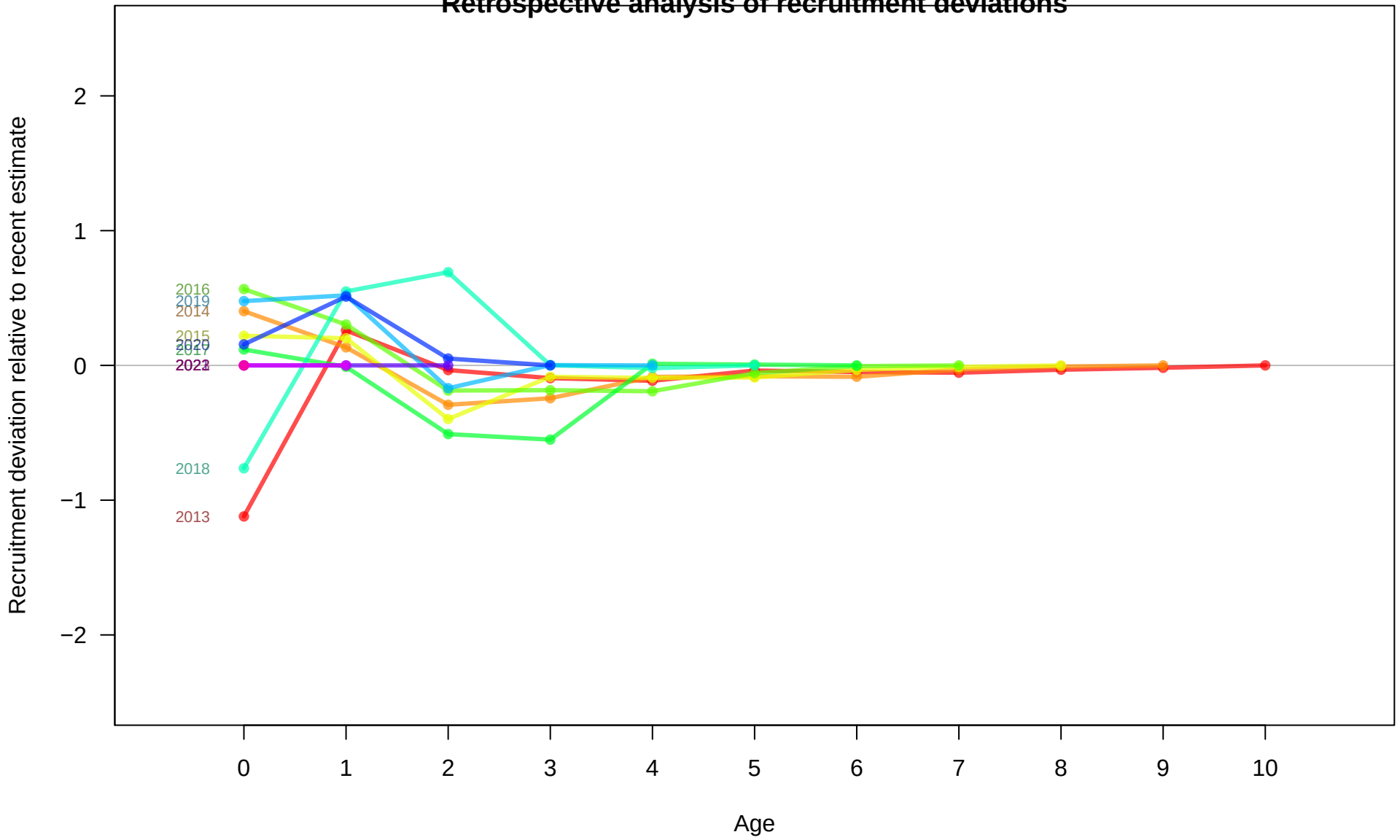
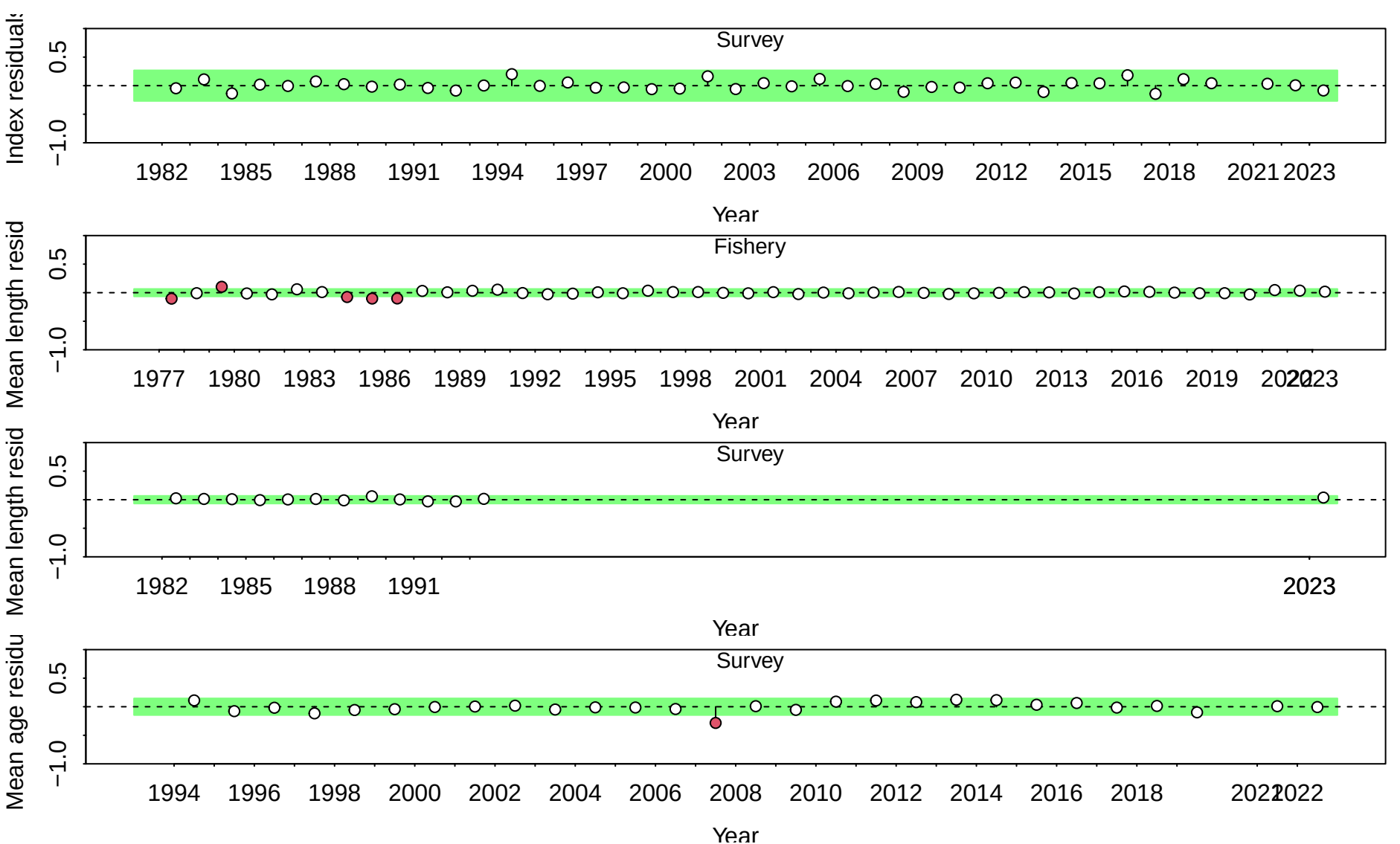
