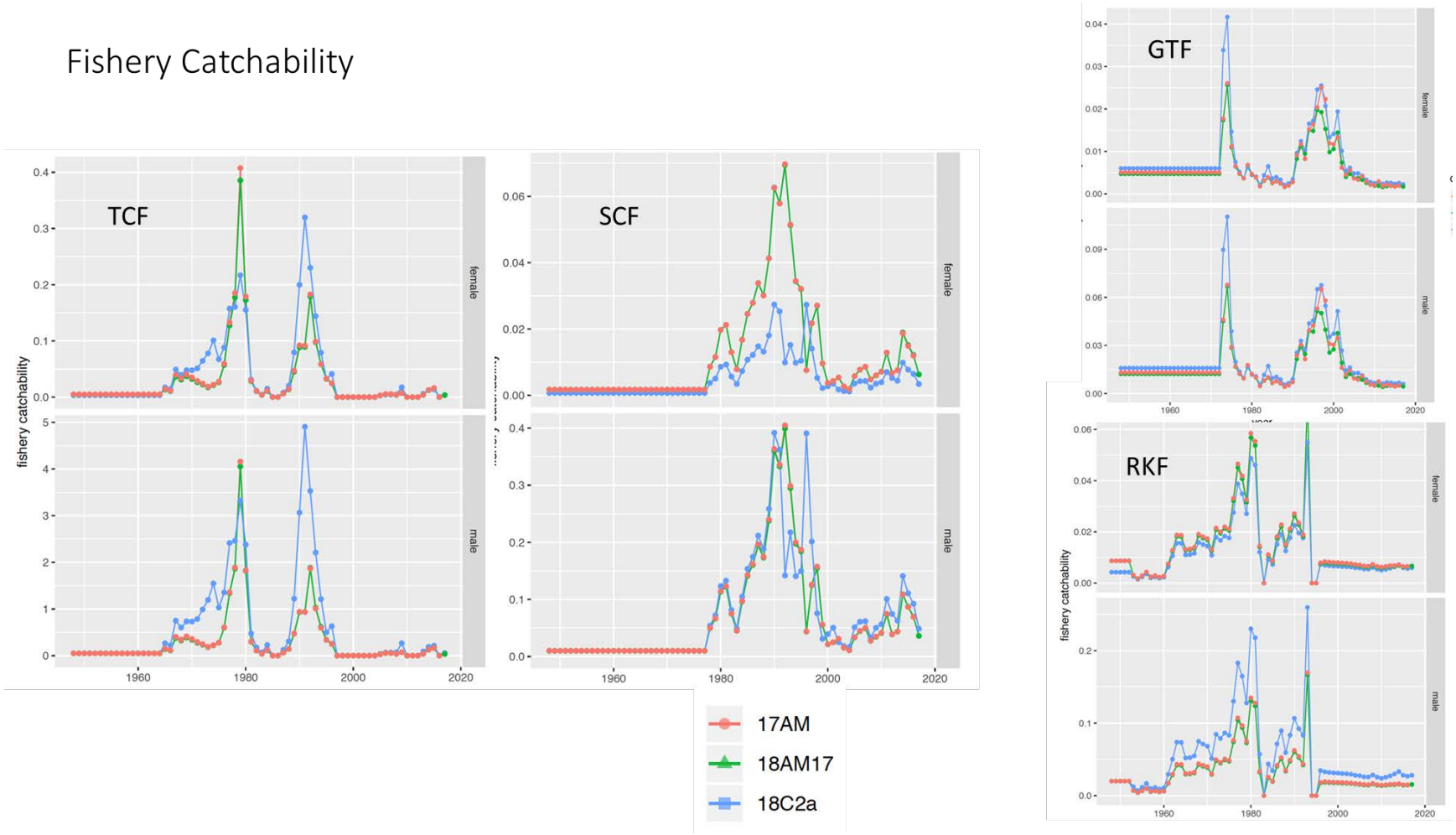

Figure 5. Comparison of estimated fully-selected catchability in the directed and bycatch fisheries from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

