Appendix H1: Model Comparisons for TCSAM02 Models AG1 and AG1c

William Stockhausen 23 April, 2017

Population processesNatural mortality

Natural Mortality

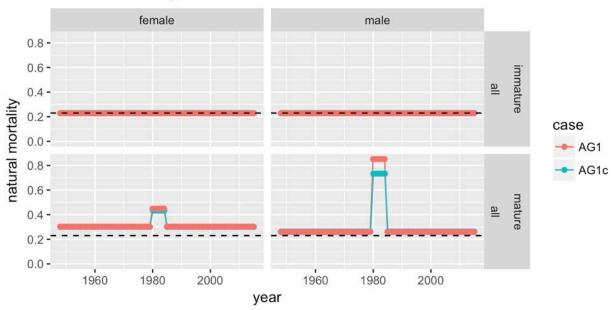


Figure 1. Estimated natural mortality rates, by year.

Probability of terminal molt

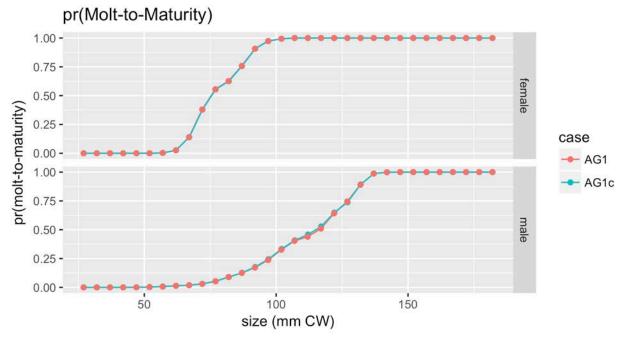


Figure 2. Probability of terminal molt.

Mean growth

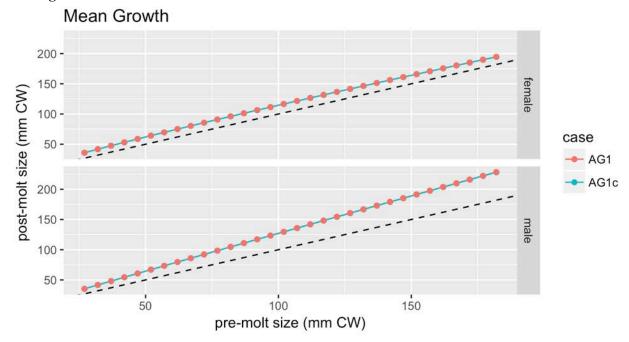


Figure 3. Mean growth.

Growth matrices

male growth: 1948-2015

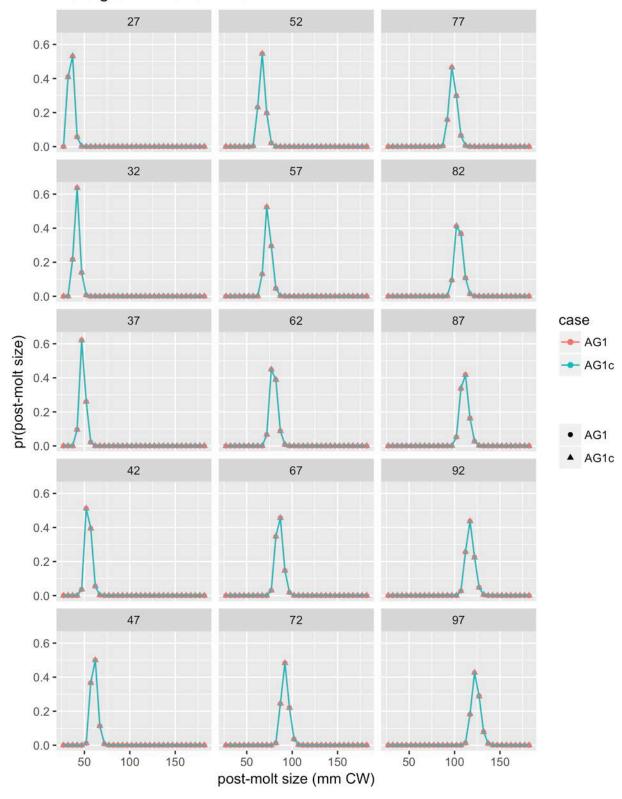


Figure 4. Growth matrices for males during 1948-2015, page 1.

male growth: 1948-2015 102 152 127 1.00 -0.75 -0.50 -0.25 -0.00 -107 132 157 1.00 -0.75 -0.50 -0.25 -0.00 -162 112 137 case 1.00 pr(post-molt size) - AG1 0.75 -- AG1c 0.50 -0.25 - AG1 0.00 -▲ AG1c 117 142 167 1.00 -0.75 -0.50 -0.25 -0.00 -122 172 147 1.00 -0.75 -0.50 -0.25 -

150

100

post-molt size (mm CW)

50

100

150

Figure 5. Growth matrices for males during 1948-2015, page 2.

150

50

0.00 -

50

100

male growth: 1948-2015

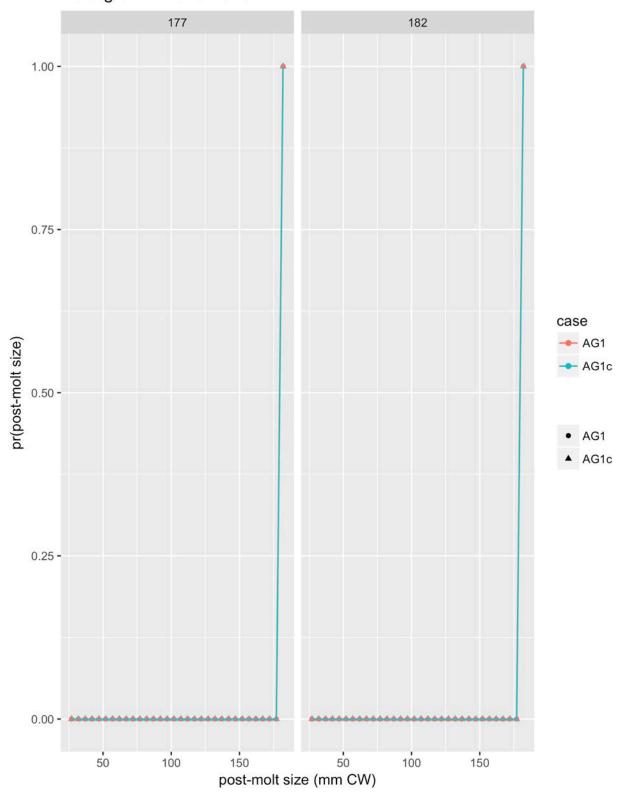


Figure 6. Growth matrices for males during 1948-2015, page 3.

female growth: 1948-2015 27 52 77 0.6 -0.4 -0.2 -0.0 -82 32 57 0.6 -0.4 -0.2 -0.0 -37 62 87 case br(post-molt size) - AG1 - AG1c • AG1 ▲ AG1c 42 67 92 0.6 -0.4 -0.2 -0.0 -72 97 47 0.6 -0.4 -0.2 -0.0 - 4 50 100 50 100 150 150 100 150 post-molt size (mm CW)

Figure 7. Growth matrices for females during 1948-2015, page 1.

female growth: 1948-2015 102 127 152 1.00 -0.75 -0.50 -0.25 -0.00 - 🐸 107 132 157 1.00 -0.75 -0.50 -0.25 -0.00 -162 112 137 case 1.00 pr(post-molt size) - AG1 0.75 -- AG1c 0.50 -0.25 - AG1 0.00 -▲ AG1c 117 142 167 1.00 -0.75 -0.50 -0.25 -0.00 - 🚧 172 122 147 1.00 -0.75 -0.50 -0.25 -0.00 -50 50 100 150 150 50 100 150 100 post-molt size (mm CW)

Figure 8. Growth matrices for females during 1948-2015, page 2.

female growth: 1948-2015

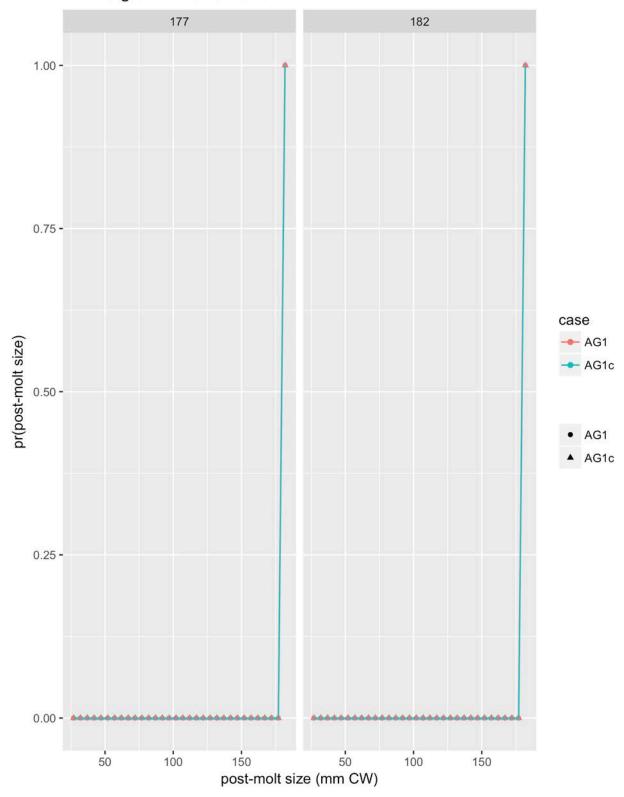


Figure 9. Growth matrices for females during 1948-2015, page 3.

Size distribution for recruits

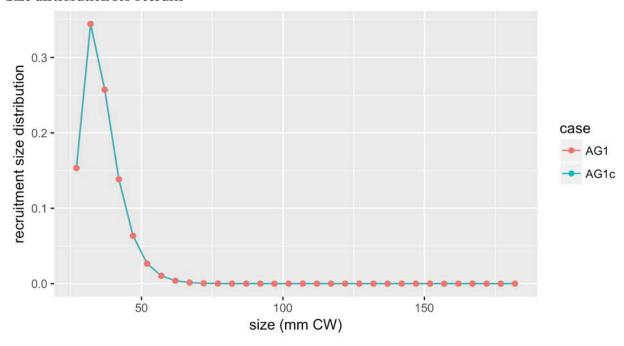


Figure 10. Size distribution for recruits.

Population results

Recruitment

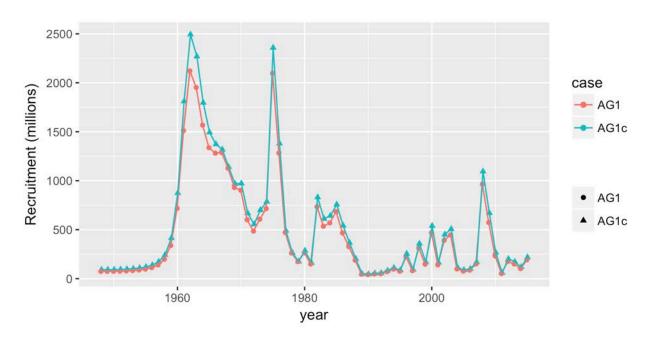


Figure 11. Estimated annual recruitment.

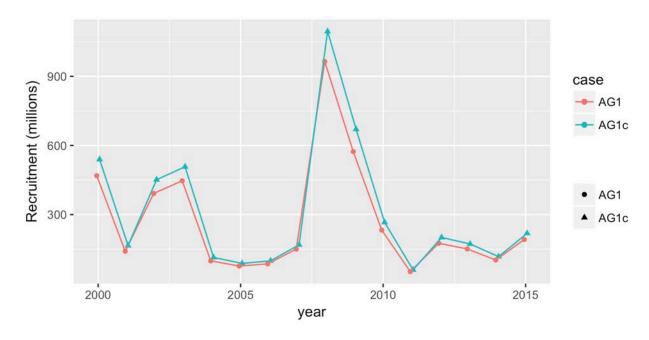


Figure 12. Estimated recent recruitment.

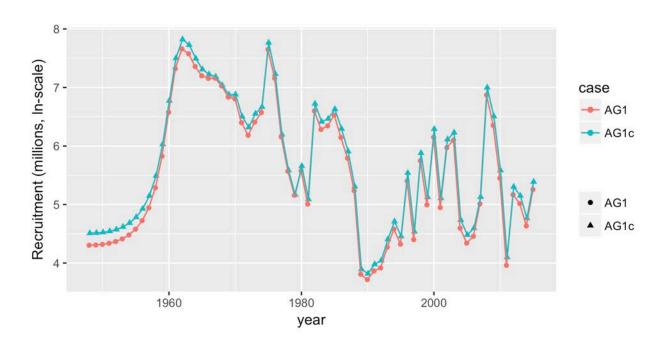


Figure 13. Estimated annual recruitment, on In-scale.

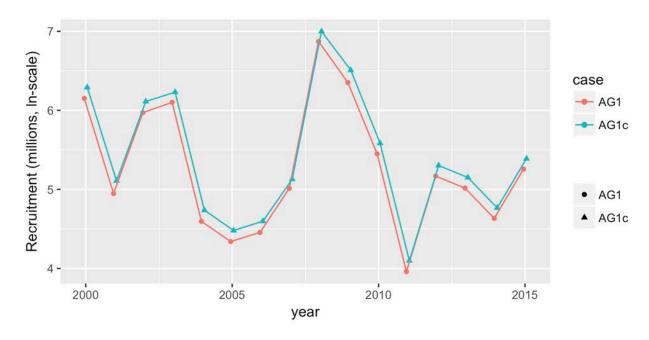


Figure 14. Estimated recent recruitment, on ln-scale.

Mature biomass

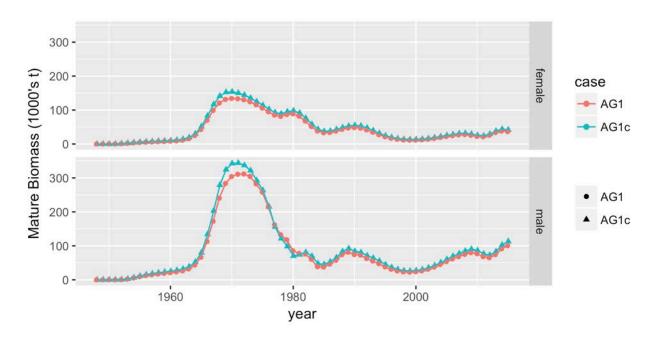


Figure 15. Estimated annual mature biomass.

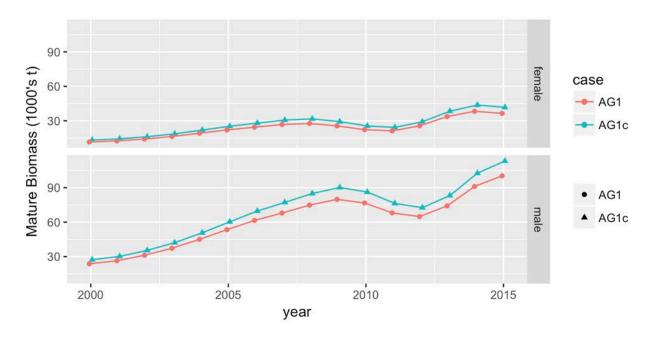


Figure 16. Estimated recent mature biomass.

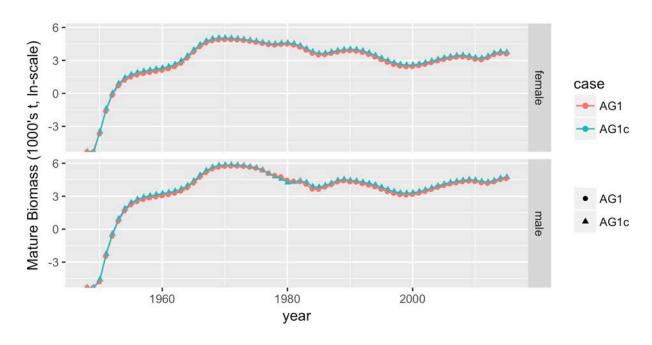


Figure 17. Estimated annual mature biomass, on ln-scale.

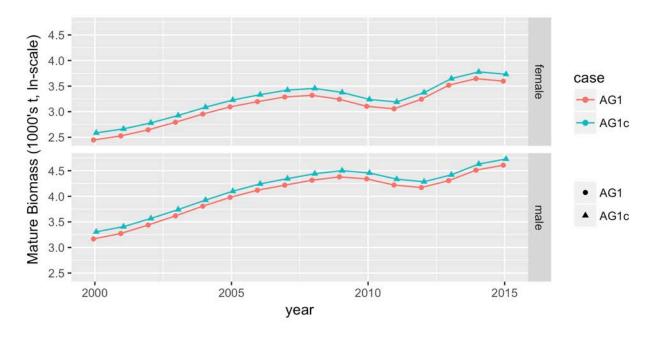


Figure 18. Estimated recent mature biomass, on ln-scale.

Population abundance

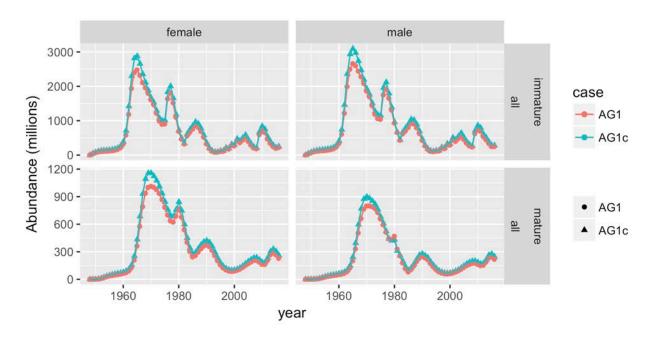


Figure 19. Population abundance trends.

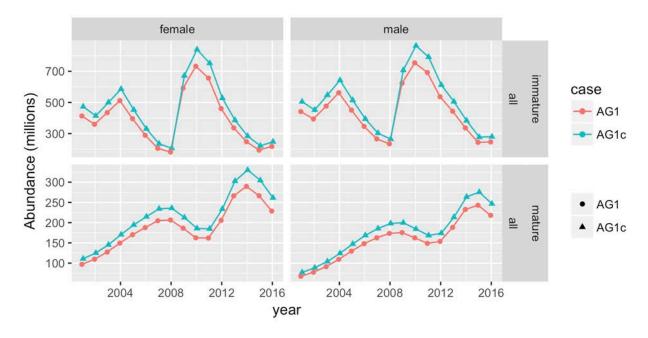


Figure 20. Recent population abundance trends.

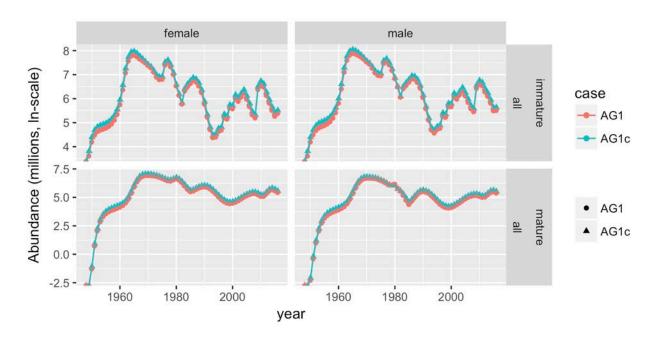


Figure 21. Ln-scale population abundance trends.

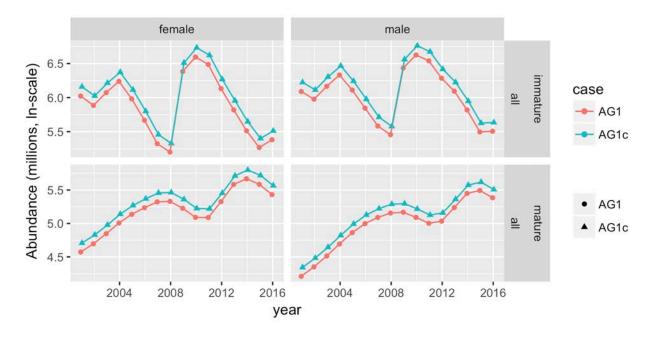


Figure 22. Recent ln-scale population abundance trends.

Biomass

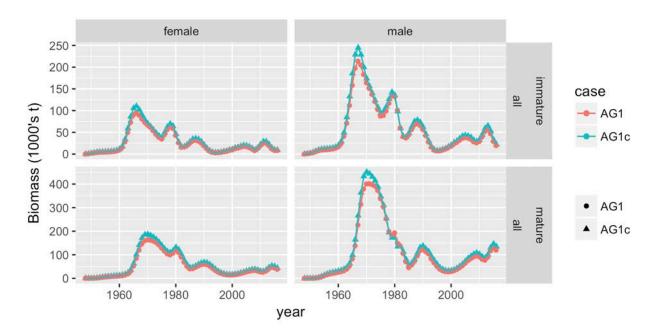


Figure 23. Population biomass trends.

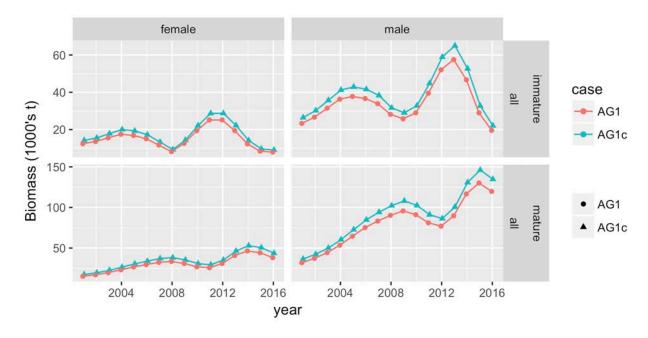


Figure 24. Recent population biomass trends.

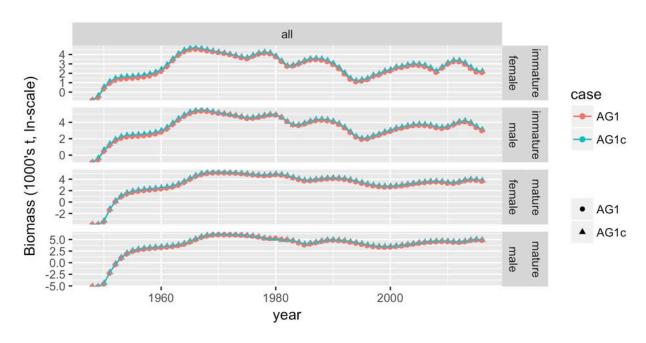


Figure 25. Ln-scale population biomass trends.

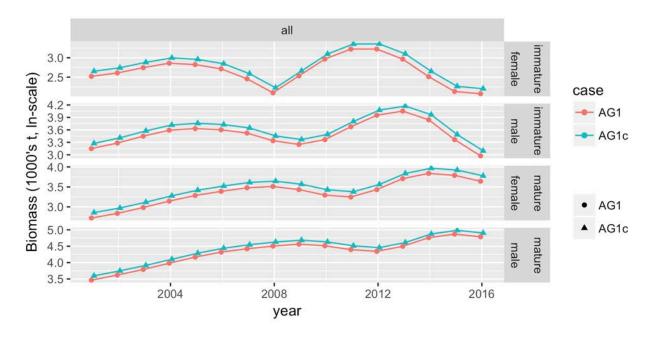


Figure 26. Recent In-scale population biomass trends.