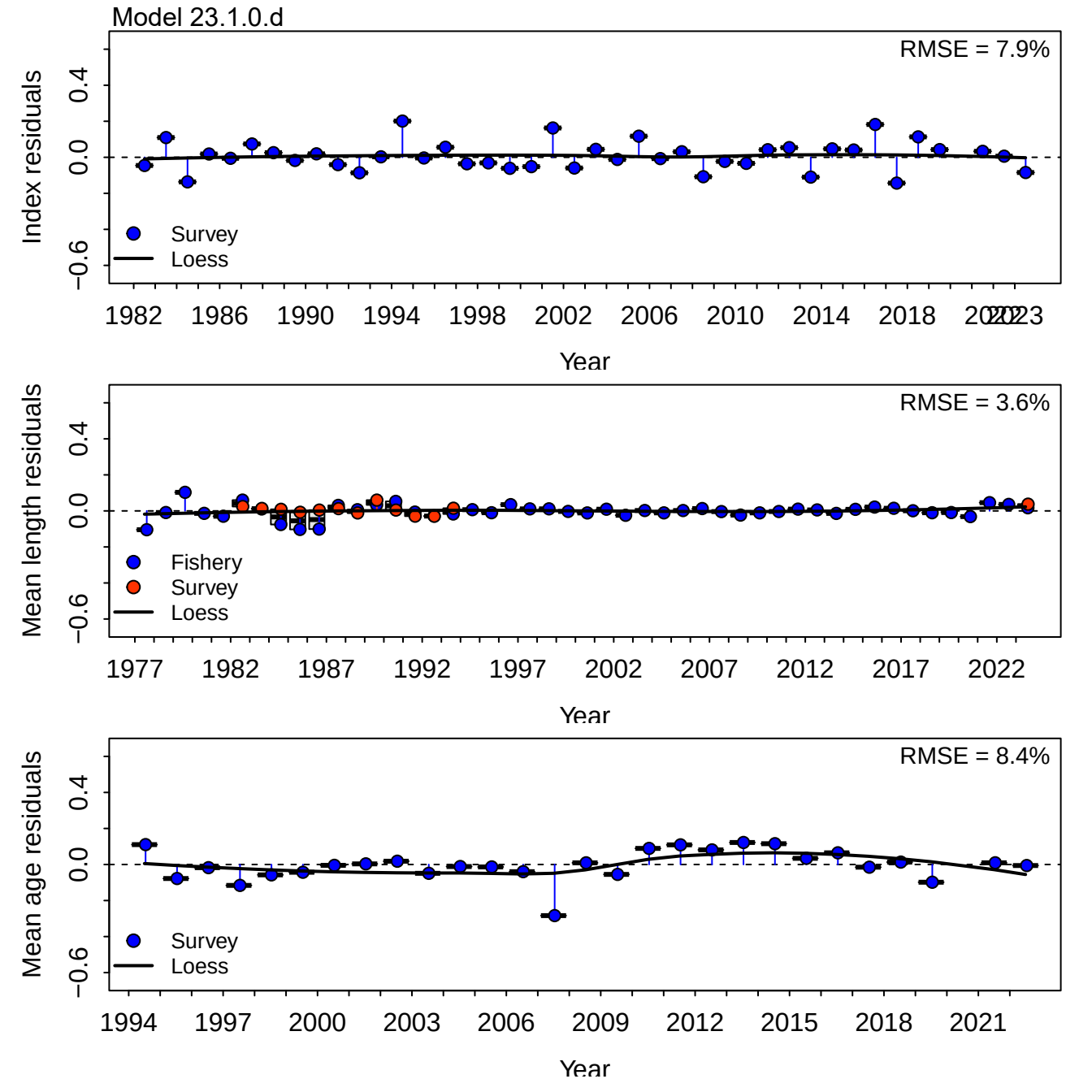
