Appendix J1:

Model Comparisons for TCAM02 Models AG3, AG3a, AG3b, and AG4

William Stockhausen

Population processes

Natural mortality

Natural Mortality

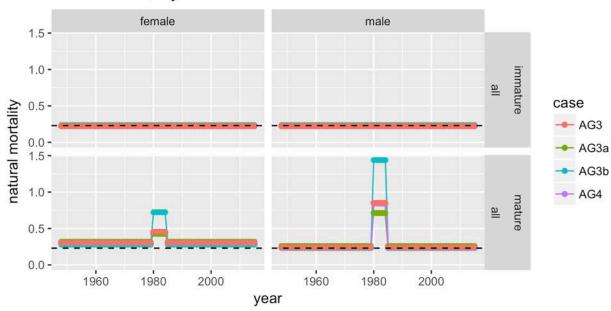


Figure 1. Estimated natural mortality rates, by year.

Probability of terminal molt

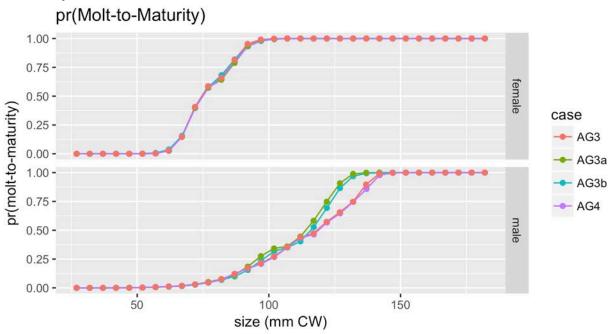


Figure 2. Probability of terminal molt.

Mean growth

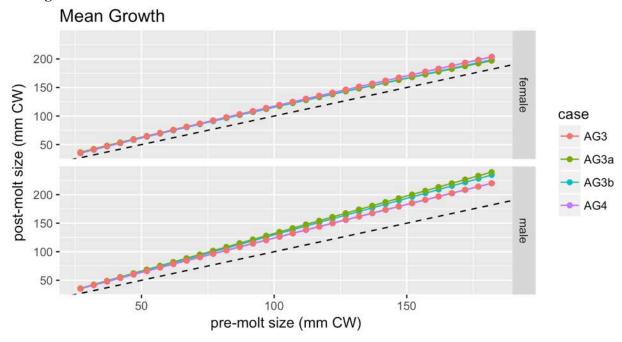


Figure 3. Mean growth.

Growth matrices

male growth: 1948-2015

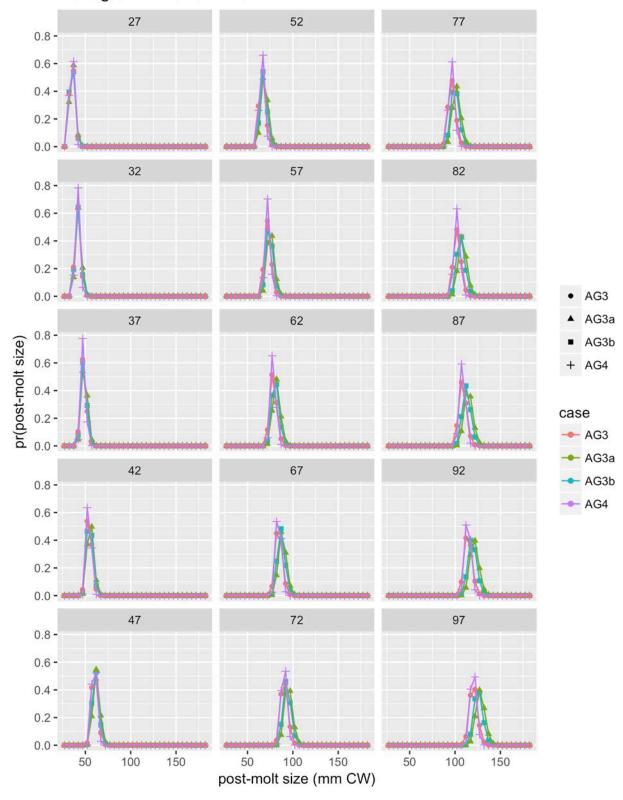


Figure 4. Growth matrices for males during 1948-2015, page 1.

male growth: 1948-2015 102 152 127 1.00 -0.75 -0.50 -0.25 -0.00 - 4 157 107 132 1.00 -0.75 -0.50 -0.25 -0.00 -AG3 112 162 AG3a 137 1.00 pr(post-molt size) AG3b 0.75 -+ AG4 0.50 case 0.25 -AG3 0.00 -AG3a 142 167 117 - AG3b 1.00 -- AG4 0.75 -0.50 -0.25 -0.00 -147 172 122 1.00 -0.75 -0.50 -0.25 -

50

100

150

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

150

50

100

post-molt size (mm CW)

150

0.00 -

50

100

male growth: 1948-2015

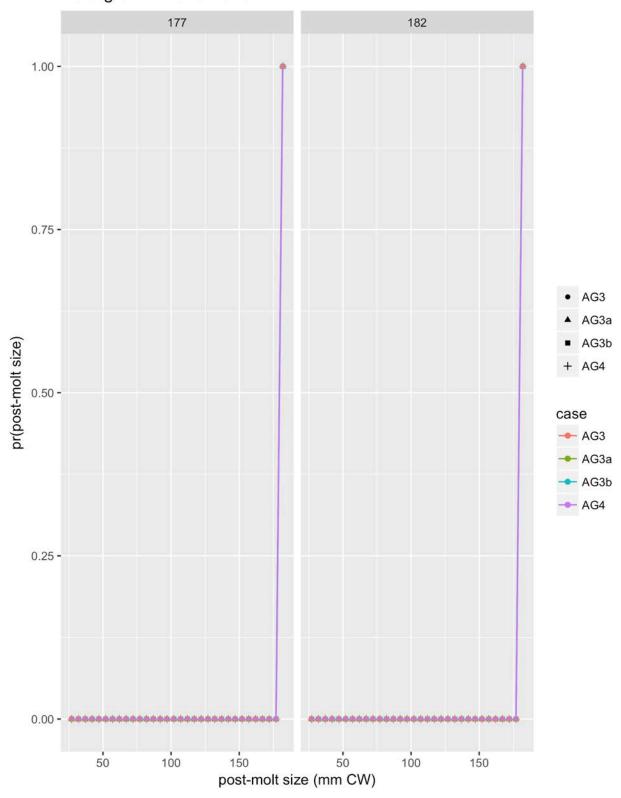


Figure 6. Growth matrices for males during 1948-2015, page 3.

female growth: 1948-2015 27 52 77 0.8 -0.6 -0.4 -0.2 -0.0 -32 57 82 0.8 -0.6 -0.4 -0.2 -0.0 -AG3 ▲ AG3a 37 62 87 0.8 - 0.6 - 0.4 - 0.2 - 0.0 - AG3b + AG4 case - AG3 AG3a 42 67 92 - AG3b 0.8 -- AG4 0.6 -0.4 -0.2 -0.0 47 72 97 0.8 -0.6 -0.4 -0.2 -0.0 -100 50 150 50 50 100 150 100 150 post-molt size (mm CW)

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

female growth: 1948-2015 102 152 127 1.00 -0.75 -0.50 -0.25 -0.00 - 4 107 132 157 1.00 -0.75 -0.50 -0.25 -0.00 -AG3 112 162 AG3a 137 1.00 pr(post-molt size) AG3b 0.75 -+ AG4 0.50 case 0.25 -AG3 0.00 -AG3a 117 142 167 - AG3b 1.00 -- AG4 0.75 -0.50 -0.25 -0.00 -147 172 122 1.00 -0.75 -0.50 -0.25 -0.00 -50 100 50 100 150 150 50 100 150

post-molt size (mm CW)

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

female growth: 1948-2015

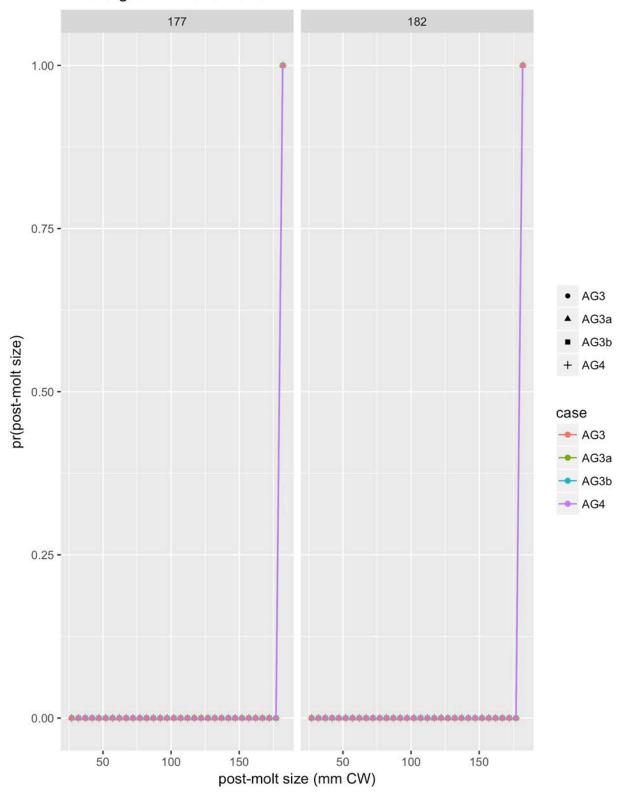


Figure 9. Growth matrices for females during 1948-2015, page 3.

Size distribution for recruits

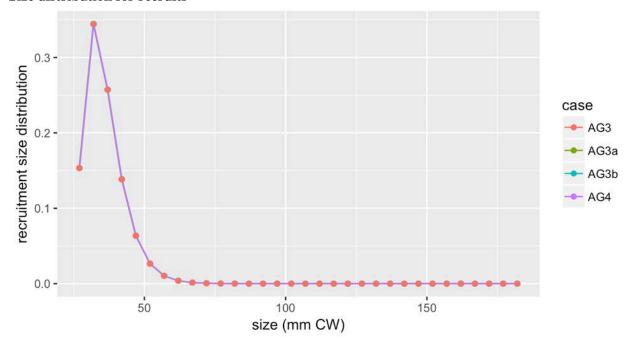


Figure 10. Size distribution for recruits.

Population results

Recruitment

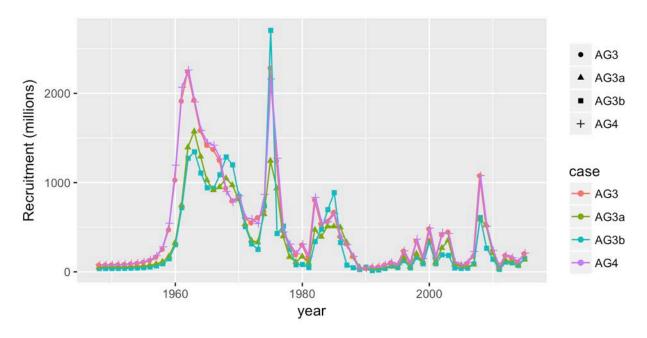


Figure 11. Estimated annual recruitment.

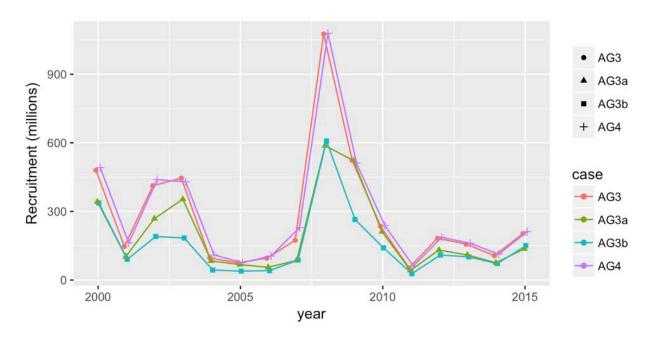


Figure 12. Estimated recent recruitment.

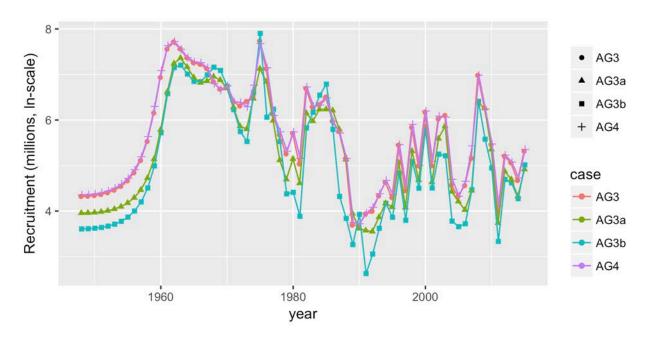


Figure 13. Estimated annual recruitment, on ln-scale.

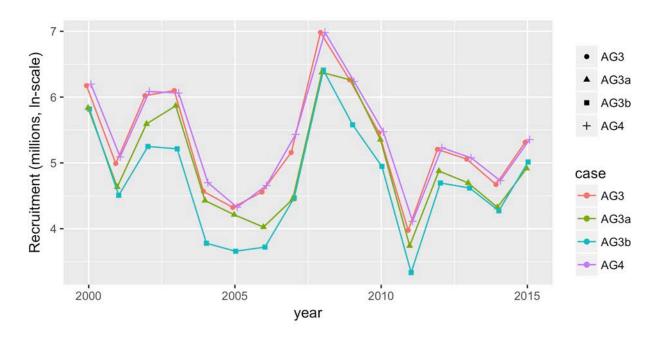


Figure 14. Estimated recent recruitment, on ln-scale.

Mature biomass

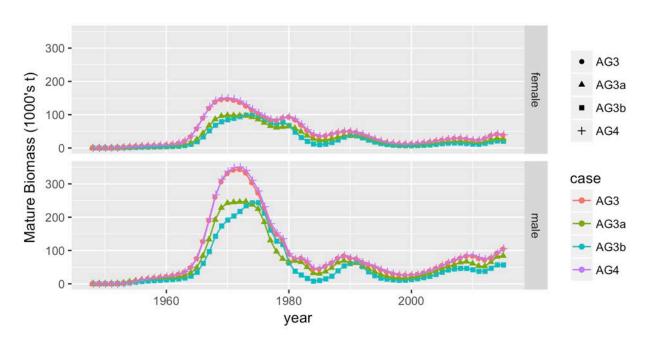


Figure 15. Estimated annual mature biomass.

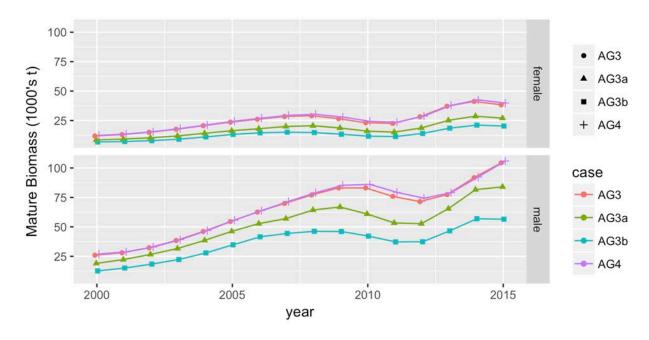


Figure 16. Estimated recent mature biomass.

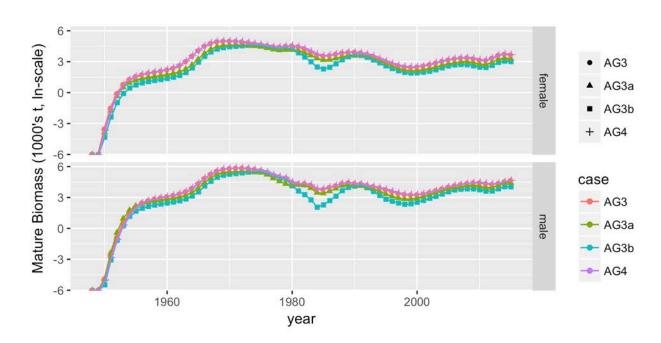


Figure 17. Estimated annual mature biomass, on ln-scale.

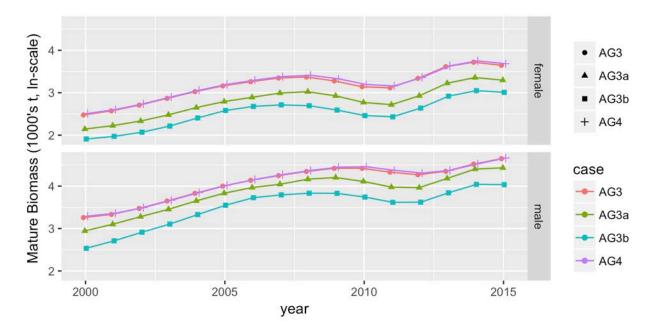


Figure 18. Estimated recent mature biomass, on ln-scale.

Population abundance

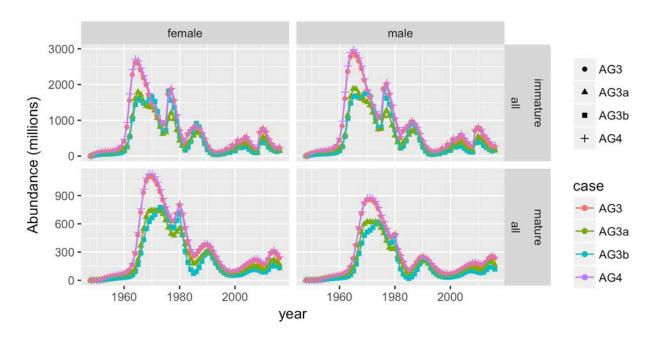


Figure 19. Population abundance trends.

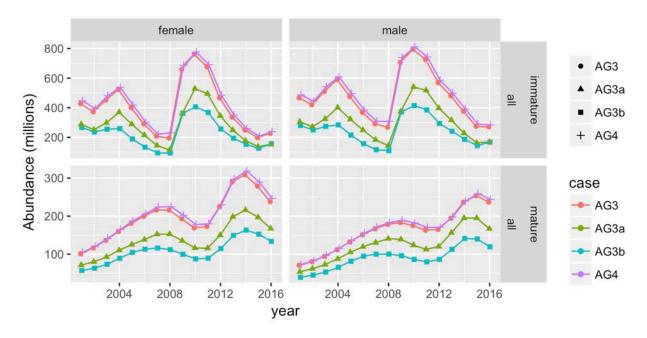


Figure 20. Recent population abundance trends.

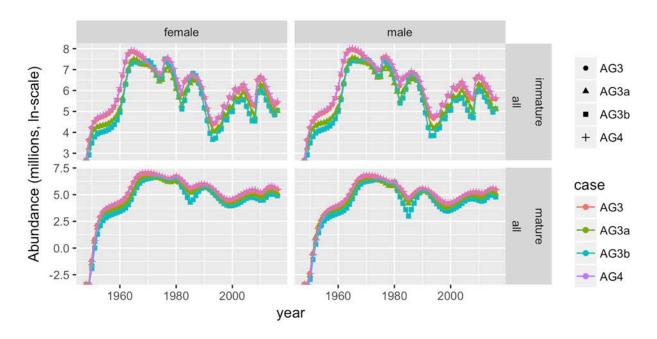


Figure 21. Ln-scale population abundance trends.

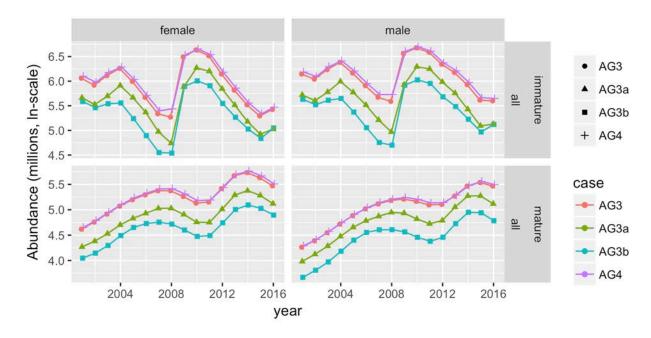


Figure 22. Recent ln-scale population abundance trends.

Biomass

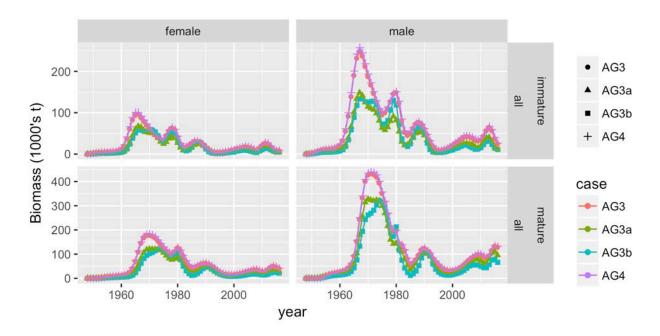


Figure 23. Population biomass trends.

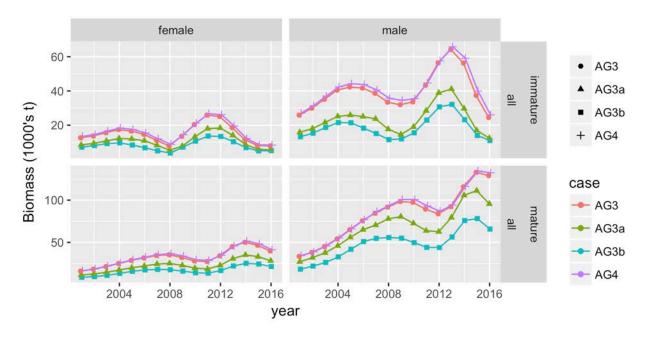


Figure 24. Recent population biomass trends.

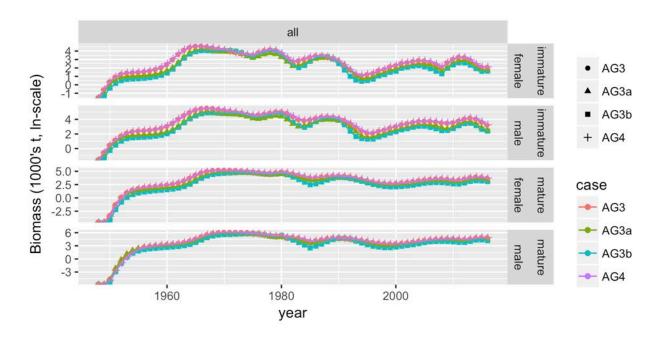


Figure 25. Ln-scale population biomass trends.

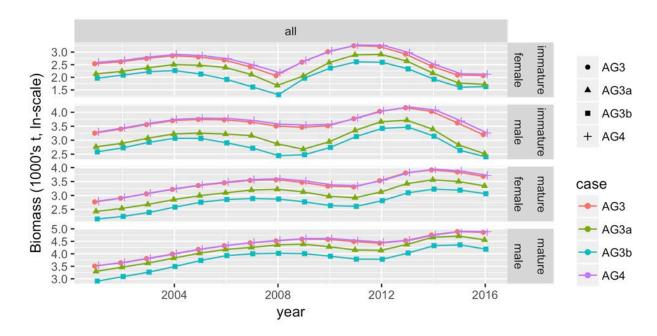


Figure 26. Recent ln-scale population biomass trends.