Surveys

Survey catchability

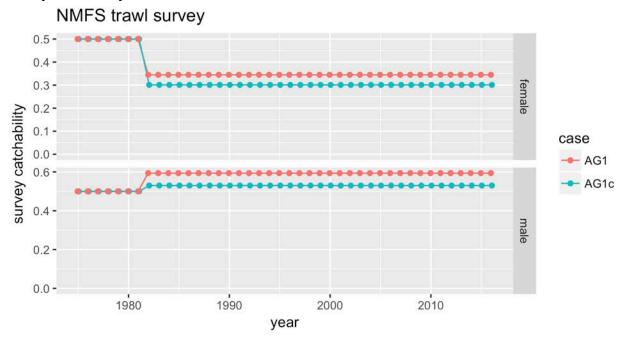
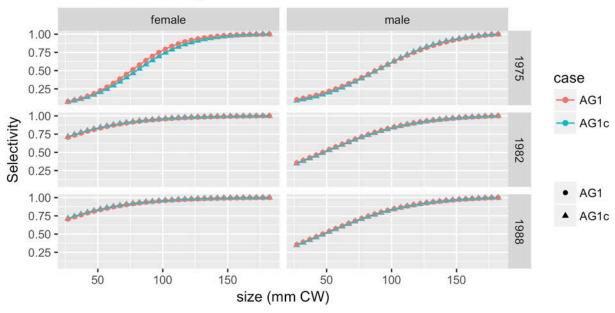


Figure 27. Survey catchabilities for NMFS trawl survey.

Survey selectivity functions

NMFS trawl survey



NMFS trawl survey.1

Survey abundance

NMFS trawl survey

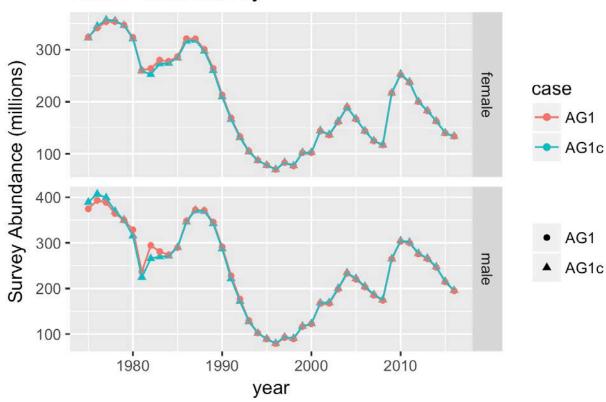


Figure 29. NMFS trawl survey catch abundance.

Survey biomass

NMFS trawl survey 40 Survey Biomass (1000's t) 30 female case → AG1 20 -- AG1c 10 -160 -• AG1 120 male ▲ AG1c 80 -40 -2010 1980 2000 1990 year

Figure 30. NMFS trawl survey catch biomass.

Survey size compositions

NMFS trawl survey

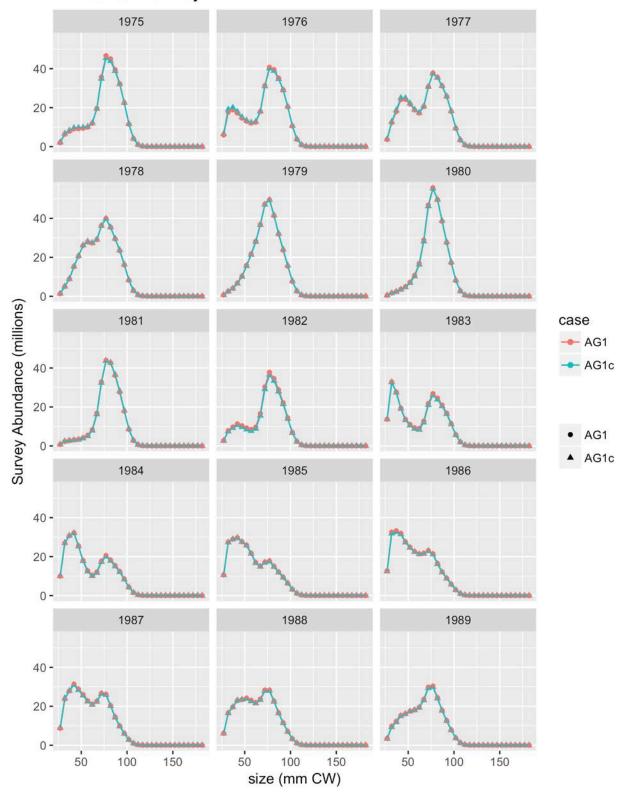


Figure 31. NMFS trawl survey catch abundance for female all all, (1 of 3).

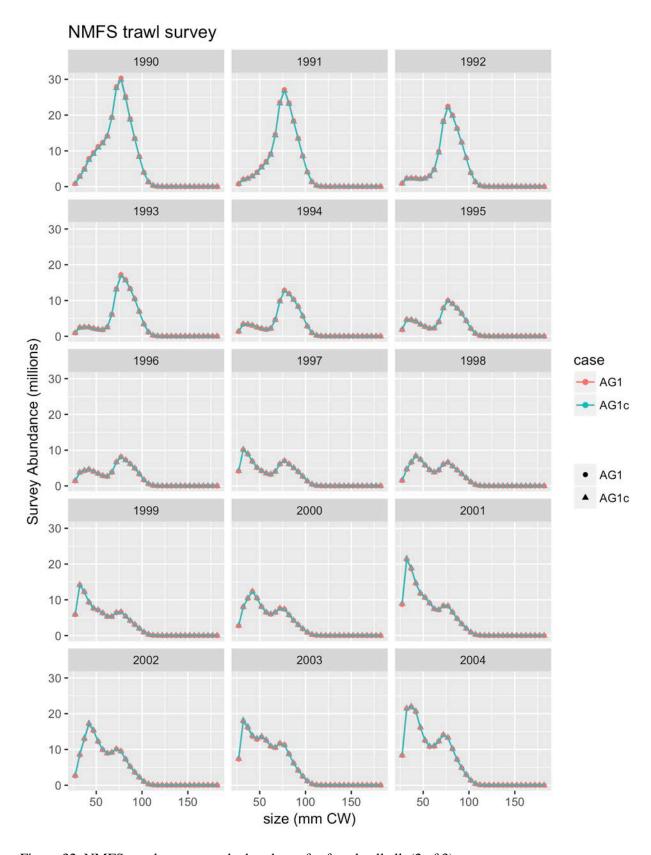


Figure 32. NMFS trawl survey catch abundance for female all all, (2 of 3).

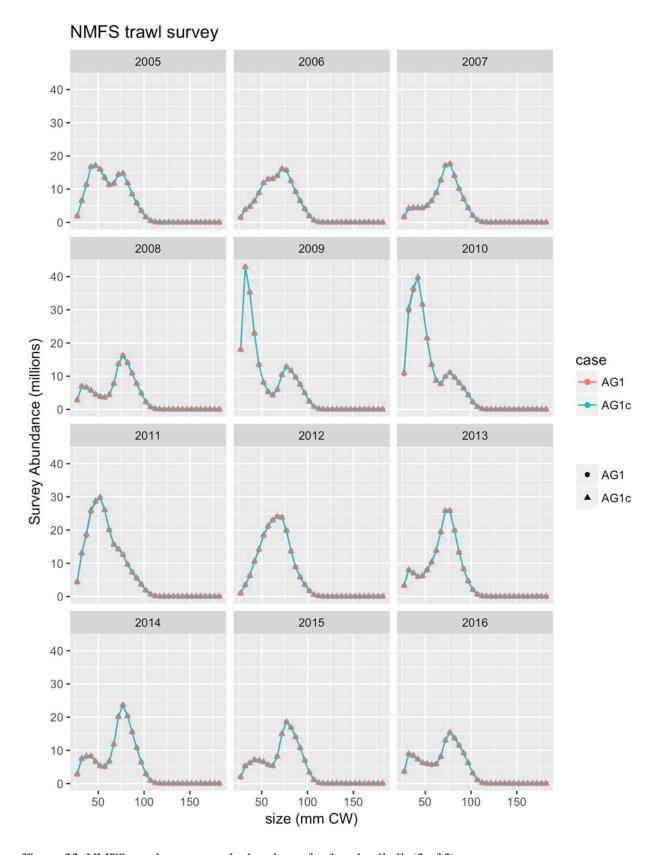


Figure 33. NMFS trawl survey catch abundance for female all all, (3 of 3).

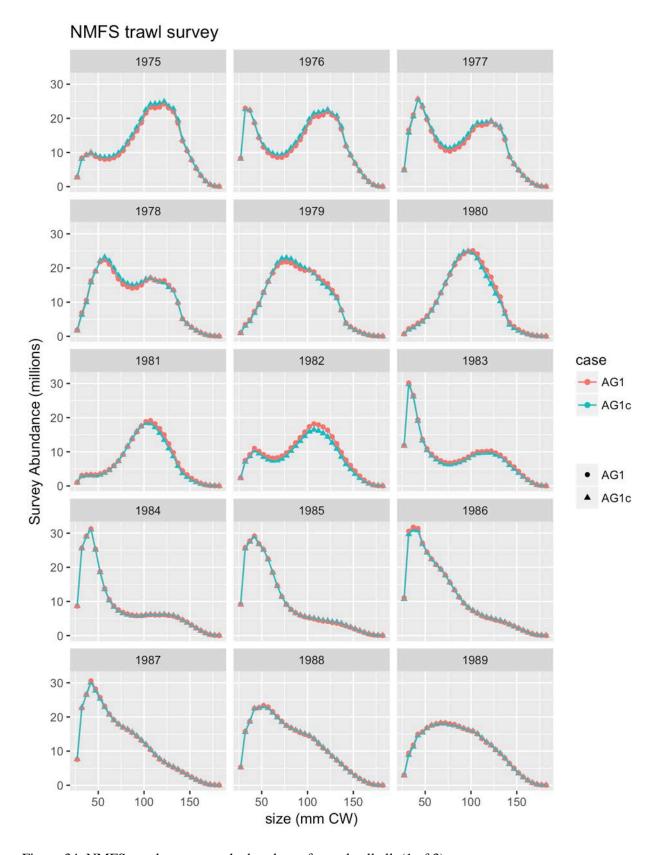


Figure 34. NMFS trawl survey catch abundance for male all all, (1 of 3).

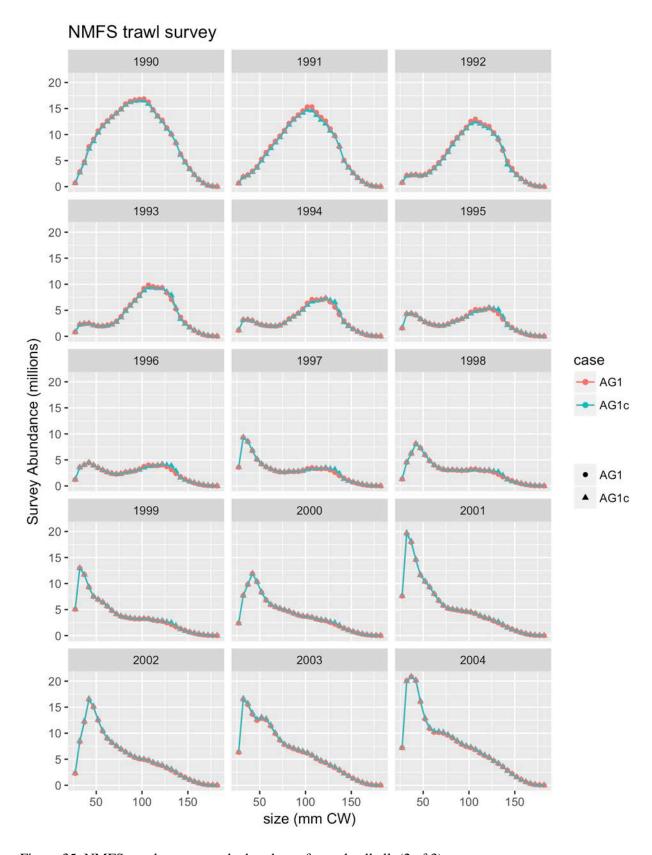


Figure 35. NMFS trawl survey catch abundance for male all all, (2 of 3).

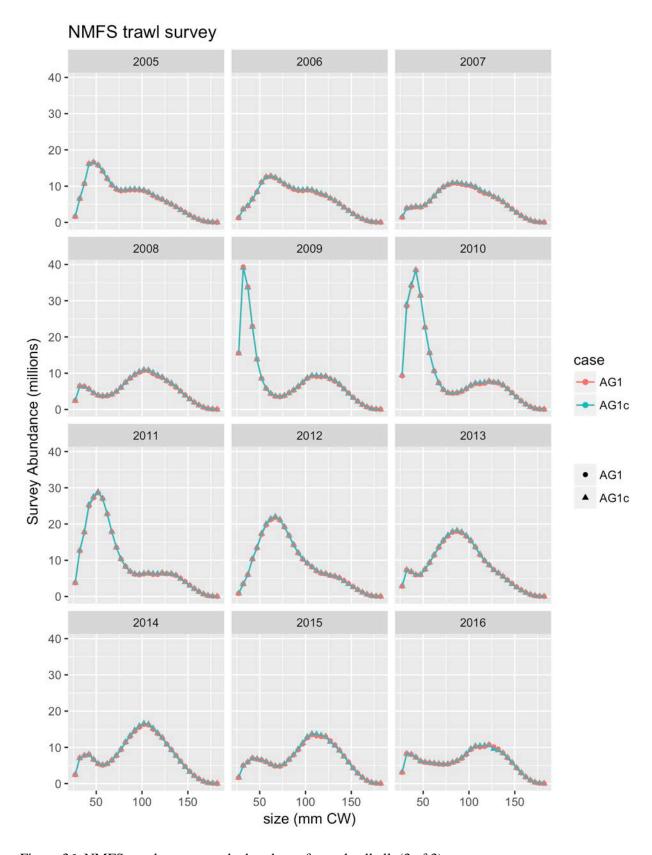


Figure 36. NMFS trawl survey catch abundance for male all all, (3 of 3).

Fisheries

Fishery catchability

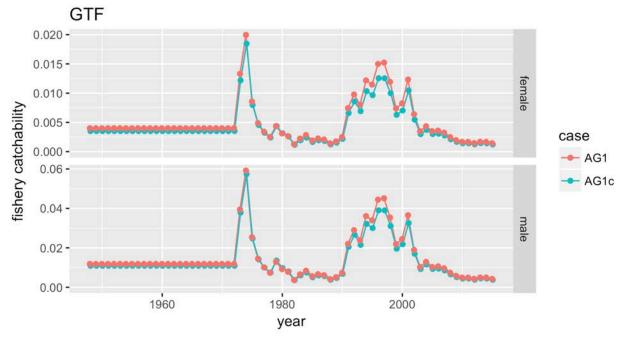


Figure 37. Fishery catchabilities for GTF.

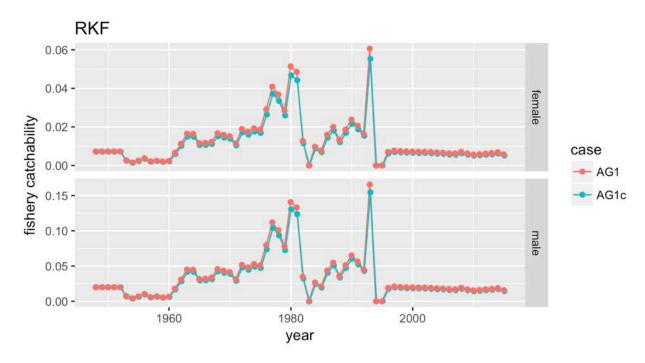


Figure 38. Fishery catchabilities for RKF.

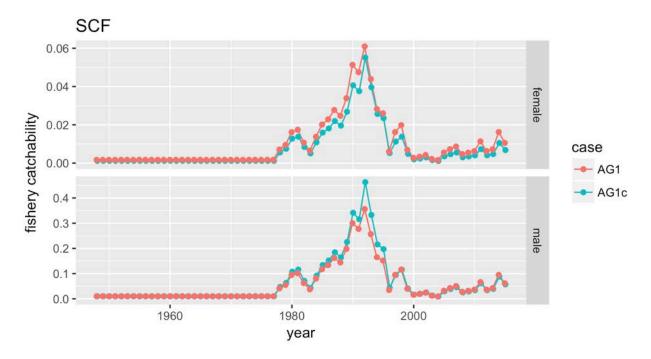


Figure 39. Fishery catchabilities for SCF.

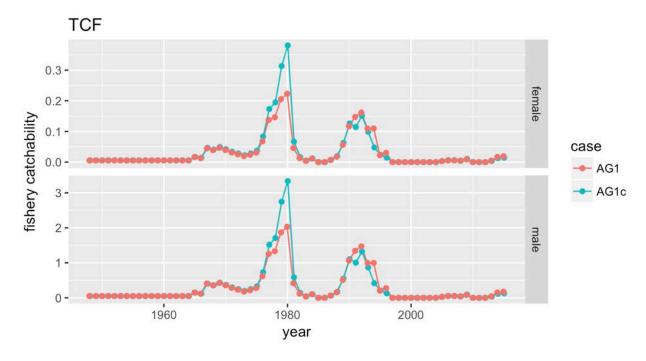


Figure 40. Fishery catchabilities for TCF.

Total selectivity functions

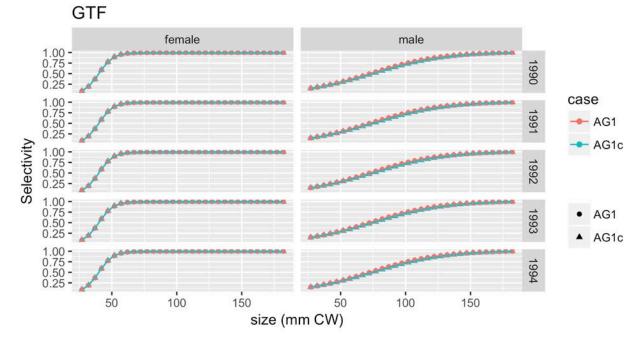


Figure 41. Selectivity functions for GTF(1 of 6).

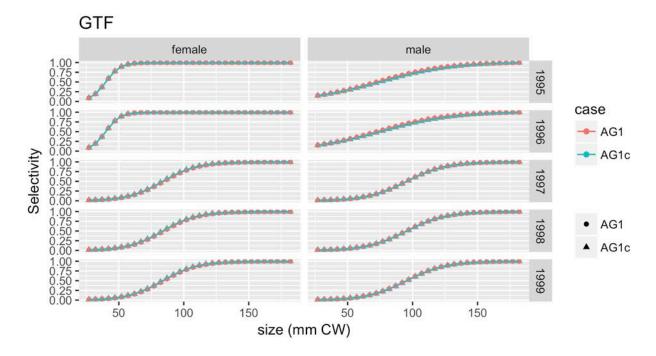


Figure 42. Selectivity functions for GTF(2 of 6).

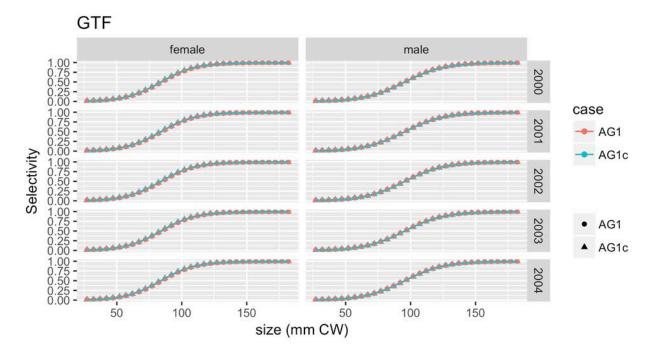


Figure 43. Selectivity functions for GTF(3 of 6).

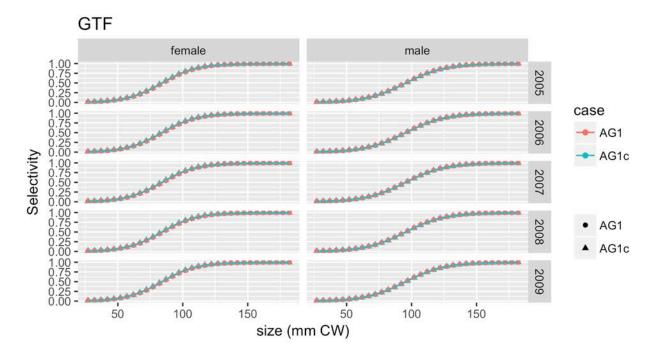


Figure 44. Selectivity functions for GTF(4 of 6).

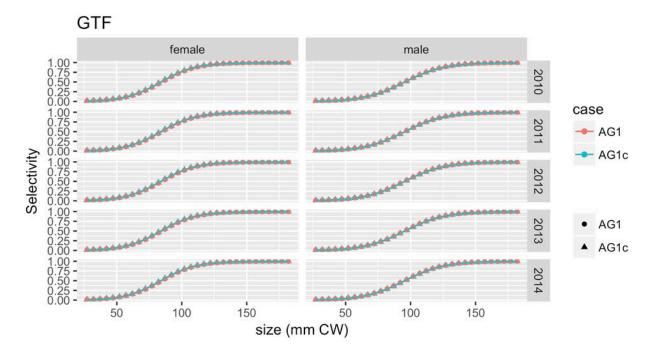


Figure 45. Selectivity functions for GTF(5 of 6).

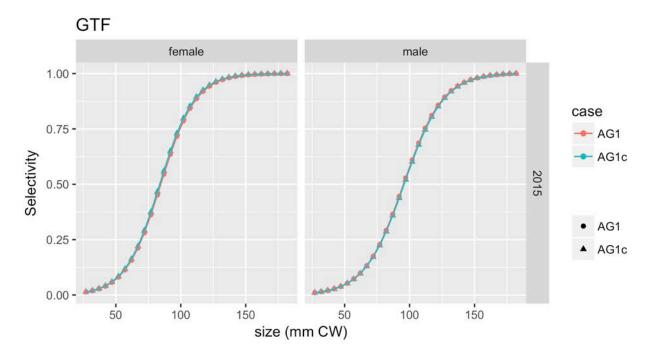


Figure 46. Selectivity functions for GTF(6 of 6).

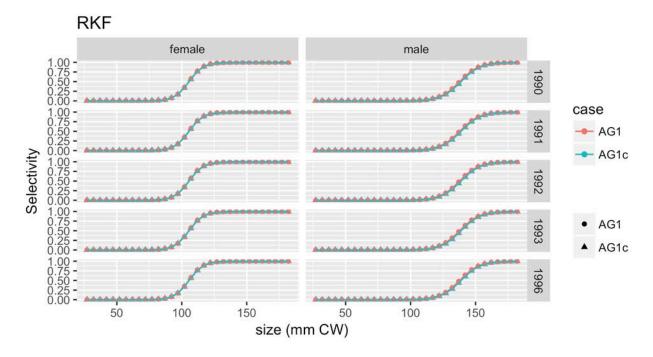


Figure 47. Selectivity functions for RKF(1 of 5).

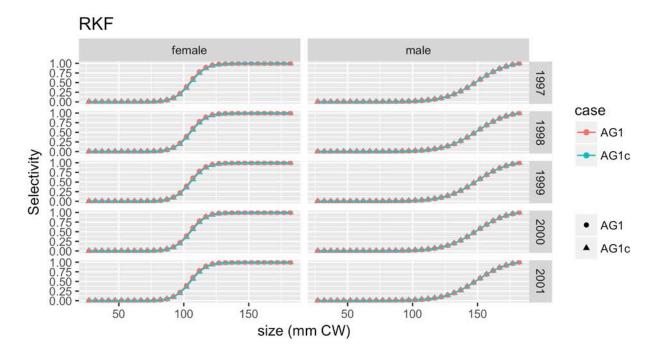


Figure 48. Selectivity functions for RKF(2 of 5).