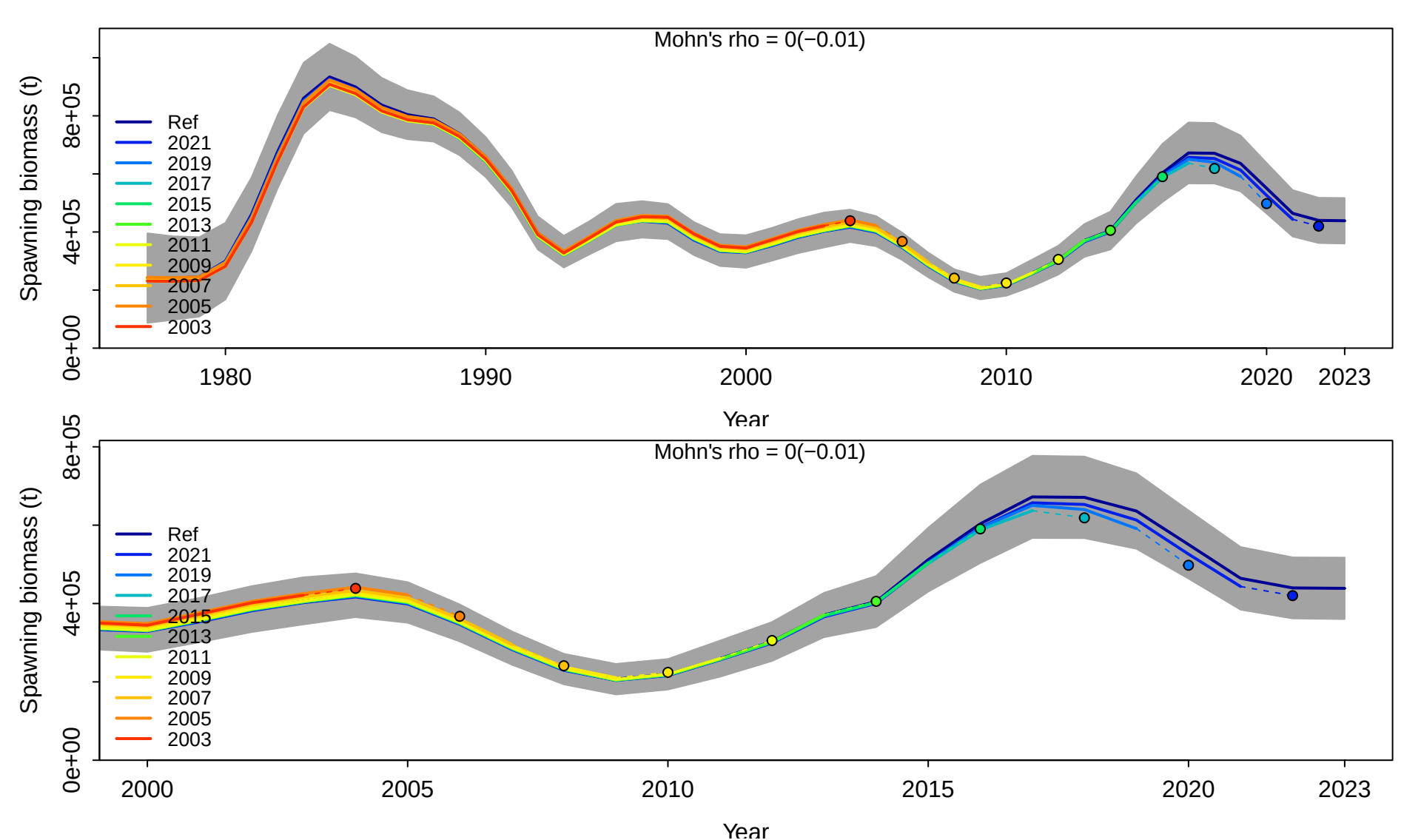
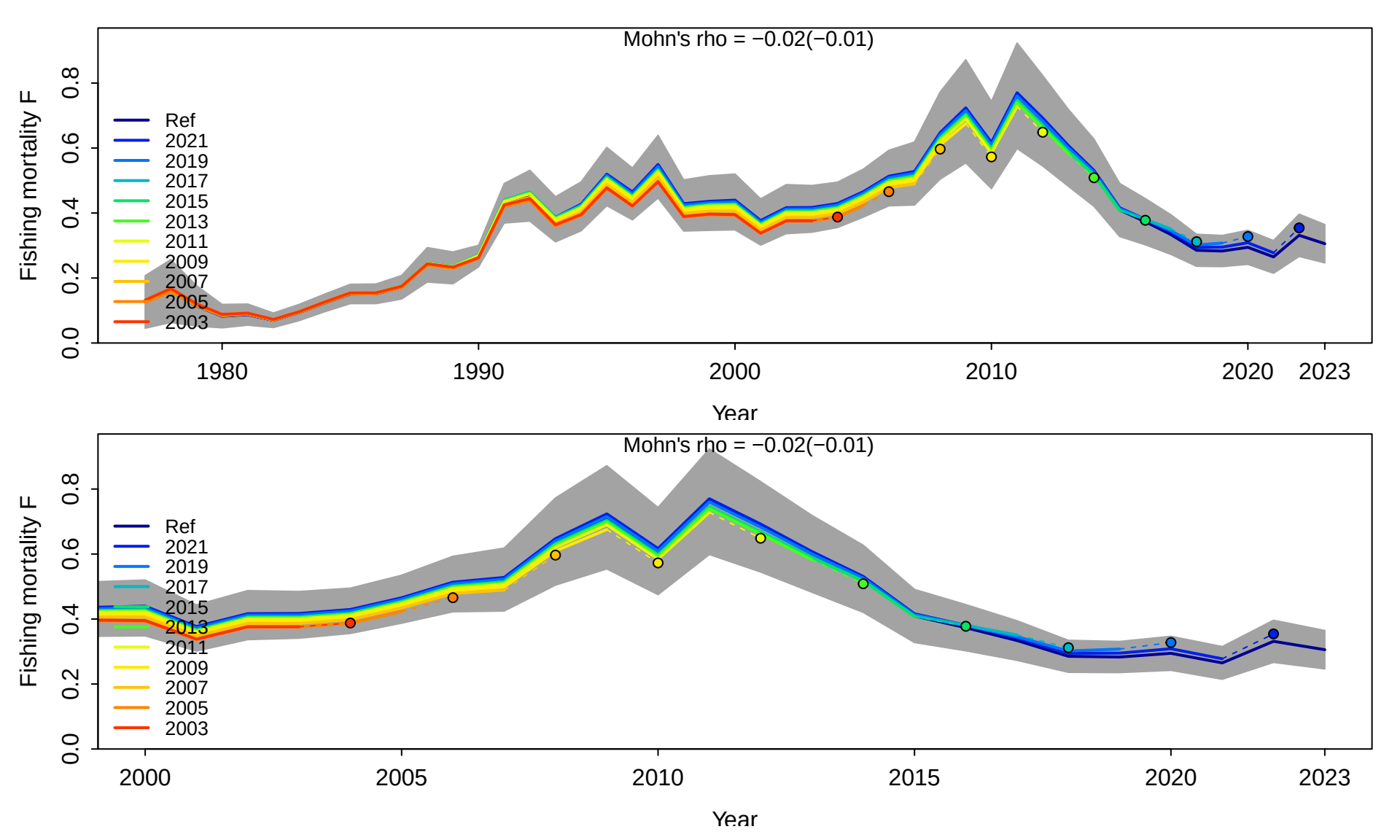