Surveys

Survey catchability

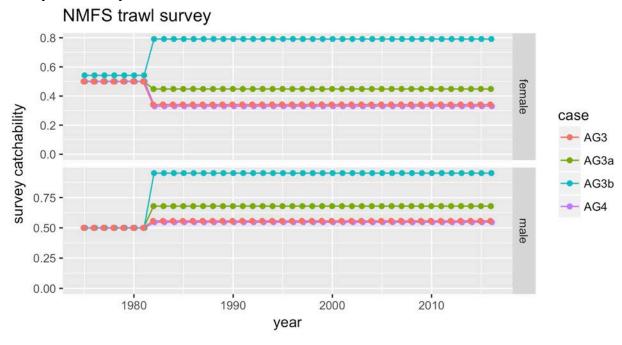
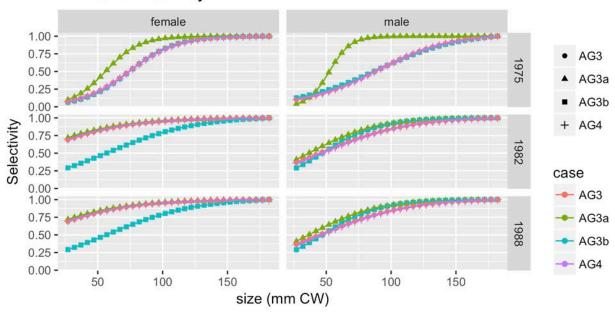


Figure 27. Survey catchabilities for NMFS trawl survey.

Survey selectivity functions

NMFS trawl survey



NMFS trawl survey.1

Survey abundance

NMFS trawl survey

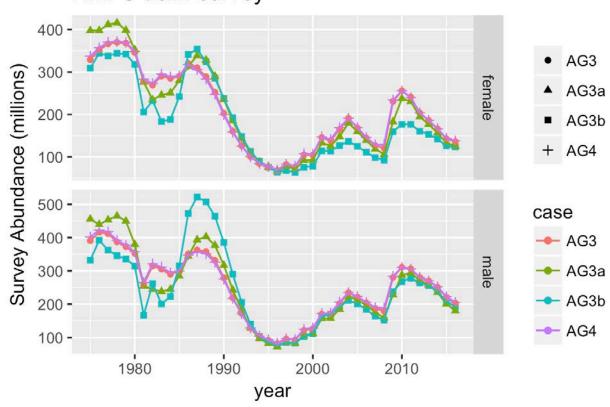


Figure 29. NMFS trawl survey catch abundance.

Survey biomass

NMFS trawl survey 50 -AG3 40 -Survey Biomass (1000's t) female AG3a 30 -■ AG3b 20 -+ AG4 10 case 150 - AG3 100 -- AG3a - AG3b 50 -- AG4 2010 2000 1990 1980 year

Figure 30. NMFS trawl survey catch biomass.

Survey size compositions

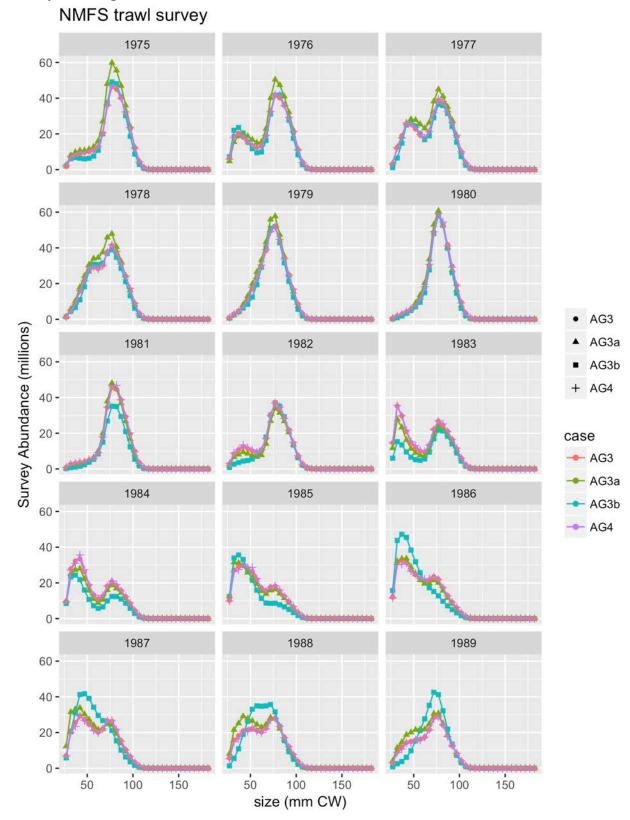


Figure 31. NMFS trawl survey catch abundance for female all all, (1 of 3).

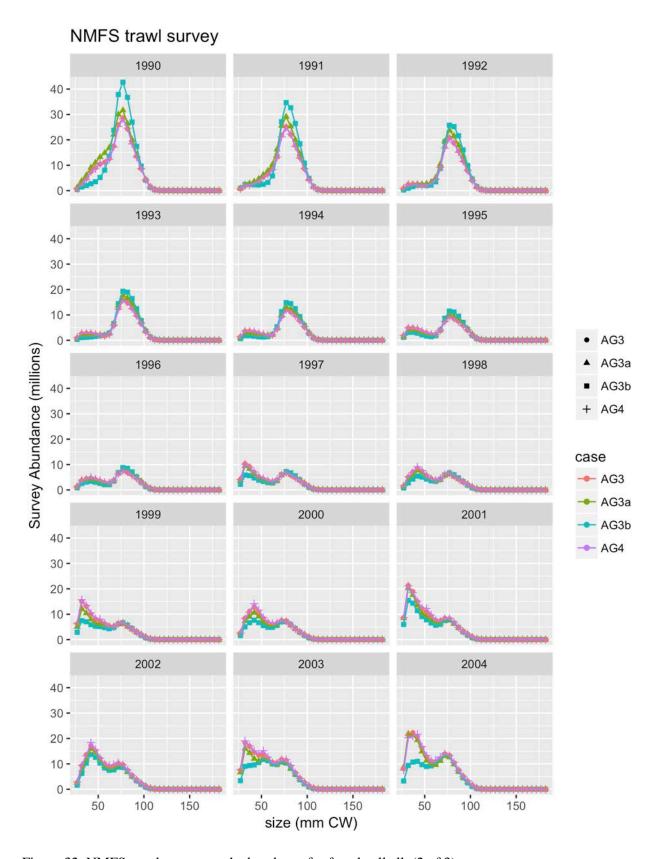


Figure 32. NMFS trawl survey catch abundance for female all all, (2 of 3).

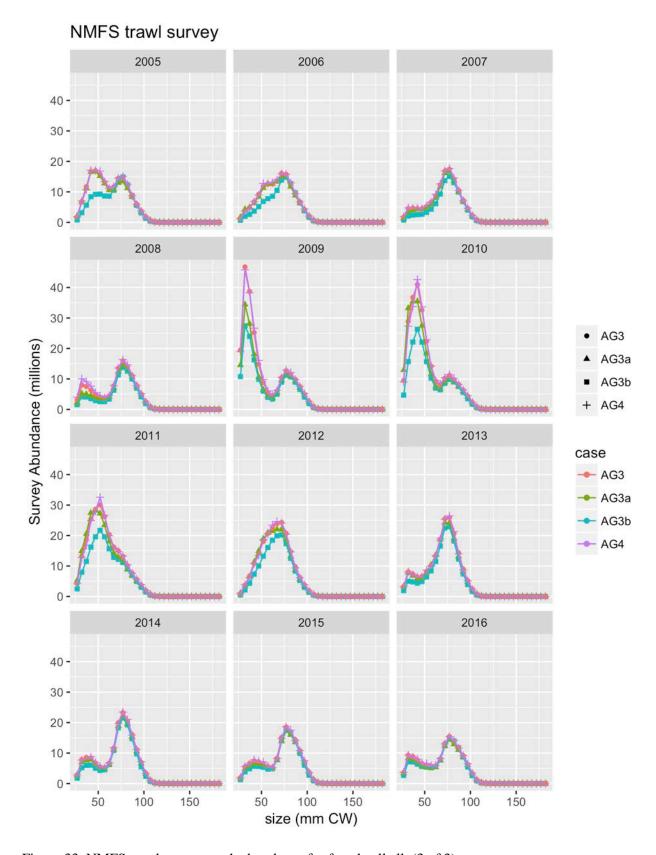


Figure 33. NMFS trawl survey catch abundance for female all all, (3 of 3).

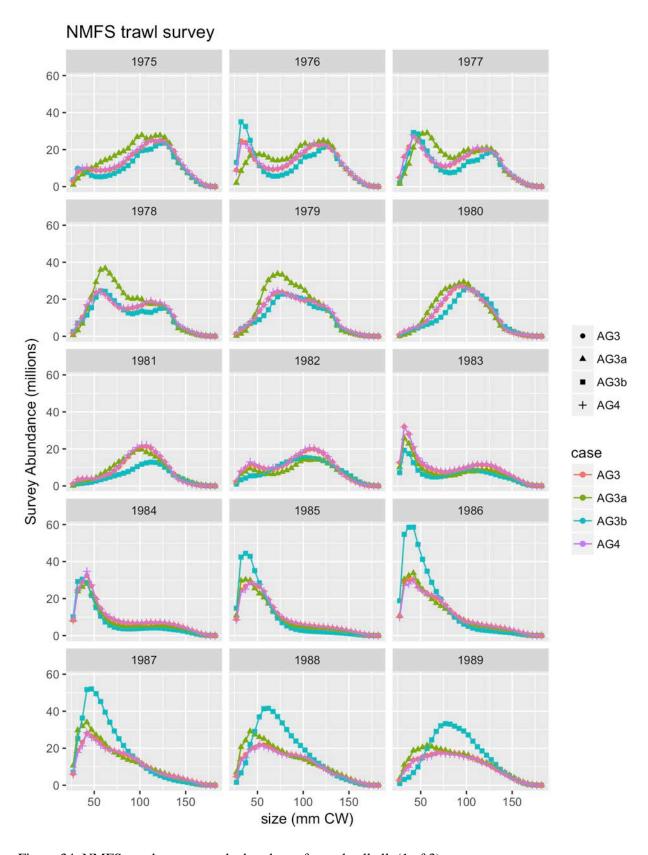


Figure 34. NMFS trawl survey catch abundance for male all all, (1 of 3).

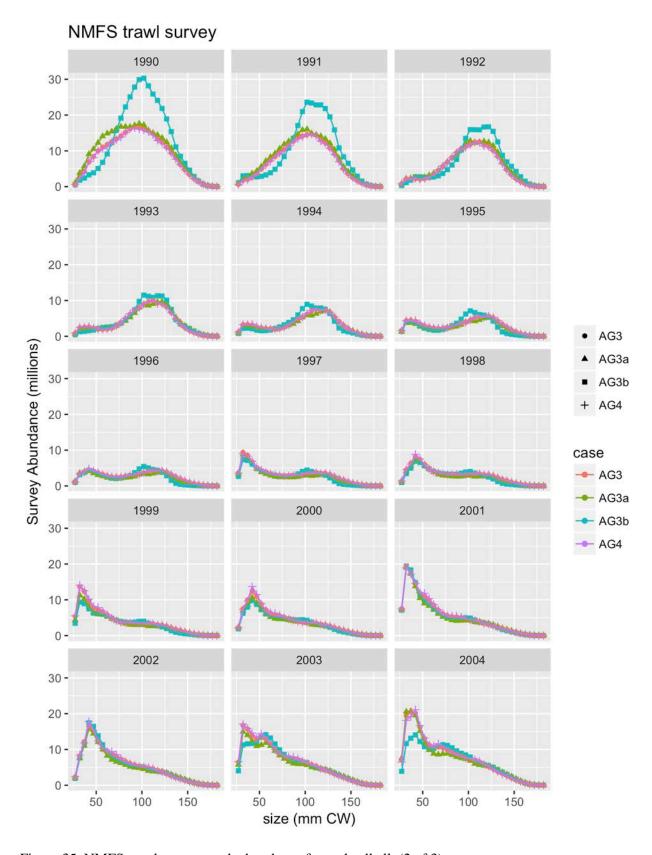


Figure 35. NMFS trawl survey catch abundance for male all all, (2 of 3).

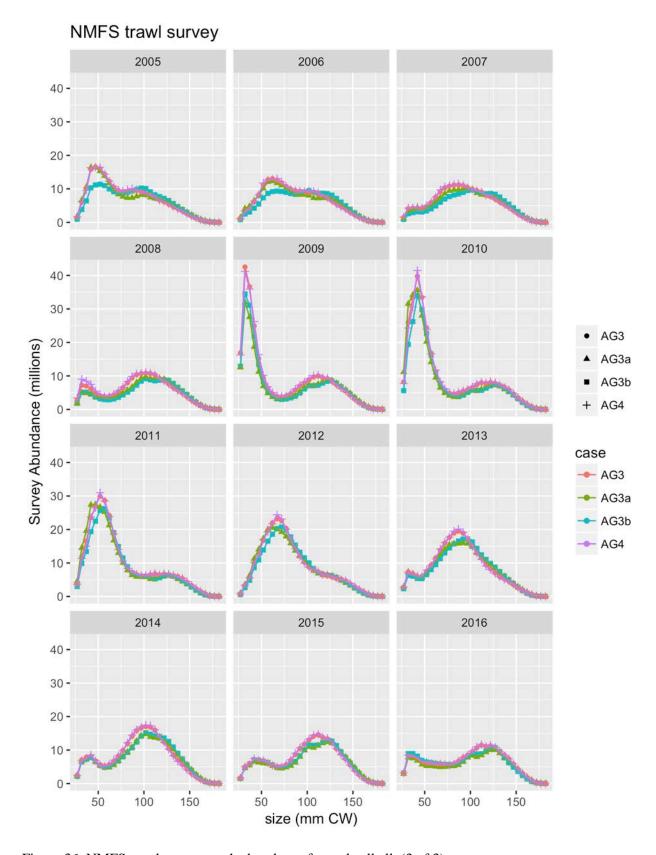


Figure 36. NMFS trawl survey catch abundance for male all all, (3 of 3).

Fisheries

Fishery catchability

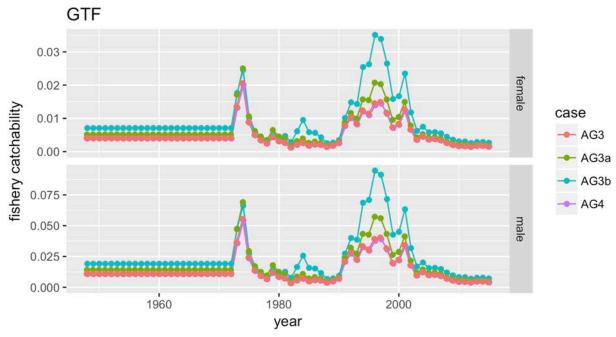


Figure 37. Fishery catchabilities for GTF.

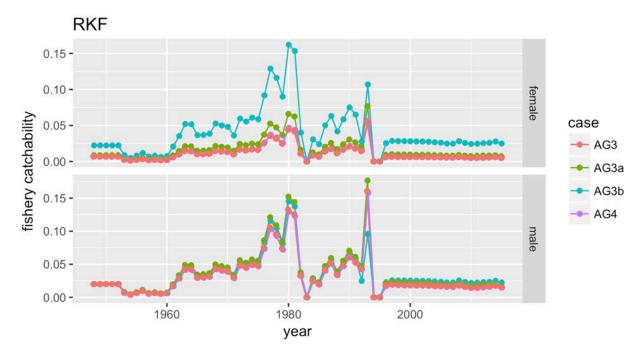


Figure 38. Fishery catchabilities for RKF.

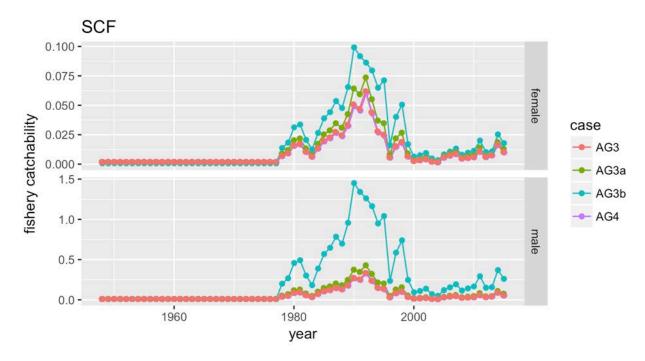


Figure 39. Fishery catchabilities for SCF.

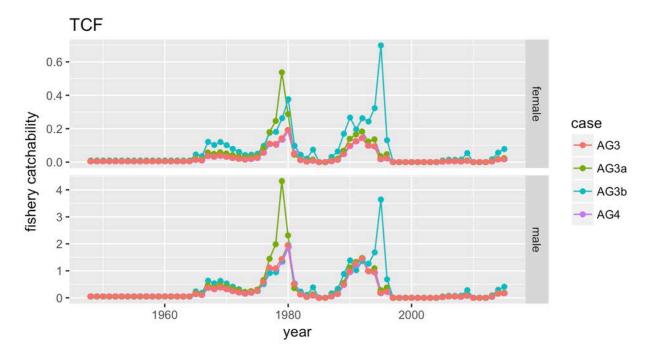


Figure 40. Fishery catchabilities for TCF.

Total selectivity functions

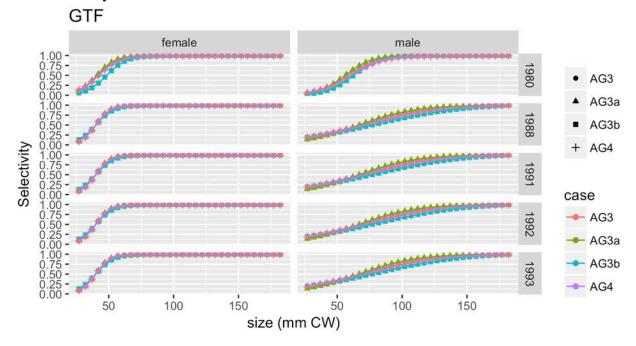


Figure 41. Selectivity functions for GTF(1 of 6).

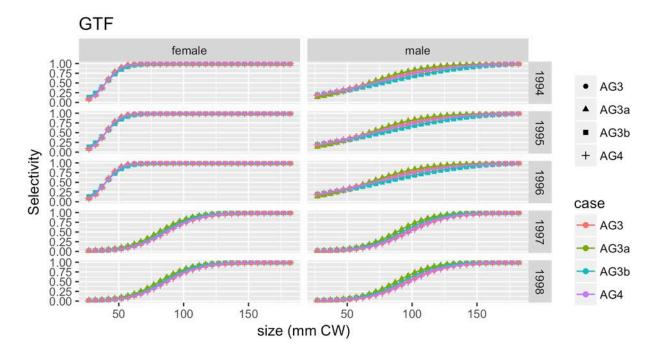


Figure 42. Selectivity functions for GTF(2 of 6).

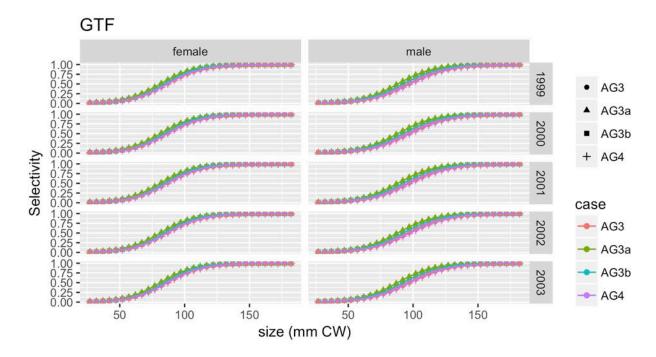


Figure 43. Selectivity functions for GTF(3 of 6).

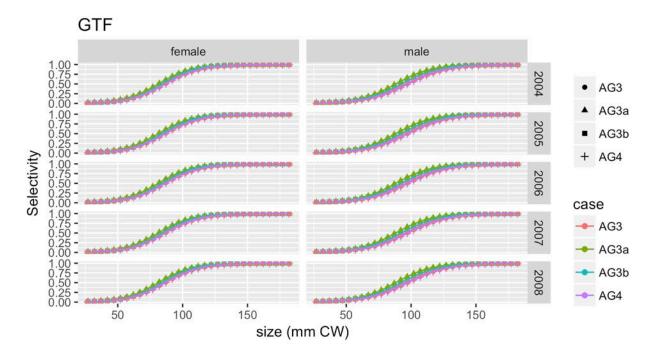


Figure 44. Selectivity functions for GTF(4 of 6).

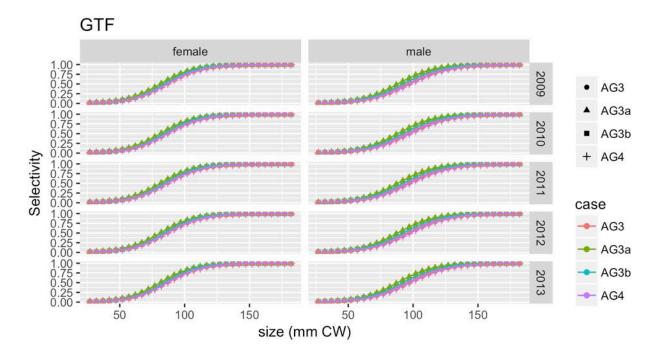


Figure 45. Selectivity functions for GTF(5 of 6).

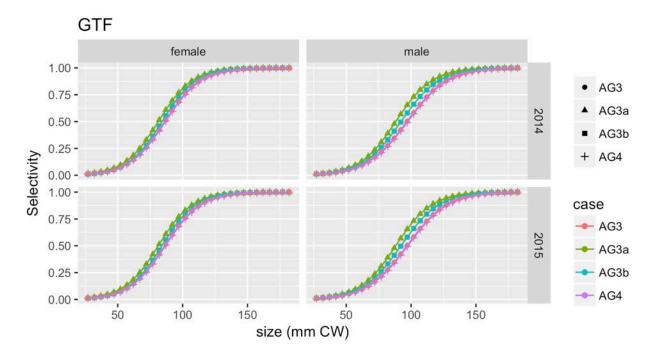


Figure 46. Selectivity functions for GTF(6 of 6).

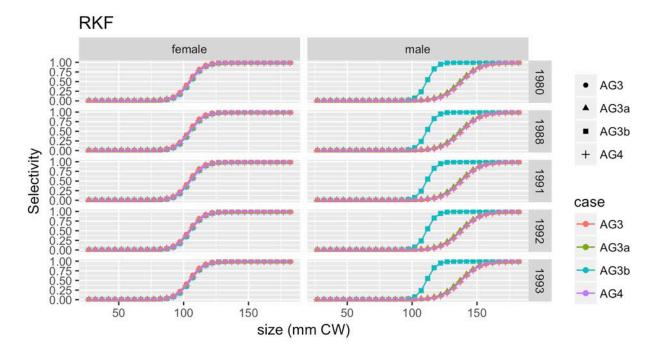


Figure 47. Selectivity functions for RKF(1 of 5).