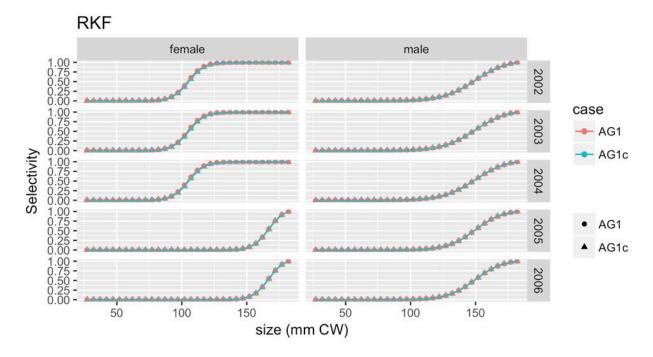


Figure 49. Selectivity functions for RKF(3 of 5).

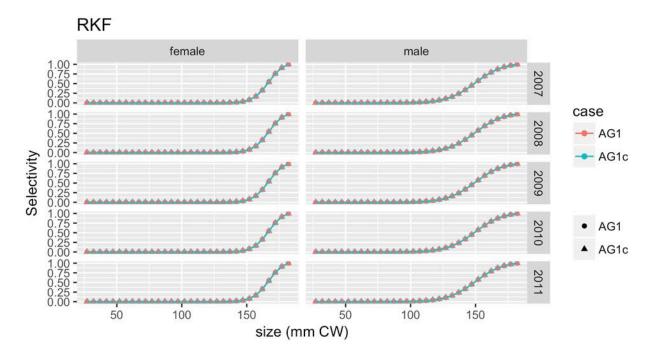


Figure 50. Selectivity functions for RKF(4 of 5).

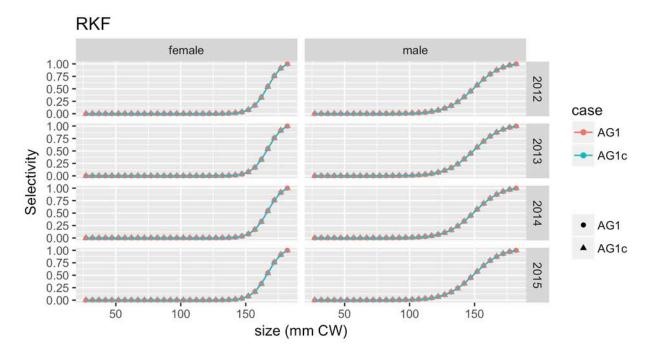


Figure 51. Selectivity functions for RKF(5 of 5).

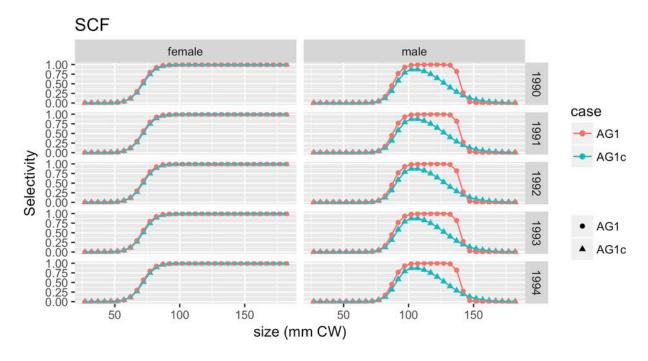


Figure 52. Selectivity functions for SCF(1 of 6).

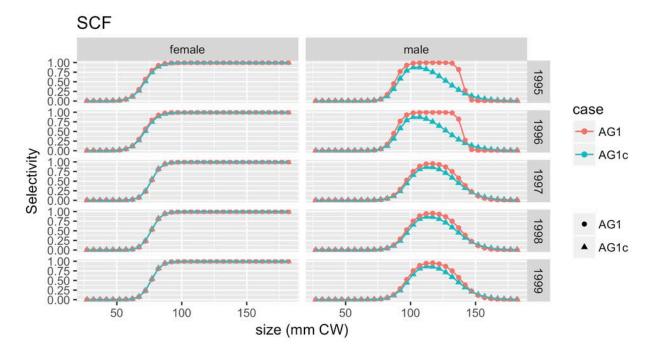


Figure 53. Selectivity functions for SCF(2 of 6).

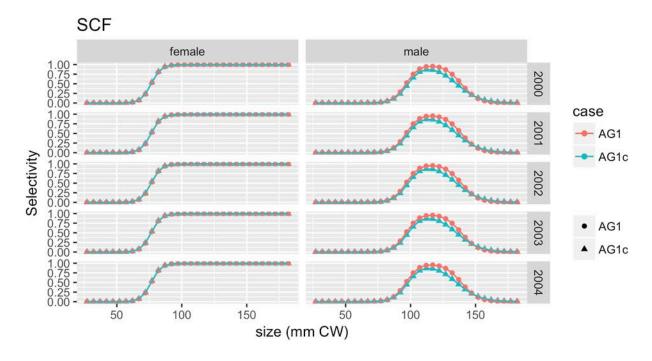


Figure 54. Selectivity functions for SCF(3 of 6).

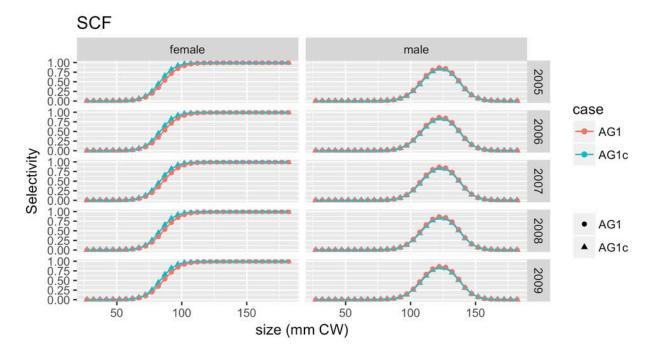


Figure 55. Selectivity functions for SCF(4 of 6).

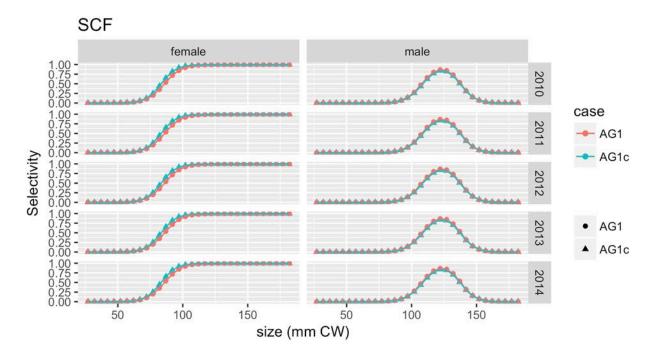


Figure 56. Selectivity functions for SCF(5 of 6).

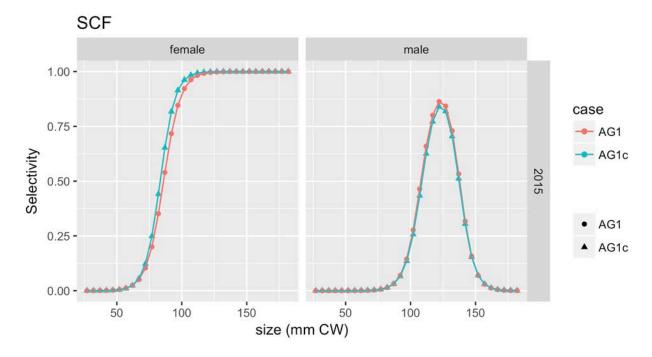


Figure 57. Selectivity functions for SCF(6 of 6).

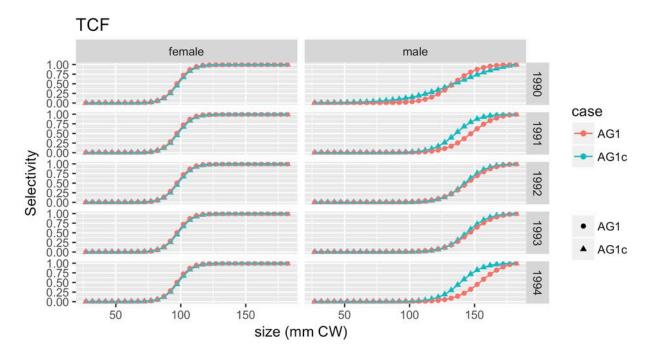


Figure 58. Selectivity functions for TCF(1 of 3).

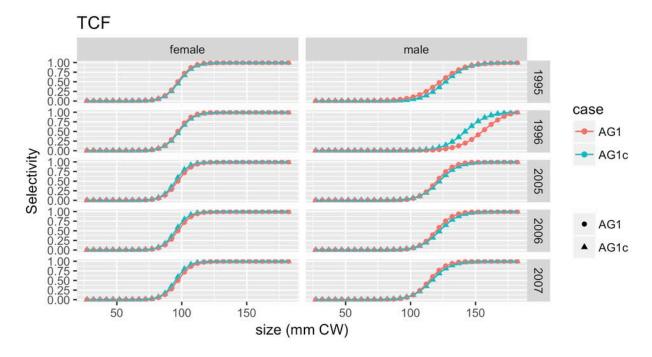


Figure 59. Selectivity functions for TCF(2 of 3).

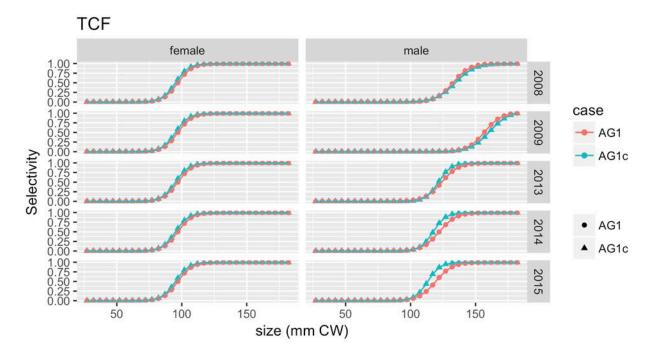


Figure 60. Selectivity functions for TCF(3 of 3).

Retention functions

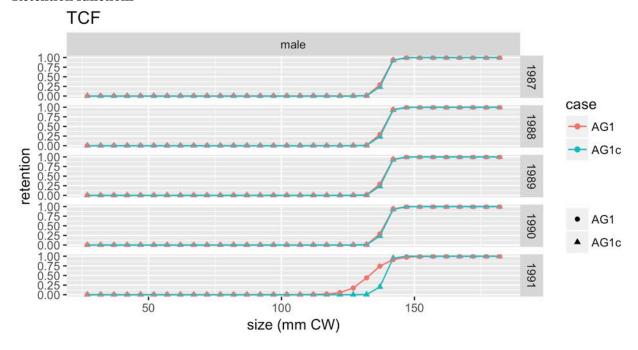


Figure 61. Retention functions for TCF(1 of 4).

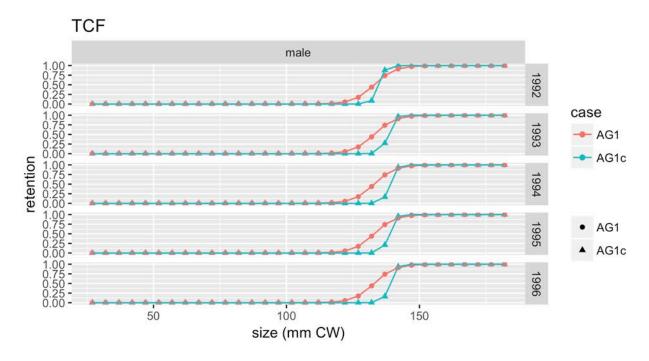


Figure 62. Retention functions for TCF(2 of 4).

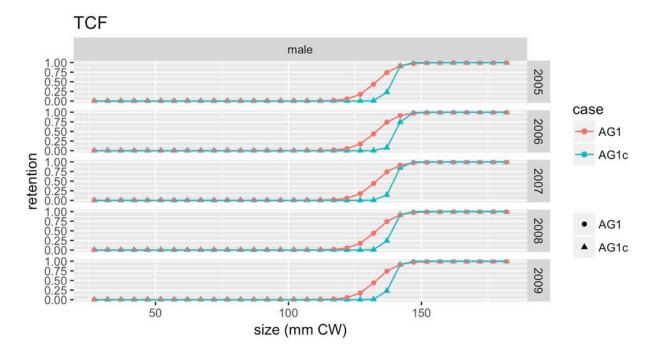


Figure 63. Retention functions for TCF(3 of 4).

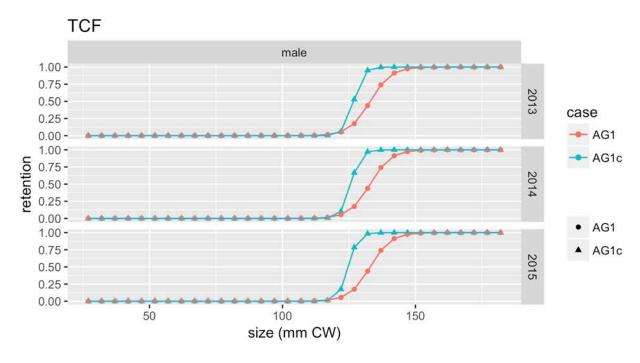


Figure 64. Retention functions for TCF(4 of 4).

Total catch abundance

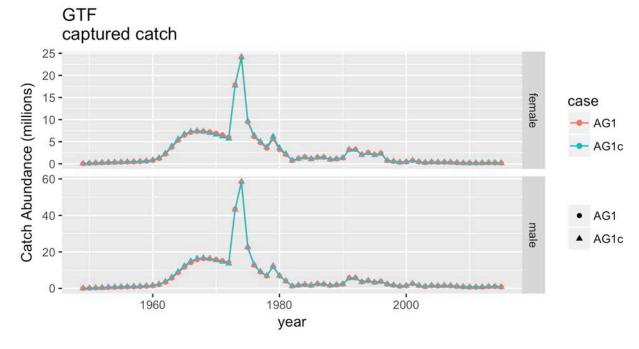


Figure 65. Predicted GTF captured catch abundance.

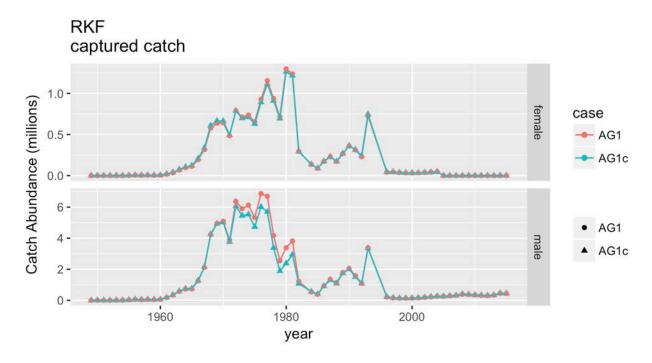


Figure 66. Predicted RKF captured catch abundance.

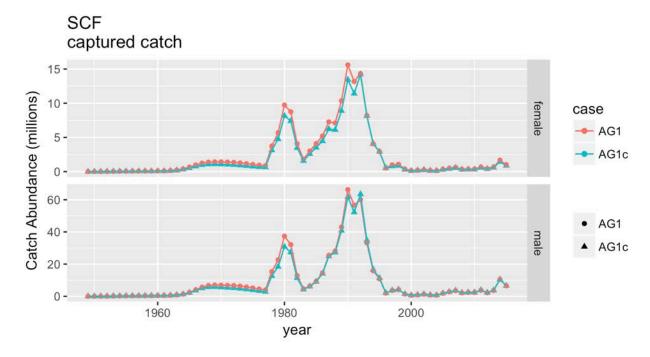


Figure 67. Predicted SCF captured catch abundance.

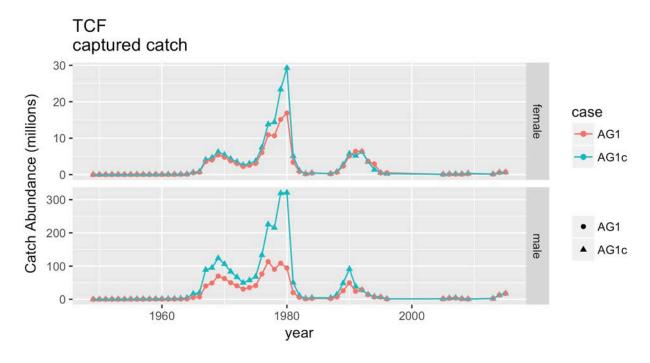


Figure 68. Predicted TCF captured catch abundance.

Total catch biomass

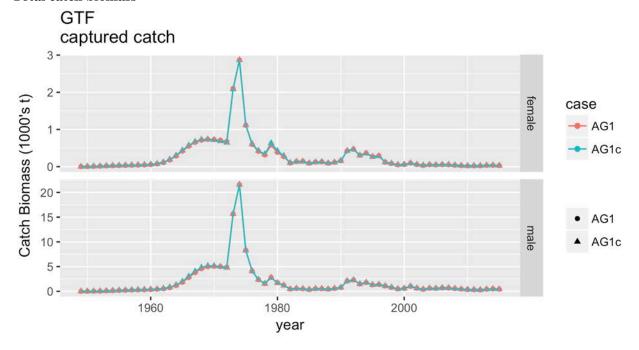


Figure 69. Predicted GTF captured catch biomass.

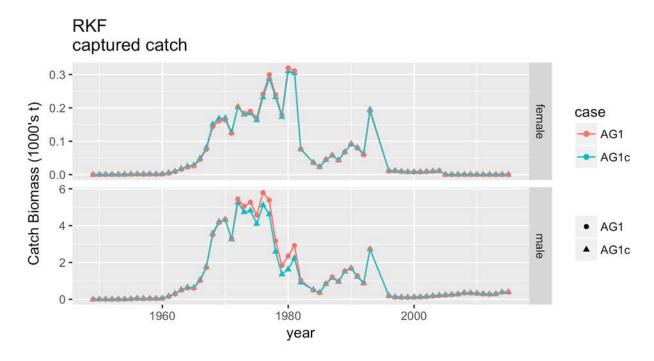


Figure 70. Predicted RKF captured catch biomass.

SCF captured catch 2.5 -2.0 -Catch Biomass (1000's t) 1.5 female case 1.0 -- AG1 0.5 -- AG1c 0.0 20 - AG1 male AG1c 10 -0 -1980 2000 1960 year

Figure 71. Predicted SCF captured catch biomass.

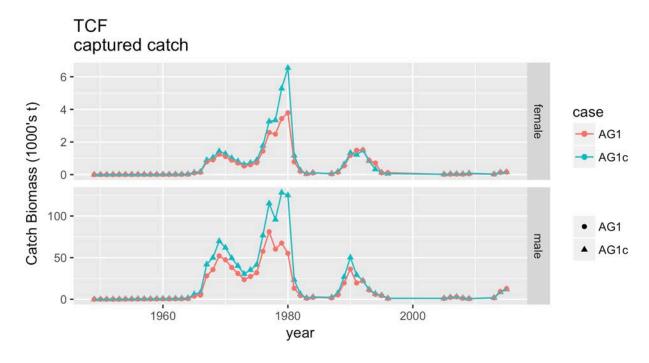


Figure 72. Predicted TCF captured catch biomass.

Retained catch abundance

TCF retained catch

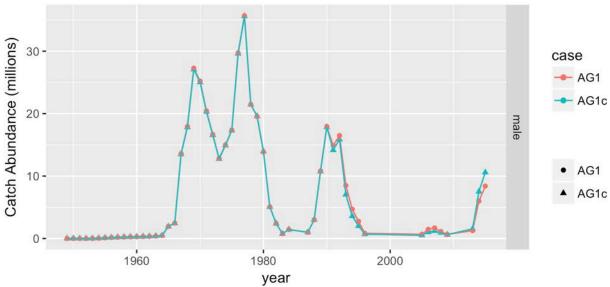


Figure 73. Predicted TCF retained catch abundance.

Retained catch biomass

TCF

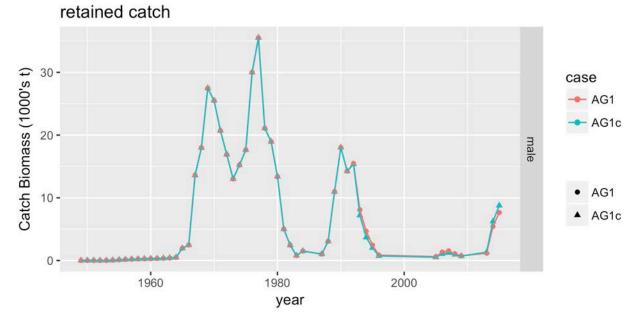


Figure 74. Predicted TCF retained catch biomass.

Total catch size compositions

GTF captured catch for female all all

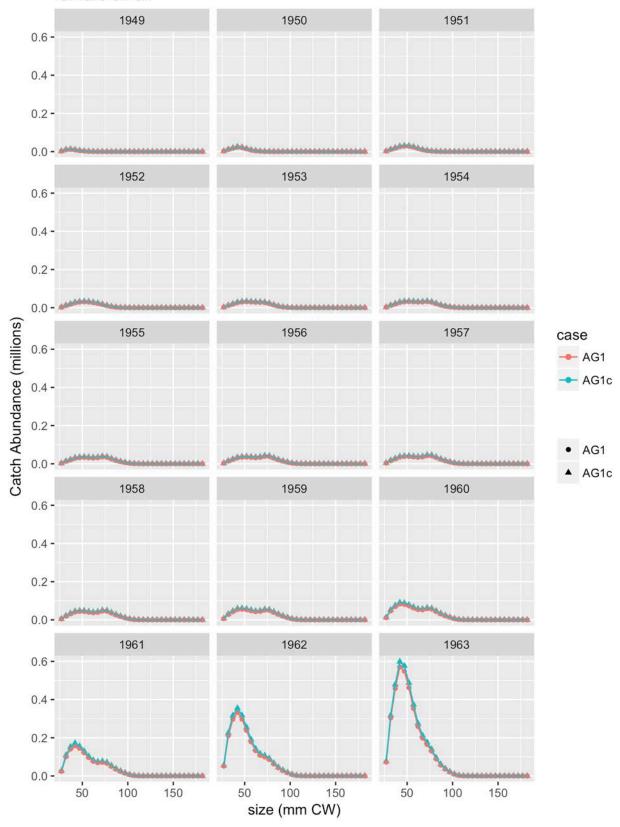


Figure 75. Predicted GTF captured catch abundance for female all all, (1 of 5).

GTF captured catch for female all all

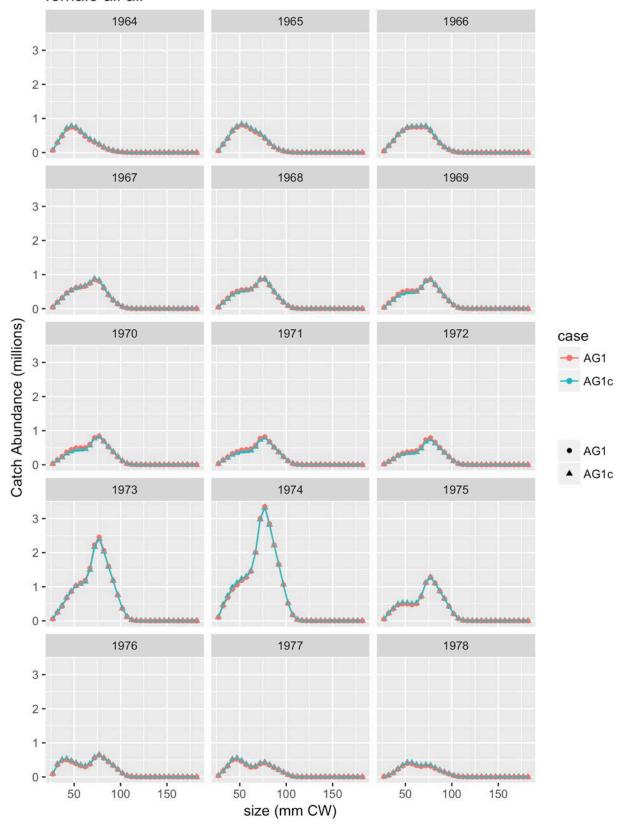


Figure 76. Predicted GTF captured catch abundance for female all all, (2 of 5).