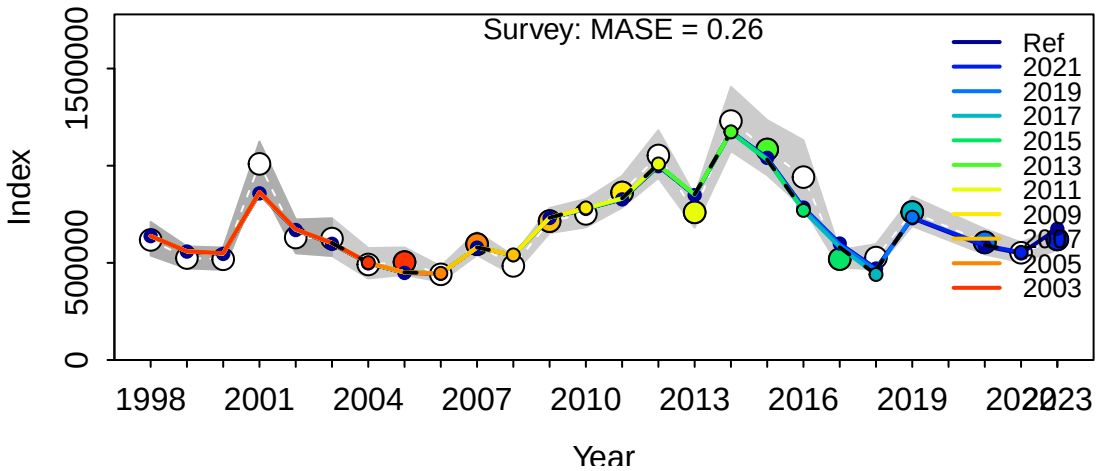