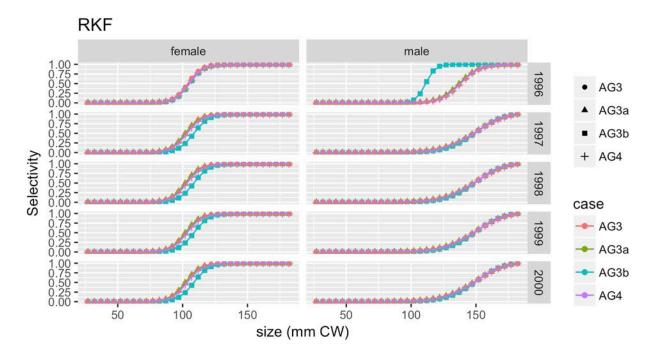


Figure 48. Selectivity functions for RKF(2 of 5).

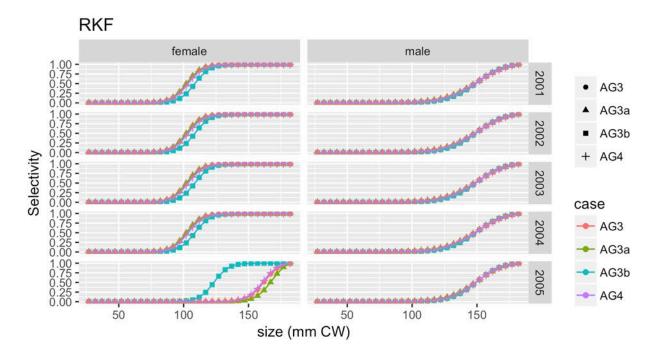


Figure 49. Selectivity functions for RKF(3 of 5).

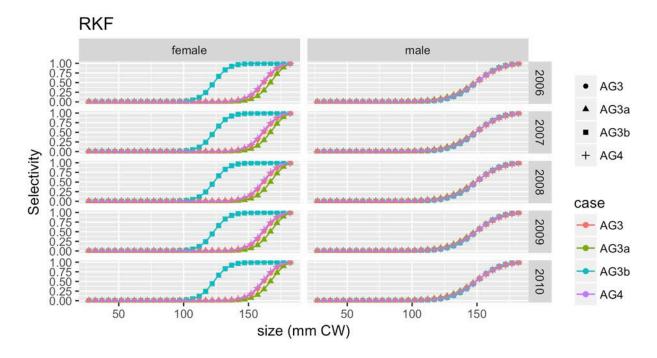


Figure 50. Selectivity functions for RKF(4 of 5).

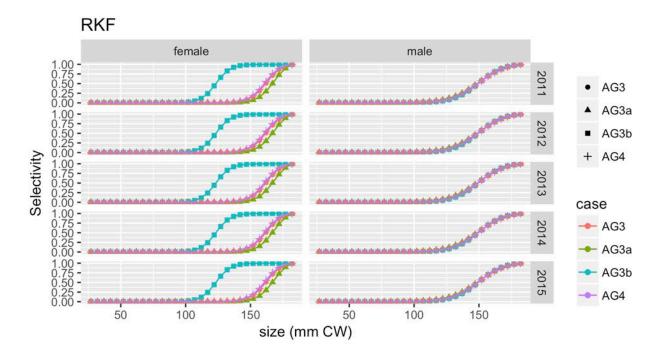


Figure 51. Selectivity functions for RKF(5 of 5).

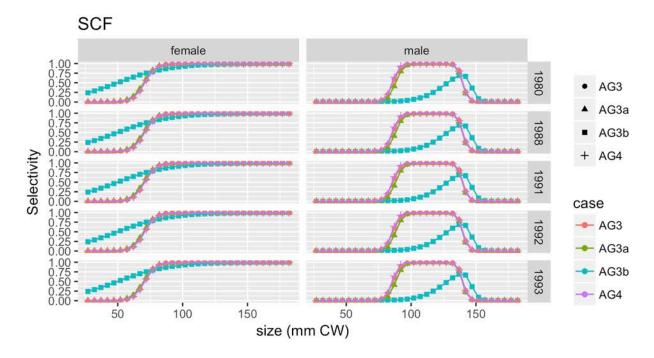


Figure 52. Selectivity functions for SCF(1 of 6).

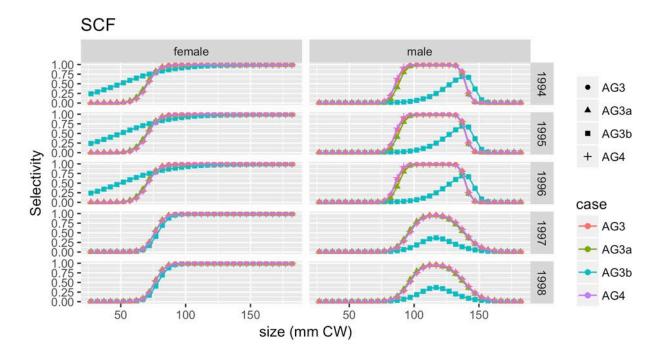


Figure 53. Selectivity functions for SCF(2 of 6).

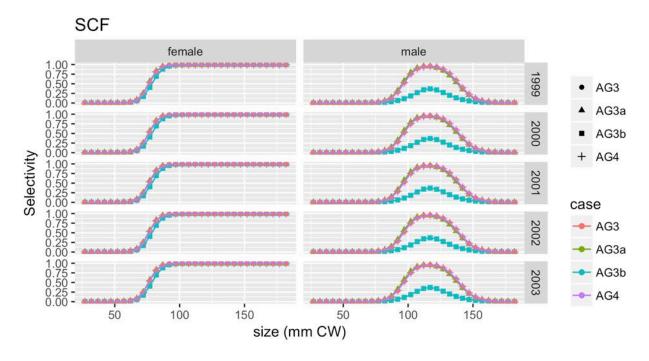


Figure 54. Selectivity functions for SCF(3 of 6).

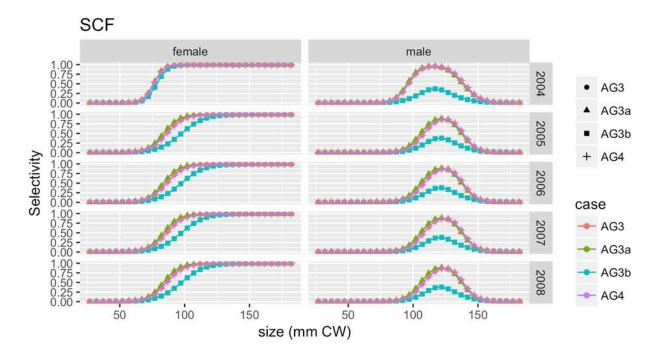


Figure 55. Selectivity functions for SCF(4 of 6).

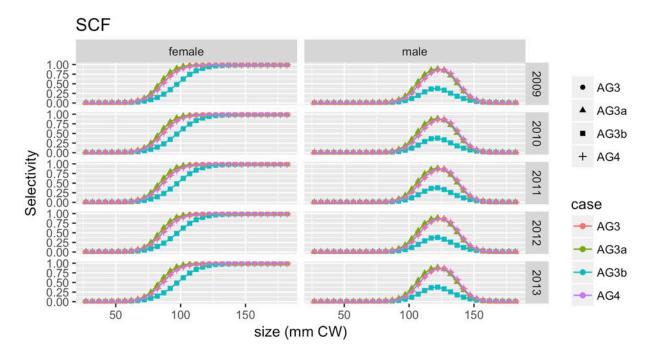


Figure 56. Selectivity functions for SCF(5 of 6).

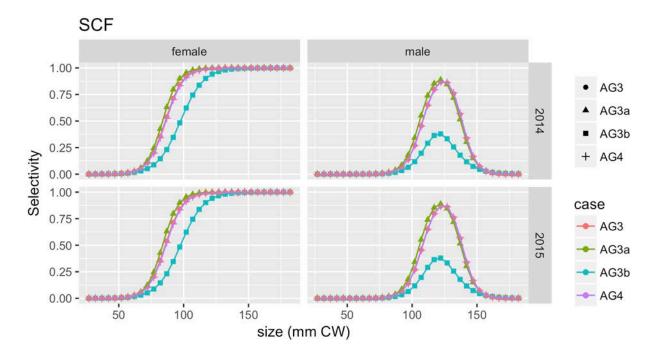


Figure 57. Selectivity functions for SCF(6 of 6).

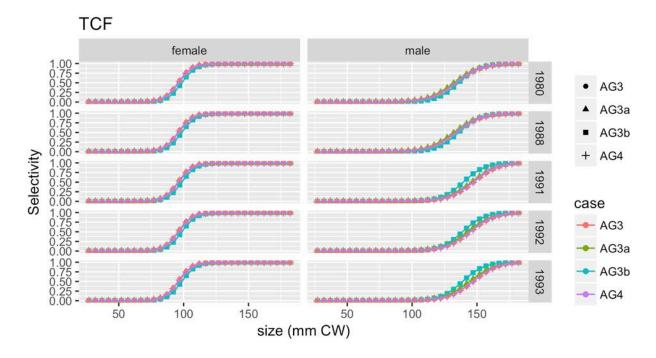


Figure 58. Selectivity functions for TCF(1 of 4).

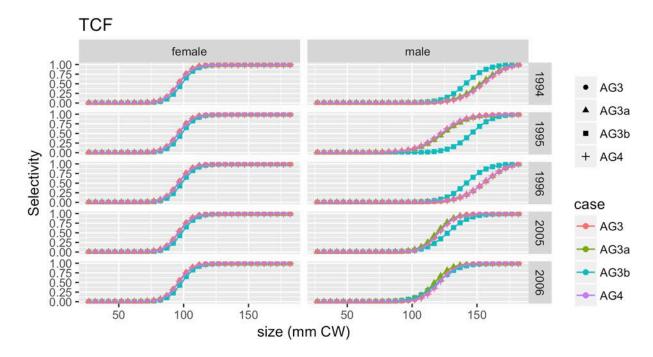


Figure 59. Selectivity functions for TCF(2 of 4).

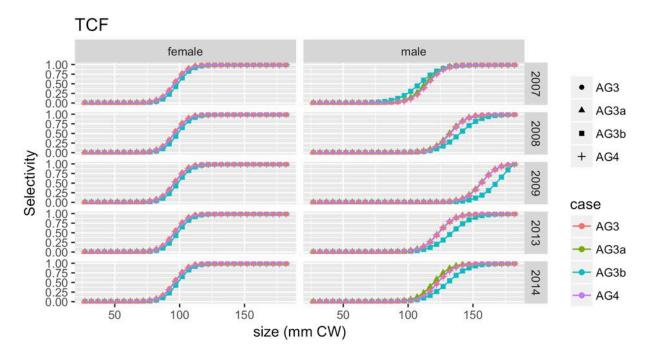


Figure 60. Selectivity functions for TCF(3 of 4).

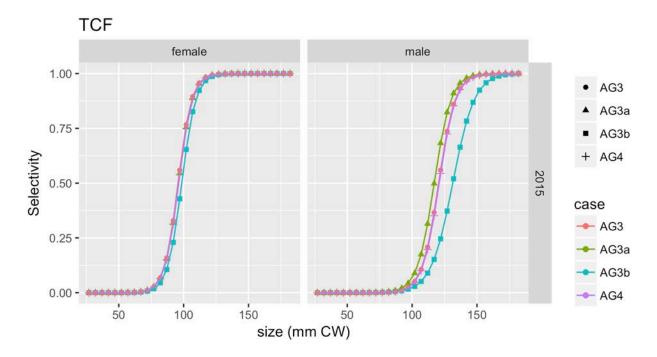


Figure 61. Selectivity functions for TCF(4 of 4).

Retention functions

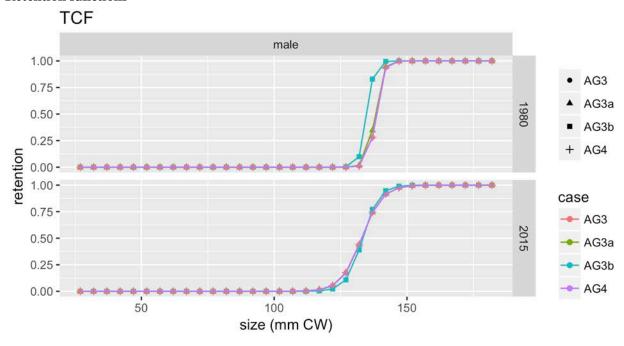


Figure 62. Retention functions for TCF(1 of 1).

Total catch abundance

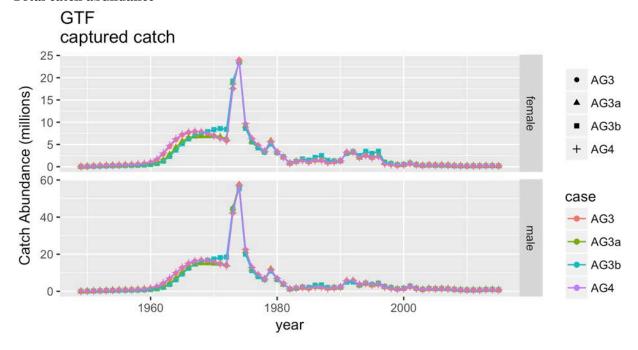


Figure 63. Predicted GTF captured catch abundance.

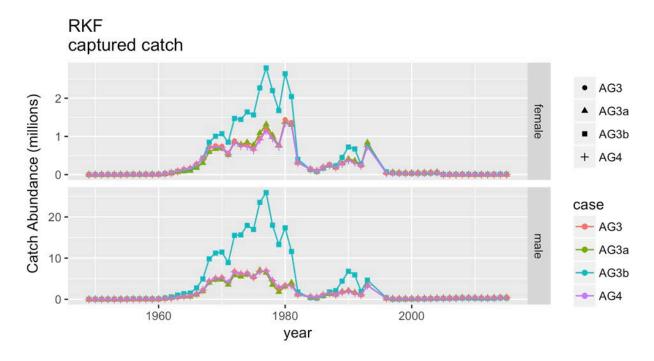


Figure 64. Predicted RKF captured catch abundance.

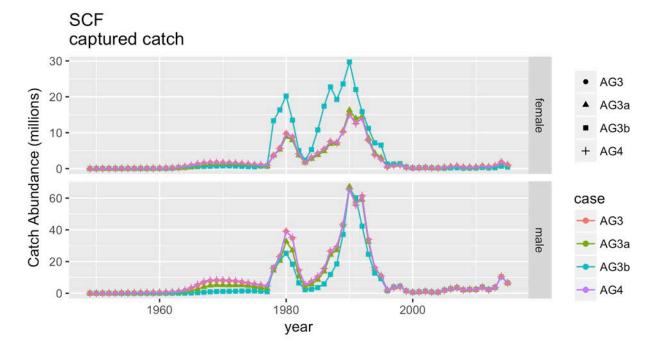


Figure 65. Predicted SCF captured catch abundance.

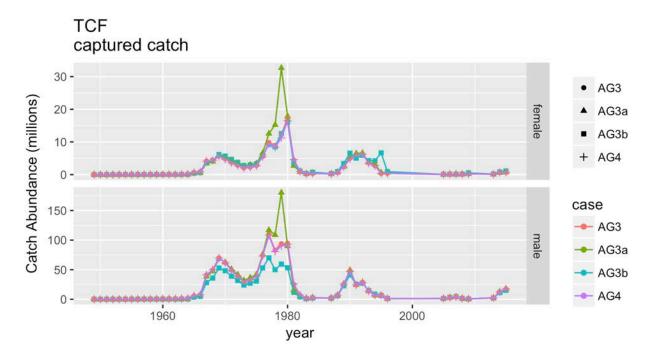


Figure 66. Predicted TCF captured catch abundance.

Total catch biomass

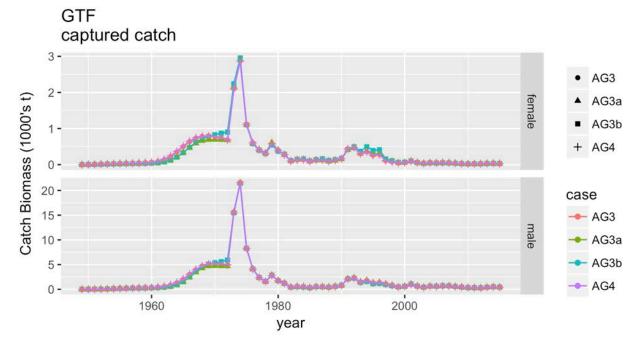


Figure 67. Predicted GTF captured catch biomass.

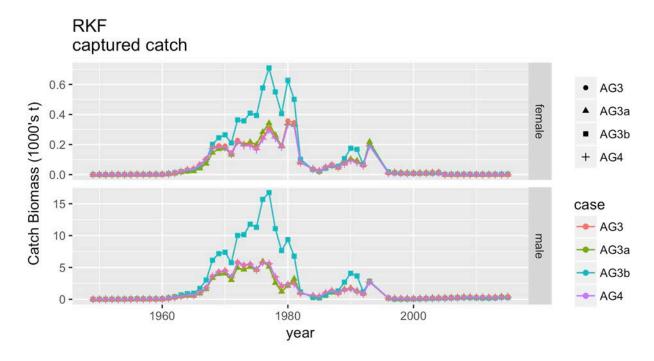


Figure 68. Predicted RKF captured catch biomass.

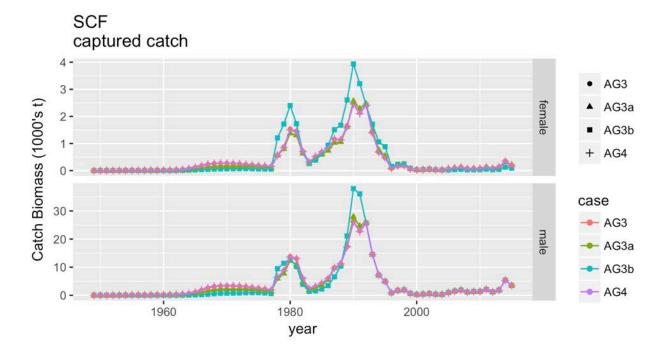


Figure 69. Predicted SCF captured catch biomass.

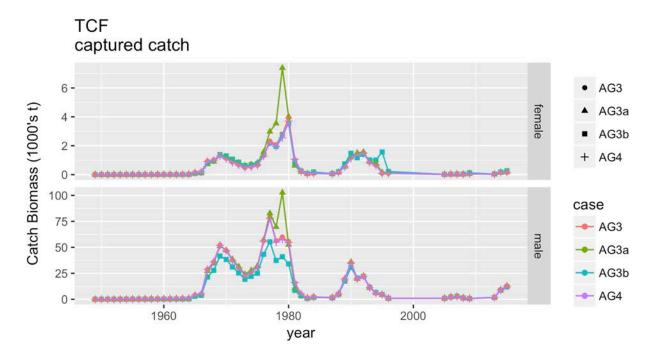


Figure 70. Predicted TCF captured catch biomass.

Retained catch abundance

TCF retained catch AG3 Catch Abundance (millions) 30 -AG3a AG3b + AG4 20 male case AG3 10 -► AG3a - AG3b 0 -- AG4 1960 2000 1980

year

Figure 71. Predicted TCF retained catch abundance.

Retained catch biomass

TCF retained catch AG3 30 -Catch Biomass (1000's t) AG3a AG3b + AG4 20 male case AG3 ► AG3a - AG3b - AG4 0 -2000 1960 1980 year

Figure 72. Predicted TCF retained catch biomass.

Total catch size compositions

GTF captured catch for female all all

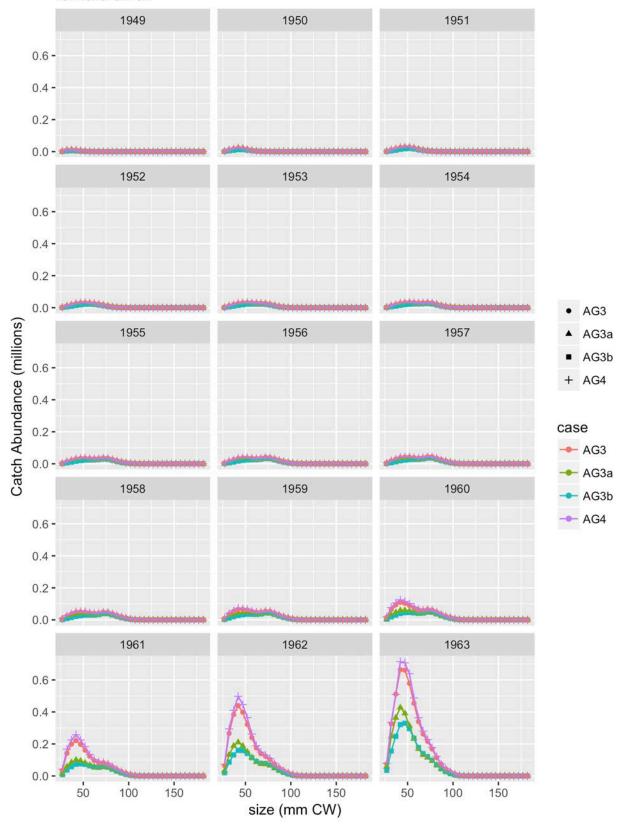


Figure 73. Predicted GTF captured catch abundance for female all all, (1 of 5).

GTF captured catch for female all all

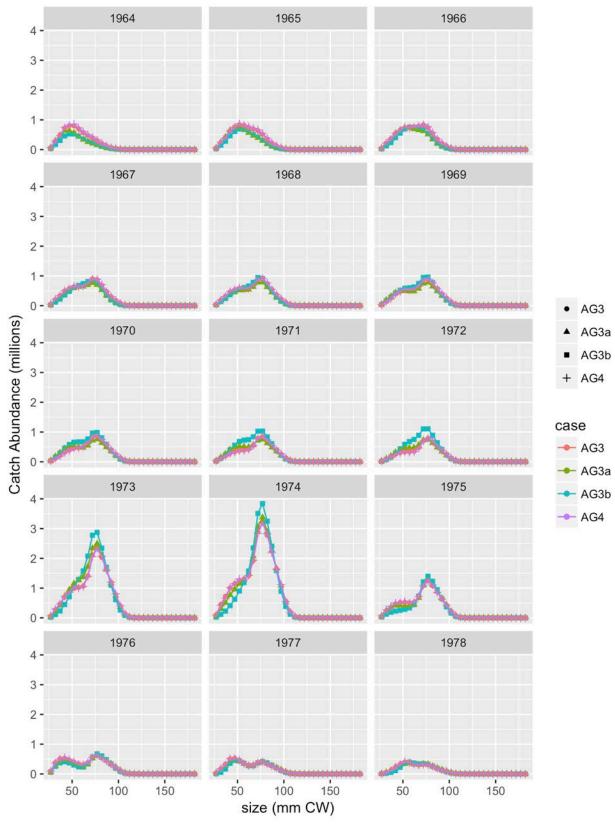


Figure 74. Predicted GTF captured catch abundance for female all all, (2 of 5).