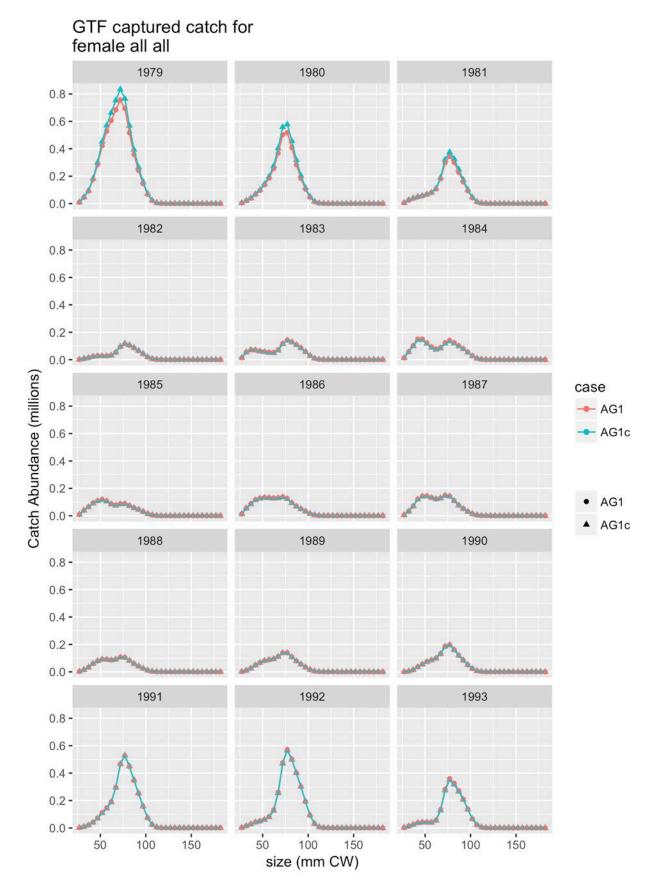


Figure 77. Predicted GTF captured catch abundance for female all all, (3 of 5).

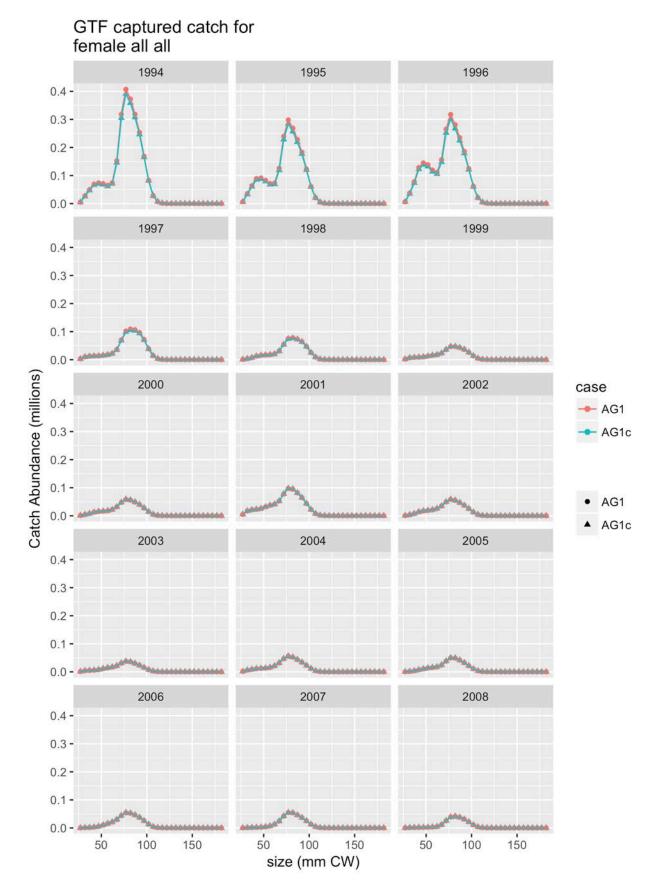


Figure 78. Predicted GTF captured catch abundance for female all all, (4 of 5).

GTF captured catch for female all all

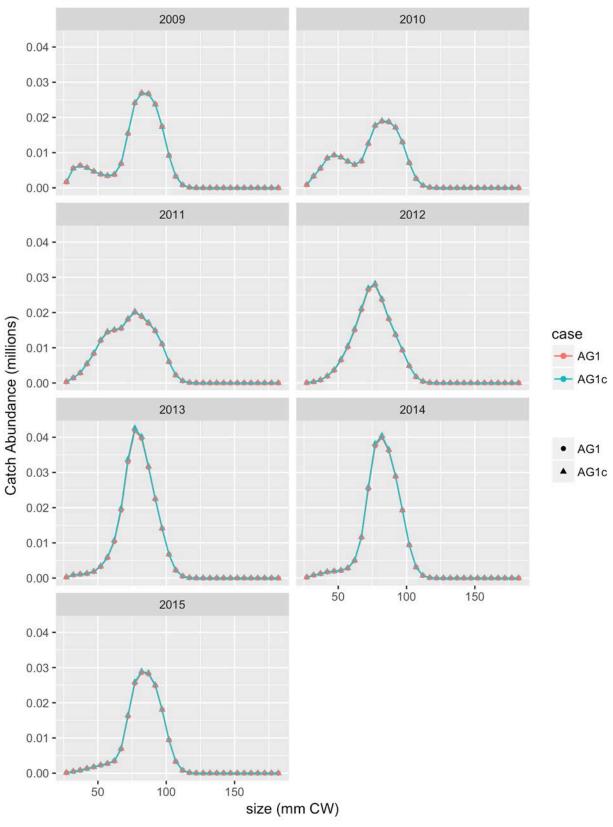


Figure 79. Predicted GTF captured catch abundance for female all all, (5 of 5).

GTF captured catch for male all all

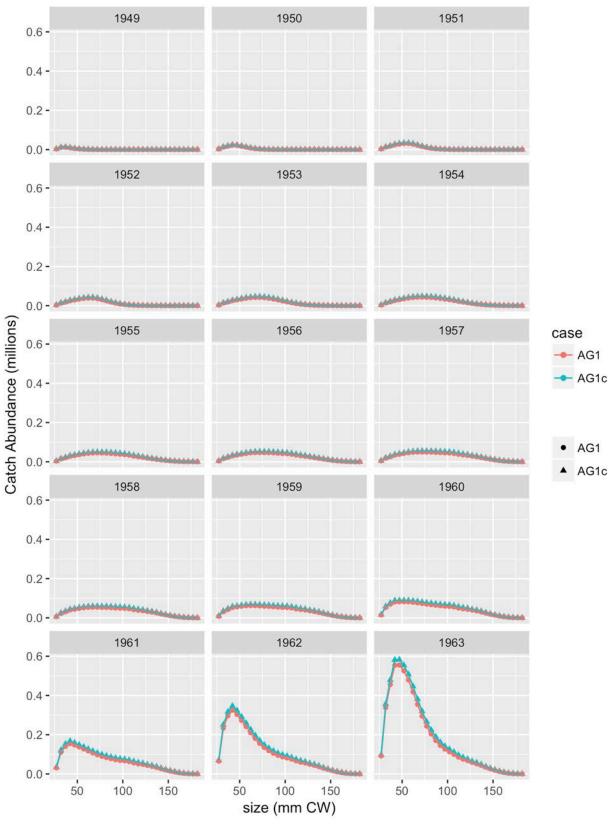


Figure 80. Predicted GTF captured catch abundance for male all all, (1 of 5).

GTF captured catch for male all all

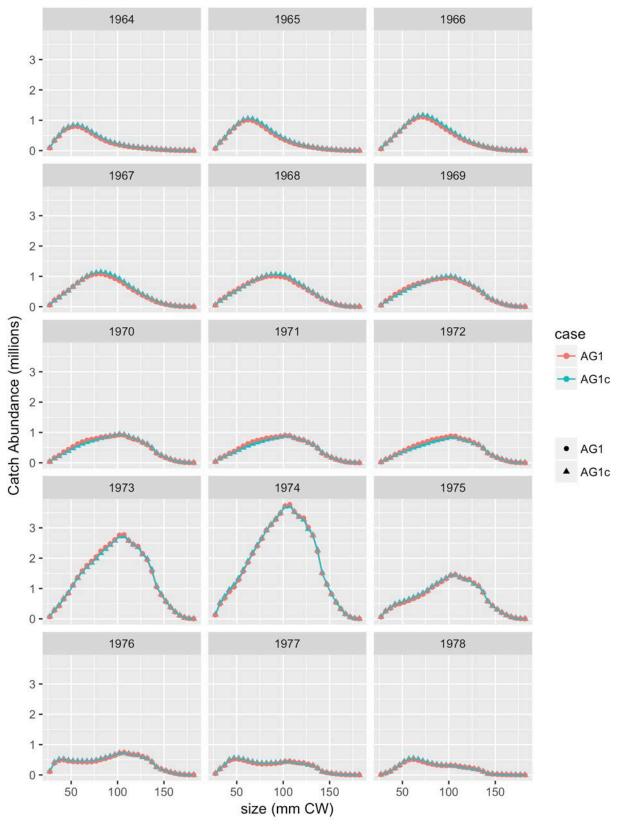


Figure 81. Predicted GTF captured catch abundance for male all all, (2 of 5).

GTF captured catch for male all all 1979 1980 1981 1.00 -0.75 -0.50 -0.25 -0.00 1982 1983 1984 1.00 -0.75 -0.50 -0.25 -0.00 -Catch Abundance (millions) 1985 1986 1987 case 1.00 --- AG1 - AG1c 0.75 -0.50 -0.25 -• AG1 0.00 -▲ AG1c 1988 1989 1990 1.00 -0.75 -0.50 -0.25 -0.00 -1991 1992 1993 1.00 -0.75 -0.50 -0.25 -0.00 -100 100 100 150 150 50 150 50 50 size (mm CW)

Figure 82. Predicted GTF captured catch abundance for male all all, (3 of 5).

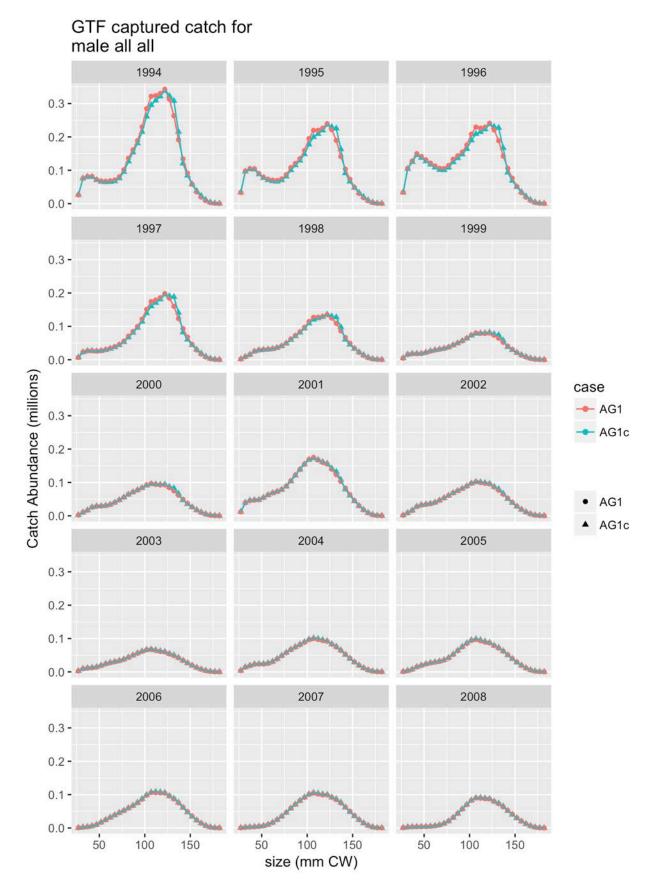


Figure 83. Predicted GTF captured catch abundance for male all all, (4 of 5).

GTF captured catch for male all all 2009 2010 0.075 -0.050 -0.025 -0.000 -2011 2012 0.075 -0.050 -Catch Abundance (millions) case 0.025 --- AG1 ► AG1c 0.000 -2013 2014 • AG1 0.075 -▲ AG1c 0.050 -0.025 -0.000 -100 150 50 2015 0.075 -0.050 -0.025 -0.000 -100 150 50 size (mm CW)

Figure 84. Predicted GTF captured catch abundance for male all all, (5 of 5).

RKF captured catch for female all all

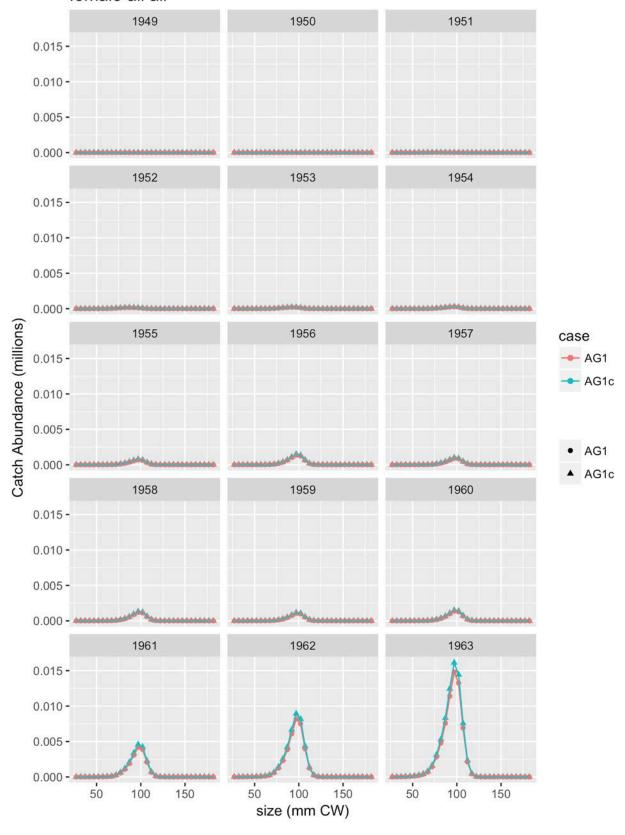


Figure 85. Predicted RKF captured catch abundance for female all all, (1 of 5).

RKF captured catch for female all all

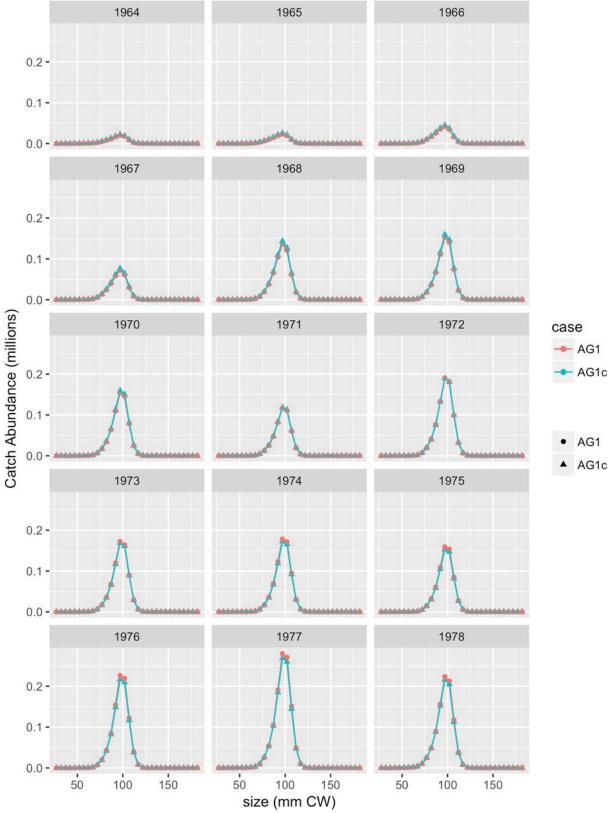


Figure 86. Predicted RKF captured catch abundance for female all all, (2 of 5).

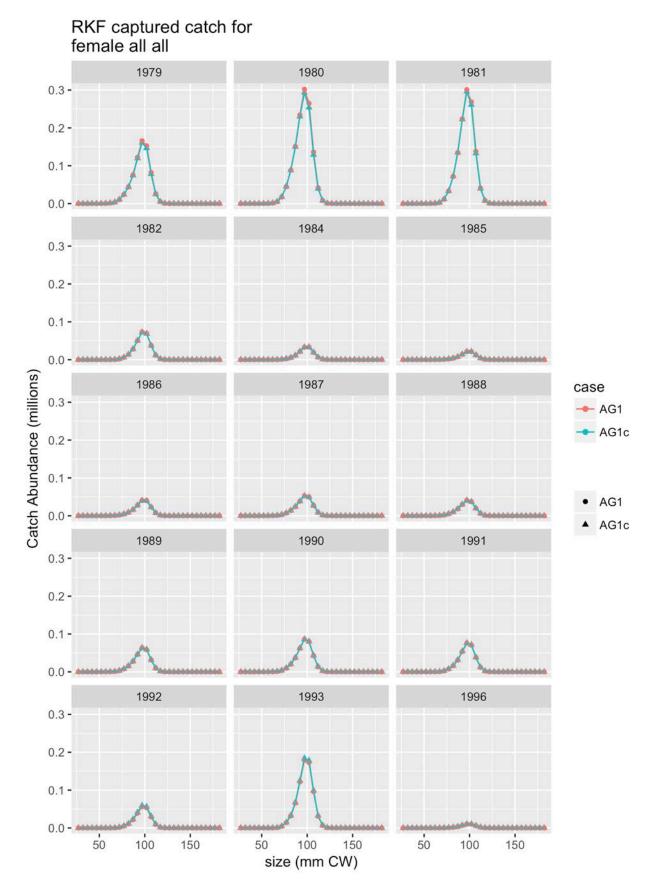


Figure 87. Predicted RKF captured catch abundance for female all all, (3 of 5).

RKF captured catch for female all all 1997 1998 1999 0.009 -0.006 -0.003 -0.000 2000 2001 2002 0.009 -0.006 -0.003 -0.000 Catch Abundance (millions) 2004 2003 2005 case **→** AG1 0.009 -- AG1c 0.006 -0.003 -• AG1 0.000 -▲ AG1c 2006 2007 2008 0.009 -0.006 -0.003 -0.000 - 4 2009 2010 2011 0.009 -0.006 -0.003 -0.000 - 4 100 150 50 100 150 50 100 150 50 size (mm CW)

Figure 88. Predicted RKF captured catch abundance for female all all, (4 of 5).

RKF captured catch for female all all

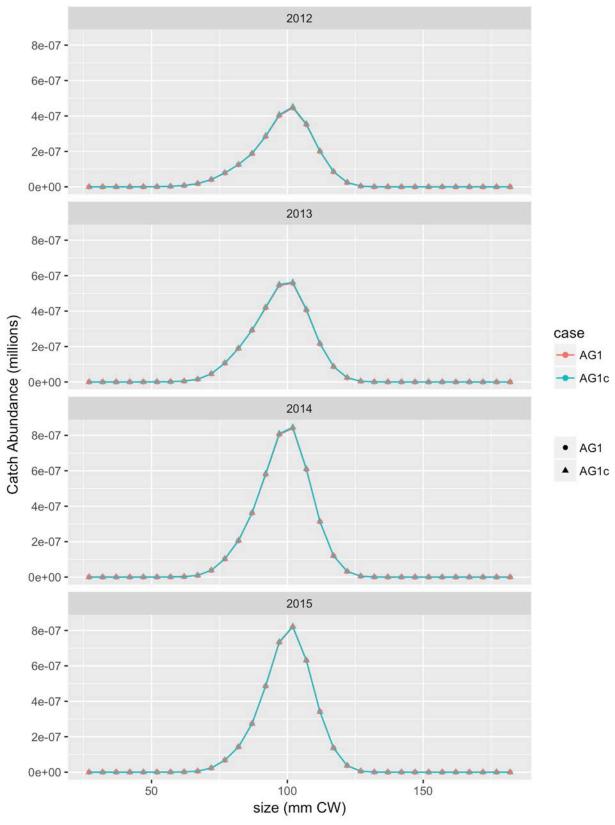


Figure 89. Predicted RKF captured catch abundance for female all all, (5 of 5).

RKF captured catch for male all all

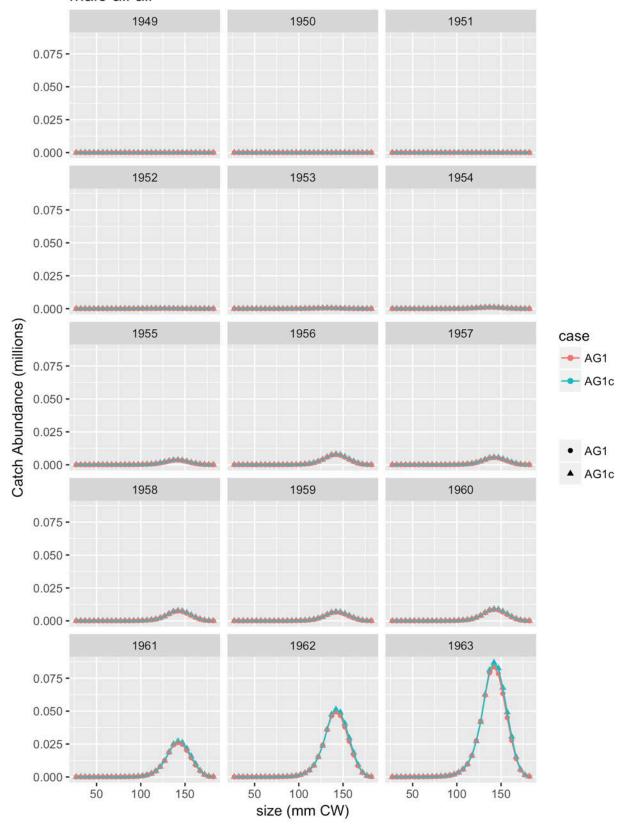


Figure 90. Predicted RKF captured catch abundance for male all all, (1 of 5).

RKF captured catch for male all all

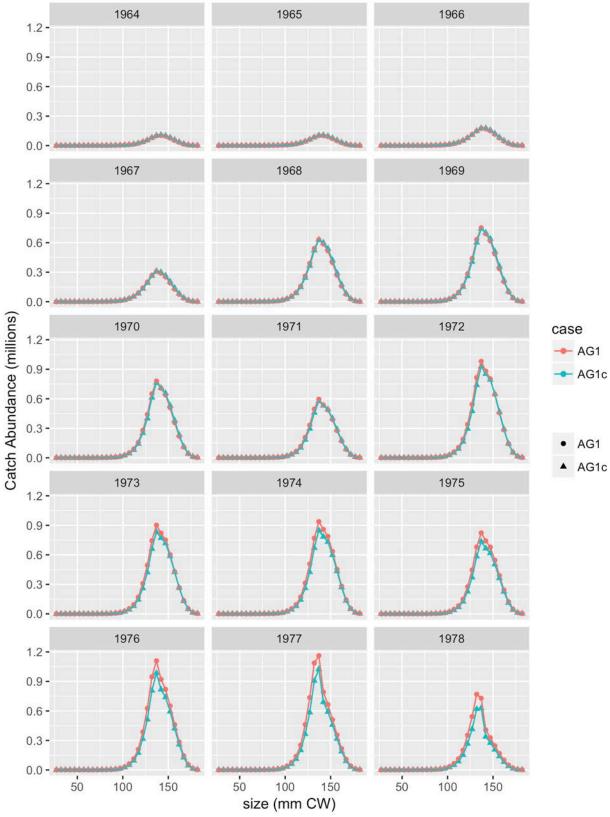


Figure 91. Predicted RKF captured catch abundance for male all all, (2 of 5).