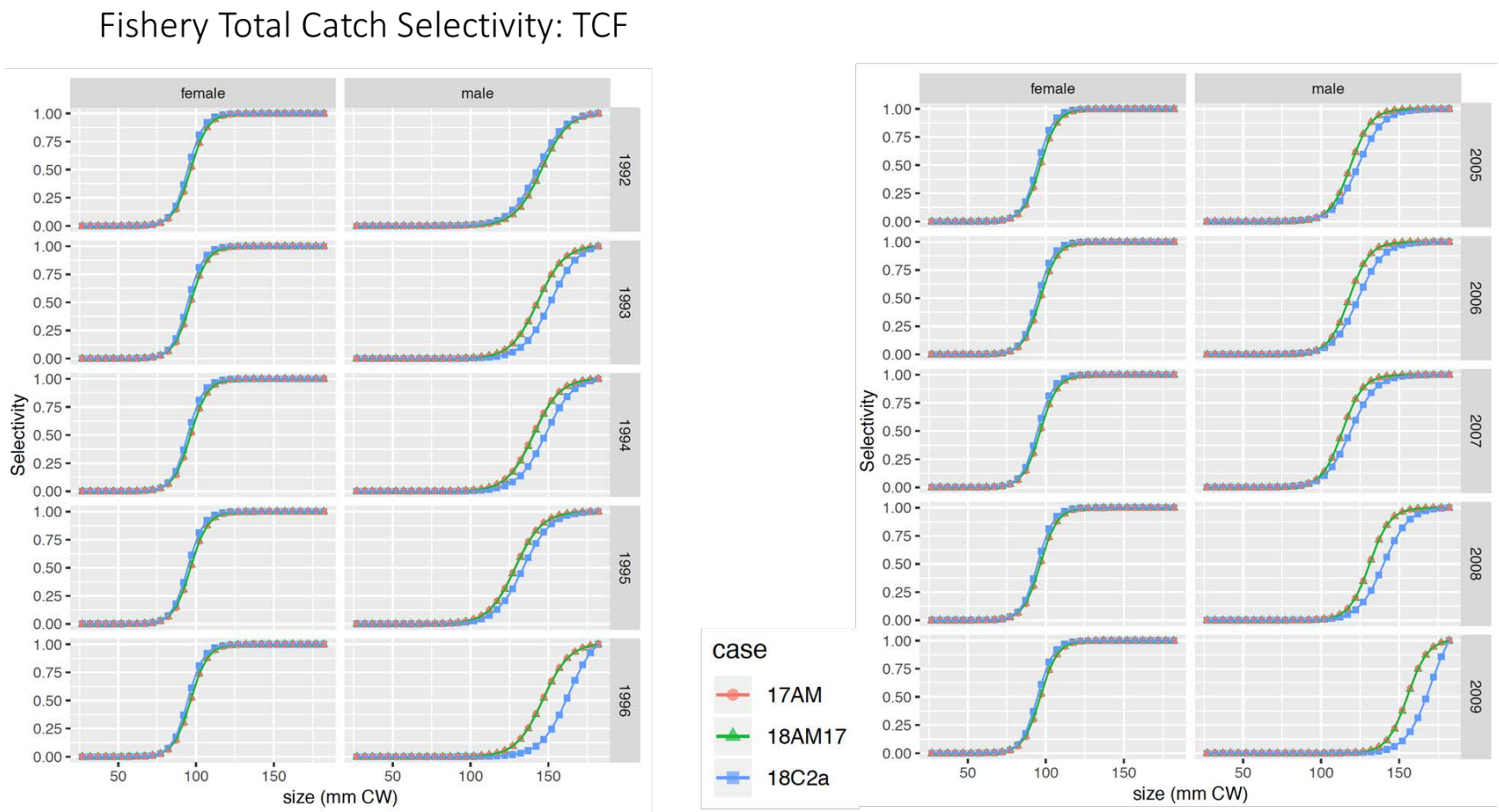

Figure 6. Comparison of estimated selectivity in the directed fishery from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