Retrospective analysis of recruitment deviations
Recruitment deviation relative to recent estimate
2
1
0
−1
−2
2016
2019
2014
2015
2020
2017
2021
2018
2013
0
1
2
3
4
5
6
7
8
9
10
Age

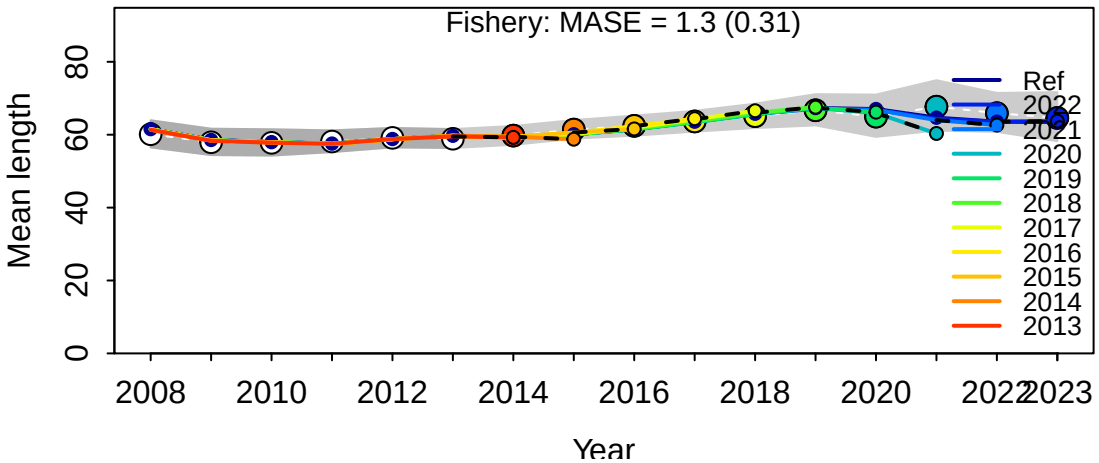

Index residuals
Survey
0.5
−1.0
1982 1985 1988 1991 1994 1997 2000 2003 2006 2009 2012 2015 2018 2021 2023
Year
Mean length resid
Fishery
0.5
−1.0
1977 1980 1983 1986 1989 1992 1995 1998 2001 2004 2007 2010 2013 2016 2019 2023
Year
Mean length resid
Survey
0.5
−1.0
1982 1985 1988 1991 2023
Year
Mean age residu
Survey
0.5
−1.0
1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2022
Year