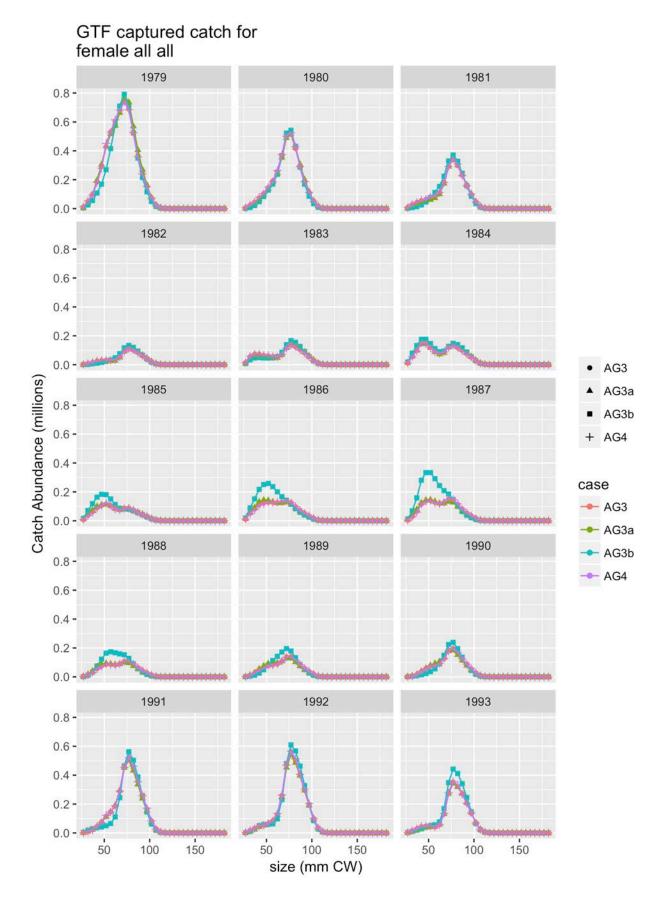


Figure 75. Predicted GTF captured catch abundance for female all all, (3 of 5).

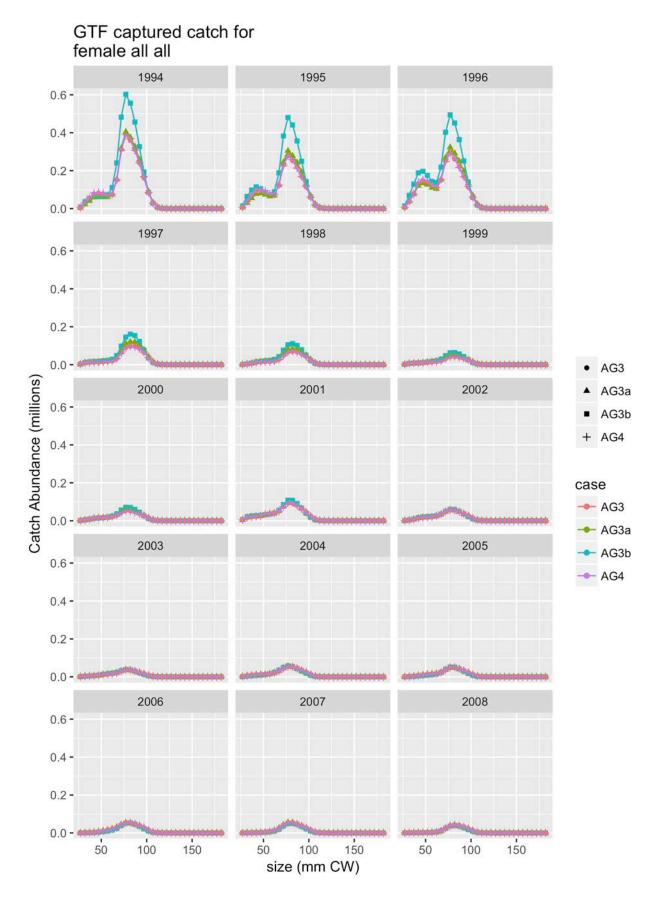


Figure 76. Predicted GTF captured catch abundance for female all all, (4 of 5).

GTF captured catch for female all all 2009 2010 0.04 -0.03 -0.02 -0.01 -0.00 -2011 2012 0.04 -0.03 -AG3 0.02 -Catch Abundance (millions) AG3a 0.01 -AG3b + AG4 0.00 2013 2014 case 0.04 -- AG3 0.03 -► AG3a - AG3b 0.02 -AG4 0.01 -0.00 - 🤲 50 100 150 2015 0.04 -0.03 -0.02 -

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

150

size (mm CW)

100

0.01 -

0.00 -

50

GTF captured catch for male all all

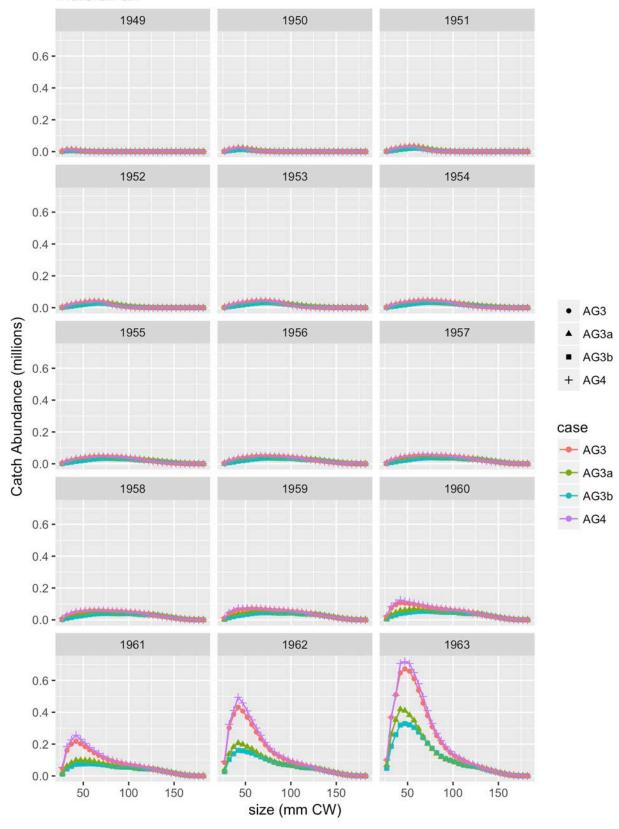


Figure 78. Predicted GTF captured catch abundance for male all all, (1 of 5).

GTF captured catch for male all all 1964 1965 1966 3 -2-1967 1968 1969 4 -3 -2-AG3 Catch Abundance (millions) 1972 1970 1971 AG3a AG3b + AG4 case - AG3 AG3a 1974 1973 1975 - AG3b - AG4 3 -2 -0 -1976 1977 1978 4 -3 -2 -

Figure 79. Predicted GTF captured catch abundance for male all all, (2 of 5).

50

100

size (mm CW)

150

100

50

150

100

50

150

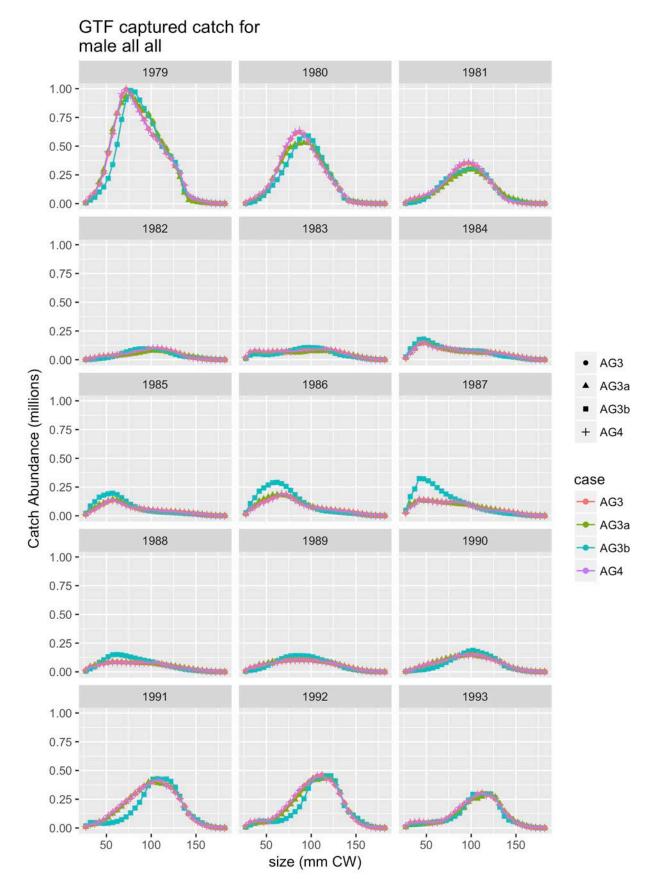


Figure 80. Predicted GTF captured catch abundance for male all all, (3 of 5).

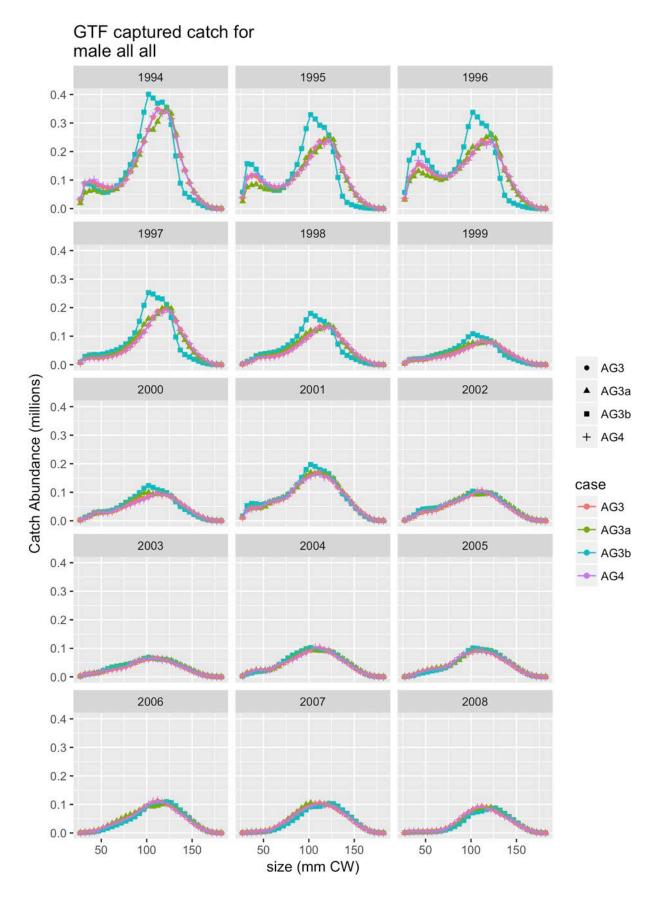


Figure 81. Predicted GTF captured catch abundance for male all all, (4 of 5).

GTF captured catch for male all all 2009 2010 0.100 -0.075 -0.050 -0.025 -0.000 -2011 2012 0.100 -0.075 -0.050 -AG3 Catch Abundance (millions) AG3a 0.025 -AG3b + AG4 0.000 -2013 2014 0.100 case - AG3 0.075 -► AG3a - AG3b 0.050 -AG4 0.025 -0.000 - * 50 100 150 2015 0.100 -0.075 -0.050 -0.025 -0.000 - 🚧 150 100 50 size (mm CW)

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

RKF captured catch for female all all

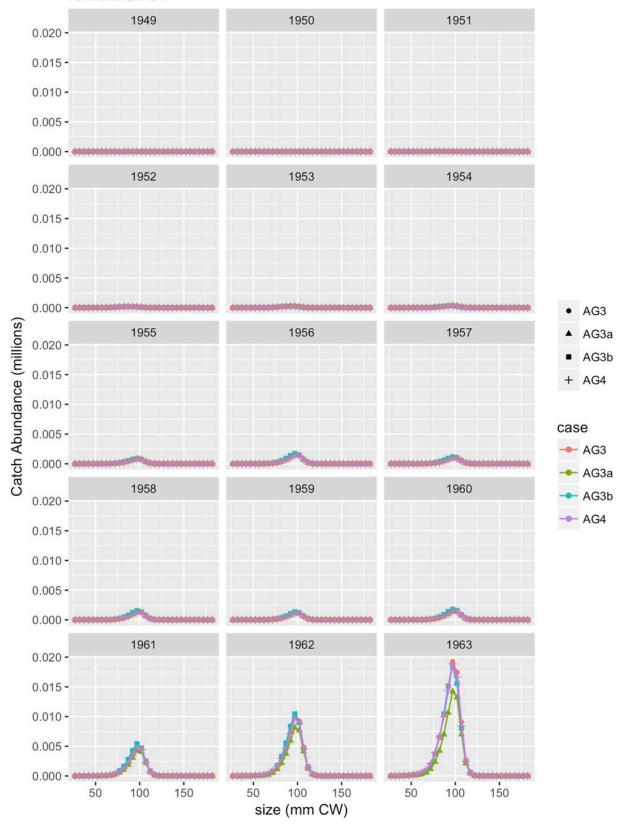


Figure 83. Predicted RKF captured catch abundance for female all all, (1 of 5).

RKF captured catch for female all all

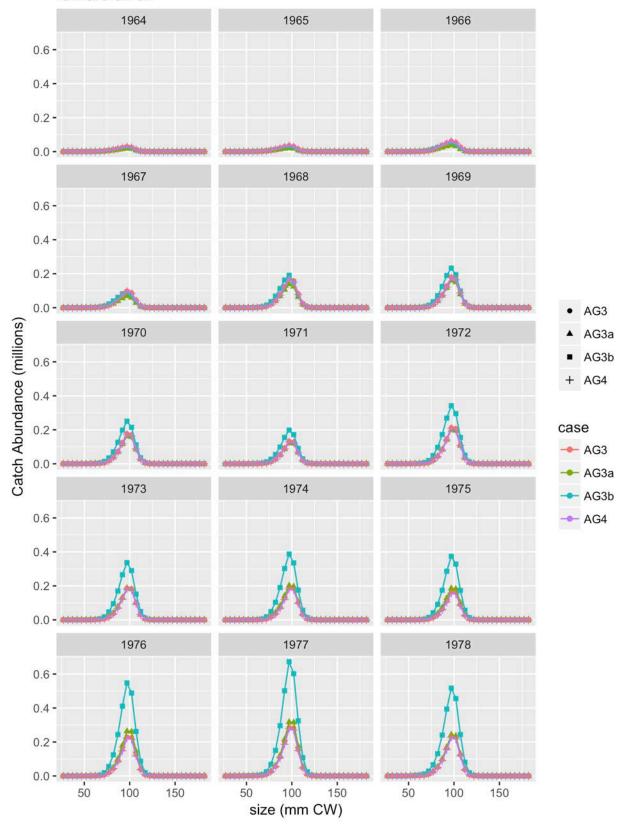


Figure 84. Predicted RKF captured catch abundance for female all all, (2 of 5).

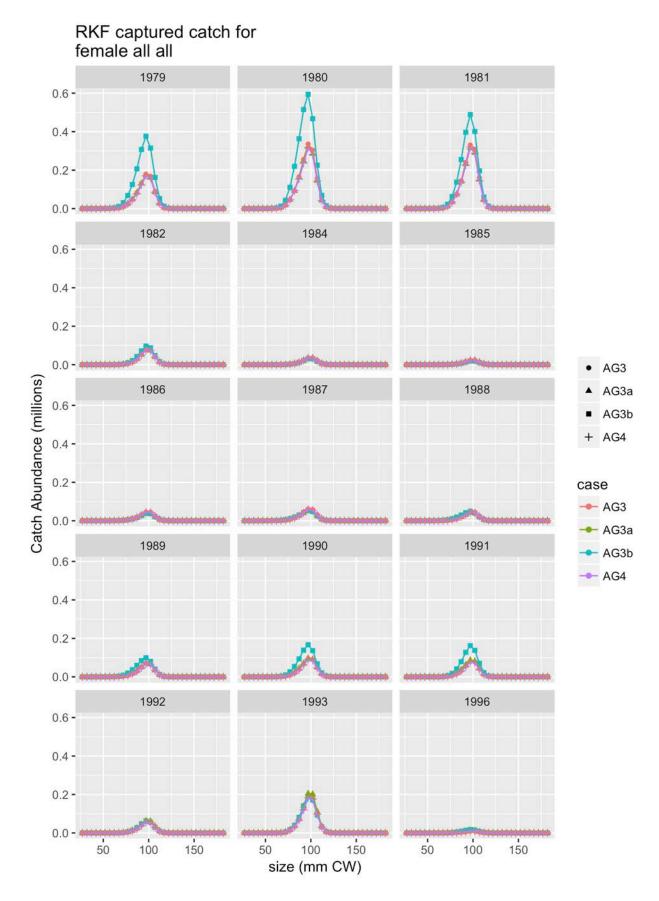


Figure 85. Predicted RKF captured catch abundance for female all all, (3 of 5).

RKF captured catch for female all all 1997 1998 1999 0.015 -0.010 -0.005 -0.000 2000 2001 2002 0.015 -0.010 -0.005 -0.000 AG3 Catch Abundance (millions) 2004 2005 2003 AG3a 0.015 -AG3b + AG4 0.010 -0.005 case AG3 0.000 -AG3a 2006 2007 2008 - AG3b 0.015 -AG4 0.010 -0.005 -0.000 -2009 2010 2011 0.015 -0.010 -0.005 -0.000 - # 100 50 100 150 50 50 100 150 150 size (mm CW)

Figure 86. Predicted RKF captured catch abundance for female all all, (4 of 5).

RKF captured catch for female all all

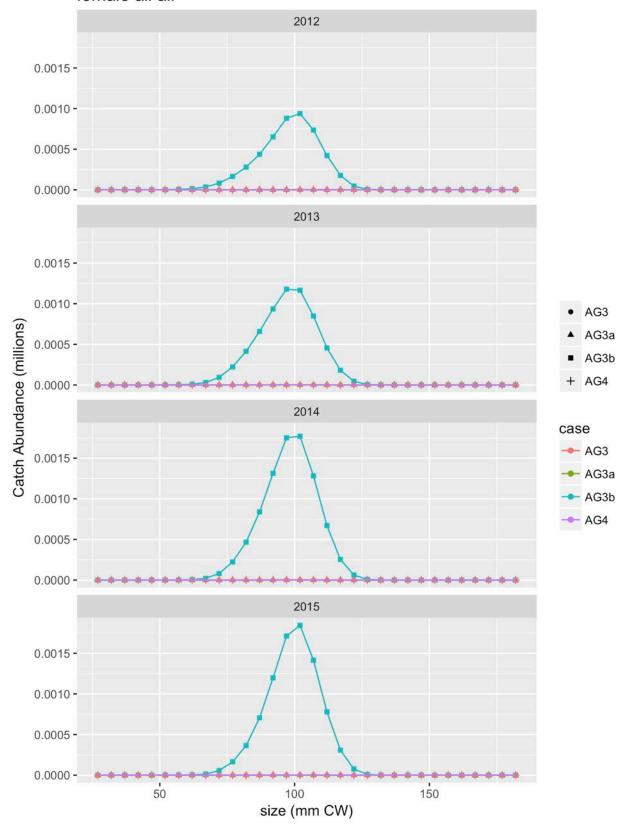


Figure 87. Predicted RKF captured catch abundance for female all all, (5 of 5).

RKF captured catch for male all all

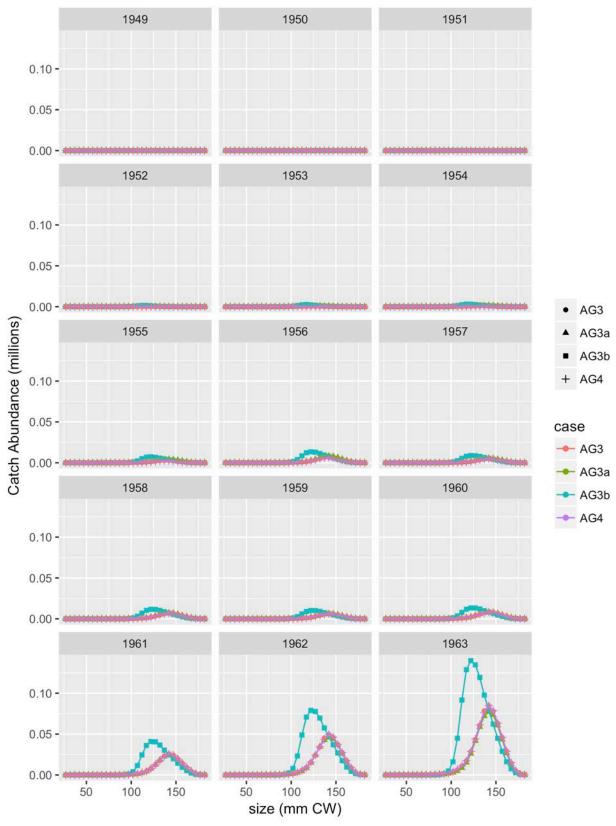


Figure 88. Predicted RKF captured catch abundance for male all all, (1 of 5).

RKF captured catch for male all all

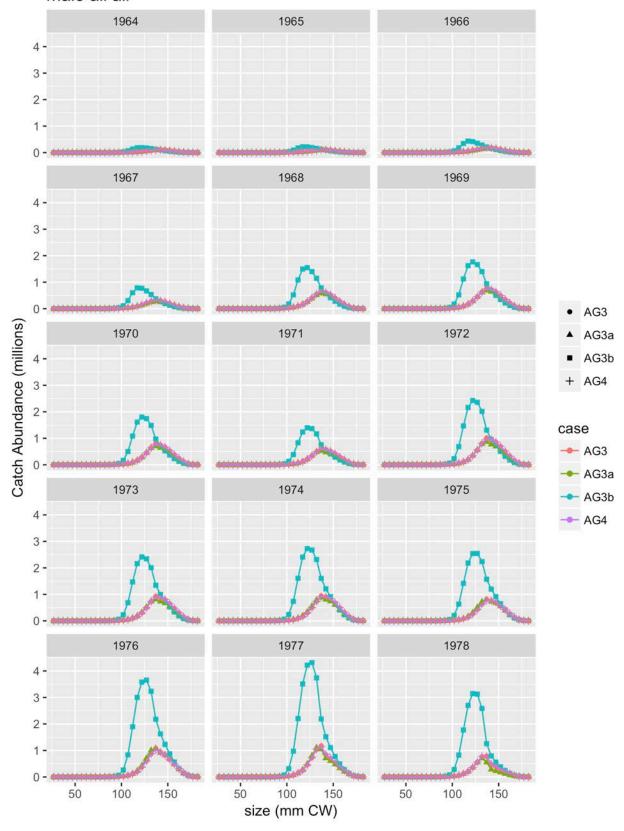


Figure 89. Predicted RKF captured catch abundance for male all all, (2 of 5).

RKF captured catch for male all all 1979 1980 1981 3 -2-1 -1982 1985 1984 3 -2 -1 -AG3 1987 1988 1986 AG3a AG3b + AG4 case AG3 AG3a 1989 1990 1991 - AG3b AG4 3 -2 -1 -0 -

Catch Abundance (millions) 1992 1993 1996 3 -2-0 - # 100 100 150 50 100 150 150 50 50 size (mm CW) Figure 90. Predicted RKF captured catch abundance for male all all, (3 of 5).

RKF captured catch for male all all 1997 1999 1998 0.05 -0.04 -0.03 -0.02 -0.01 -0.00 -2000 2001 2002 0.05 -0.04 -0.03 -0.02 -0.01 -0.00 -AG3 Catch Abundance (millions) 2003 2004 2005 AG3a 0.05 -AG3b 0.04 -+ AG4 0.03 -0.02 case 0.01 -- AG3 0.00 -► AG3a 2006 2007 2008 - AG3b 0.05 -AG4 0.04 -0.03 -0.02 -0.01 -0.00 -2009 2010 2011 0.05 -0.04 -0.03 -

Figure 91. Predicted RKF captured catch abundance for male all all, (4 of 5).