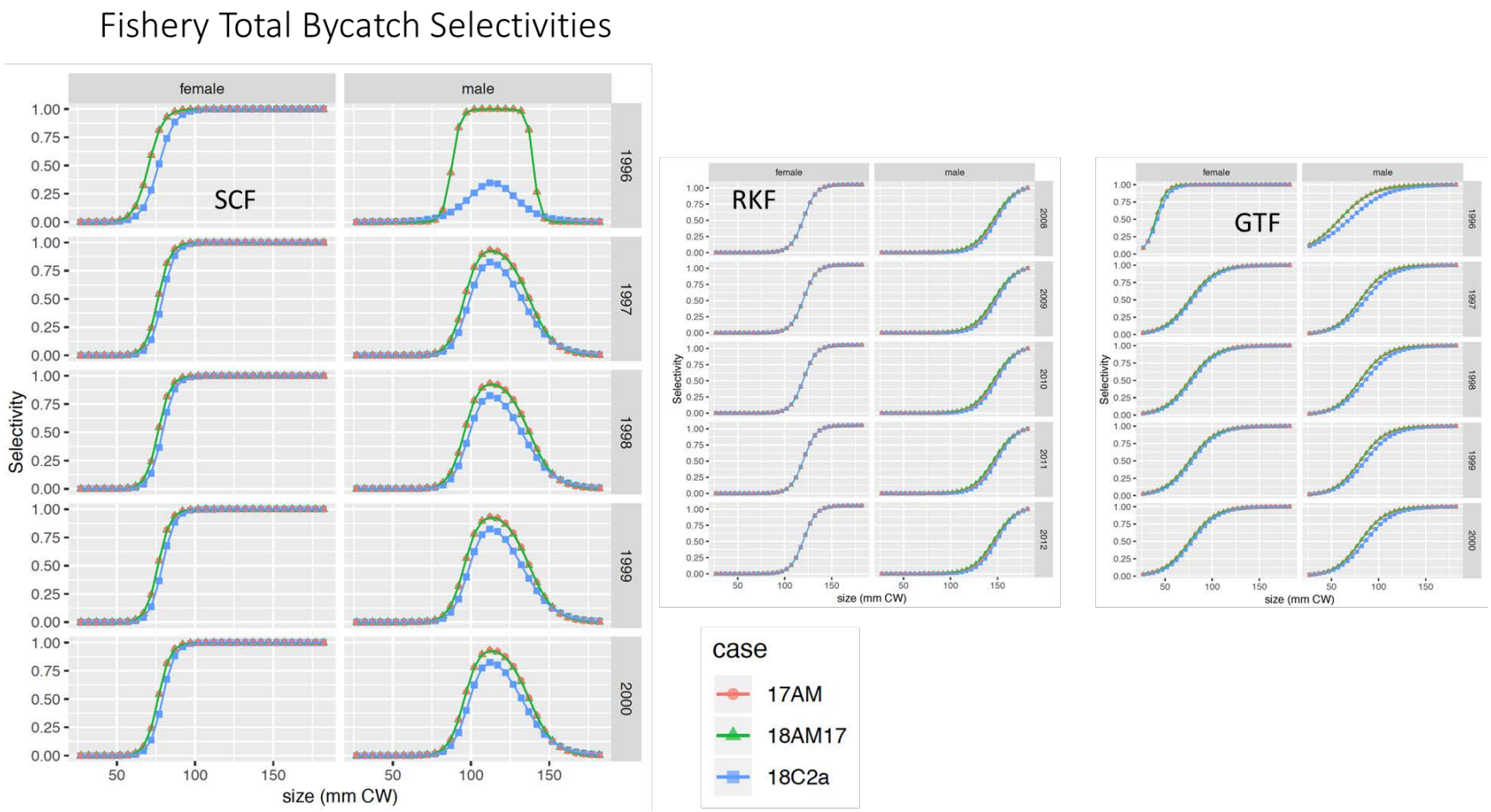

Figure 7. Comparison of estimated selectivities in the bycatch fisheries from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