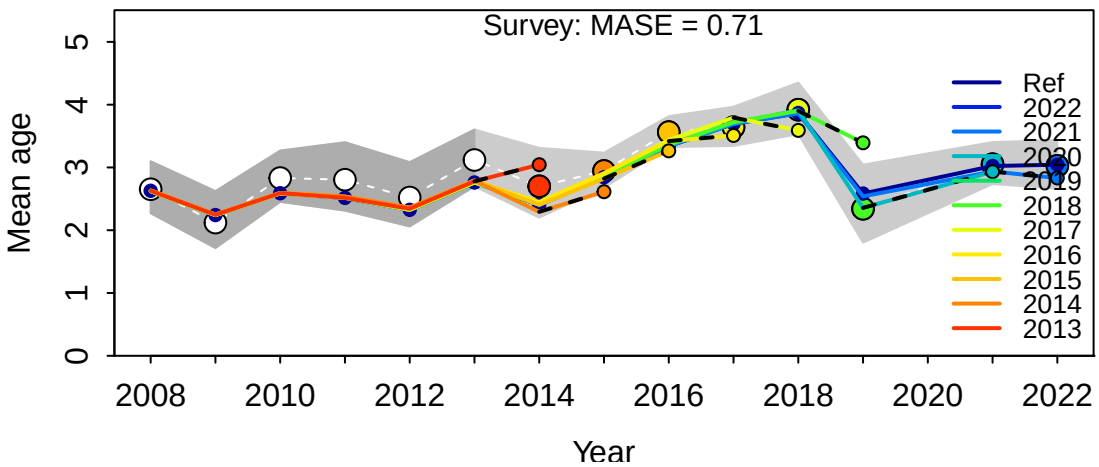

Model 23.1.0.d
RMSE = 7.9%
Index residuals
0.4
0.0
−0.6
Survey
Loess
1982
1986
1990
1994
1998
2002
2006
2010
2014
2018
Year
RMSE = 3.6%
Mean length residuals
Fishery
Survey
Loess
1977
1982
1987
1992
1997
2002
2007
2012
2017
2022
Year
RMSE = 8.4%
Mean age residuals
Survey
Loess
1994
1997
2000
2003
2006
2009
2012
2015
2018
2021
Year