50

100

size (mm CW)

150

50

100

150

0.02 **-**0.01 **-**0.00 **-**

50

100

150

RKF captured catch for male all all 2012 0.06 -0.04 -0.02 -0.00 -2013 0.06 -0.04 -AG3 Catch Abundance (millions) 0.02 -AG3a AG3b + AG4 0.00 2014 0.06 case - AG3 AG3a 0.04 -- AG3b AG4 0.02 -0.00 -2015 0.06 -0.04 -0.02 -0.00 -50 100 150 size (mm CW)

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

SCF captured catch for female all all

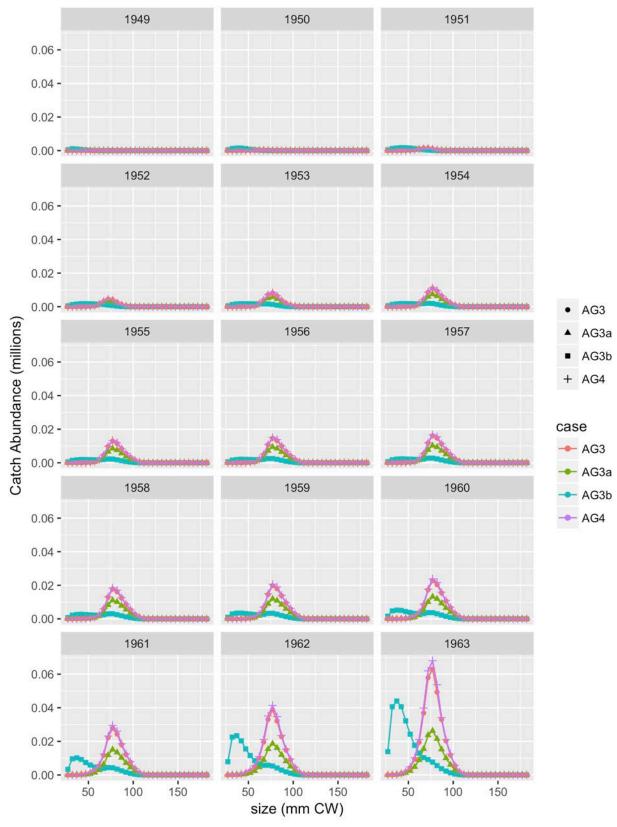


Figure 93. Predicted SCF captured catch abundance for female all all, (1 of 5).

SCF captured catch for female all all 1964 1965 1966 1.5 -1.0 -0.5 -0.0 -1967 1968 1969 1.5 -1.0 -0.5 -0.0 -AG3 Catch Abundance (millions) 1970 1971 1972 AG3a 1.5 -AG3b + AG4 1.0 -0.5 case AG3 0.0 AG3a 1973 1974 1975 - AG3b 1.5 -AG4 1.0 -0.5 -0.0 -1977 1976 1978 1.5 -1.0 -0.5 -0.0 -100 150 100 150 50 50 100 150 50

Figure 94. Predicted SCF captured catch abundance for female all all, (2 of 5).

size (mm CW)

SCF captured catch for female all all 1979 1980 1981 4 -2 -1982 1983 1984 4 -2-0 -AG3 Catch Abundance (millions) 1985 1986 1987 AG3a AG3b + AG4 case - AG3 ► AG3a 1988 1989 1990 - AG3b AG4 4 -2 -1991 1992 1993 4 -2-0 -100 150 150 50 100 150 100 50 50 size (mm CW)

Figure 95. Predicted SCF captured catch abundance for female all all, (3 of 5).

SCF captured catch for female all all 1994 1995 1996 1.25 -1.00 -0.75 -0.50 -0.25 -0.00 -1999 1997 1998 1.25 -1.00 -0.75 -0.50 -0.25 -0.00 -AG3 Catch Abundance (millions) 2002 2000 2001 AG3a 1.25 -AG3b 1.00 -+ AG4 0.75 -0.50 case 0.25 -AG3 0.00 -AG3a 2003 2004 2005 - AG3b 1.25 -AG4 1.00 -0.75 -0.50 -0.25 -0.00 -2006 2007 2008 1.25 -1.00 -0.75 -0.50 -0.25 -0.00 - * 50 100 150 50 100 150 50 100 150 size (mm CW)

Figure 96. Predicted SCF captured catch abundance for female all all, (4 of 5).

SCF captured catch for female all all

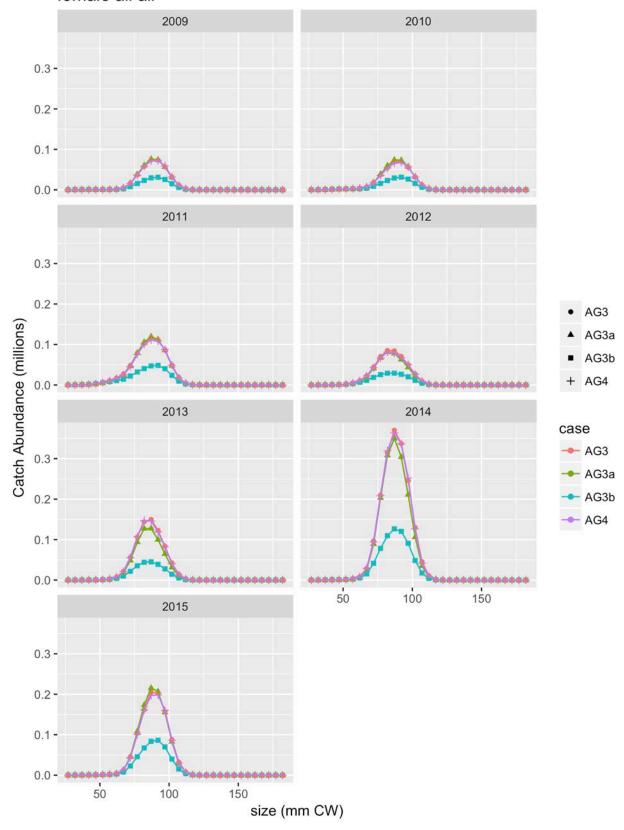


Figure 97. Predicted SCF captured catch abundance for female all all, (5 of 5).

SCF captured catch for male all all

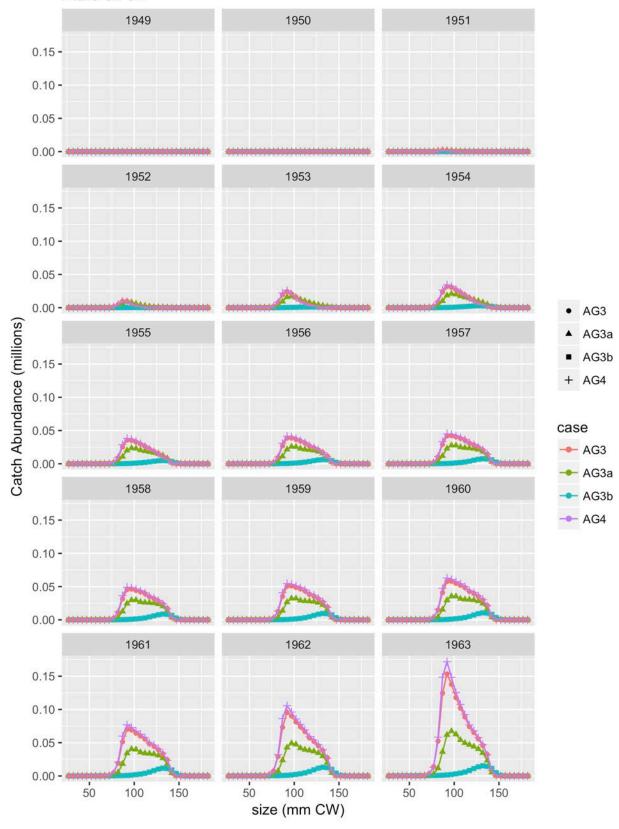


Figure 98. Predicted SCF captured catch abundance for male all all, (1 of 5).

SCF captured catch for male all all

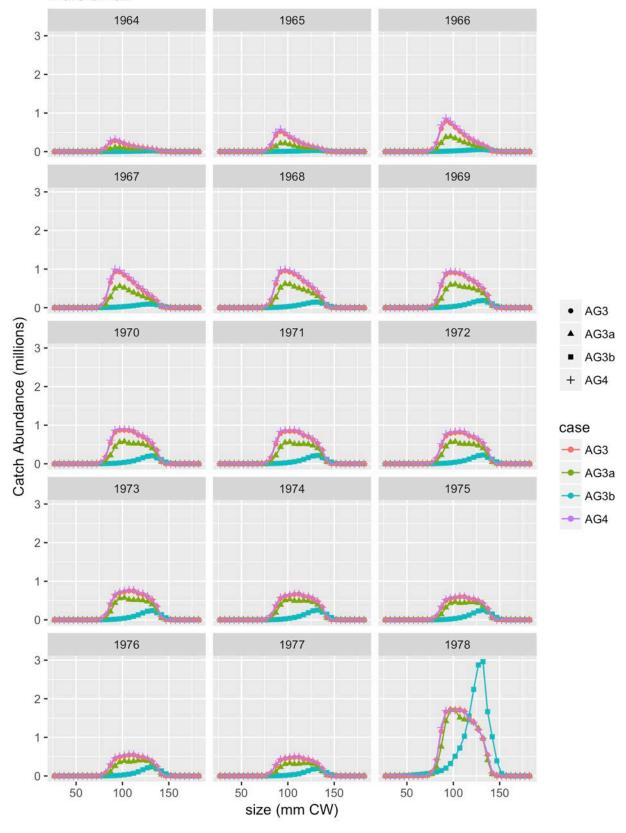


Figure 99. Predicted SCF captured catch abundance for male all all, (2 of 5).

SCF captured catch for male all all 1979 1980 1981 10.0 -7.5 -5.0 -2.5 -0.0 -1983 1982 1984 10.0 -7.5 -5.0 -2.5 -0.0 -AG3 Catch Abundance (millions) 1987 1985 1986 AG3a 10.0 -AG3b 7.5 -+ AG4 5.0 case 2.5 -AG3 0.0 -► AG3a 1990 1988 1989 - AG3b 10.0 -AG4 7.5 -5.0 -2.5 -0.0 -1991 1992 1993 10.0 -7.5 -5.0 -2.5 -0.0 -100 100 50 150 50 100 150 150 50 size (mm CW)

Figure 100. 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 -AG3 Catch Abundance (millions) 2000 2001 2002 AG3a AG3b 2.0 -+ AG4 1.5 -1.0 case 0.5 -AG3 0.0 -AG3a 2003 2004 2005 - AG3b AG4 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 101. Predicted SCF captured catch abundance for male all all, (4 of 5).

SCF captured catch for male all all

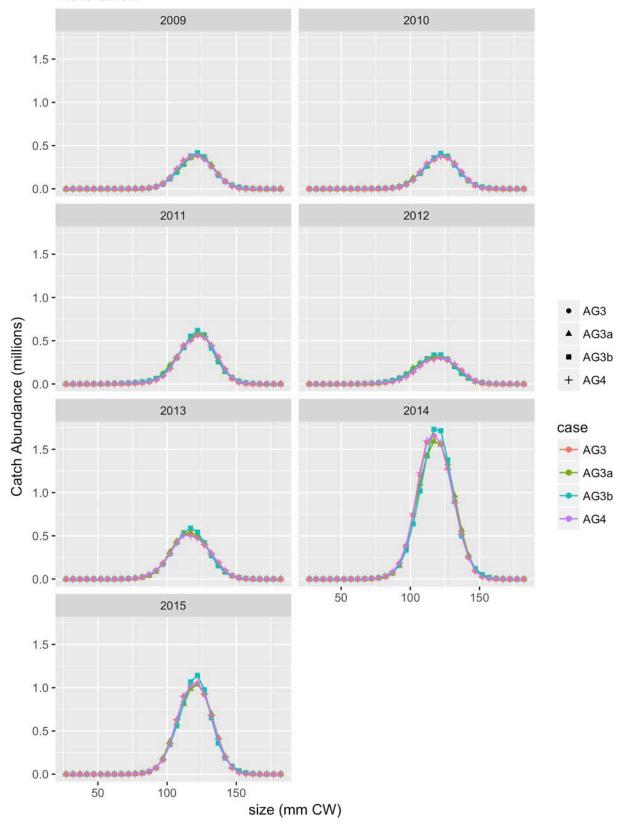


Figure 102. Predicted SCF captured catch abundance for male all all, (5 of 5).

TCF captured catch for female all all

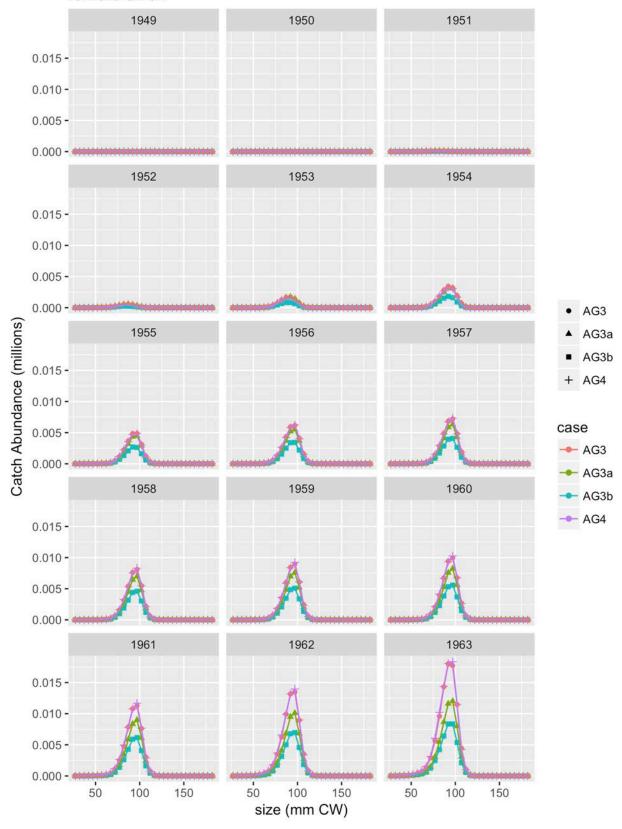


Figure 103. Predicted TCF captured catch abundance for female all all, (1 of 4).

TCF captured catch for female all all

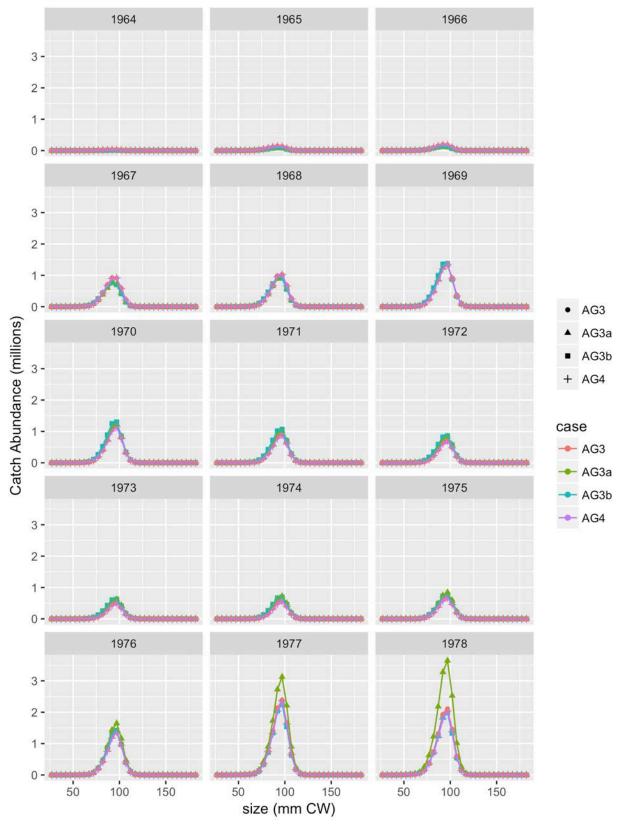


Figure 104. Predicted TCF captured catch abundance for female all all, (2 of 4).

TCF captured catch for female all all 1979 1980 1981 6 -2 -1982 1983 1984 6 -4 -2-AG3 Catch Abundance (millions) 1987 1988 1989 AG3a AG3b + AG4 case - AG3 AG3a 1990 1991 1992 - AG3b AG4 6 -4 -2-0 -1993 1994 1995 6 -4 -2 -0 - # 100 150 100 150 150 50 50 50 100 size (mm CW)

Figure 105. Predicted TCF captured catch abundance for female all all, (3 of 4).

TCF captured catch for female all all

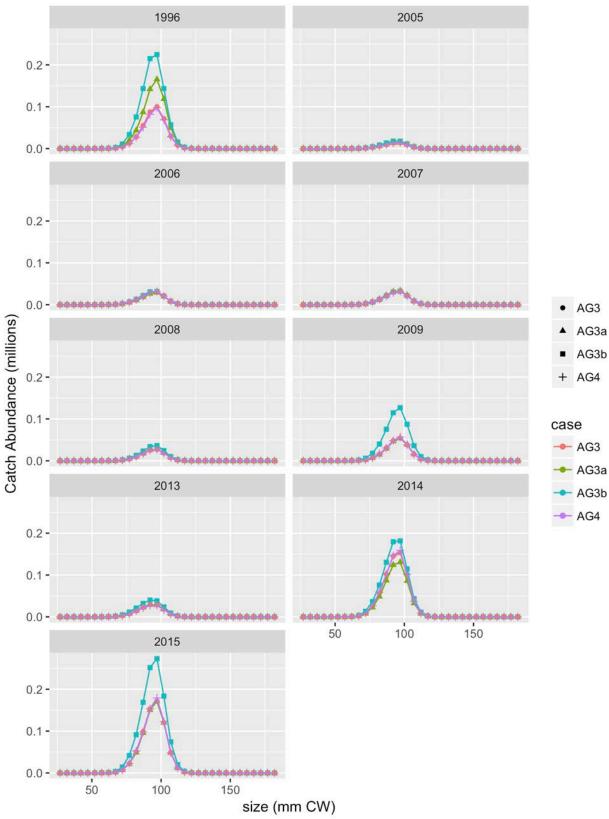


Figure 106. Predicted TCF captured catch abundance for female all all, (4 of 4).

TCF captured catch for male all all 1949 1951 1950 0.12 -0.09 -0.06 -0.03 -0.00 -1952 1953 1954 0.12 -0.09 -0.06 -0.03 -0.00 -AG3 Catch Abundance (millions) 1955 1956 1957 AG3a 0.12 AG3b 0.09 -+ AG4 0.06 case 0.03 -- AG3 0.00 -- AG3a 1958 1959 1960 - AG3b 0.12 AG4 0.09 -0.06 -0.03 -0.00 -1962 1963 1961 0.12 -0.09 -0.06 -

150

50

100

100

size (mm CW)

Figure 107. Predicted TCF captured catch abundance for male all all, (1 of 4).

50

150

100

0.03 -

0.00 - *

50

150

TCF captured catch for male all all

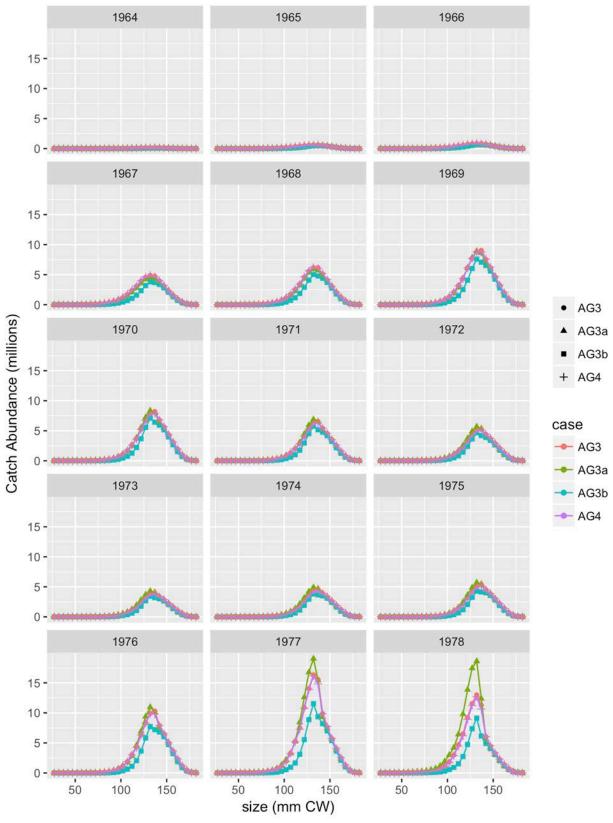


Figure 108. Predicted TCF captured catch abundance for male all all, (2 of 4).

TCF captured catch for male all all 1979 1980 1981 30 -20 -10-1983 1982 1984 30 -20 -10 -0 -AG3 Catch Abundance (millions) 1988 1989 1987 AG3a 30 AG3b + AG4 20 -10case AG3 0 - AG3a 1990 1991 1992 - AG3b 30 AG4 20 -10 -0 -1994 1995 1993 30 -20 -10-0 - * 100 100 50 100 150 150 50 50 150 size (mm CW)

Figure 109. Predicted TCF captured catch abundance for male all all, (3 of 4).

TCF captured catch for male all all

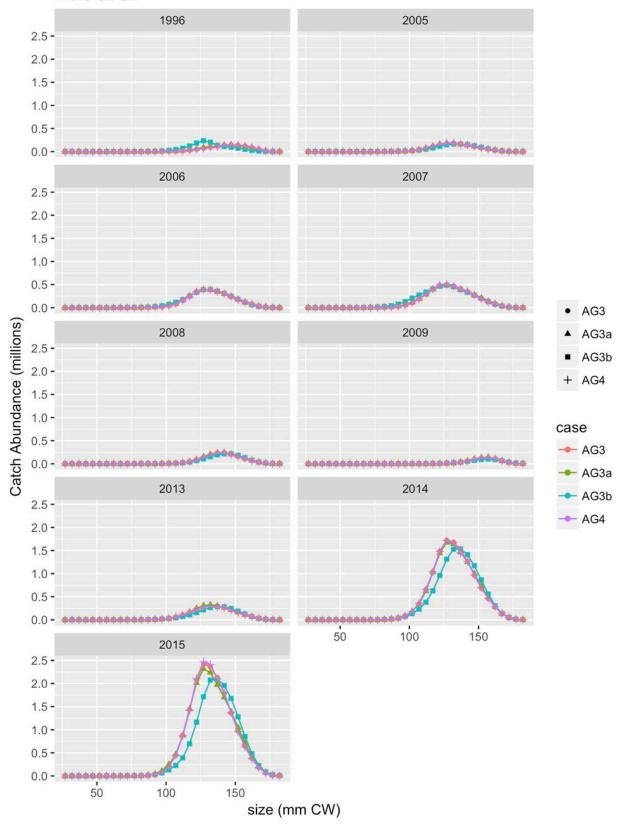


Figure 110. Predicted TCF captured catch abundance for male all all, (4 of 4).