RKF captured catch for male all all 1979 1980 1981 0.6 -0.4 -0.2 -0.0 -1982 1984 1985 0.6 -0.4 -0.2 -0.0 -Catch Abundance (millions) 1986 1987 1988 case 0.6 ---- AG1 - AG1c 0.4 -0.2 -• AG1 0.0 -▲ AG1c 1989 1990 1991 0.6 -0.4 -0.2 -0.0 -1993 1996 1992 0.6 -0.4 -0.2 -0.0 - 🌲 150 100 100 150 150 50 100 50 50 size (mm CW)

Figure 92. Predicted RKF captured catch abundance for male all all, (3 of 5).

RKF captured catch for male all all 1997 1998 1999 0.05 -0.04 -0.03 -0.02 -0.01 -0.00 - 4 2000 2001 2002 0.05 -0.04 -0.03 -0.02 -0.01 -0.00 -Catch Abundance (millions) 2004 2003 2005 case 0.05 ---- AG1 0.04 -► AG1c 0.03 -0.02 -0.01 -• AG1 0.00 -▲ AG1c 2006 2007 2008 0.05 -0.04 -0.03 -0.02 -0.01 -0.00 -2009 2010 2011 0.05 -0.04 -0.03 -0.02 -0.01 -0.00 - 🐸

Figure 93. Predicted RKF captured catch abundance for male all all, (4 of 5).

50

100

size (mm CW)

150

50

100

50

100

150

150

RKF captured catch for male all all 2012 0.06 -0.04 -0.02 -0.00 -2013 0.06 -0.04 -Catch Abundance (millions) 0.02 case - AG1 AG1c 0.00 2014 0.06 -• AG1 ▲ AG1c 0.04 -0.02 -0.00 -2015 0.06 -0.04 -0.02 -0.00 -100 size (mm CW) 50 150

Figure 94. Predicted RKF captured catch abundance for male all all, (5 of 5).

SCF captured catch for female all all

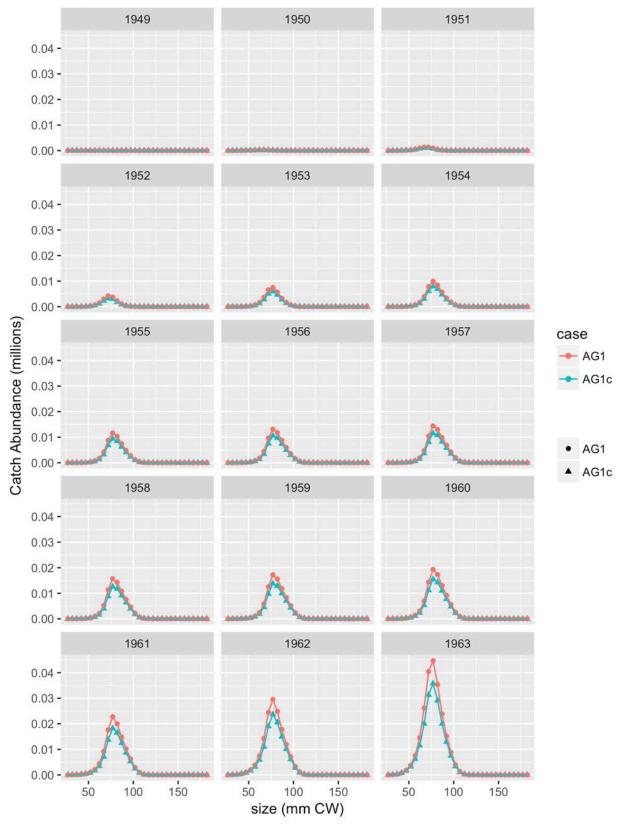


Figure 95. Predicted SCF captured catch abundance for female all all, (1 of 5).

SCF captured catch for female all all 1964 1965 1966 0.6 -0.4 -0.2 -0.0 - 4 1967 1968 1969 0.6 -0.4 -0.2 -0.0 -Catch Abundance (millions) 1970 1971 1972 case -- AG1 0.6 -- AG1c 0.4 -0.2 -• AG1 0.0 -▲ AG1c 1973 1974 1975 0.6 -0.4 -0.2 -0.0 -1977 1976 1978 0.6 -0.4 -

Figure 96. Predicted SCF captured catch abundance for female all all, (2 of 5).

50

150

100

size (mm CW)

0.2 -

0.0 -

50

100

150

150

100

50

SCF captured catch for female all all 1979 1980 1981 3 -2 -1 -0 -1984 1982 1983 3 -2-1 -Catch Abundance (millions) 1985 1986 1987 case - AG1 - AG1c • AG1 ▲ AG1c 1990 1988 1989 3 -2 -1 -0 - м 1991 1992 1993 3 -2-1 -0 - м 0 100 150 size (mm CW) 100 150 150 150 50 50 100 50

Figure 97. Predicted SCF captured catch abundance for female all all, (3 of 5).

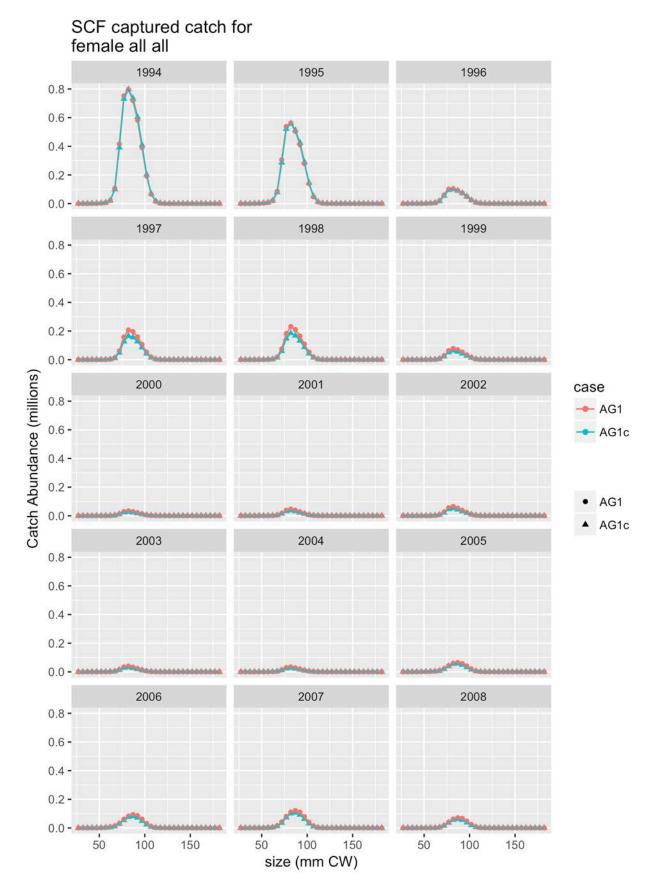


Figure 98. Predicted SCF captured catch abundance for female all all, (4 of 5).

SCF captured catch for female all all

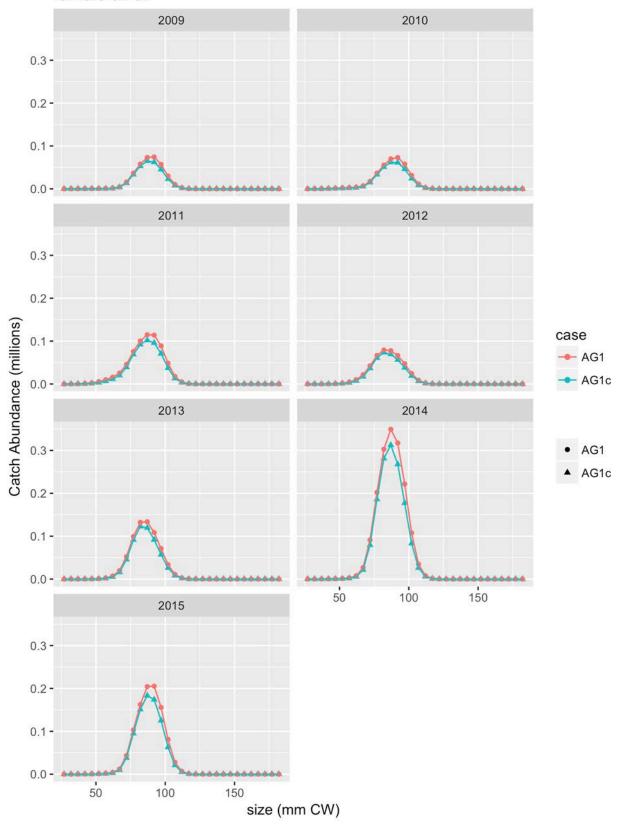


Figure 99. Predicted SCF captured catch abundance for female all all, (5 of 5).

SCF captured catch for male all all

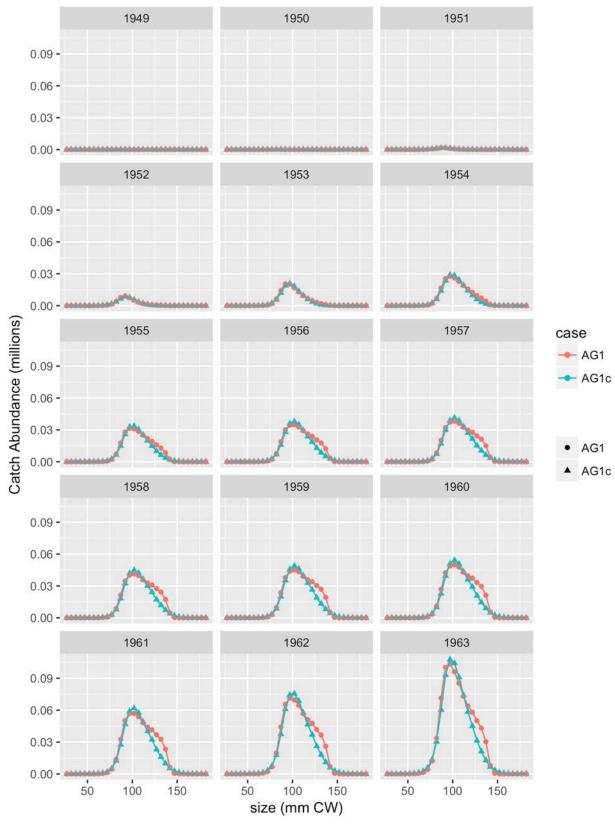


Figure 100. Predicted SCF captured catch abundance for male all all, (1 of 5).

SCF captured catch for male all all

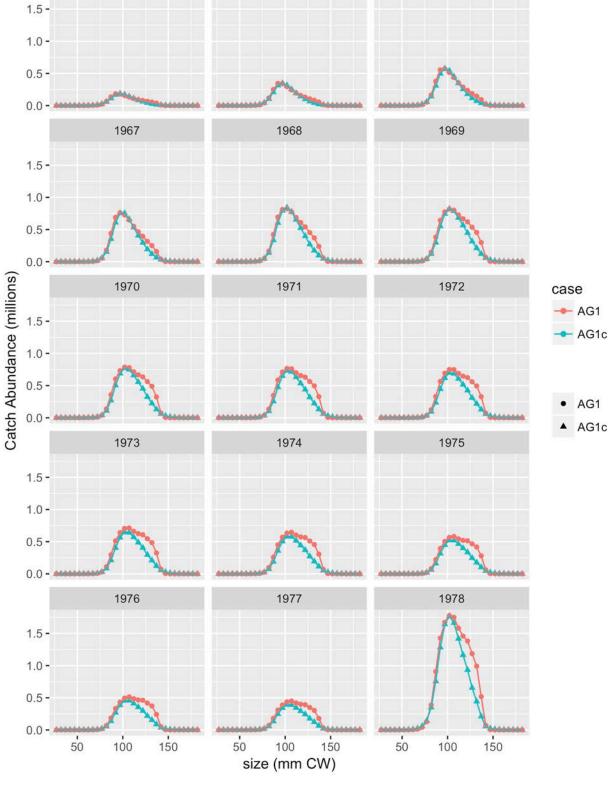


Figure 101. Predicted SCF captured catch abundance for male all all, (2 of 5).

SCF captured catch for male all all 1979 1980 1981 7.5 -5.0 -2.5 -0.0 -1982 1983 1984 7.5 -5.0 -2.5 -0.0 -Catch Abundance (millions) 1985 1987 1986 case -- AG1 7.5 -- AG1c 5.0 -2.5 -• AG1 0.0 -▲ AG1c 1988 1990 1989 7.5 -5.0 -2.5 -0.0 -1992 1991 1993 7.5 -5.0 -2.5 -0.0 -100 150 100 100 150 50 50 150 50 size (mm CW)

Figure 102. Predicted SCF captured catch abundance for male all all, (3 of 5).

SCF captured catch for male all all 1994 1995 1996 2.0 -1.5 -1.0 -0.5 -0.0 -1997 1998 1999 2.0 -1.5 -1.0 -0.5 -0.0 -Catch Abundance (millions) 2000 2002 2001 case --- AG1 2.0 -- AG1c 1.5 -1.0 -0.5 -• AG1 0.0 -▲ AG1c 2003 2004 2005 2.0 -1.5 -1.0 -0.5 -0.0 -2006 2007 2008 2.0 -1.5 -1.0 -0.5 -0.0 - 🌲 50 100 150 50 100 50 150 150 100 size (mm CW)

Figure 103. Predicted SCF captured catch abundance for male all all, (4 of 5).

SCF captured catch for male all all

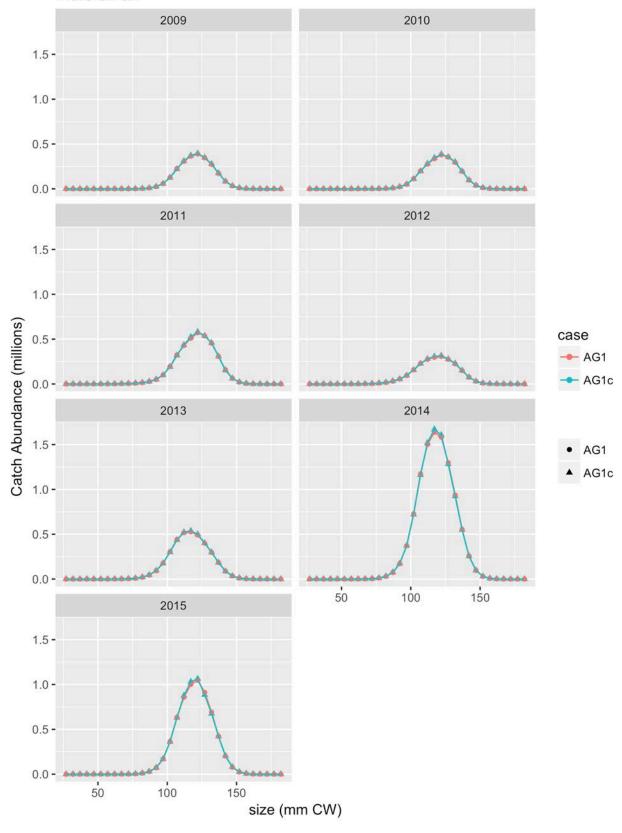


Figure 104. Predicted SCF captured catch abundance for male all all, (5 of 5).

TCF captured catch for female all all

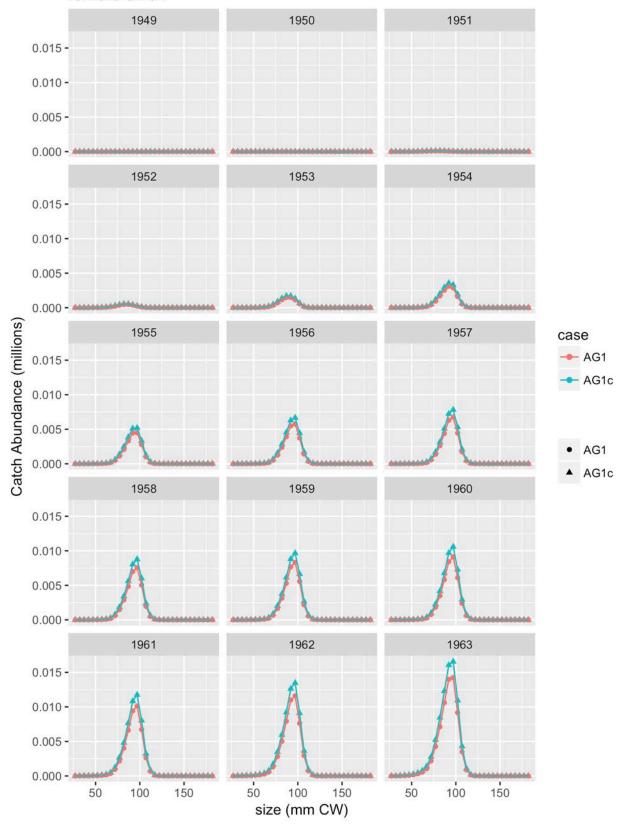


Figure 105. Predicted TCF captured catch abundance for female all all, (1 of 4).

TCF captured catch for female all all

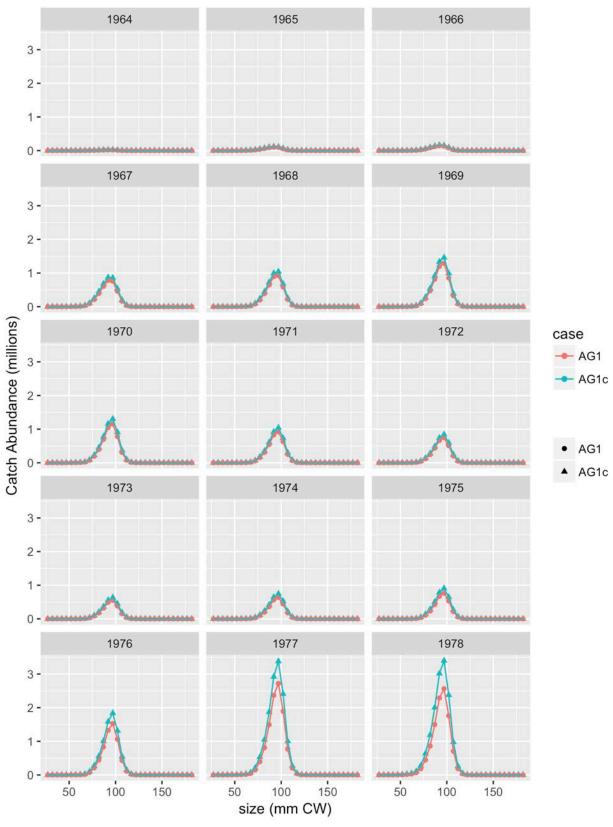


Figure 106. Predicted TCF captured catch abundance for female all all, (2 of 4).

TCF captured catch for female all all 1979 1980 1981 6 -4 -2-1982 1983 1984 6 -4 -2 -Catch Abundance (millions) 1987 1988 1989 case - AG1 - AG1c • AG1 ▲ AG1c 1990 1991 1992 6 -4 -2 -0 -1993 1994 1995 6 -4 -2-100 100 150 50 100 150 50 150 50 size (mm CW)

Figure 107. Predicted TCF captured catch abundance for female all all, (3 of 4).

TCF captured catch for female all all 2005 1996 0.15 -0.10 -0.05 -0.00 -2007 2006 0.15 -0.10 -0.05 -0.00 -Catch Abundance (millions) 2008 2009 case **→** AG1 0.15 -- AG1c 0.10 -0.05 -AG1 0.00 -▲ AG1c 2013 2014 0.15 -0.10 -0.05 -0.00 -150 50 100 2015 0.15 -0.10 -0.05 -0.00 -50 100 150

Figure 108. Predicted TCF captured catch abundance for female all all, (4 of 4).

size (mm CW)

TCF captured catch for male all all 1949 1950 1951 0.10 -0.05 -0.00 -1953 1952 1954 0.10 -0.05 -0.00 Catch Abundance (millions) 1956 1955 1957 case --- AG1 - AG1c 0.10 -0.05 -AG1 0.00 ▲ AG1c 1958 1959 1960 0.10 -0.05 -0.00 -1963 1961 1962 0.10 -0.05 -0.00 -100 150 50 100 150 50 150 50 100 size (mm CW)

Figure 109. Predicted TCF captured catch abundance for male all all, (1 of 4).

TCF captured catch for male all all 1964 1965 1966 20 -15-10-5 -1967 1968 1969 20 -15-10-5 -Catch Abundance (millions) 1970 1971 1972 case - AG1 20 -- AG1c 15 -10-5 -• AG1 ▲ AG1c 1975 1973 1974 20 -15-10-5 -0 -1977 1978 1976 20 -15-10 -5 -

Figure 110. Predicted TCF captured catch abundance for male all all, (2 of 4).

50

100

50

150

0 100 150 size (mm CW)

150

150

100

50

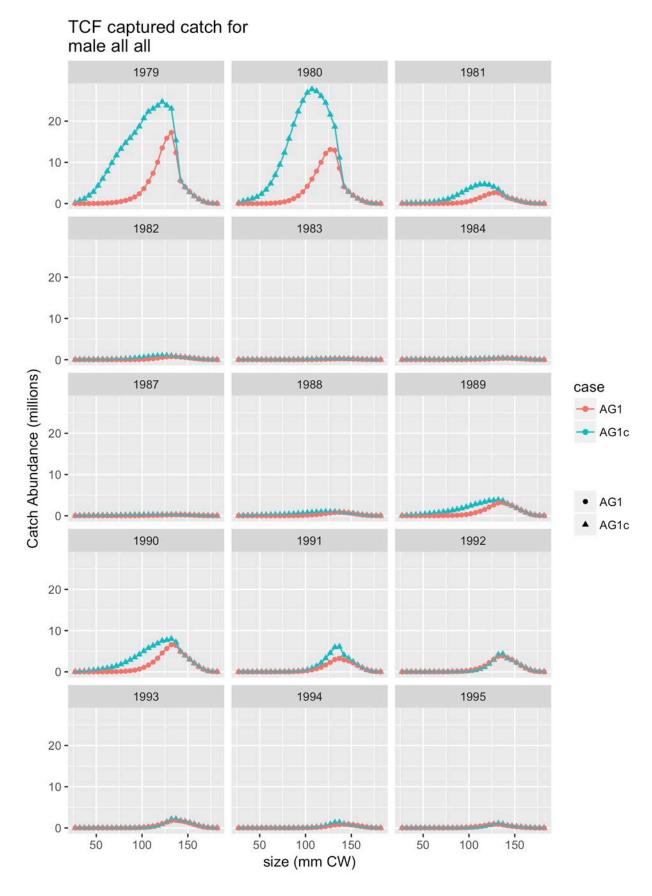


Figure 111. Predicted TCF captured catch abundance for male all all, (3 of 4).