Fits to survey biomass

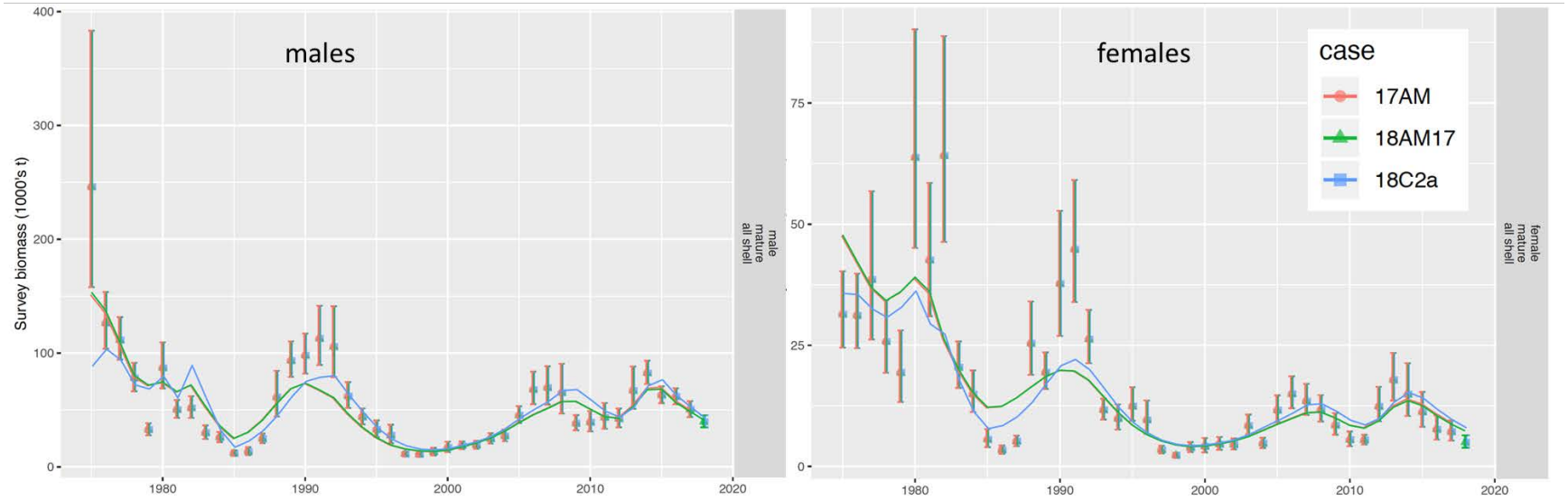

Figure 8. Comparison of fits to survey biomass from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

Male catch in the directed fishery

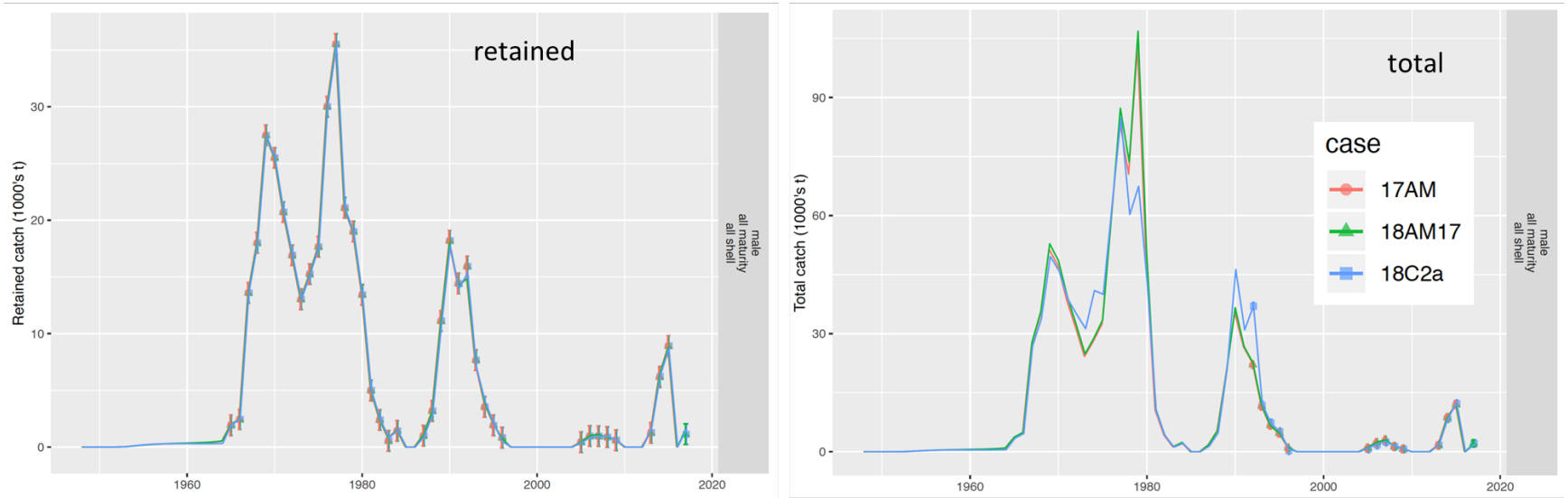

Figure 9. Comparison of fits to male catch biomass in the directed fishery from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