Retained catch size compositions

TCF retained catch for male all all

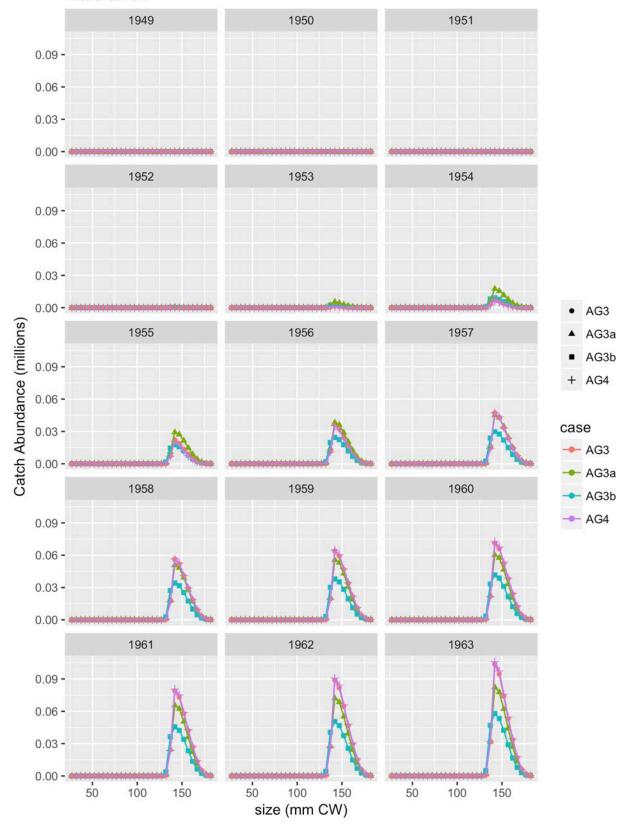


Figure 111. Predicted TCF retained catch abundance for male all all, (1 of 4).

TCF retained catch for male all all

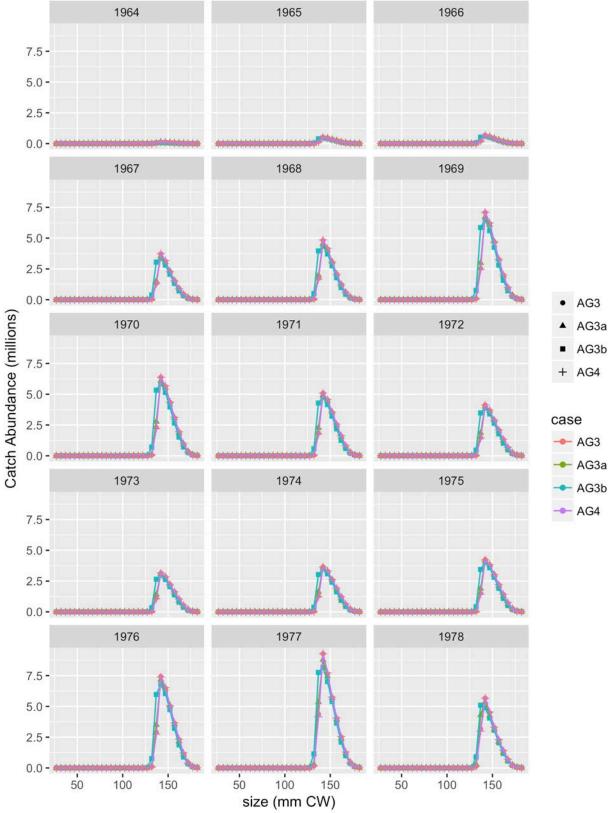


Figure 112. Predicted TCF retained catch abundance for male all all, (2 of 4).

TCF retained catch for male all all 1979 1980 1981 5 -4 -3 -2-1 -1982 1983 1984 5-4 -3-2-1-0 - AG3 Catch Abundance (millions) 1988 1989 1987 AG3a AG3b + AG4 3 case - AG3 AG3a 1990 1992 1991 - AG3b 5 -AG4 4 -3 -2-1 -0 -1993 1994 1995 5-4 -3 -2-1 -0 -150 100 150 100 50 100 150 50 50

Figure 113. Predicted TCF retained catch abundance for male all all, (3 of 4).

size (mm CW)

TCF retained catch for male all all

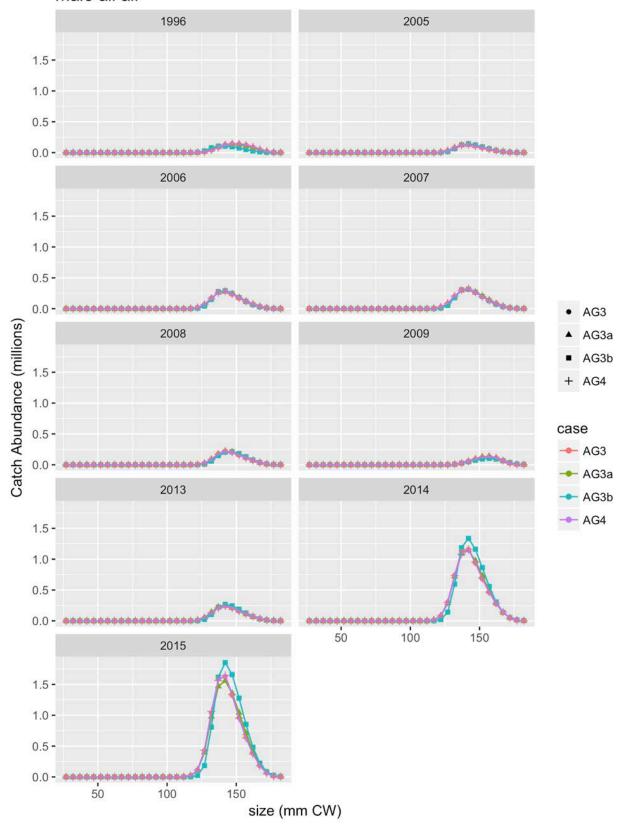


Figure 114. Predicted TCF retained catch abundance for male all all, (4 of 4).

Model fits

Survey biomass

NMFS trawl survey

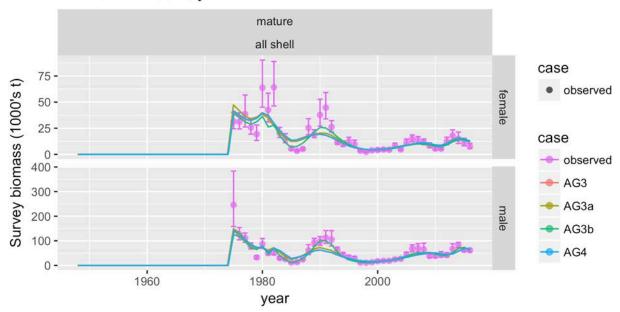


Figure 115. Comparison of observed and predicted survey biomass for NMFS trawl survey.



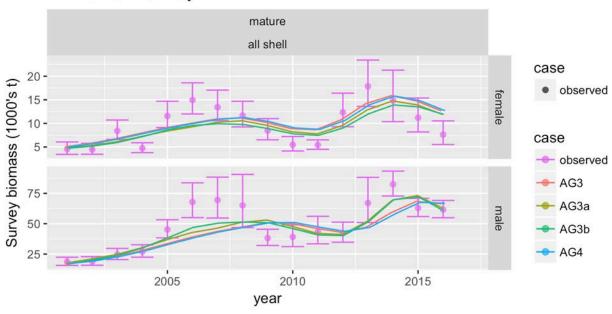


Figure 116. Comparison of observed and predicted survey biomass for NMFS trawl survey. Recent time period.

Mean survey size compositions

NMFS trawl survey

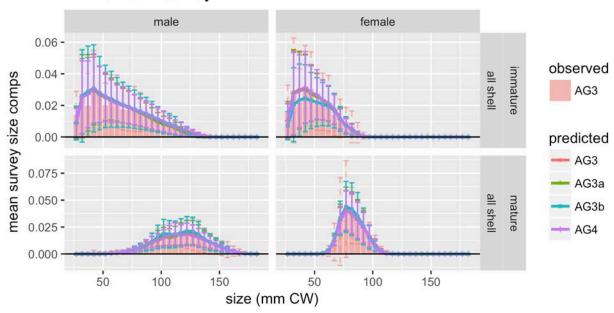


Figure 117. Comparison of observed and predicted &&xms mean survey size comps for NMFS trawl survey.

Survey size compositions

NMFS trawl survey: male, immature, all shell

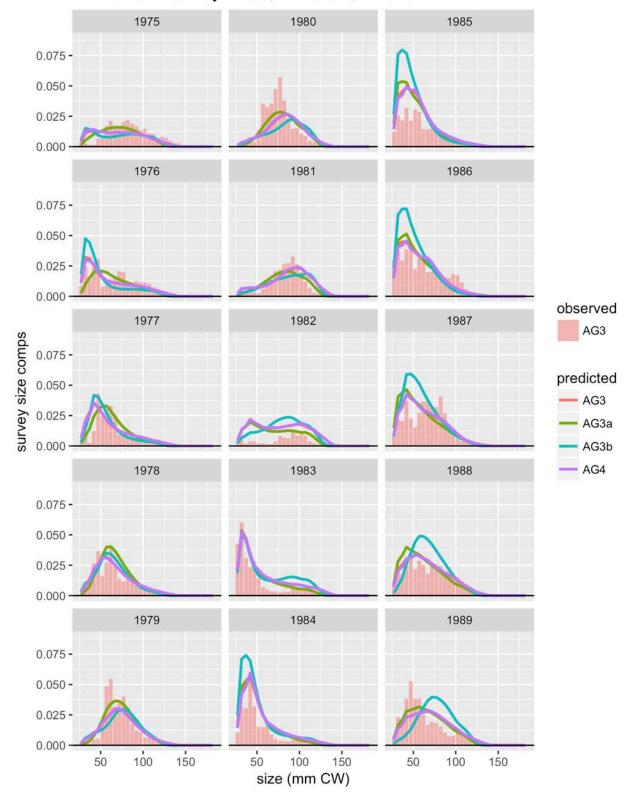


Figure 118. Comparison of observed and predicted male, immature, all shell survey size comps for NMFS trawl survey. Page 1 of 3.

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 observed 1997 2002 1992 AG3 survey size comps 0.075 predicted 0.050 -AG3 0.025 -AG3a 0.000 AG3b AG4 1993 1998 2003 0.075 -0.050 -0.025 -0.000 -1994 1999 2004 0.075 -0.050 -0.025 -0.000 50 50 50 100 150 100 150 150 100 size (mm CW)

Figure 119. 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 2005 2010 2015 0.075 -0.050 -0.025 -0.000 2006 2011 2016 0.075 -0.050 -0.025 -0.000 observed 2007 2012 2017 AG3 survey size comps 0.075 predicted 0.050 -AG3 0.025 -AG3a 0.000 AG3b 2008 2013 AG4 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 120. 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 observed 1977 1982 1987 AG3 survey size comps 0.04 predicted - AG3 0.02 -AG3a 0.00 AG3b 1978 AG4 1983 1988 0.04 -0.02 -0.00 1979 1984 1989 0.04 -0.02 -0.00 50 50 100 50 150 100 150 100 150 size (mm CW)

Figure 121. 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 observed 1992 1997 2002 AG3 survey size comps 0.04 predicted - AG3 0.02 -AG3a 0.00 AG3b 1993 AG4 1998 2003 0.04 -0.02 -0.00 1994 1999 2004 0.04 -0.02 -0.00 50 100 150 50 150 100 50 150 100 size (mm CW)

Figure 122. 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 observed 2012 2007 2017 AG3 survey size comps 0.04 predicted - AG3 0.02 -AG3a 0.00 AG3b 2008 2013 AG4 2018 0.04 -0.02 -0.00 2009 2014 2019 0.04 -0.02 -0.00 50 100 50 50 100 150 150 100 150 size (mm CW)

Figure 123. 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 1975 1980 1985 0.100 -0.075 -0.050 -0.025 -0.000 -1976 1981 1986 0.100 -0.075 -0.050 -0.025 -0.000 observed 1977 1987 1982 AG3 survey size comps 0.100 -0.075 predicted 0.050 -- AG3 0.025 -AG3a 0.000 AG3b AG4 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 124. 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 2000 1990 1995 0.100 -0.075 -0.050 -0.025 -0.000 1991 1996 2001 0.100 -0.075 -0.050 -0.025 -0.000 observed 1992 1997 2002 AG3 survey size comps 0.100 -0.075 predicted 0.050 -- AG3 0.025 -AG3a 0.000 AG3b 1993 1998 2003 AG4 0.100 -0.075 -0.050 -0.025 -0.000 -2004 1994 1999 0.100 -0.075 -0.050 -0.025 -0.000 50 50 100 150 100 150 100 150 50 size (mm CW)

Figure 125. 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 observed 2007 2012 2017 AG3 survey size comps 0.100 -0.075 predicted 0.050 -- AG3 0.025 -AG3a 0.000 AG3b 2008 2013 2018 AG4 0.100 -0.075 -0.050 -0.025 -0.000 2009 2014 2019 0.100 -0.075 -0.050 -0.025 -0.000 50 50 100 150 100 150 50 100 150 size (mm CW)

Figure 126. 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 observed 1982 1987 1977 AG3 0.20 survey size comps 0.15 predicted 0.10 -- AG3 0.05 -AG3a 0.00 AG3b AG4 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 50 50 150 50 150 100 100 100 150 size (mm CW)

Figure 127. 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 observed 2002 1992 1997 AG3 0.20 survey size comps 0.15 predicted 0.10 -- AG3 0.05 -AG3a 0.00 AG3b 1993 1998 2003 AG4 0.20 -0.15 -0.10 -0.05 -0.00 -1994 1999 2004 0.20 -0.15 -0.10 -0.05 -0.00 150 50 50 100 150 50 100 100 150 size (mm CW)

Figure 128. 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 observed 2007 2012 2017 AG3 0.20 survey size comps 0.15 predicted 0.10 -- AG3 0.05 -AG3a 0.00 AG3b 2008 2013 2018 AG4 0.20 -0.15 -0.10 -0.05 -0.00 -2009 2014 2019 0.20 -0.15 -0.10 -0.05 -0.00 50 50 100 150 150 100 50 100 150 size (mm CW)

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

Growth data

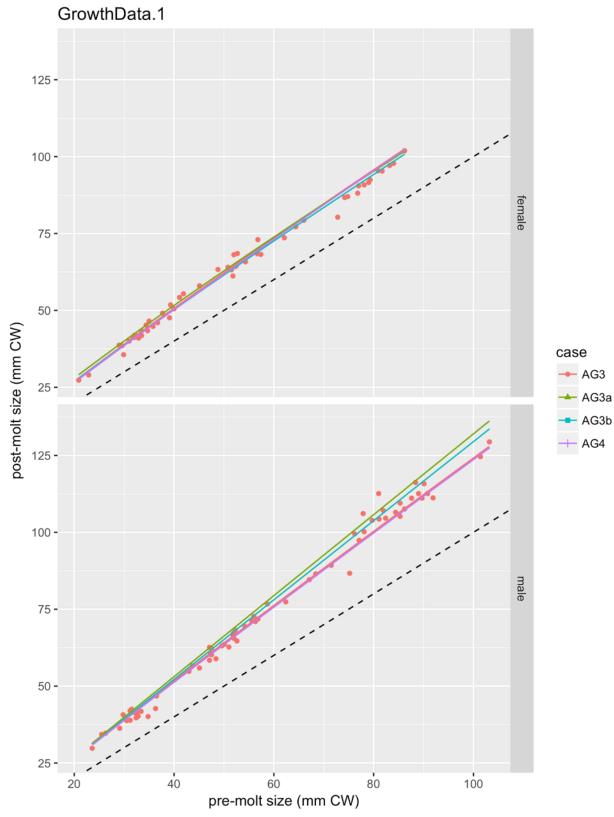


Figure 130. Model fits to GrowthData.1.

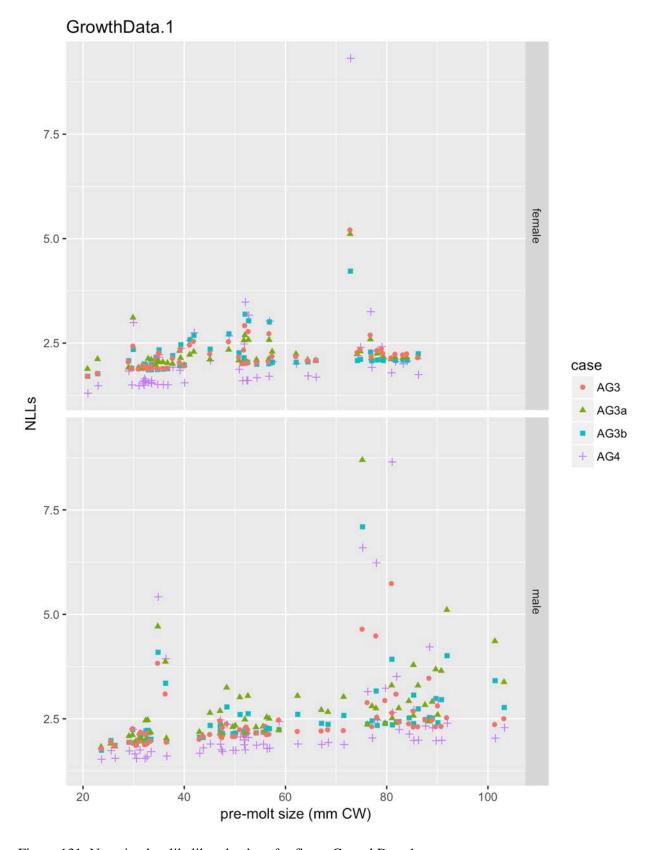


Figure 131. Negative log-likelihood values for fits to GrowthData.1.

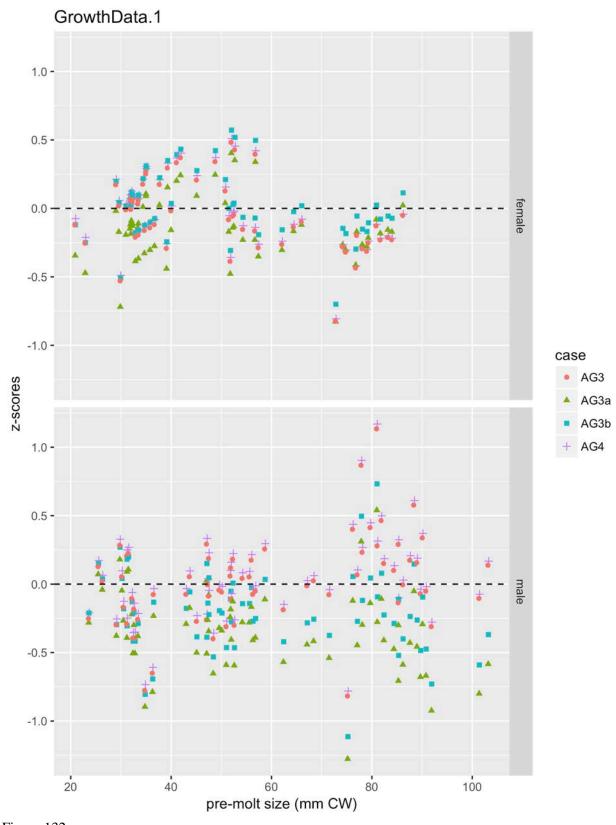


Figure 132.

Z-scores for fits to GrowthData.1.

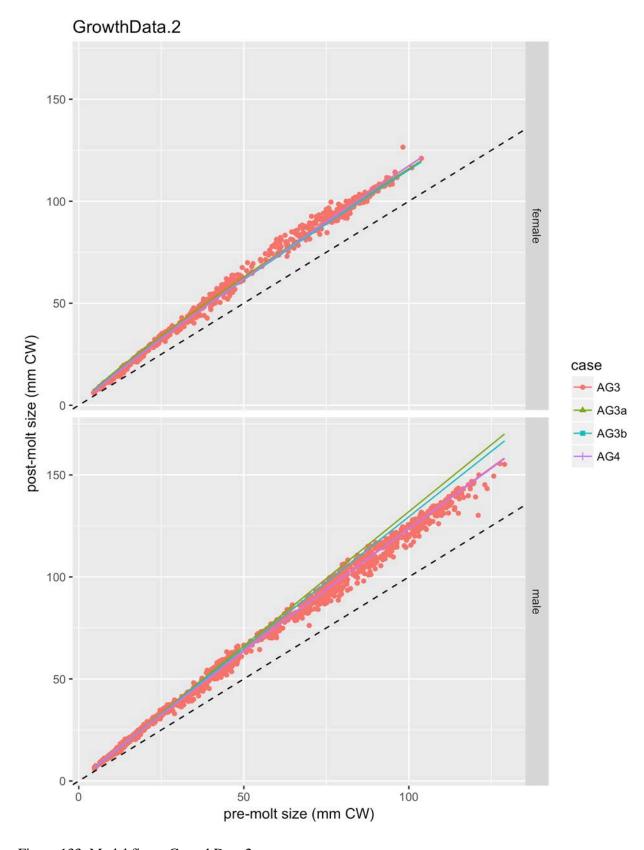


Figure 133. Model fits to GrowthData.2.

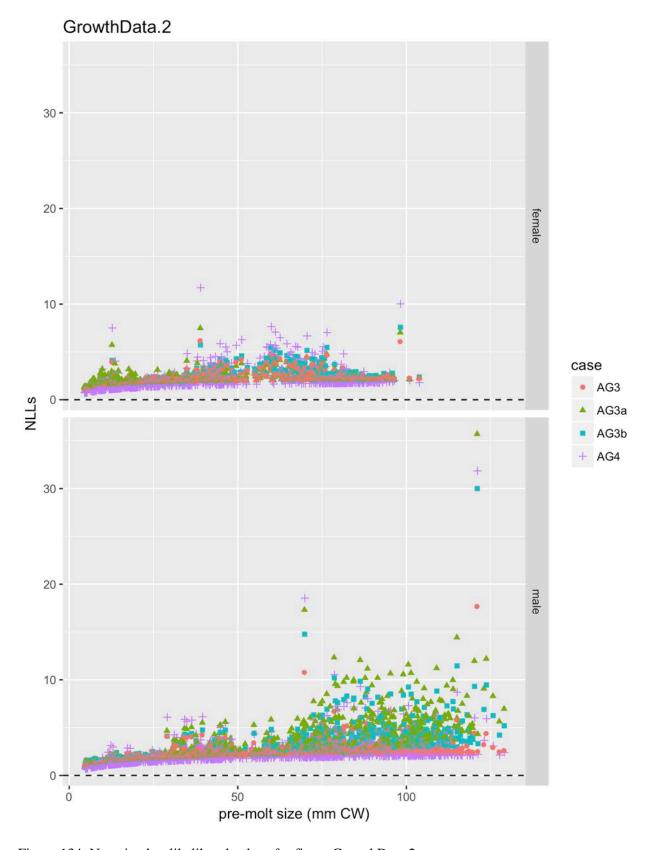


Figure 134. Negative log-likelihood values for fits to GrowthData.2.