TCF captured catch for male all all

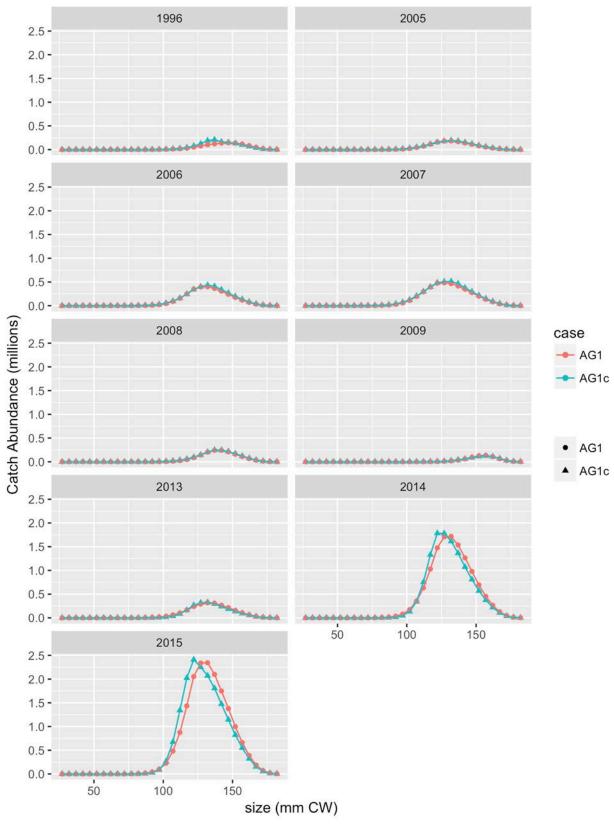


Figure 112. Predicted TCF captured catch abundance for male all all, (4 of 4).

Retained catch size compositions

TCF retained catch for male all all

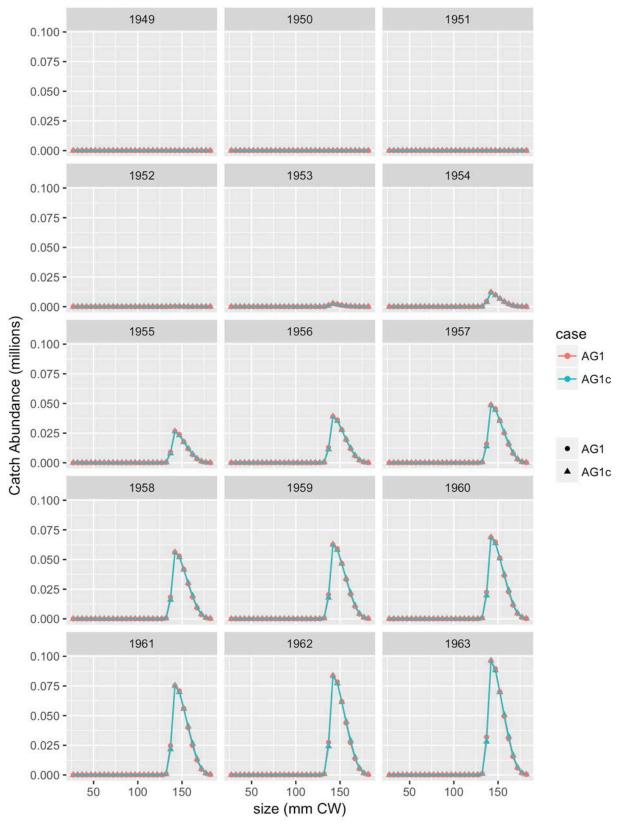


Figure 113. Predicted TCF retained catch abundance for male all all, (1 of 4).

TCF retained catch for male all all

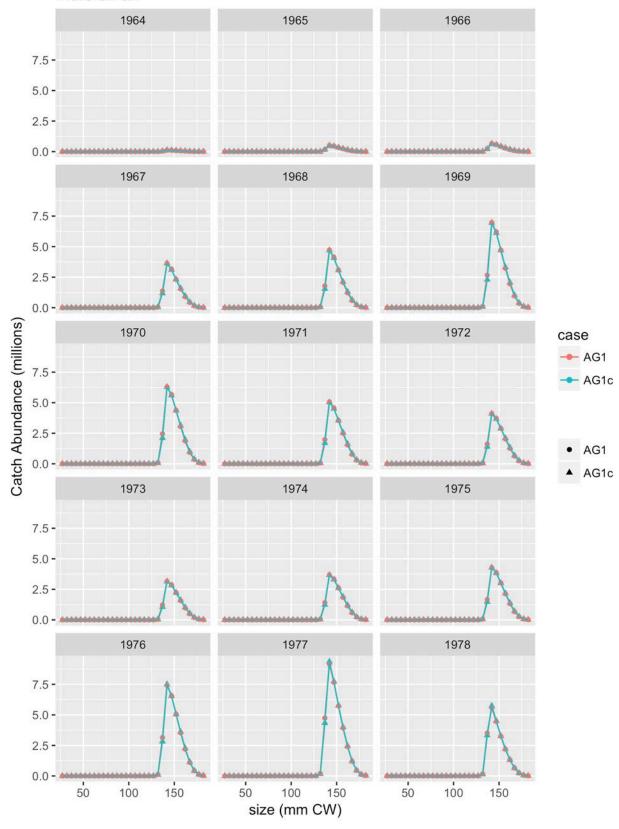


Figure 114. Predicted TCF retained catch abundance for male all all, (2 of 4).

TCF retained catch for male all all 1979 1980 1981 4 -2-1982 1983 1984 4 -2-Catch Abundance (millions) 1987 1988 1989 case -- AG1 - AG1c • AG1 ▲ AG1c 1990 1991 1992 4 -2 -1993 1994 1995 4 -2 -100 100 150 100 150 50 150 50 50 size (mm CW)

Figure 115. Predicted TCF retained catch abundance for male all all, (3 of 4).

TCF retained catch for male all all

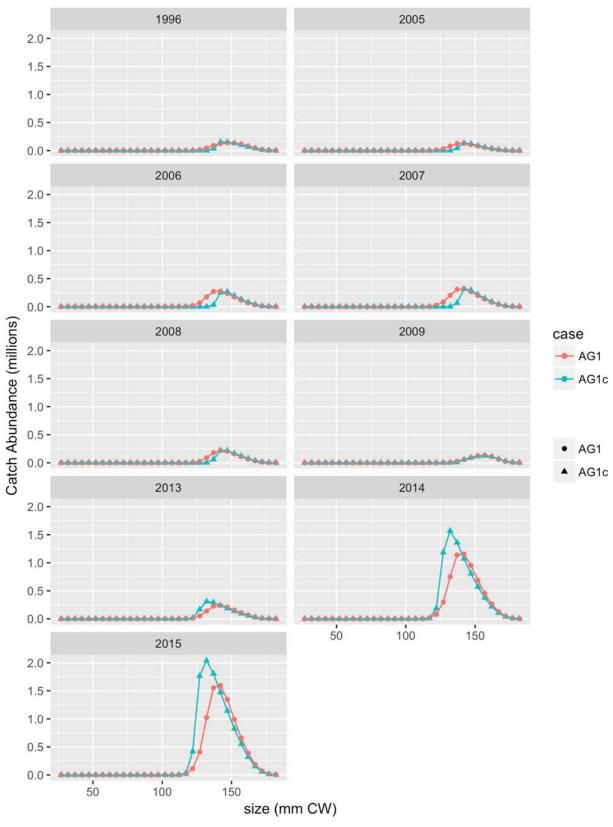


Figure 116. Predicted TCF retained catch abundance for male all all, (4 of 4).

Model fits

Survey biomass

NMFS trawl survey

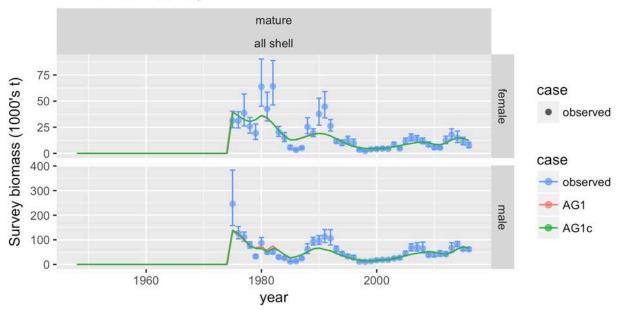


Figure 117. Comparison of observed and predicted survey biomass for NMFS trawl survey.



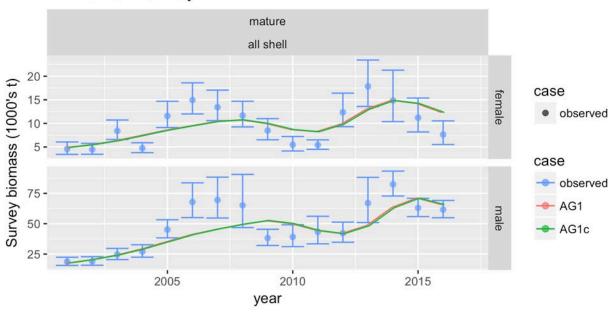


Figure 118. Comparison of observed and predicted survey biomass for NMFS trawl survey. Recent time period.

Mean survey size compositions

NMFS trawl survey

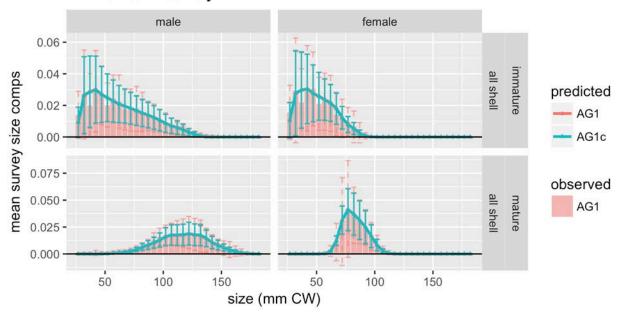


Figure 119. Comparison of observed and predicted &&xms mean survey size comps for NMFS trawl survey.

Survey size compositions

NMFS trawl survey: male, immature, all shell

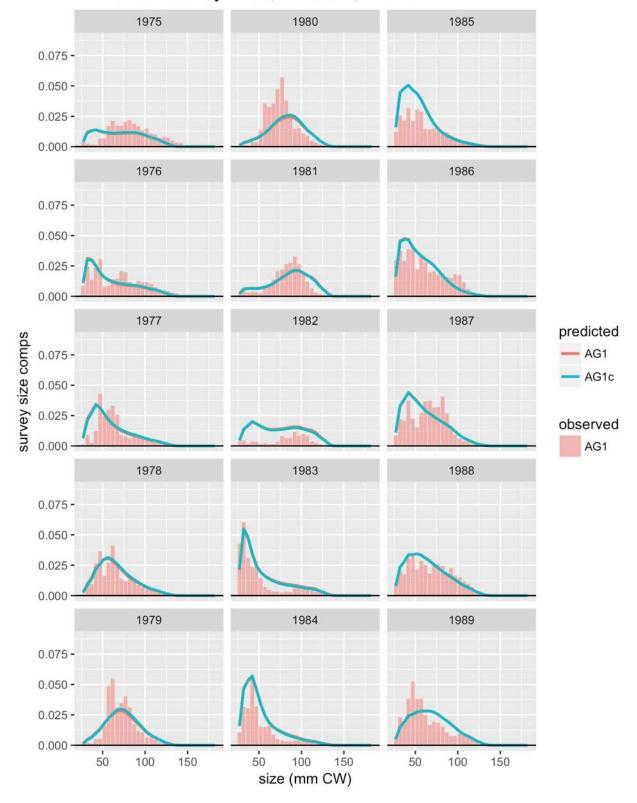


Figure 120. Comparison of observed and predicted male, immature, all shell survey size comps for NMFS trawl survey. Page 1 of 3.

NMFS trawl survey: male, immature, all shell 1990 1995 2000 0.075 -0.050 -0.025 -0.000 1991 1996 2001 0.075 -0.050 -0.025 -0.000 1992 1997 2002 predicted survey size comps - AG1 0.075 -AG1c 0.050 -0.025 observed 0.000 AG1 2003 1993 1998 0.075 -0.050 -0.025 -0.000 1994 1999 2004 0.075 -0.050 -0.025 -0.000 50 100 50 50 100 150 100 150 150 size (mm CW)

Figure 121. Comparison of observed and predicted male, immature, all shell survey size comps for NMFS trawl survey. Page 2 of 3.

NMFS trawl survey: male, immature, all shell 2010 2005 2015 0.075 -0.050 -0.025 -0.000 2006 2011 2016 0.075 -0.050 -0.025 -0.000 2012 2007 2017 predicted survey size comps - AG1 0.075 -AG1c 0.050 -0.025 observed 0.000 AG1 2013 2008 2018 0.075 -0.050 -0.025 -0.000 2009 2014 2019 0.075 -0.050 -0.025 -0.000 50 50 100 50 100 100 150 150 150 size (mm CW)

Figure 122. Comparison of observed and predicted male, immature, all shell survey size comps for NMFS trawl survey. Page 3 of 3.

NMFS trawl survey: male, mature, all shell 1975 1980 1985 0.04 -0.02 -0.00 -1976 1981 1986 0.04 -0.02 -0.00 1977 1982 1987 predicted survey size comps - AG1 0.04 -AG1c 0.02 observed 0.00 AG1 1978 1983 1988 0.04 -0.02 -0.00 -1979 1984 1989 0.04 -0.02 -0.00 100 150 50 100 50 150 50 100 150 size (mm CW)

Figure 123. Comparison of observed and predicted male, mature, all shell survey size comps for NMFS trawl survey. Page 1 of 3.

NMFS trawl survey: male, mature, all shell 1990 1995 2000 0.04 -0.02 -0.00 -1991 1996 2001 0.04 -0.02 -0.00 1992 1997 2002 predicted survey size comps - AG1 0.04 -AG1c 0.02 observed 0.00 AG1 1993 1998 2003 0.04 -0.02 -0.00 1999 1994 2004 0.04 -0.02 -0.00 50 100 150 50 100 50 150 150 100 size (mm CW)

Figure 124. Comparison of observed and predicted male, mature, all shell survey size comps for NMFS trawl survey. Page 2 of 3.

NMFS trawl survey: male, mature, all shell 2005 2010 2015 0.04 -0.02 -0.00 -2006 2011 2016 0.04 -0.02 -0.00 2012 2007 2017 predicted survey size comps - AG1 0.04 -AG1c 0.02 observed 0.00 AG1 2008 2013 2018 0.04 -0.02 -0.00 -2009 2014 2019 0.04 -0.02 -0.00 50 100 50 100 50 100 150 150 150 size (mm CW)

Figure 125. Comparison of observed and predicted male, mature, all shell survey size comps for NMFS trawl survey. Page 3 of 3.

NMFS trawl survey: female, immature, all shell 1985 1975 1980 0.100 -0.075 -0.050 -0.025 -0.000 -1976 1981 1986 0.100 -0.075 -0.050 -0.025 -0.000 1977 1982 1987 predicted survey size comps 0.100 -- AG1 0.075 -AG1c 0.050 -0.025 observed 0.000 AG1 1978 1983 1988 0.100 -0.075 -0.050 -0.025 -0.000 1979 1984 1989 0.100 -0.075 -0.050 -0.025 -0.000 50 50 50 150 100 150 100 150 100 size (mm CW)

Figure 126. Comparison of observed and predicted female, immature, all shell survey size comps for NMFS trawl survey. Page 1 of 3.

NMFS trawl survey: female, immature, all shell 1990 1995 2000 0.100 -0.075 -0.050 -0.025 -0.000 1991 1996 2001 0.100 -0.075 -0.050 -0.025 -0.000 1992 1997 2002 predicted survey size comps 0.100 -- AG1 0.075 -AG1c 0.050 -0.025 observed 0.000 AG1 1993 1998 2003 0.100 -0.075 -0.050 -0.025 -0.000 -1994 1999 2004 0.100 -0.075 -0.050 -0.025 -0.000 50 50 50 150 100 150 100 100 150 size (mm CW)

Figure 127. Comparison of observed and predicted female, immature, all shell survey size comps for NMFS trawl survey. Page 2 of 3.

NMFS trawl survey: female, immature, all shell 2005 2010 2015 0.100 -0.075 -0.050 -0.025 -0.000 2006 2011 2016 0.100 -0.075 -0.050 -0.025 -0.000 2007 2012 2017 predicted survey size comps 0.100 -- AG1 0.075 -AG1c 0.050 -0.025 observed 0.000 AG1 2008 2013 2018 0.100 -0.075 -0.050 -0.025 -0.000 2009 2014 2019 0.100 -0.075 -0.050 -0.025 -0.000 50 50 50 100 100 150 150 100 150 size (mm CW)

Figure 128. Comparison of observed and predicted female, immature, all shell survey size comps for NMFS trawl survey. Page 3 of 3.

NMFS trawl survey: female, mature, all shell 1975 1980 1985 0.20 -0.15 -0.10 -0.05 -0.00 -1976 1981 1986 0.20 -0.15 -0.10 -0.05 -0.00 1982 1987 1977 predicted 0.20 survey size comps - AG1 0.15 -AG1c 0.10 -0.05 observed 0.00 AG1 1978 1983 1988 0.20 -0.15 -0.10 -0.05 -0.00 -1979 1984 1989 0.20 -0.15 -0.10 -0.05 -0.00 100 50 100 150 150 100 50 150 50 size (mm CW)

Figure 129. Comparison of observed and predicted female, mature, all shell survey size comps for NMFS trawl survey. Page 1 of 3.

NMFS trawl survey: female, mature, all shell 1990 1995 2000 0.20 -0.15 -0.10 -0.05 -0.00 -1991 1996 2001 0.20 -0.15 -0.10 -0.05 -0.00 2002 1992 1997 predicted 0.20 survey size comps - AG1 0.15 -AG1c 0.10 -0.05 observed 0.00 AG1 1993 1998 2003 0.20 -0.15 -0.10 -0.05 -0.00 -1994 1999 2004 0.20 -0.15 -0.10 -0.05 -0.00 100 50 100 150 100 150 50 50 150 size (mm CW)

Figure 130. Comparison of observed and predicted female, mature, all shell survey size comps for NMFS trawl survey. Page 2 of 3.

NMFS trawl survey: female, mature, all shell 2005 2010 2015 0.20 -0.15 -0.10 -0.05 -0.00 -2006 2011 2016 0.20 -0.15 -0.10 -0.05 -0.00 2007 2012 2017 predicted 0.20 survey size comps - AG1 0.15 -AG1c 0.10 -0.05 observed 0.00 AG1 2008 2013 2018 0.20 -0.15 -0.10 -0.05 -0.00 -2009 2014 2019 0.20 -0.15 -0.10 -0.05 -0.00 50 50 100 150 100 150 100 150 50 size (mm CW)

Figure 131. Comparison of observed and predicted female, mature, all shell survey size comps for NMFS trawl survey. Page 3 of 3.

Growth data GrowthData.1 125 **-**100 -75 **-**50 post-molt size (mm CW) case 25 → AG1 ► AG1c 125 **-**100 -75 **-**50 **-**

pre-molt size (mm CW)

80

100

Figure 132. Model fits to GrowthData.1.

40

25 **-**

20

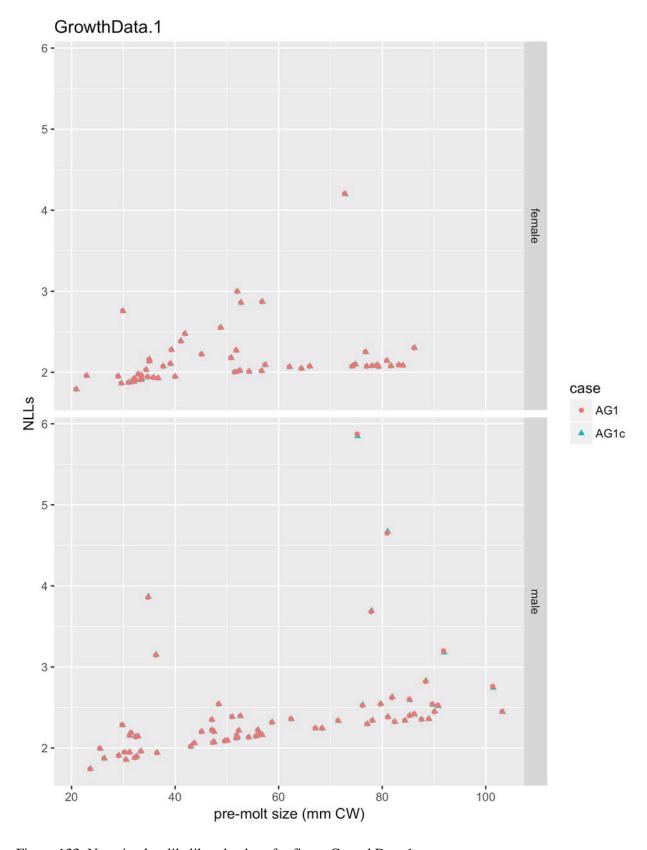
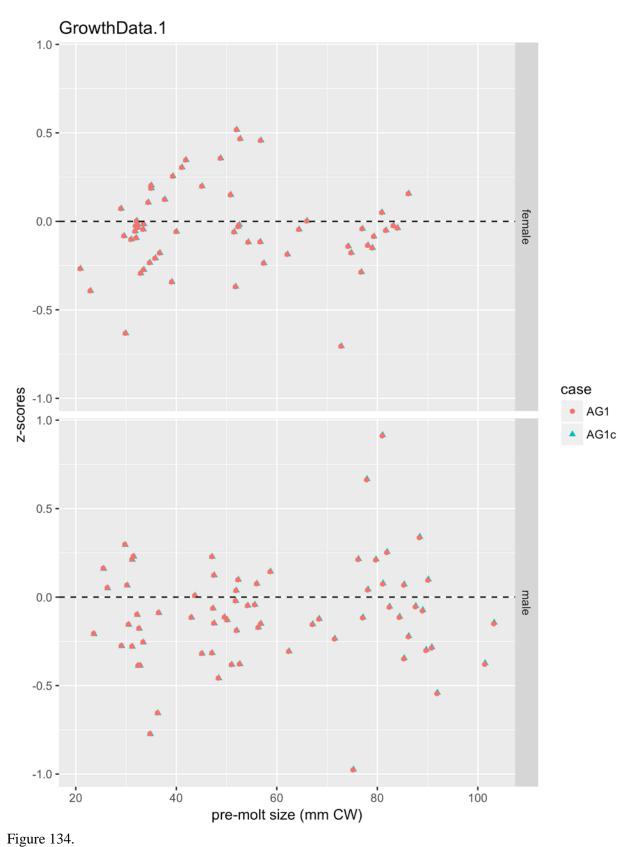


Figure 133. Negative log-likelihood values for fits to GrowthData.1.



Z-scores for fits to GrowthData.1.

Total fishery catch biomass

NOTE: Predicted and "observed" catch biomass for TCSAM2013 model results in the following plots always reflect "total catch mortality" biomass (even when "total capture" biomass was fit in the model), while TCSAM02 model results always reflect "total capture" biomass.

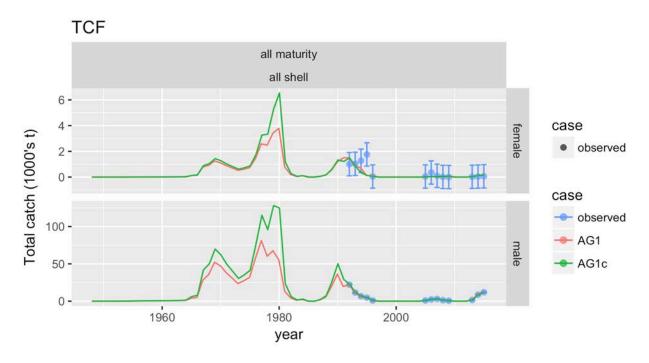


Figure 135. Comparison of observed and predicted total catch for TCF.