Fits to total male catch in bycatch fisheries

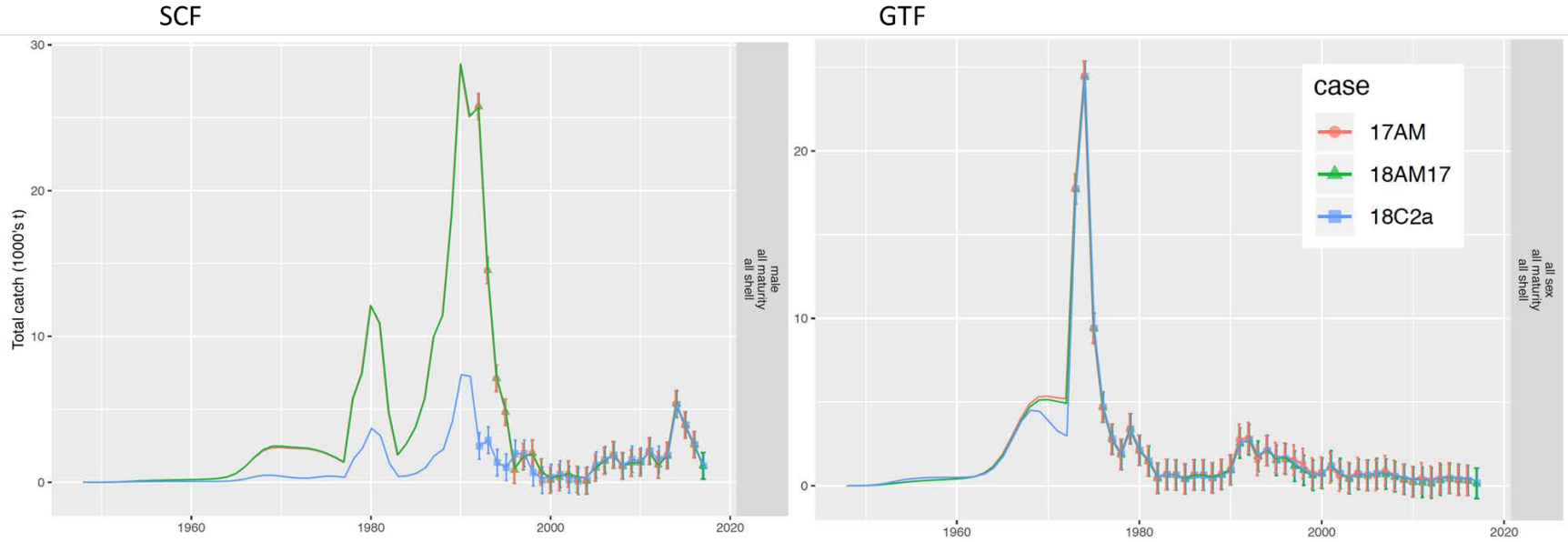

Figure 10. Comparison of fits to total male bycatch in the snow crab and groundfish fisheries from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