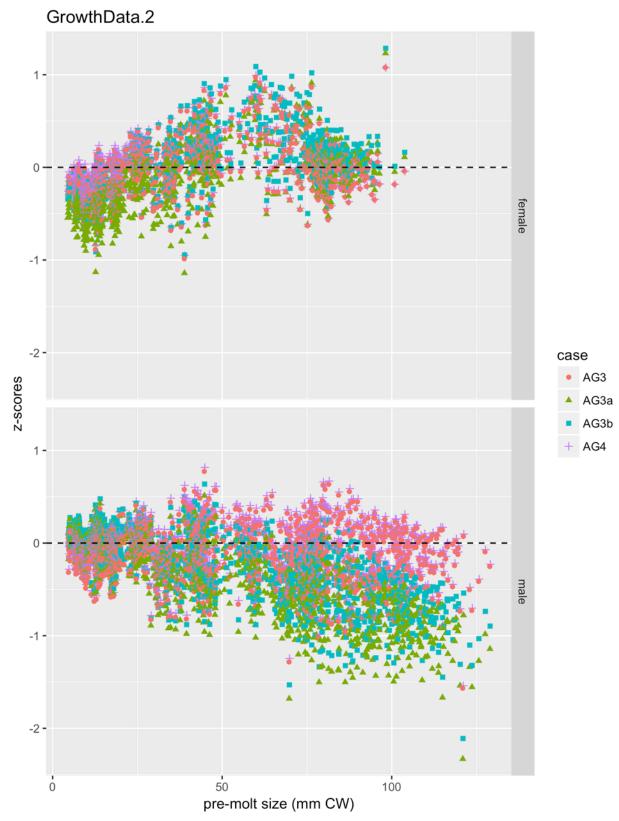


Figure 135.

Z-scores for fits to GrowthData.2.

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.

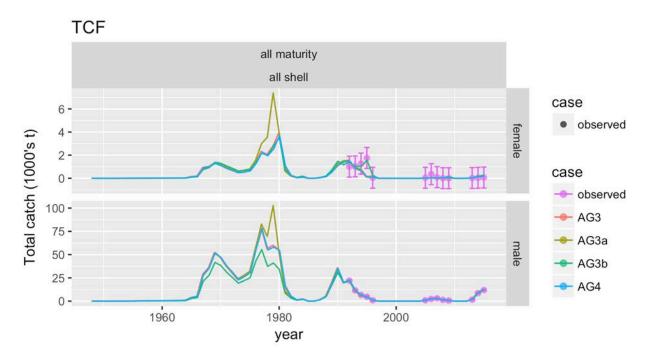


Figure 136. Comparison of observed and predicted total catch for TCF.

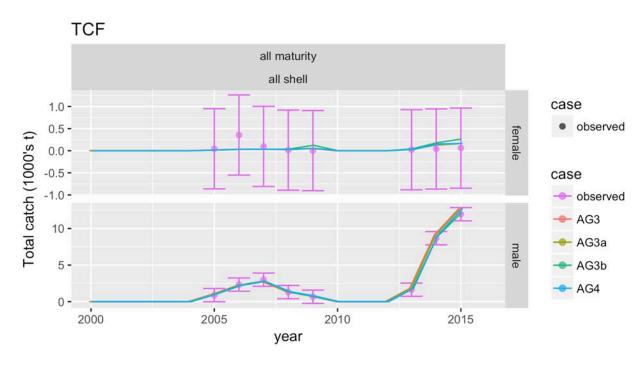


Figure 137. Comparison of observed and predicted total catch for TCF. Recent time period.

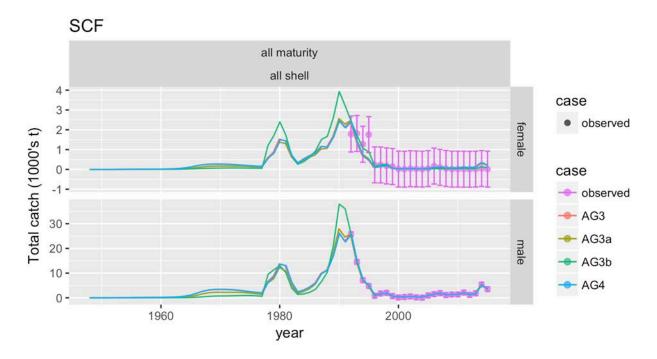


Figure 138. Comparison of observed and predicted total catch for SCF.

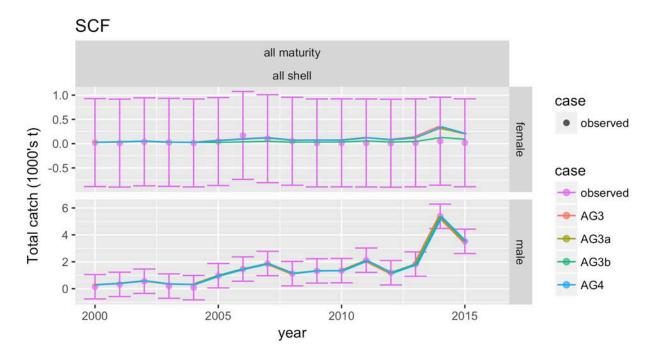


Figure 139. Comparison of observed and predicted total catch for SCF. Recent time period.

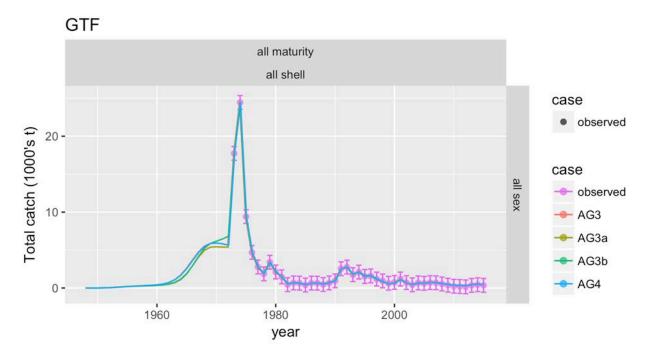


Figure 140. Comparison of observed and predicted total catch for GTF.

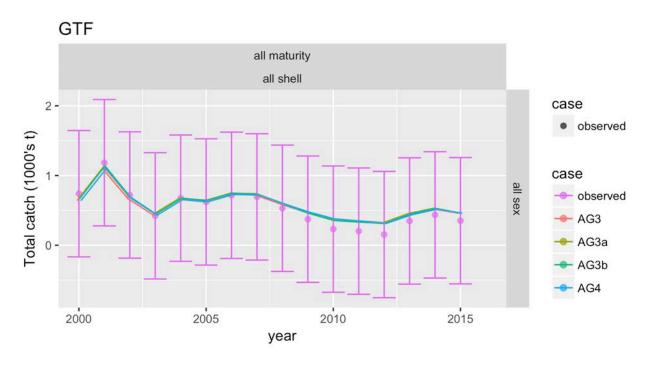


Figure 141. Comparison of observed and predicted total catch for GTF. Recent time period.

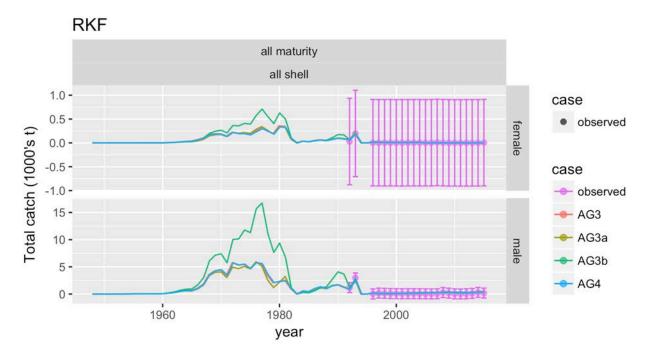


Figure 142. Comparison of observed and predicted total catch for RKF.

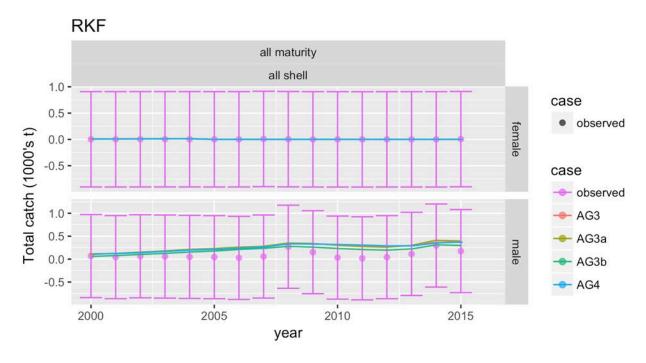


Figure 143. Comparison of observed and predicted total catch for RKF. Recent time period.

Total fishery mean size comps

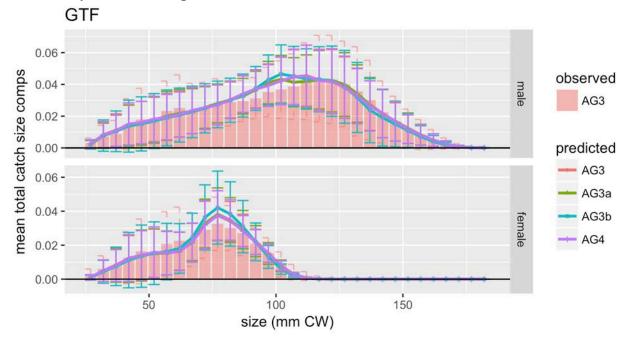


Figure 144. Comparison of observed and predicted &&xms mean total catch size comps for GTF.

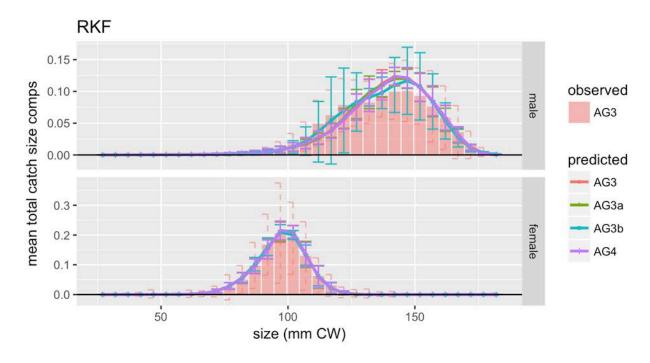


Figure 145. Comparison of observed and predicted &&xms mean total catch size comps for RKF.

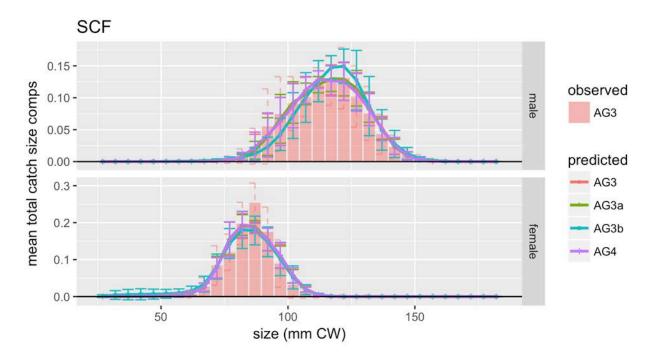


Figure 146. Comparison of observed and predicted &&xms mean total catch size comps for SCF.

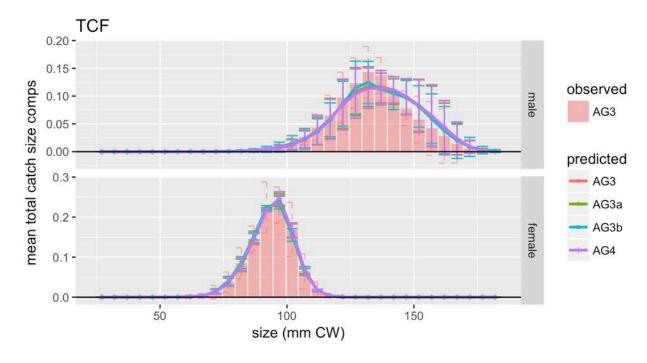


Figure 147. Comparison of observed and predicted &&xms mean total catch size comps for TCF.

Total fishery catch size comps

TCF: male, all maturity, all shell

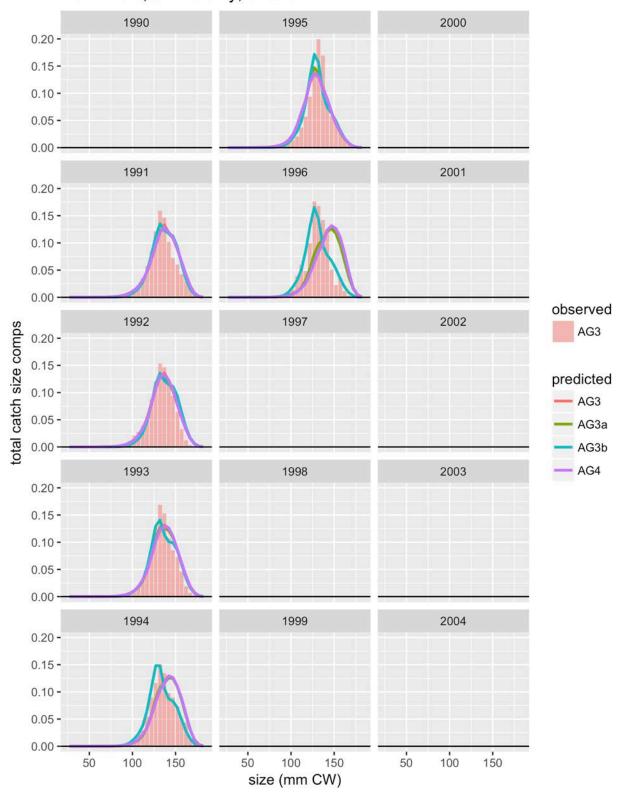


Figure 148. Comparison of observed and predicted male, all maturity, all shell total catch size comps for TCF. Page 1 of 2.

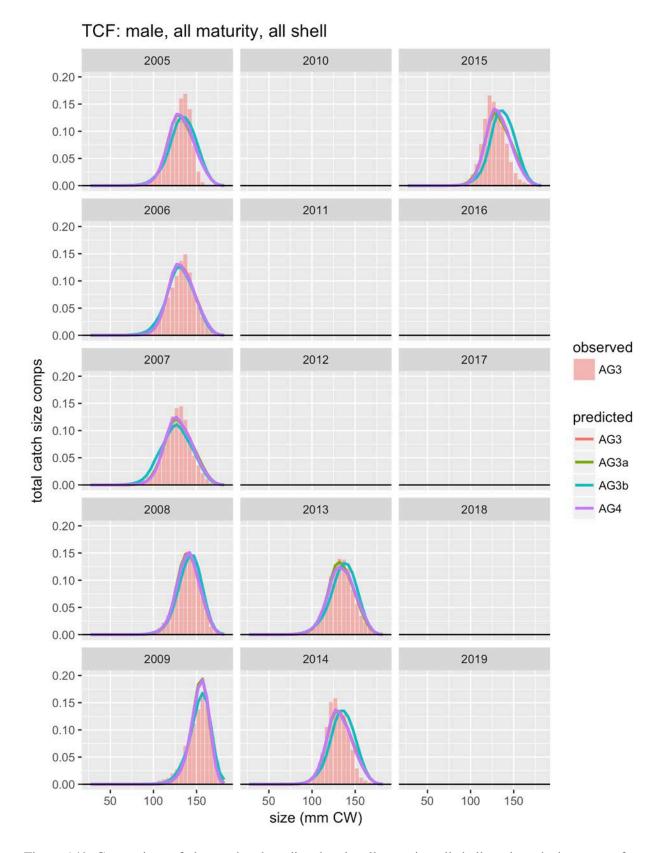


Figure 149. Comparison of observed and predicted male, all maturity, all shell total catch size comps for TCF. Page 2 of 2.

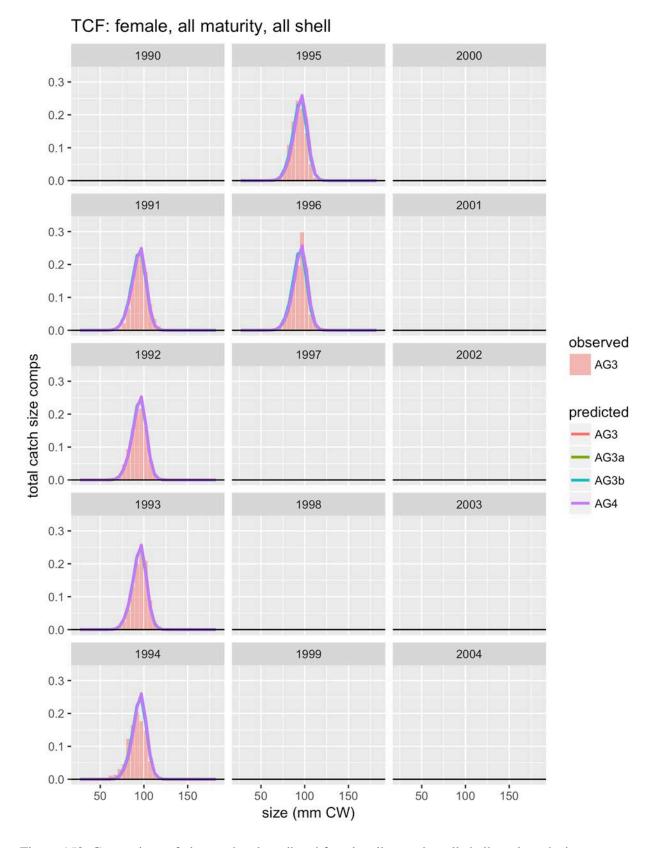


Figure 150. Comparison of observed and predicted female, all maturity, all shell total catch size comps for TCF. Page 1 of 2.

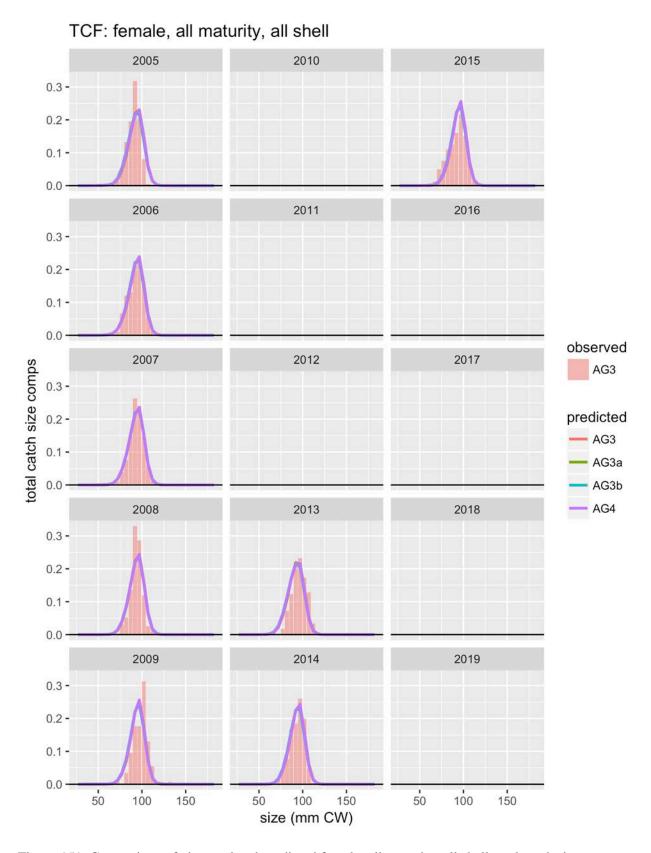


Figure 151. Comparison of observed and predicted female, all maturity, all shell total catch size comps for TCF. Page 2 of 2.

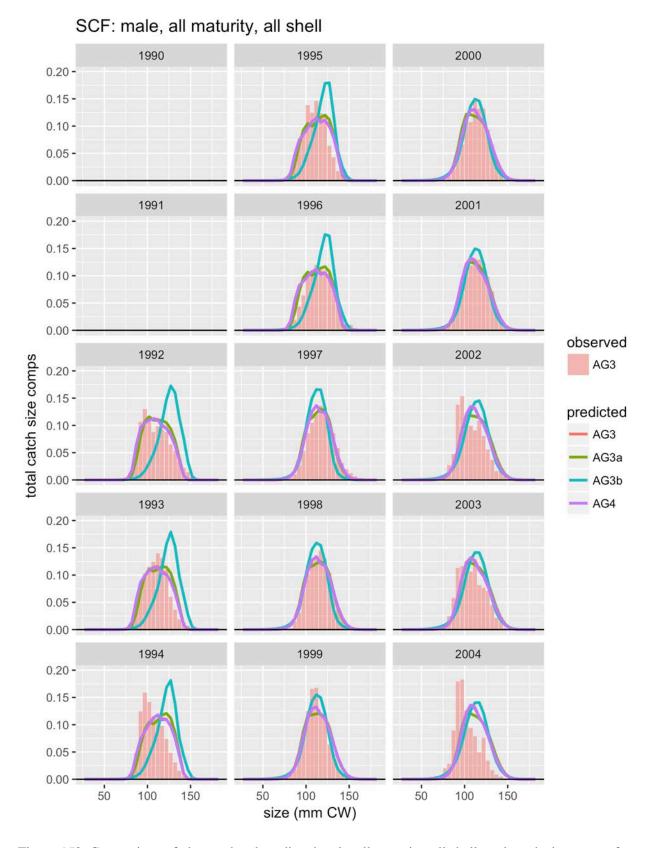


Figure 152. Comparison of observed and predicted male, all maturity, all shell total catch size comps for SCF. Page 1 of 2.

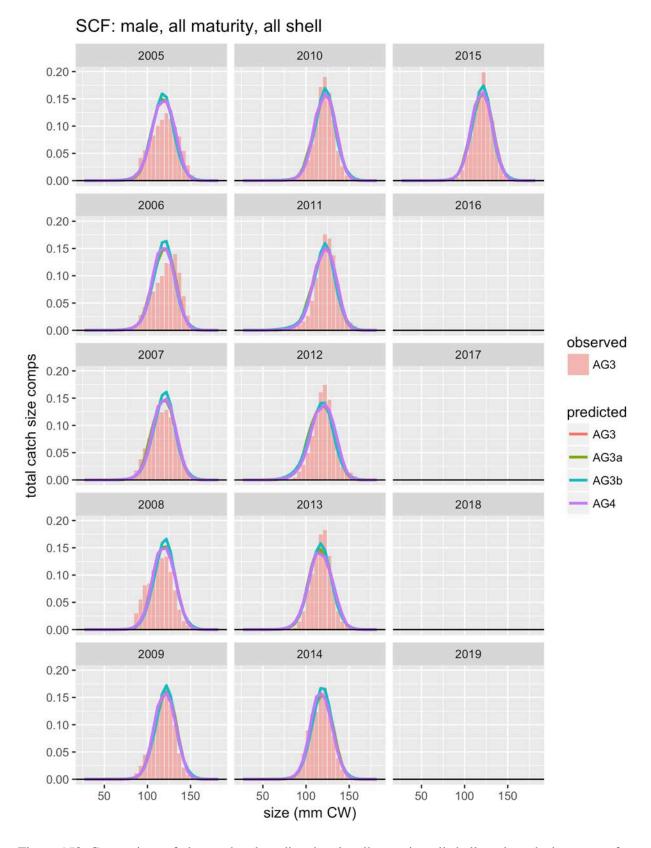


Figure 153. Comparison of observed and predicted male, all maturity, all shell total catch size comps for SCF. Page 2 of 2.