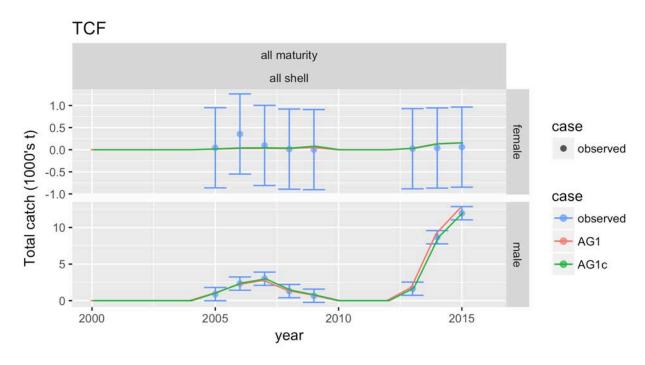


Figure 136. Comparison of observed and predicted total catch for TCF. Recent time period.

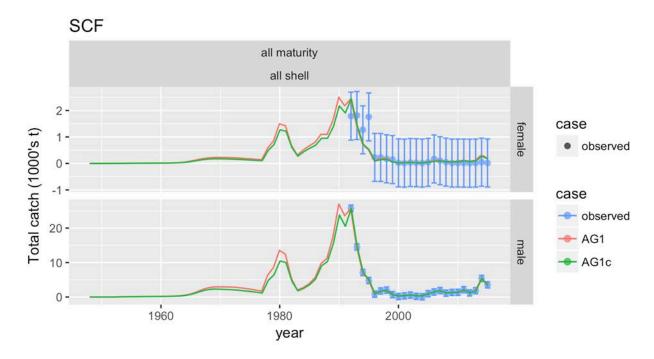


Figure 137. Comparison of observed and predicted total catch for SCF.

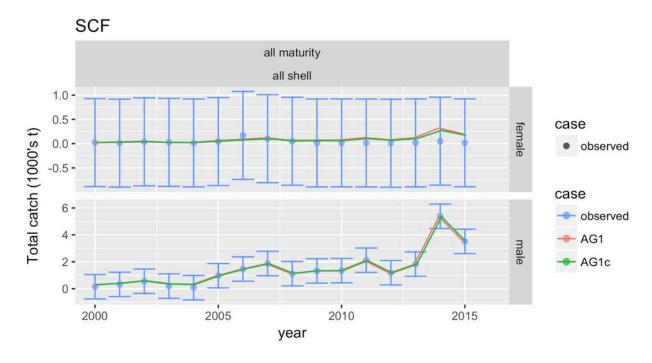


Figure 138. Comparison of observed and predicted total catch for SCF. Recent time period.

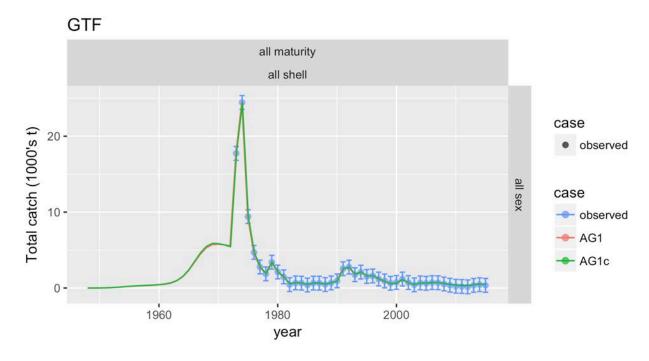


Figure 139. Comparison of observed and predicted total catch for GTF.

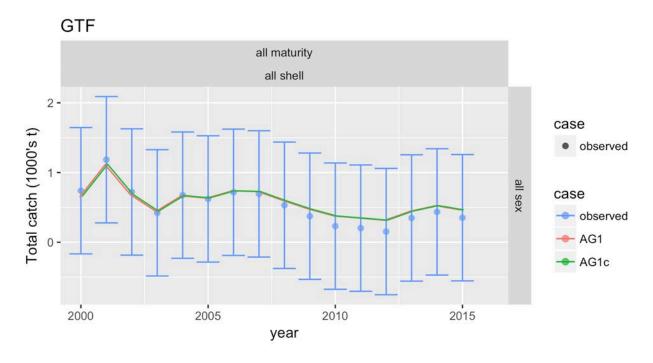


Figure 140. Comparison of observed and predicted total catch for GTF. Recent time period.

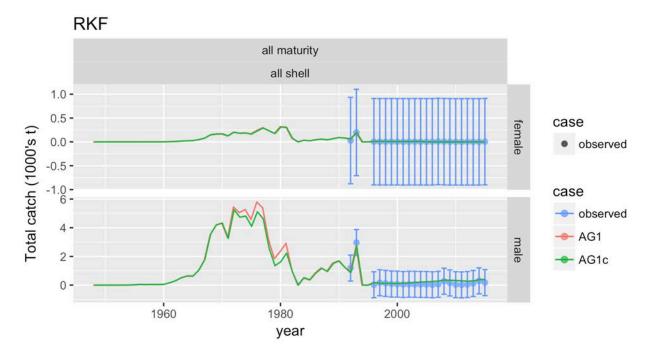


Figure 141. Comparison of observed and predicted total catch for RKF.

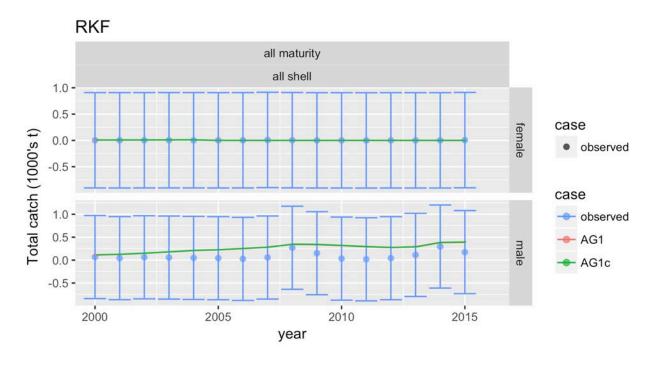


Figure 142. Comparison of observed and predicted total catch for RKF. Recent time period.

Total fishery mean size comps

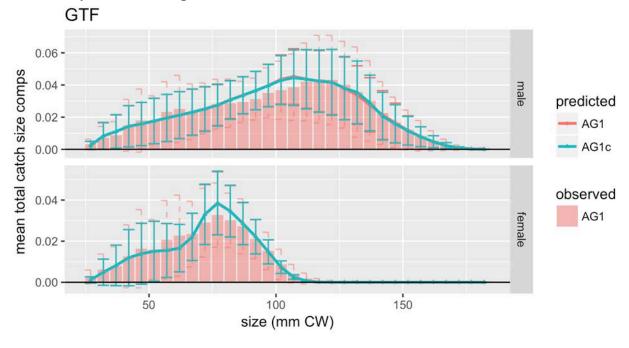


Figure 143. Comparison of observed and predicted &&xms mean total catch size comps for GTF.

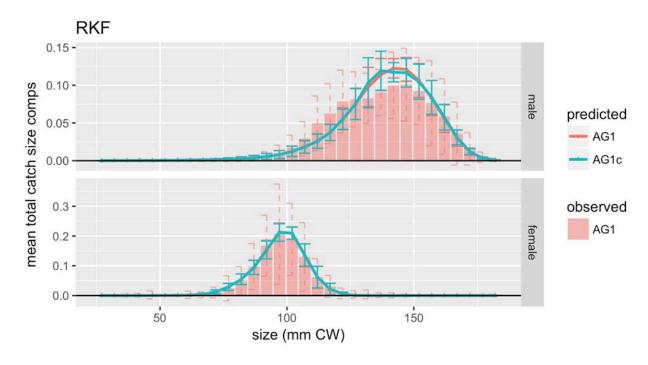


Figure 144. Comparison of observed and predicted &&xms mean total catch size comps for RKF.

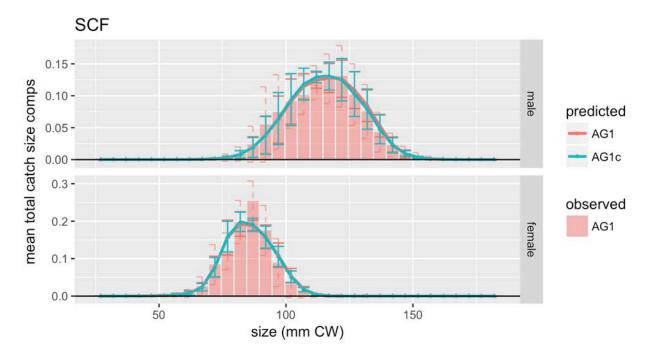


Figure 145. Comparison of observed and predicted &&xms mean total catch size comps for SCF.

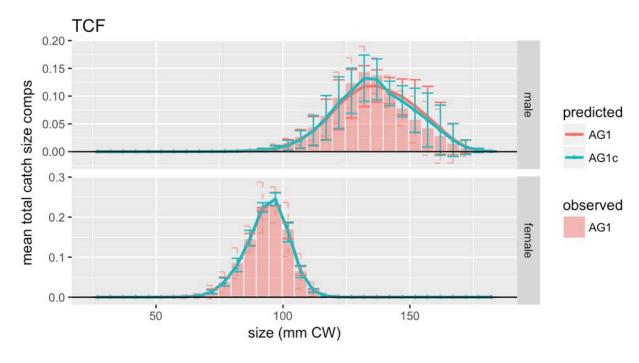


Figure 146. Comparison of observed and predicted &&xms mean total catch size comps for TCF.

Total fishery catch size comps

TCF: male, all maturity, all shell

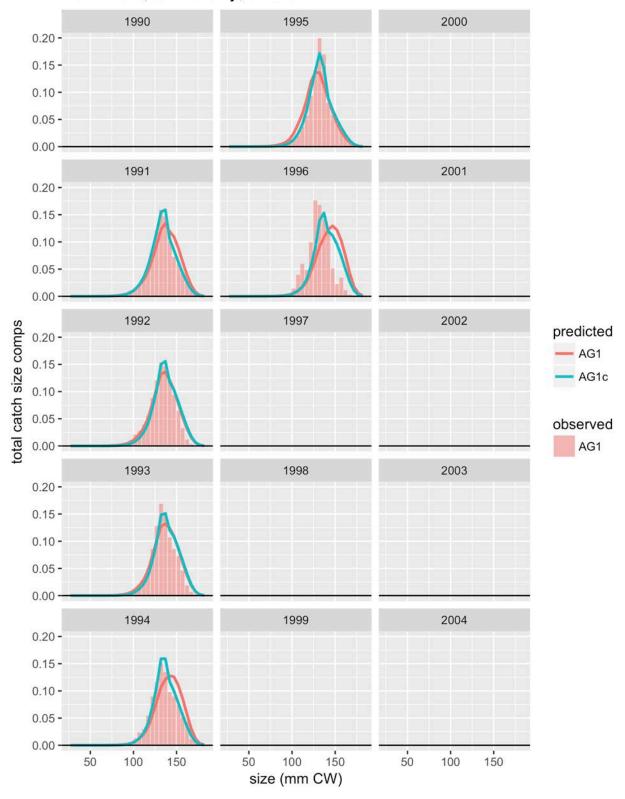


Figure 147. Comparison of observed and predicted male, all maturity, all shell total catch size comps for TCF. Page 1 of 2.

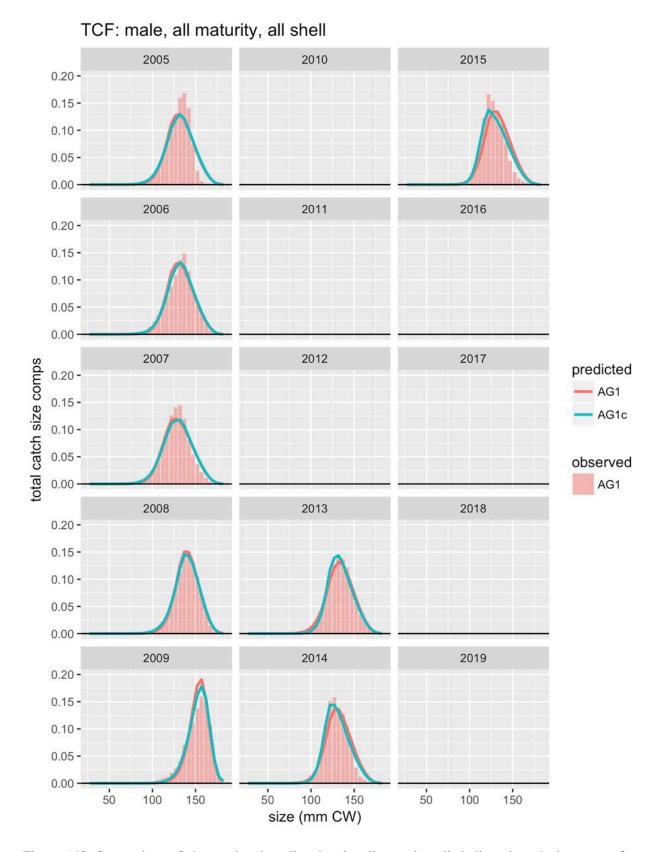


Figure 148. Comparison of observed and predicted male, all maturity, all shell total catch size comps for TCF. Page 2 of 2.

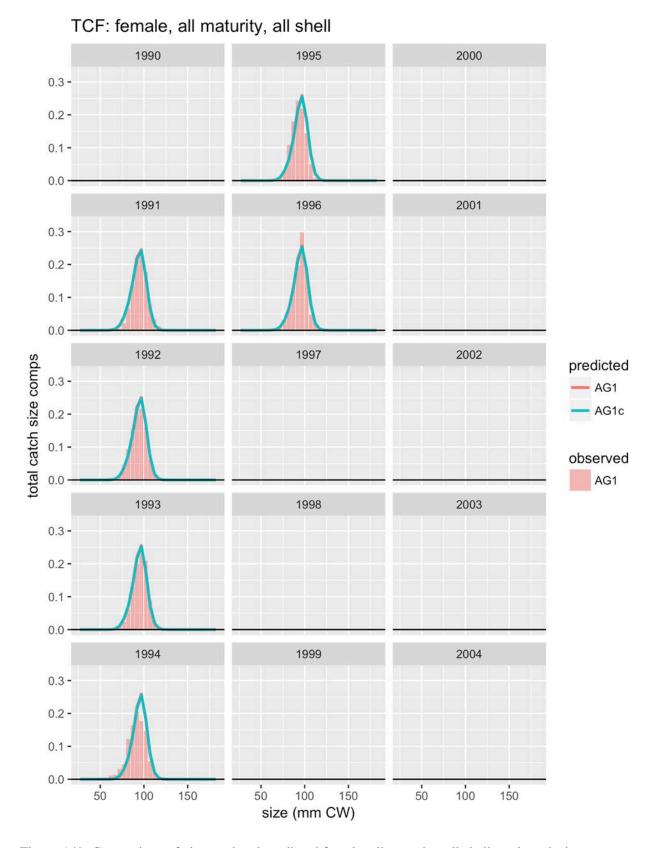


Figure 149. Comparison of observed and predicted female, all maturity, all shell total catch size comps for TCF. Page 1 of 2.

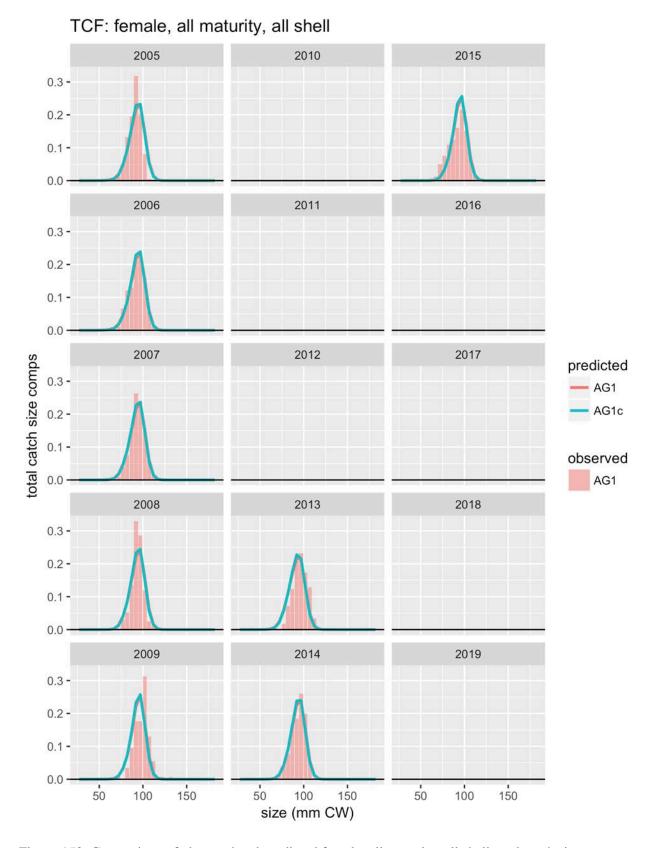


Figure 150. Comparison of observed and predicted female, all maturity, all shell total catch size comps for TCF. Page 2 of 2.

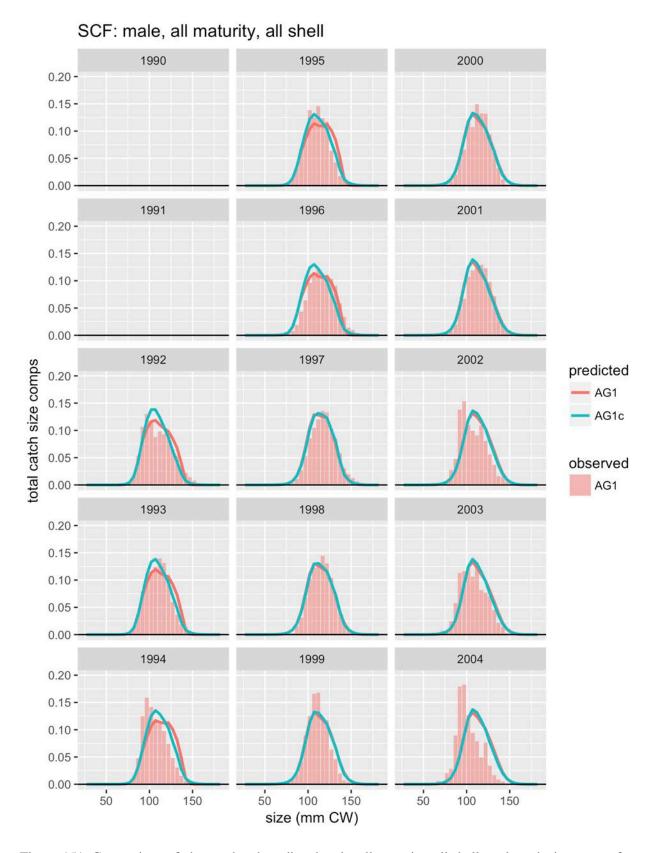


Figure 151. Comparison of observed and predicted male, all maturity, all shell total catch size comps for SCF. Page 1 of 2.

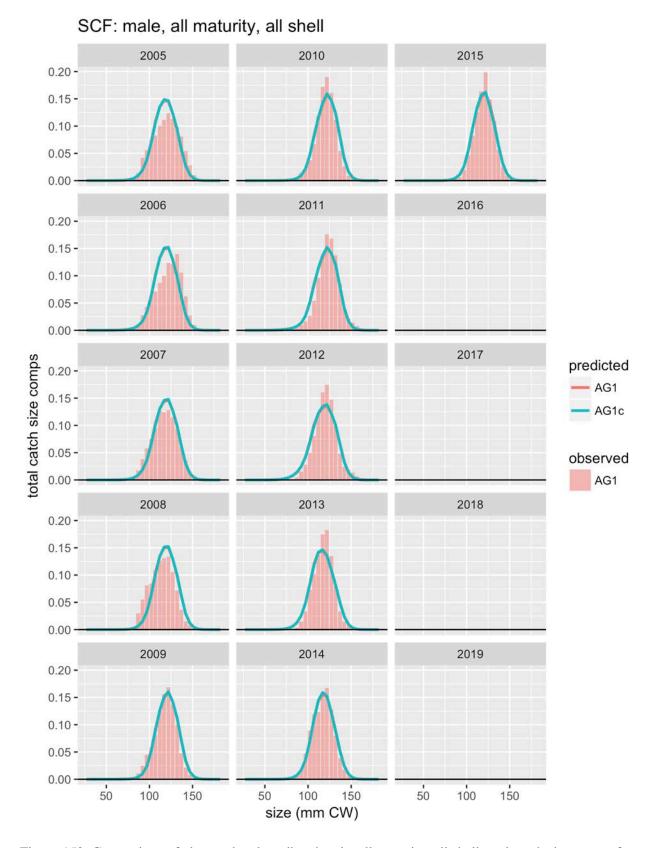


Figure 152. Comparison of observed and predicted male, all maturity, all shell total catch size comps for SCF. Page 2 of 2.

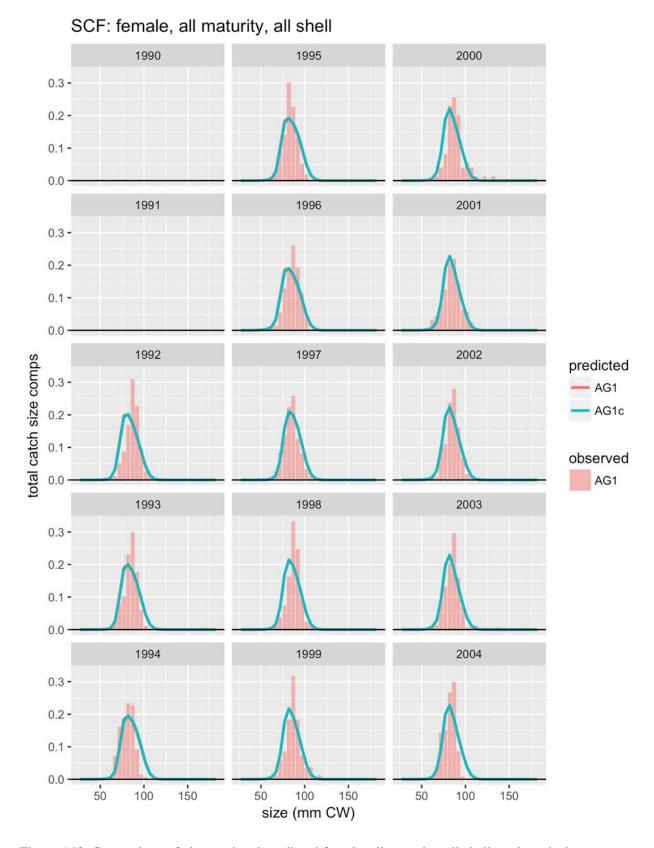


Figure 153. Comparison of observed and predicted female, all maturity, all shell total catch size comps for SCF. Page 1 of 2.