Fits to total male catch in bycatch fisheries

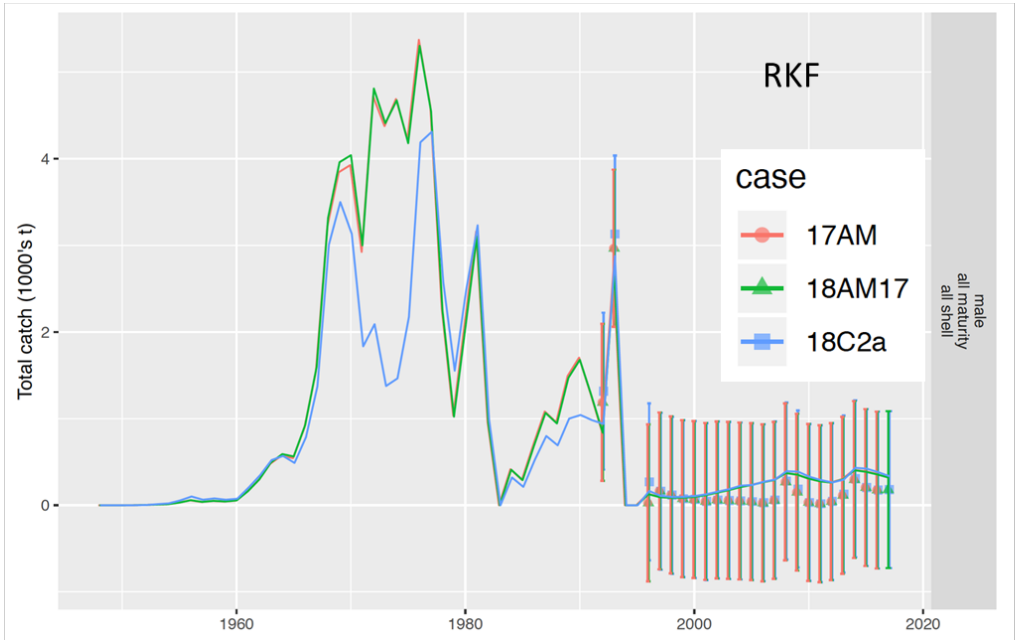

Figure 11. Comparison of fits to total male bycatch in the BBRKC fishery from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

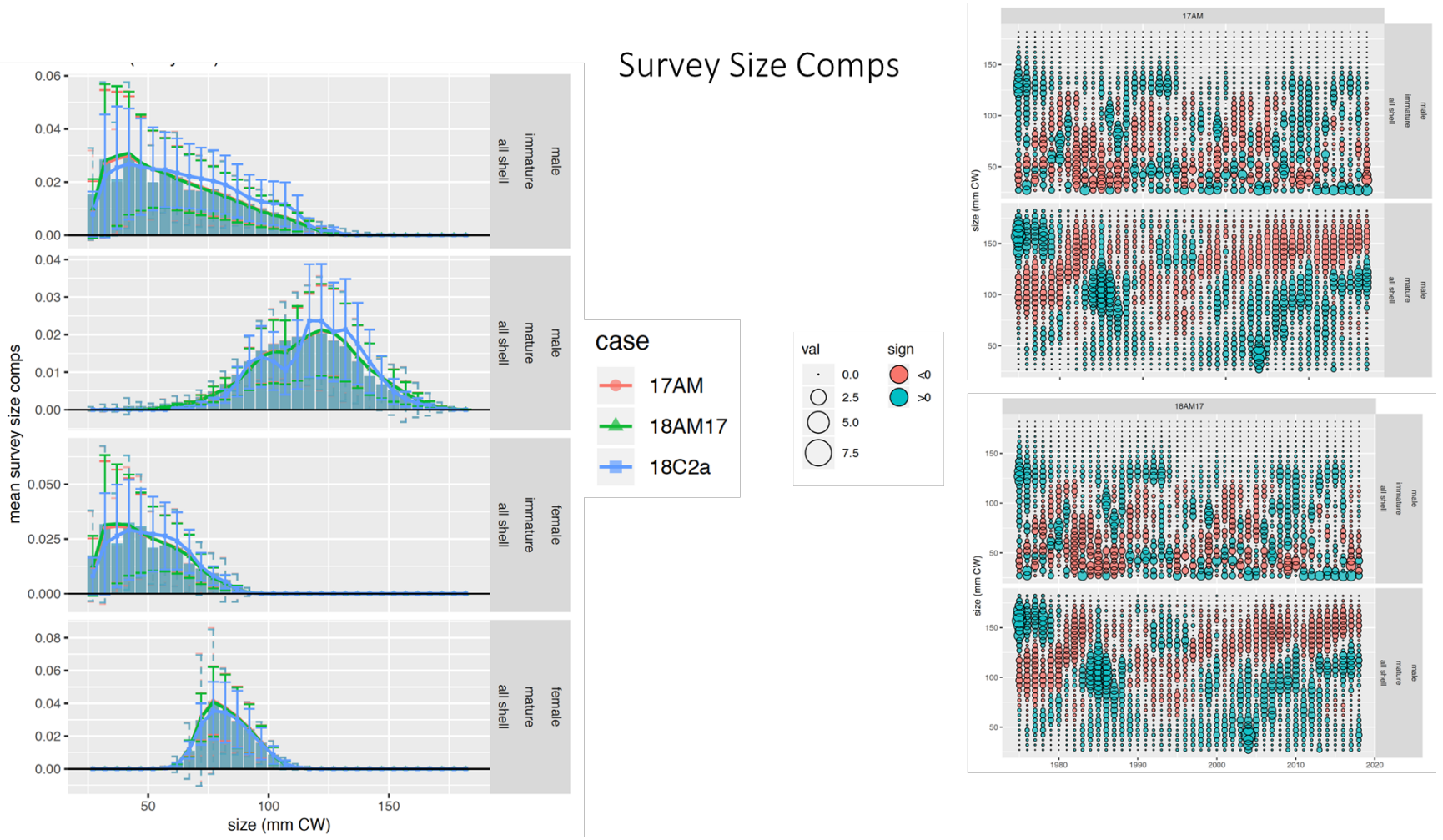

Figure 12. Comparison of mean fits to survey size compositions and residuals from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