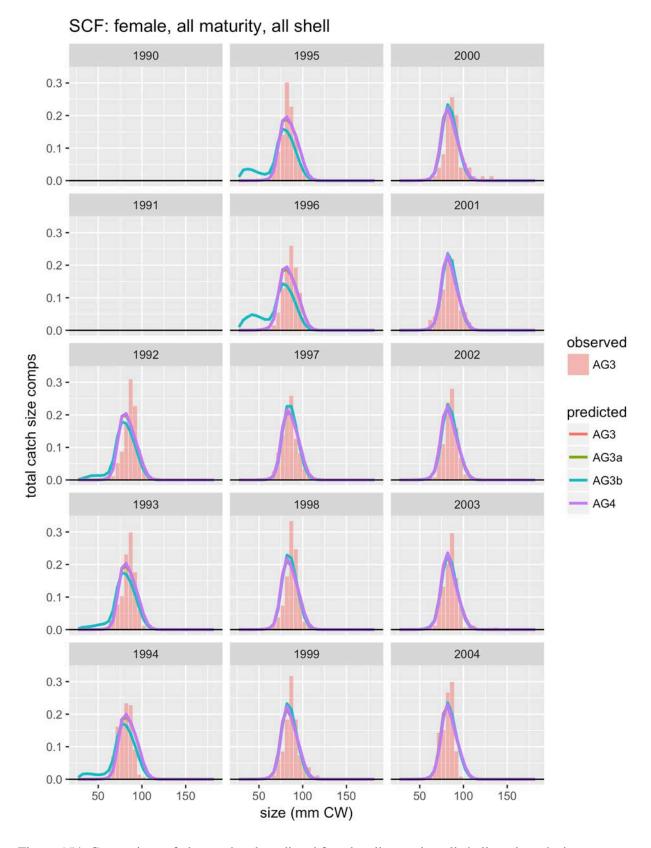


Figure 154. Comparison of observed and predicted female, all maturity, all shell total catch size comps for SCF. Page 1 of 2.

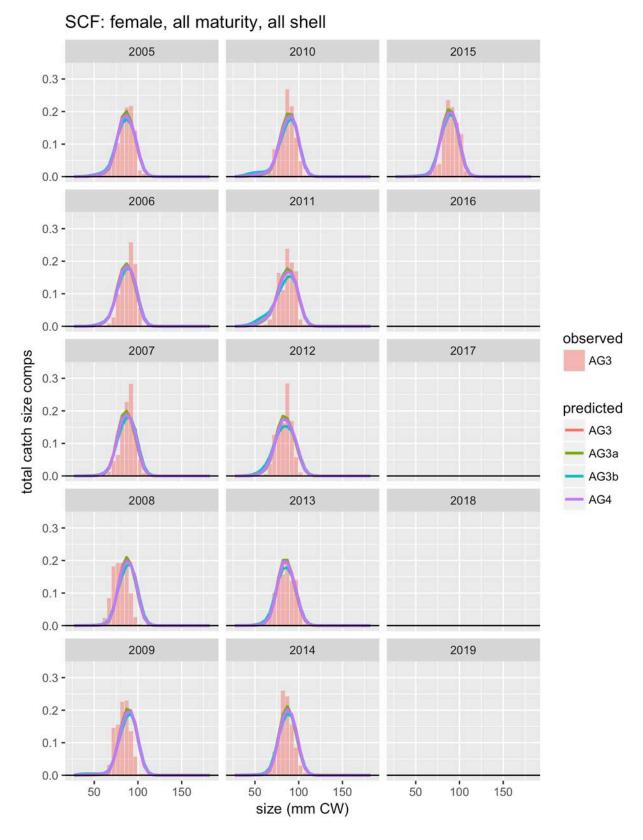


Figure 155. Comparison of observed and predicted female, all maturity, all shell total catch size comps for SCF. Page 2 of 2.

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 observed 1972 1977 1982 total catch size comps AG3 0.09 predicted 0.06 -- AG3 0.03 -AG3a 0.00 AG3b 1973 1978 1983 AG4 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 156. Comparison of observed and predicted male, all maturity, all shell total catch size comps for GTF. Page 1 of 4.

GTF: male, all maturity, all shell 1985 1990 1995 0.09 -0.06 -0.03 -0.00 1986 1991 1996 0.09 -0.06 -0.03 -0.00 observed 1987 1992 1997 total catch size comps AG3 0.09 predicted 0.06 -AG3 0.03 AG3a 0.00 AG3b AG4 1988 1993 1998 0.09 -0.06 -0.03 -0.00 1989 1994 1999 0.09 -0.06 -0.03 -0.00 50 100 50 100 50 150 150 100 150 size (mm CW)

Figure 157. 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 2006 2001 2011 0.09 -0.06 -0.03 -0.00 observed 2002 2007 2012 total catch size comps AG3 0.09 predicted 0.06 -AG3 0.03 -AG3a 0.00 AG3b 2013 2003 2008 AG4 0.09 -0.06 -0.03 -0.00 2004 2009 2014 0.09 -0.06 -0.03 -0.00 50 100 50 50 150 100 100 150 150 size (mm CW)

Figure 158. Comparison of observed and predicted male, all maturity, all shell total catch size comps for GTF. Page 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 observed 2017 2022 2027 total catch size comps AG3 0.09 predicted 0.06 -- AG3 0.03 -AG3a 0.00 AG3b 2018 2023 2028 AG4 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 159. Comparison of observed and predicted male, all maturity, all shell total catch size comps for GTF. Page 4 of 4.

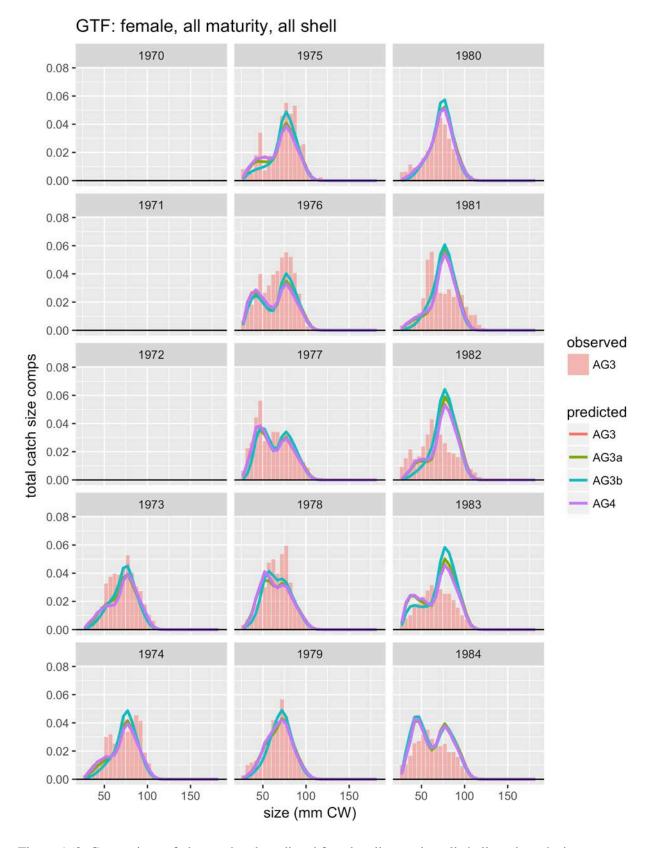


Figure 160. Comparison of observed and predicted female, all maturity, all shell total catch size comps for GTF. Page 1 of 4.

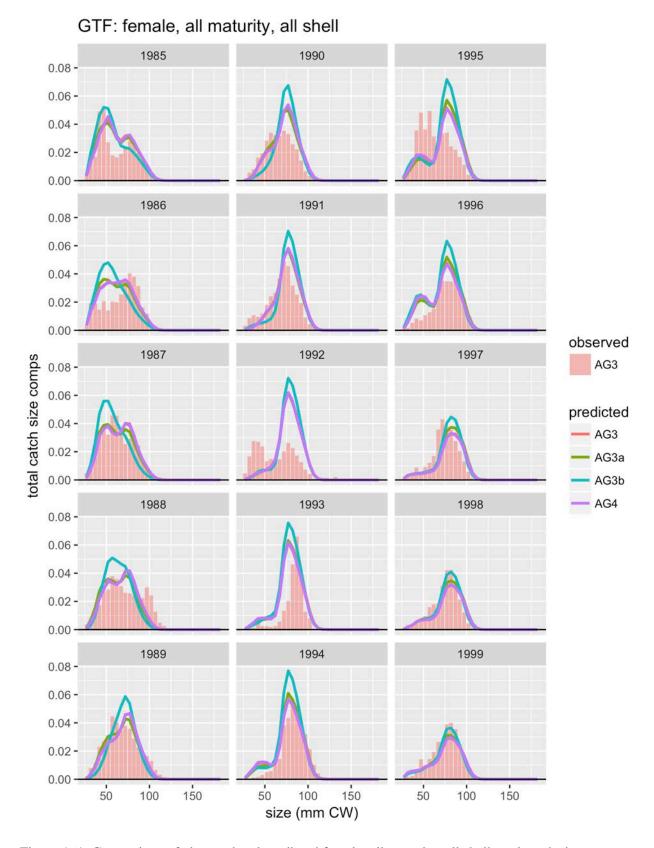


Figure 161. Comparison of observed and predicted female, all maturity, all shell total catch size comps for GTF. Page 2 of 4.

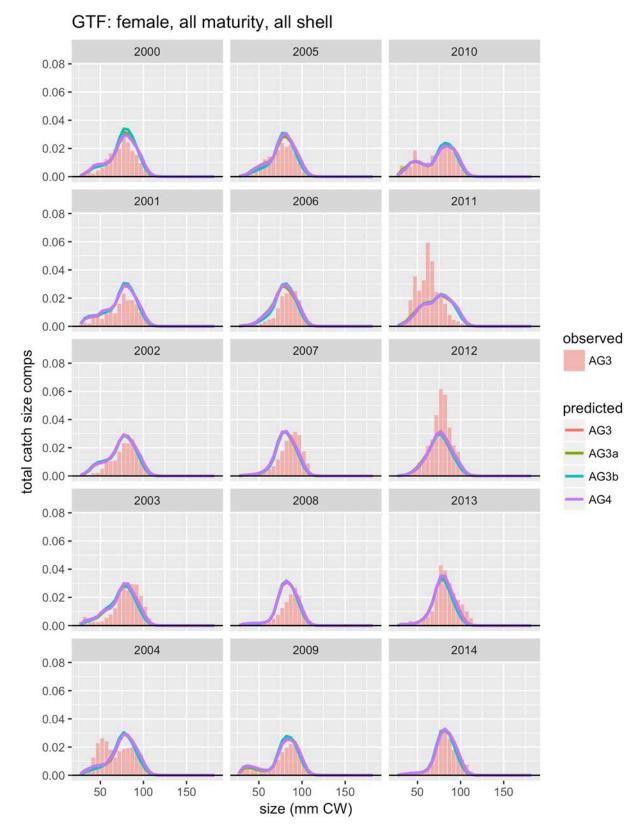


Figure 162. Comparison of observed and predicted female, all maturity, all shell total catch size comps for GTF. Page 3 of 4.

GTF: female, all maturity, all shell 2015 2020 2025 0.08 -0.06 -0.04 -0.02 -0.00 -2016 2021 2026 0.08 -0.06 -0.04 -0.02 -0.00 observed 2017 2022 2027 total catch size comps AG3 0.08 -0.06 predicted 0.04 -- AG3 0.02 -AG3a 0.00 AG3b 2018 2023 2028 AG4 0.08 -0.06 -0.04 -0.02 -0.00 2024 2029 2019 0.08 -0.06 -0.04 -0.02 -0.00 50 50 100 150 50 100 100 150 150 size (mm CW)

Figure 163. 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 2000 1990 1995 0.20 -0.15 -0.10 -0.05 -0.00 -1991 1996 2001 0.20 -0.15 -0.10 -0.05 -0.00 observed 1997 2002 1992 total catch size comps AG3 0.20 -0.15 predicted 0.10 -- AG3 0.05 -AG3a 0.00 AG3b 1993 2003 AG4 1998 0.20 -0.15 -0.10 -0.05 -0.00 -1994 1999 2004 0.20 -0.15 -0.10 -0.05 -0.00 50 100 150 50 100 50 150 100 150 size (mm CW)

Figure 164. 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 0.20 -0.15 -0.10 -0.05 -0.00 -2006 2011 2016 0.20 -0.15 -0.10 -0.05 -0.00 observed 2007 2012 2017 total catch size comps AG3 0.20 -0.15 predicted 0.10 -AG3 0.05 -AG3a 0.00 AG3b 2008 2013 AG4 2018 0.20 -0.15 -0.10 -0.05 -0.00 -2009 2014 2019 0.20 -0.15 -0.10 -0.05 -0.00 50 100 50 50 100 150 150 100 150 size (mm CW)

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

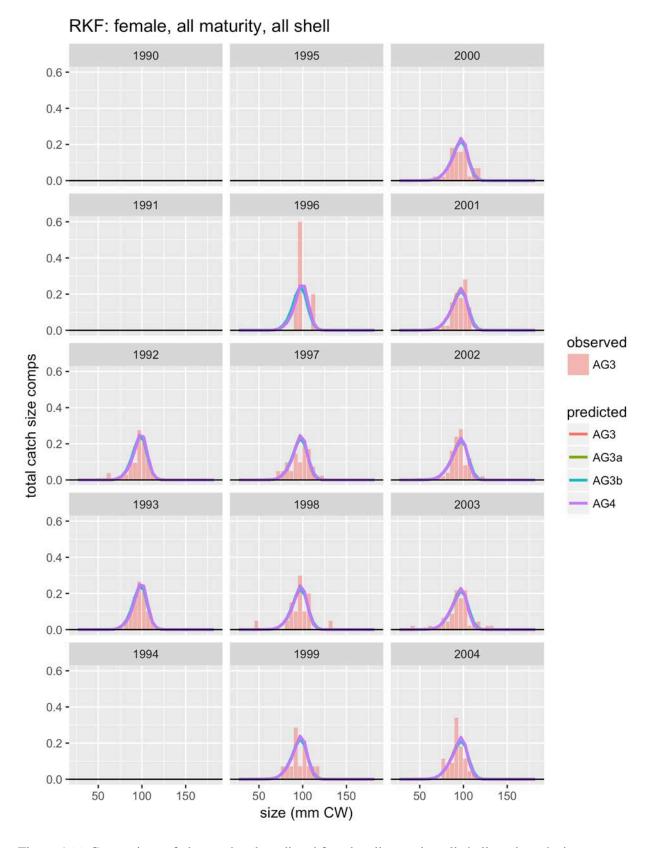


Figure 166. Comparison of observed and predicted female, all maturity, all shell total catch size comps for RKF. Page 1 of 2.

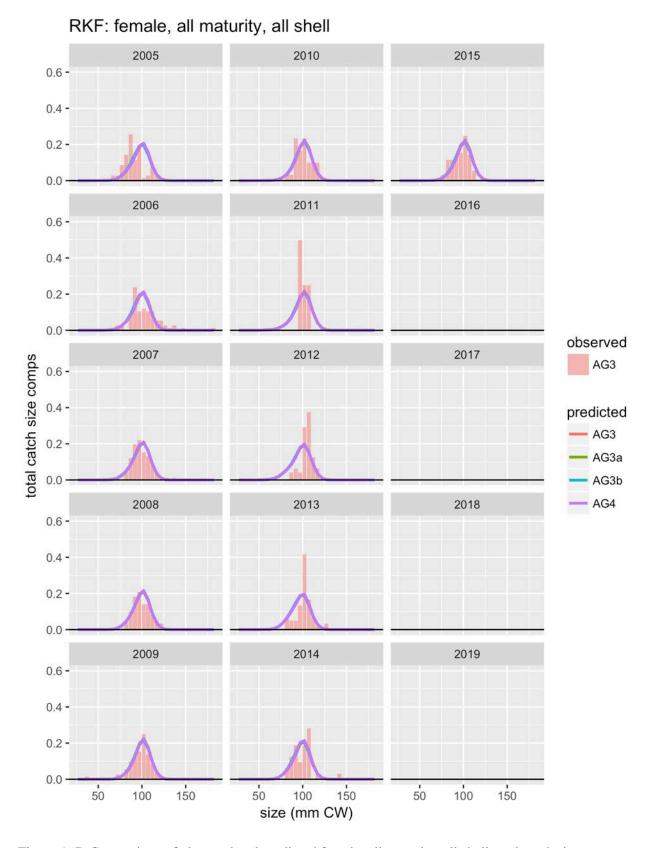


Figure 167. Comparison of observed and predicted female, all maturity, all shell total catch size comps for RKF. Page 2 of 2.

Retained fishery catch biomass

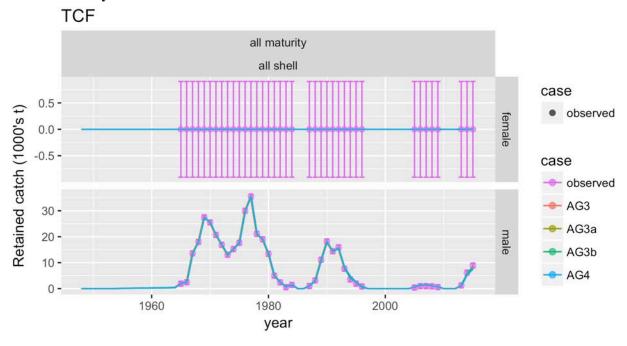


Figure 168. Comparison of observed and predicted retained catch mortality for TCF.

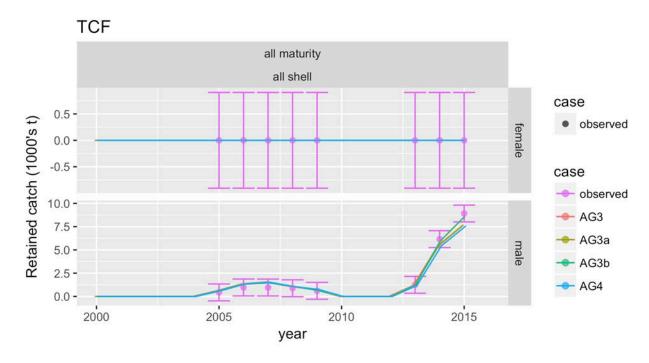


Figure 169. Comparison of observed and predicted retained catch mortality for TCF. Recent time period.

Mean retained fishery size compositions

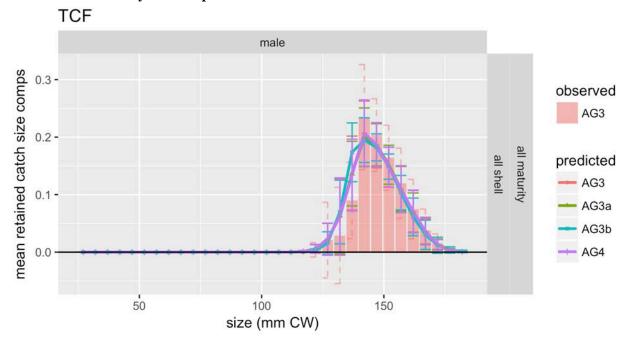


Figure 170. Comparison of observed and predicted &&xms mean retained catch size comps for TCF.

Retained fishery size compositions

TCF: male, all maturity, all shell

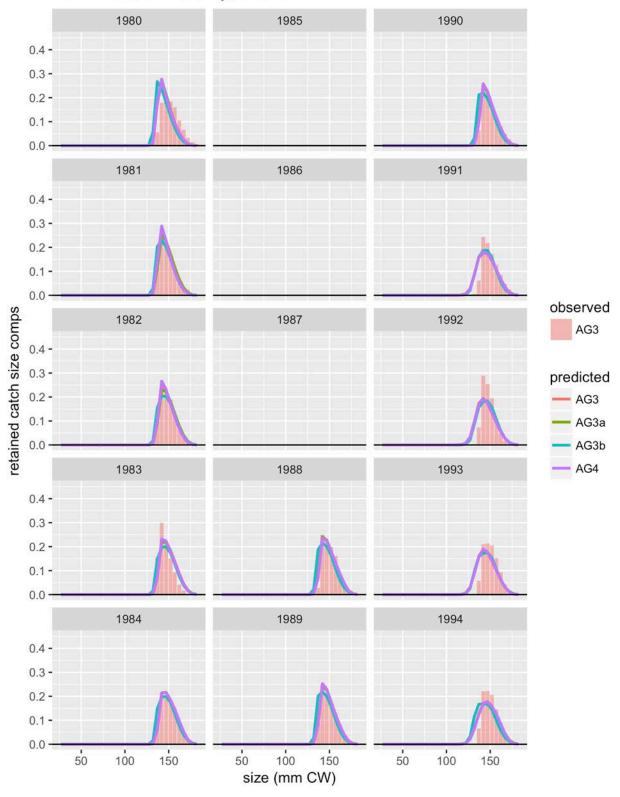


Figure 171. Comparison of observed and predicted male, all maturity, all shell retained catch size comps for TCF. Page 1 of 3.

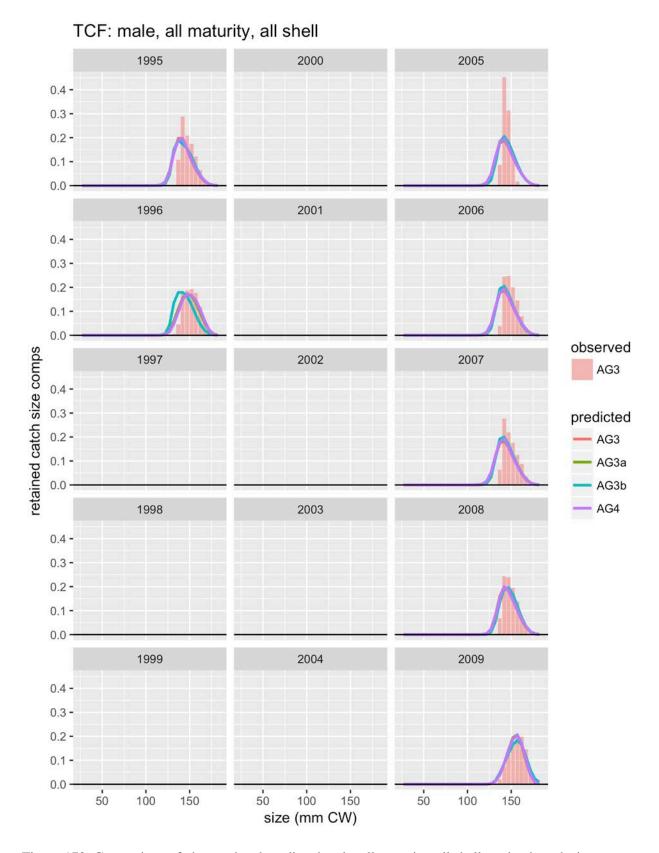


Figure 172. Comparison of observed and predicted male, all maturity, all shell retained catch size comps for TCF. Page 2 of 3.

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 observed retained catch size comps 2012 2017 2022 AG3 0.4 -0.3 predicted 0.2 -- AG3 0.1 -AG3a 0.0 AG3b AG4 2013 2018 2023 0.4 -0.3 -0.2 -0.1 -0.0 -2014 2019 2024 0.4 -0.3 -0.2 -0.1 -0.0 50 100 50 100 150 50 100 150 150 size (mm CW)

Figure 173. Comparison of observed and predicted male, all maturity, all shell retained catch size comps for TCF. Page 3 of 3.