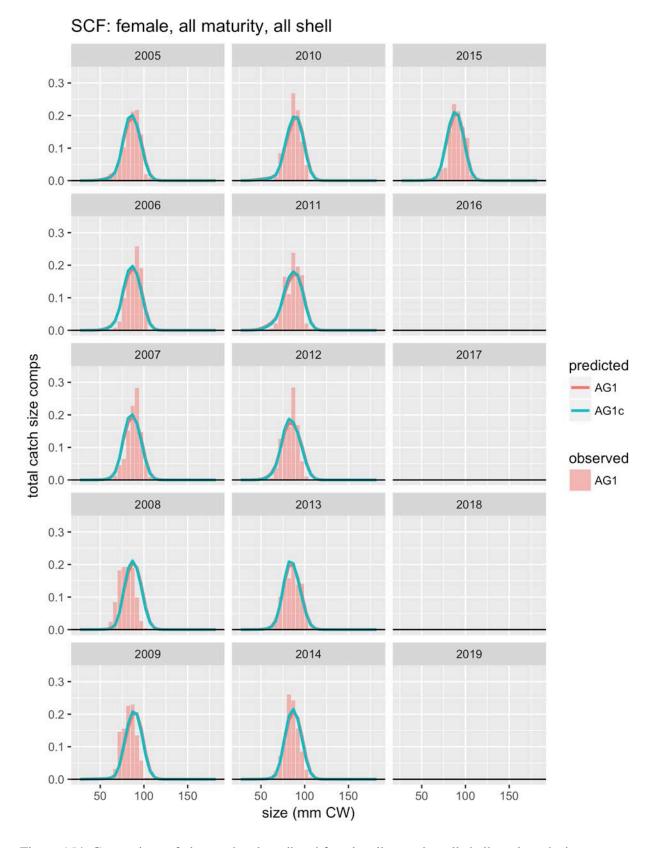


Figure 154. Comparison of observed and predicted female, all maturity, all shell total catch size comps for SCF. Page 2 of 2.

GTF: male, all maturity, all shell 1970 1975 1980 0.09 -0.06 -0.03 -0.00 -1971 1976 1981 0.09 -0.06 -0.03 -0.00 1972 1977 1982 total catch size comps predicted 0.09 -- AG1 AG1c 0.06 -0.03 observed 0.00 AG1 1978 1973 1983 0.09 -0.06 -0.03 -0.00 1974 1979 1984 0.09 -0.06 -0.03 -0.00 50 100 50 50 100 150 150 100 150 size (mm CW)

Figure 155. Comparison of observed and predicted male, all maturity, all shell total catch size comps for GTF. Page 1 of 4.

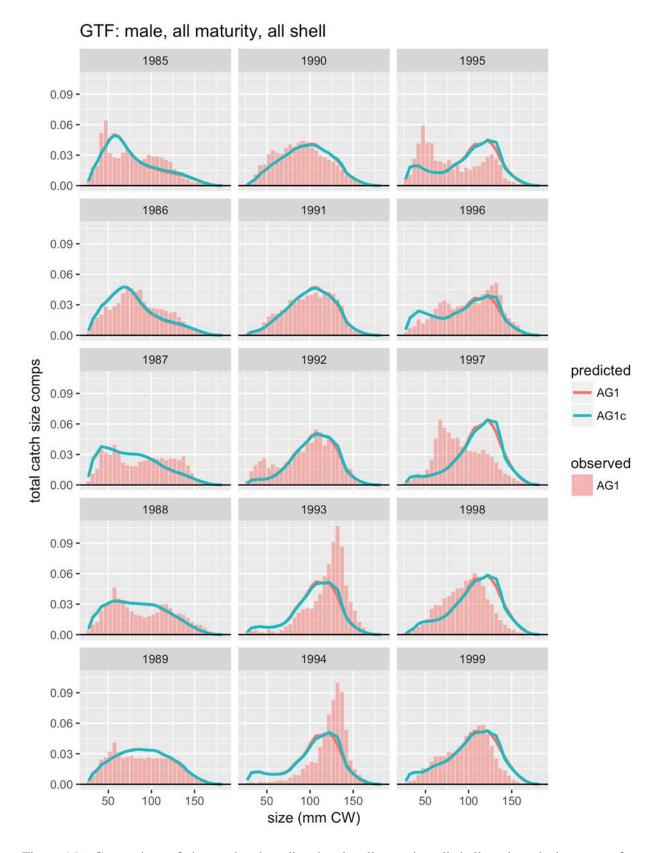


Figure 156. Comparison of observed and predicted male, all maturity, all shell total catch size comps for GTF. Page 2 of 4.

GTF: male, all maturity, all shell 2000 2005 2010 0.09 -0.06 -0.03 -0.00 2001 2006 2011 0.09 -0.06 -0.03 -0.00 2002 2007 2012 total catch size comps predicted 0.09 -- AG1 AG1c 0.06 -0.03 observed 0.00 AG1 2003 2008 2013 0.09 -0.06 -0.03 -0.00 2009 2004 2014 0.09 -0.06 -0.03 -0.00 50 100 50 100 50 100 150 150 150 size (mm CW)

Figure 157. Comparison of observed and predicted male, all maturity, all shell total catch size comps for GTF. Page 3 of 4.

GTF: male, all maturity, all shell 2015 2020 2025 0.09 -0.06 -0.03 -0.00 2016 2021 2026 0.09 -0.06 -0.03 -0.00 2017 2022 2027 total catch size comps predicted 0.09 -- AG1 AG1c 0.06 -0.03 observed 0.00 AG1 2018 2023 2028 0.09 -0.06 -0.03 -0.00 -2024 2019 2029 0.09 -0.06 -0.03 -0.00 50 50 50 100 150 100 100 150 150 size (mm CW)

Figure 158. Comparison of observed and predicted male, all maturity, all shell total catch size comps for GTF. Page 4 of 4.

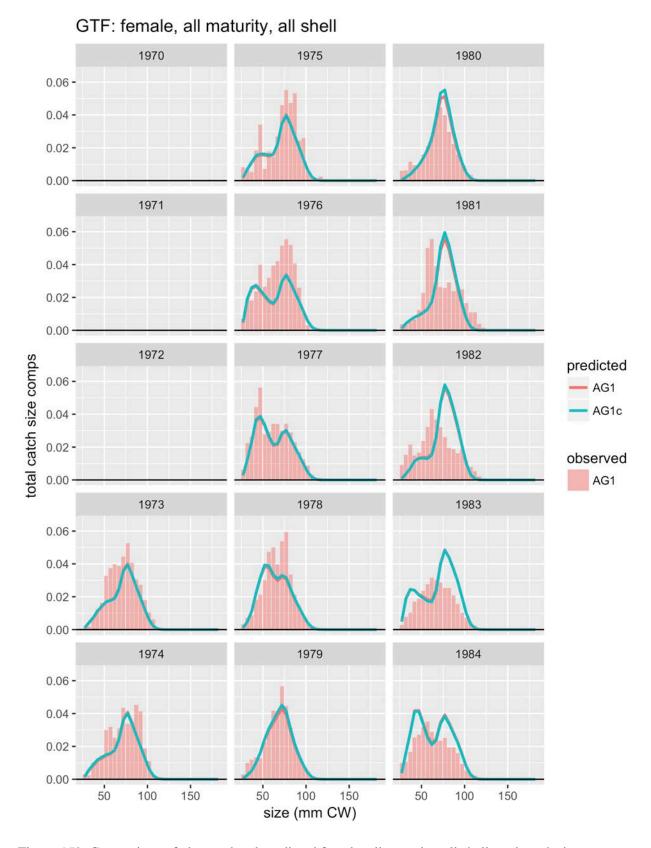


Figure 159. Comparison of observed and predicted female, all maturity, all shell total catch size comps for GTF. Page 1 of 4.

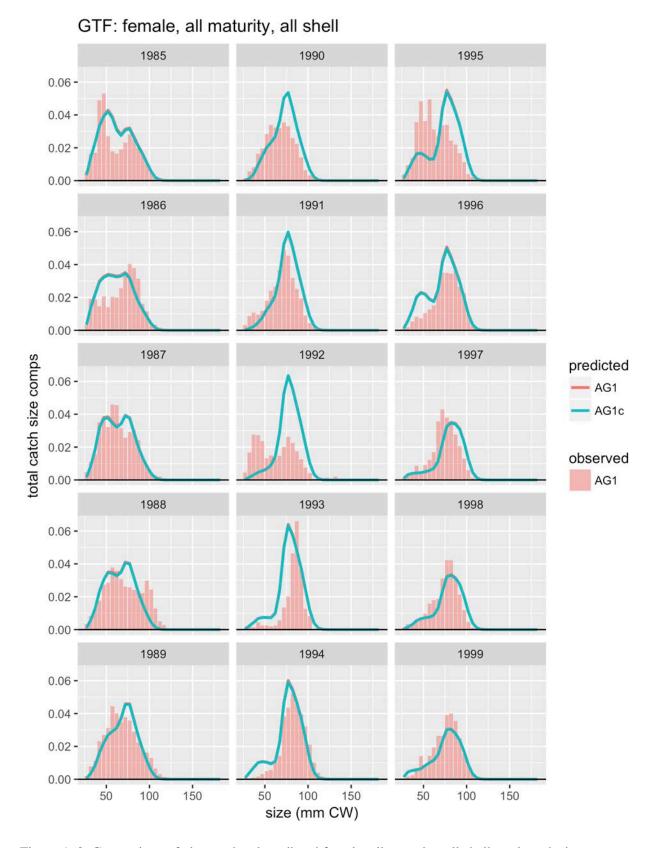


Figure 160. Comparison of observed and predicted female, all maturity, all shell total catch size comps for GTF. Page 2 of 4.

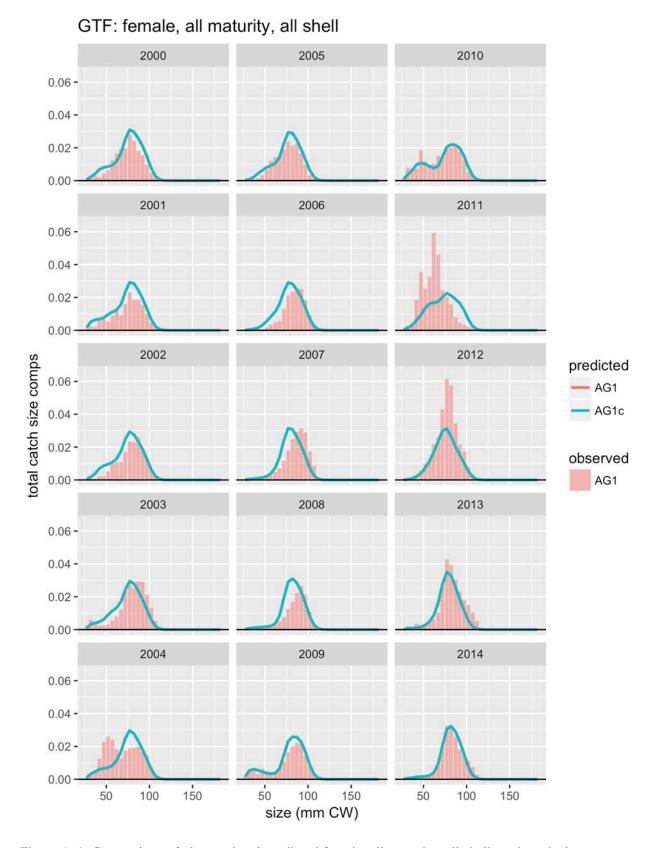


Figure 161. Comparison of observed and predicted female, all maturity, all shell total catch size comps for GTF. Page 3 of 4.

GTF: female, all maturity, all shell 2015 2020 2025 0.06 -0.04 -0.02 -0.00 -2016 2021 2026 0.06 -0.04 -0.02 -0.00 2017 2022 2027 total catch size comps predicted 0.06 -- AG1 0.04 -AG1c 0.02 observed 0.00 AG1 2023 2018 2028 0.06 -0.04 -0.02 -0.00 -2024 2019 2029 0.06 -0.04 -0.02 -0.00 50 50 50 100 150 100 100 150 150 size (mm CW)

Figure 162. Comparison of observed and predicted female, all maturity, all shell total catch size comps for GTF. Page 4 of 4.

RKF: male, all maturity, all shell 1990 1995 2000 0.15 -0.10 -0.05 -0.00 -1991 1996 2001 0.15 -0.10 -0.05 -0.00 2002 1992 1997 total catch size comps predicted - AG1 0.15 -AG1c 0.10 -0.05 observed 0.00 AG1 1993 1998 2003 0.15 -0.10 -0.05 -0.00 1994 1999 2004 0.15 -0.10 -0.05 -0.00 50 100 150 50 100 50 100 150 150 size (mm CW)

Figure 163. Comparison of observed and predicted male, all maturity, all shell total catch size comps for RKF. Page 1 of 2.

RKF: male, all maturity, all shell 2005 2010 2015 0.15 -0.10 -0.05 -0.00 -2011 2006 2016 0.15 -0.10 -0.05 -0.00 2007 2012 2017 total catch size comps predicted - AG1 0.15 -AG1c 0.10 -0.05 observed 0.00 AG1 2013 2008 2018 0.15 -0.10 -0.05 -0.00 -2009 2014 2019 0.15 -0.10 -0.05 -0.00 50 50 100 150 50 100 100 150 150 size (mm CW)

Figure 164. Comparison of observed and predicted male, all maturity, all shell total catch size comps for RKF. Page 2 of 2.

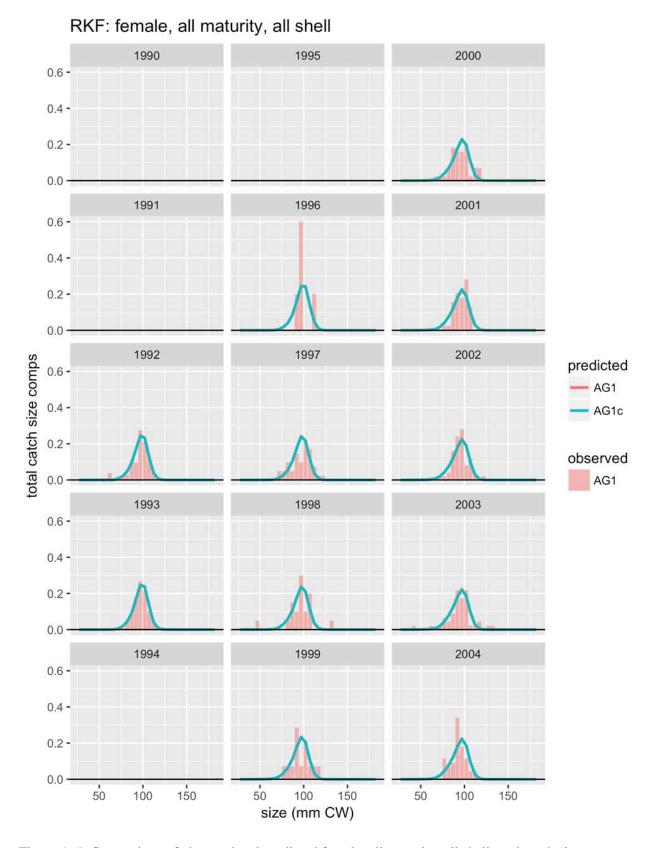


Figure 165. Comparison of observed and predicted female, all maturity, all shell total catch size comps for RKF. Page 1 of 2.

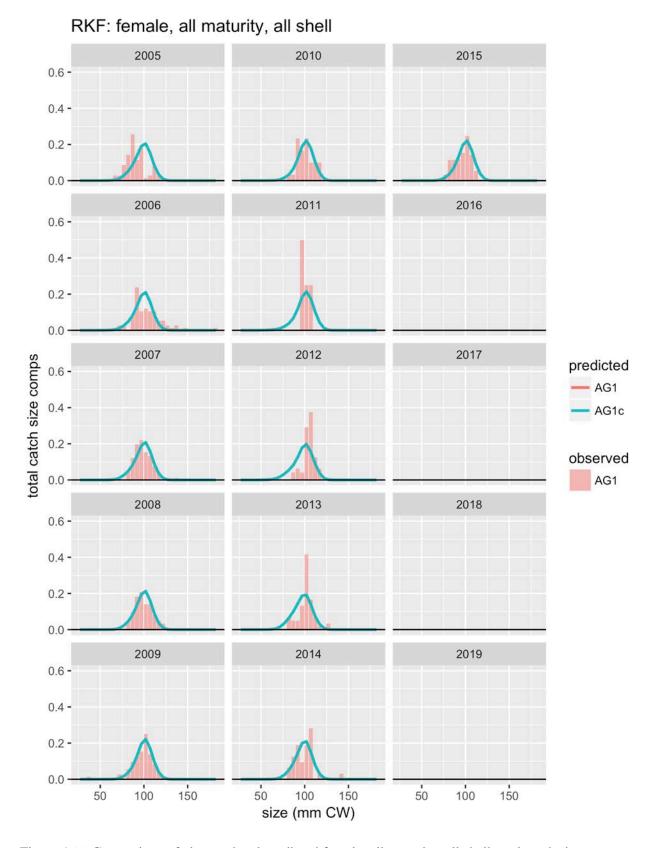


Figure 166. Comparison of observed and predicted female, all maturity, all shell total catch size comps for RKF. Page 2 of 2.

Retained fishery catch biomass

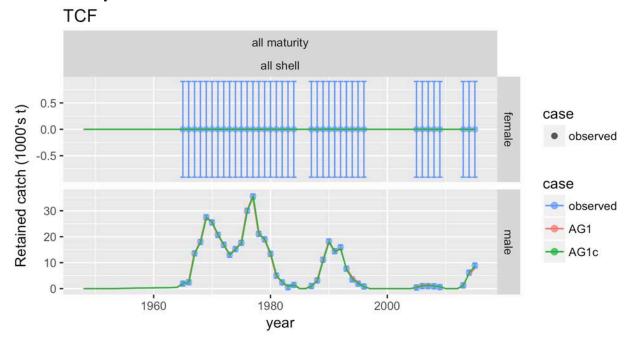


Figure 167. Comparison of observed and predicted retained catch mortality for TCF.

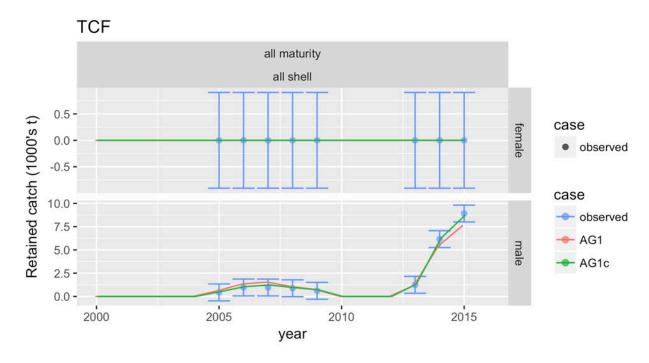


Figure 168. Comparison of observed and predicted retained catch mortality for TCF. Recent time period.

Mean retained fishery size compositions

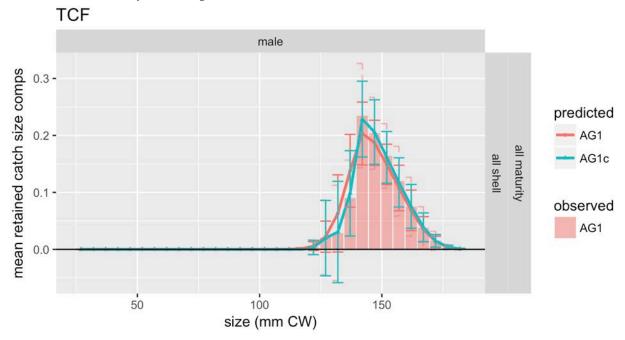


Figure 169. Comparison of observed and predicted &&xms mean retained catch size comps for TCF.

Retained fishery size compositions

TCF: male, all maturity, all shell

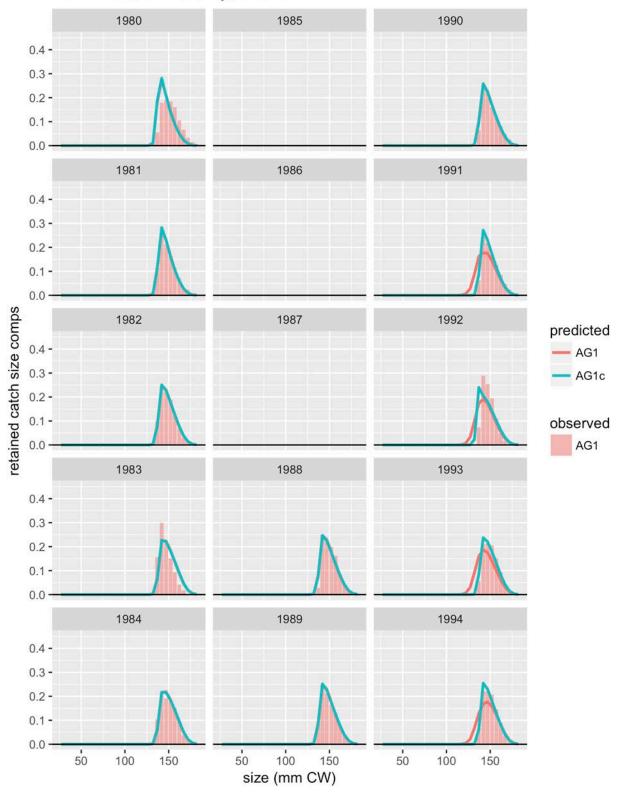


Figure 170. Comparison of observed and predicted male, all maturity, all shell retained catch size comps for TCF. Page 1 of 3.

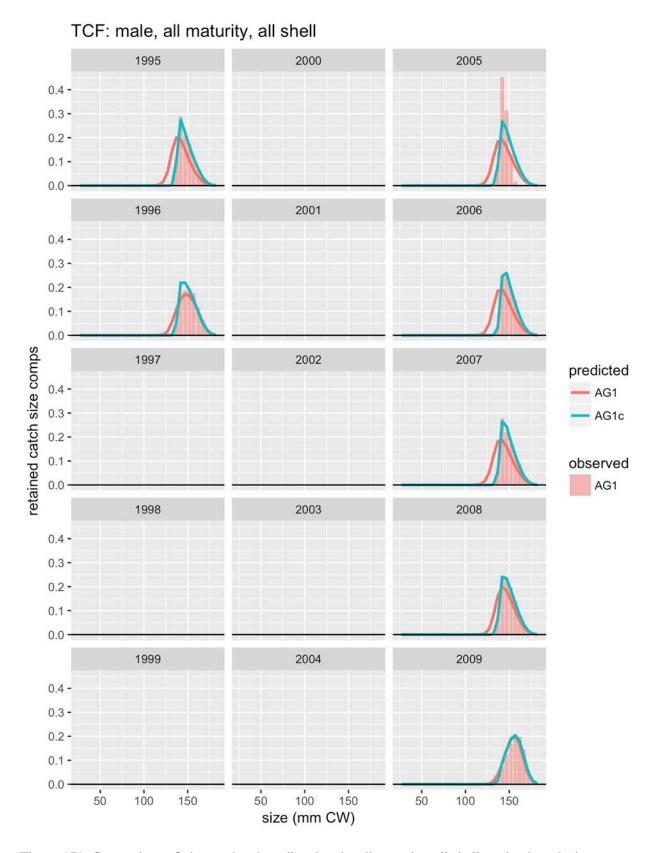


Figure 171. Comparison of observed and predicted male, all maturity, all shell retained catch size comps for TCF. Page 2 of 3.

TCF: male, all maturity, all shell 2010 2015 2020 0.4 -0.3 -0.2 -0.1 -0.0 -2011 2016 2021 0.4 -0.3 -0.2 -0.1 -0.0 retained catch size comps 2012 2017 2022 predicted 0.4 -- AG1 0.3 -AG1c 0.2 -0.1 observed 0.0 AG1 2023 2013 2018 0.4 -0.3 -0.2 -0.1 -0.0 -2014 2019 2024 0.4 -0.3 -0.2 -0.1 -0.0 50 50 50 100 150 100 150 100 150 size (mm CW)

Figure 172. Comparison of observed and predicted male, all maturity, all shell retained catch size comps for TCF. Page 3 of 3.