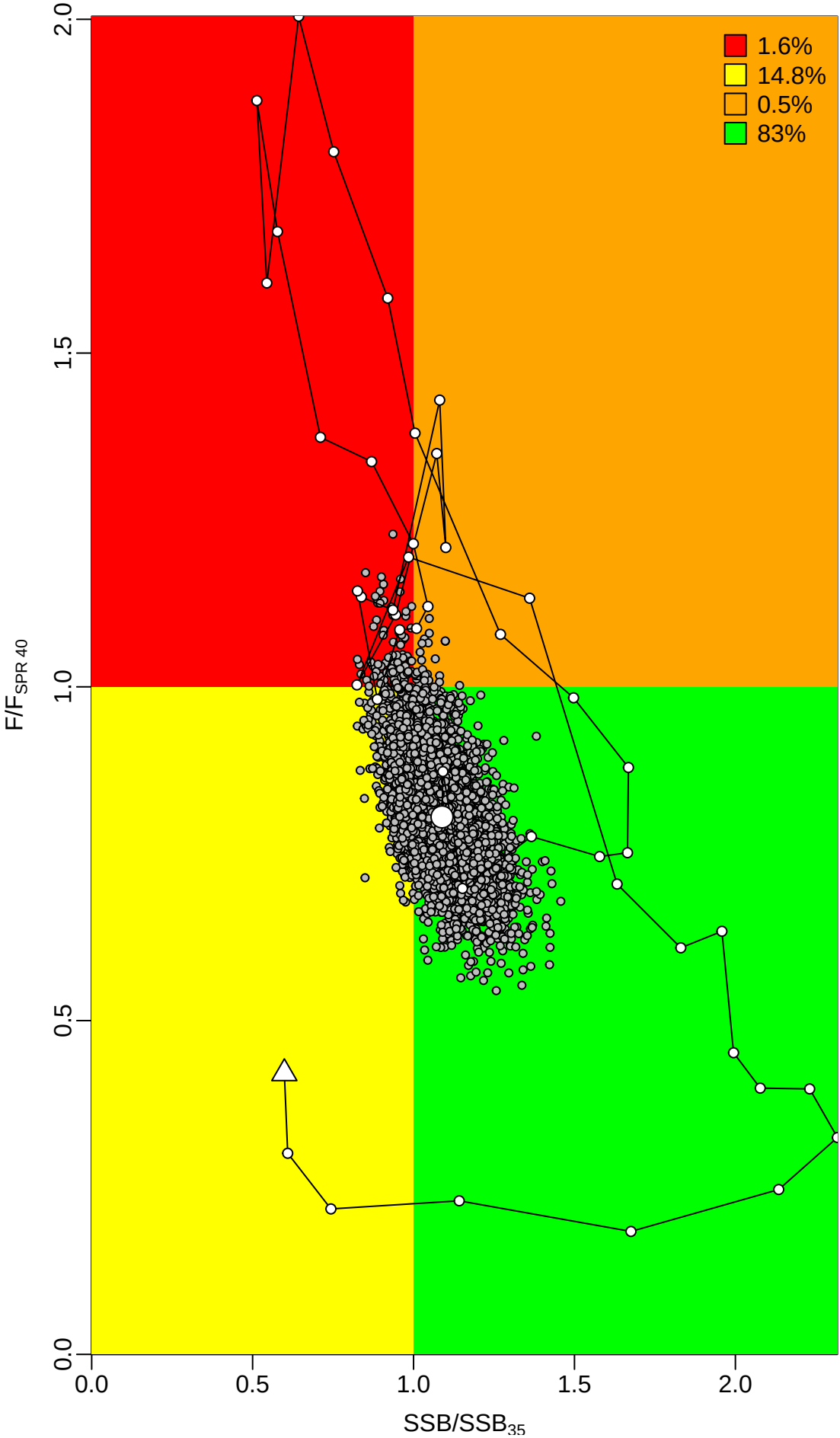

Mohn's rho = 0(−0.01)
Spawning biomass (t)
0e+00
4e+05
8e+05
Ref
2021
2019
2017
2015
2013
2011
2009
2007
2005
2003
1980
1990
2000
2010
2020
2023
Year
Mohn's rho = 0(−0.01)
Spawning biomass (t)
0e+00
4e+05
8e+05
Ref
2021
2019
2017
2015
2013
2011
2009
2007
2005
2003
2000
2005
2010
2015
2020
2023
Year

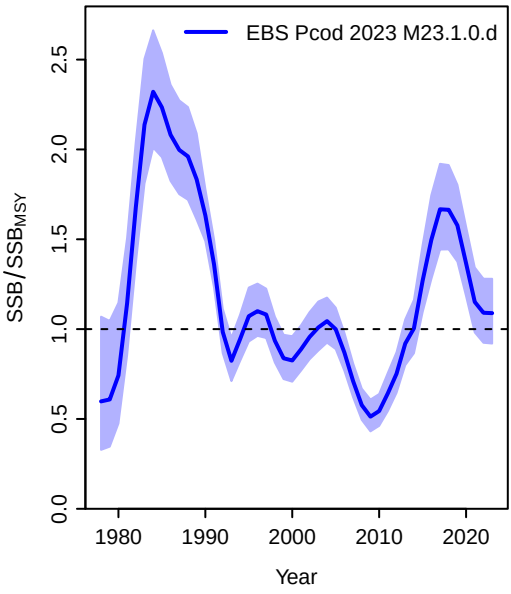

Mohn's rho = −0.02(−0.01)
Fishing mortality F
0.0
0.2
0.4
0.6
0.8
Ref
2021
2019
2017
2015
2013
2011
2009
2007
2005
2003
1980
1990
2000
2010
2020
2023
Year
Mohn's rho = −0.02(−0.01)
Fishing mortality F
0.0
0.2
0.4
0.6
0.8
Ref
2021
2019
2017
2015
2013
2011
2009
2007
2005
2003
2000
2005
2010
2015
2020
2023
Year