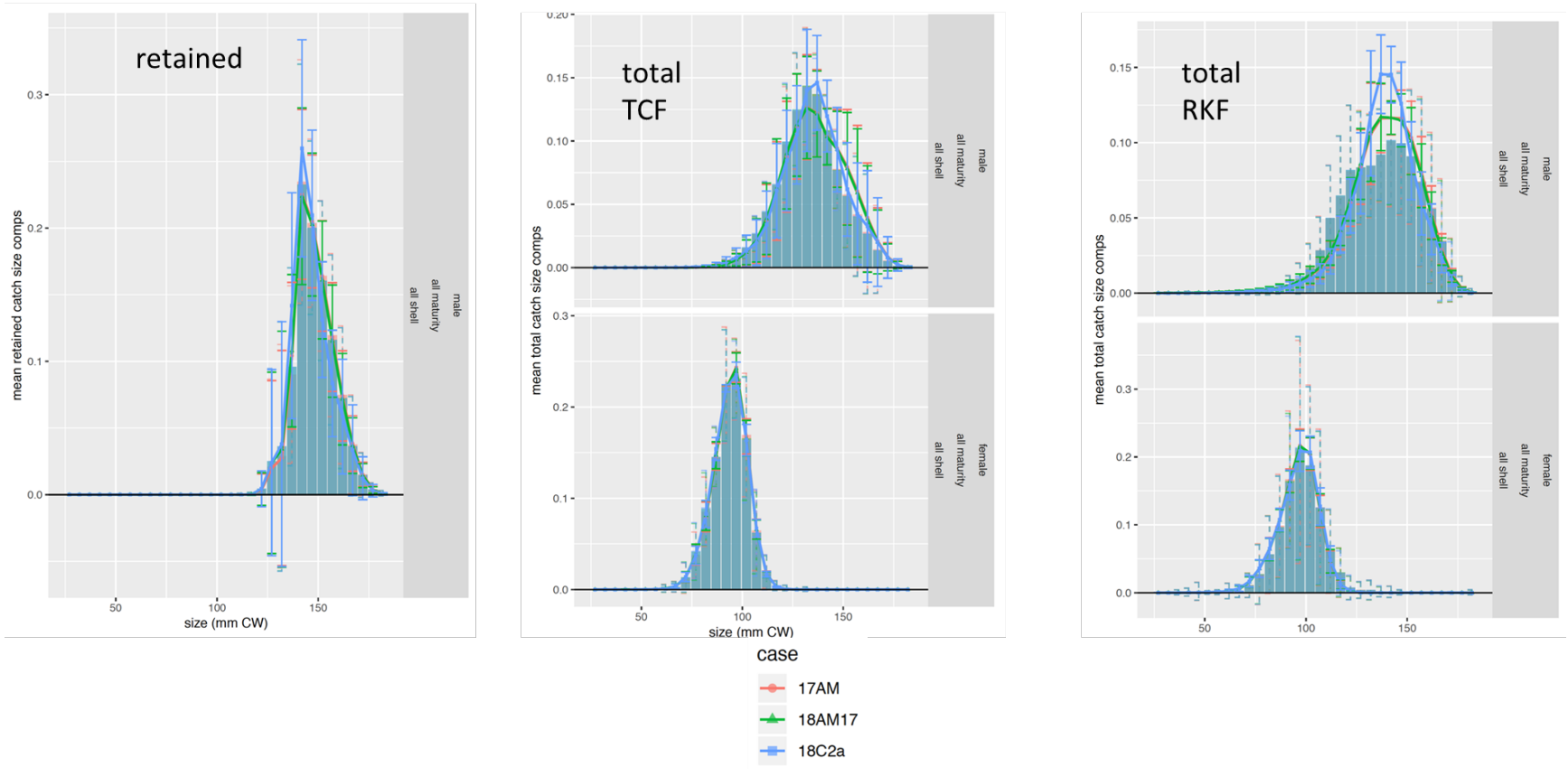

Figure 13. Comparison of mean fits to fishery size compositions from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).

Fishery Size Compositions

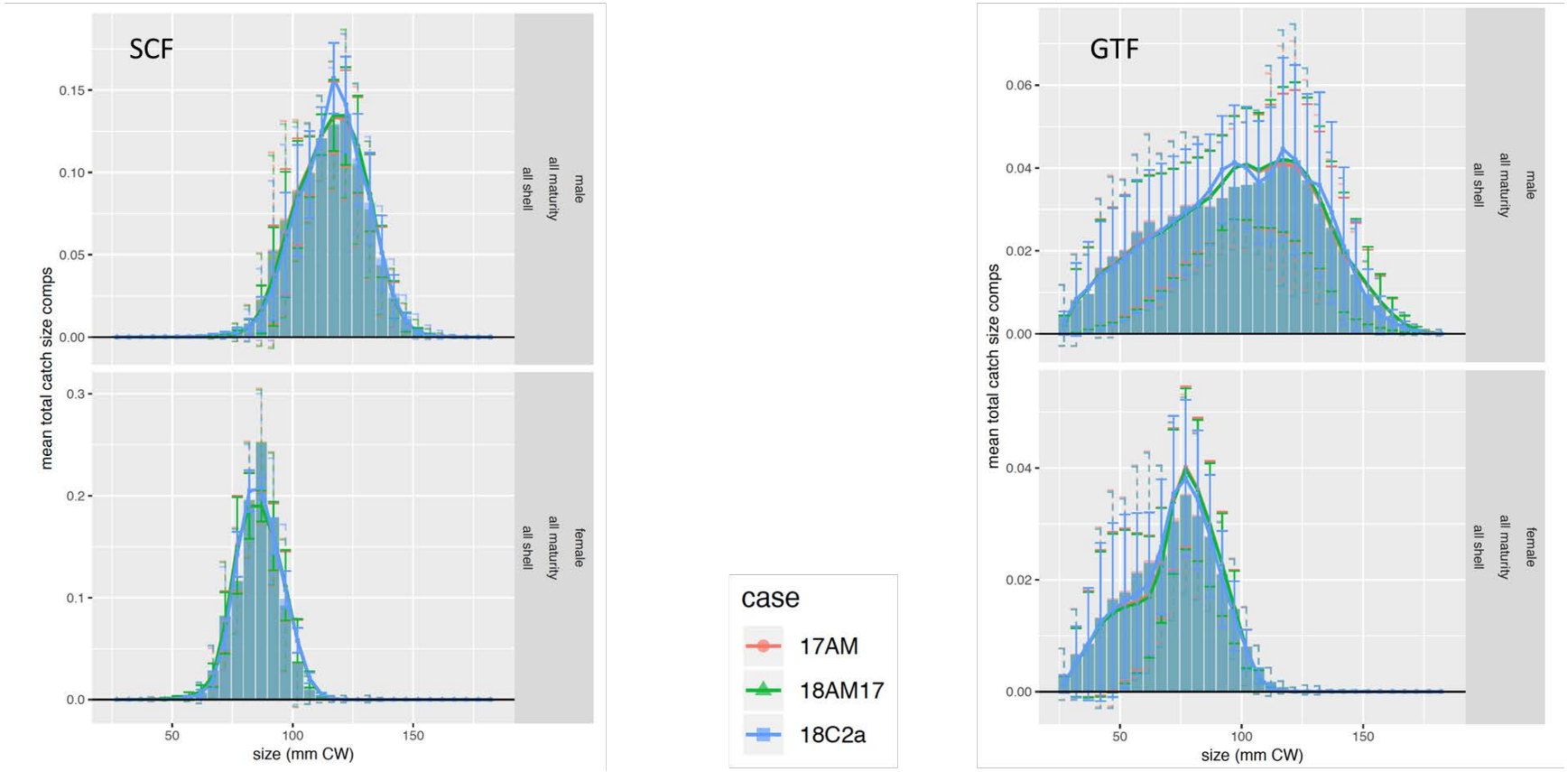

Figure 14. Comparison of mean fits to fishery size compositions from the CPT's recommended scenario (18AM17), the 2017 assessment model (17AM), and the author's preferred scenario (18C2a).