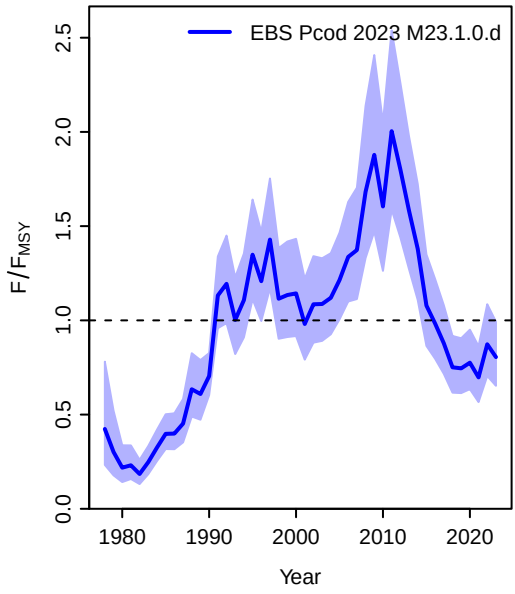

Survey: MASE = 0.26
Index
0
500000
1500000
1998
2001
2004
2007
2010
2013
2016
2019
2022
2023
Year
Ref
2021
2019
2017
2015
2013
2011
2009
2007
2005
2003

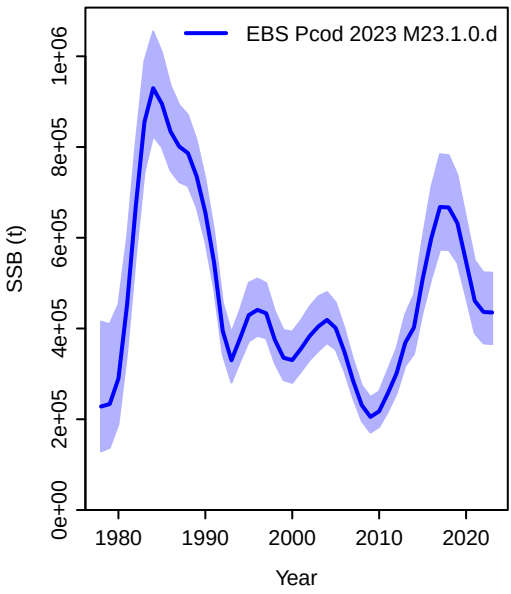

Fishery: MASE = 1.3 (0.31)
Mean length
0
20
40
60
80
2008
2010
2012
2014
2016
2018
2020
2022
2023
Year
Ref
2022
2021
2020
2019
2018
2017
2016
2015
2014
2013

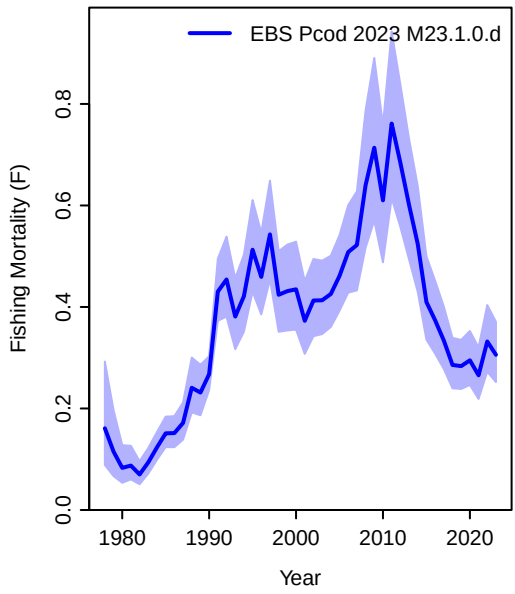

Survey: MASE = 0.71
Mean age
0
1
2
3
4
5
2008
2010
2012
2014
2016
2018
2020
2022
Year
Ref
2022
2021
2020
2019
2018
2017
2016
2015
2014
2013

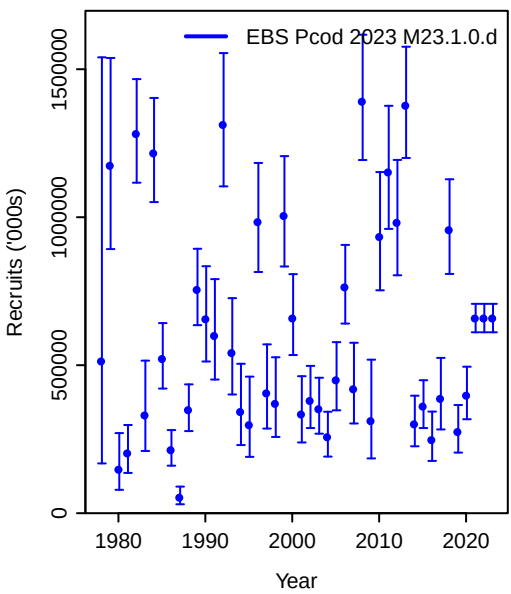

1.6%
14.8%
0.5%
83%
2.0
1.5
1.0
0.5
0.0
F/F$_{SPR\ 40}$
0.0
0.5
1.0
1.5
2.0
SSB/SSB$_{35}$

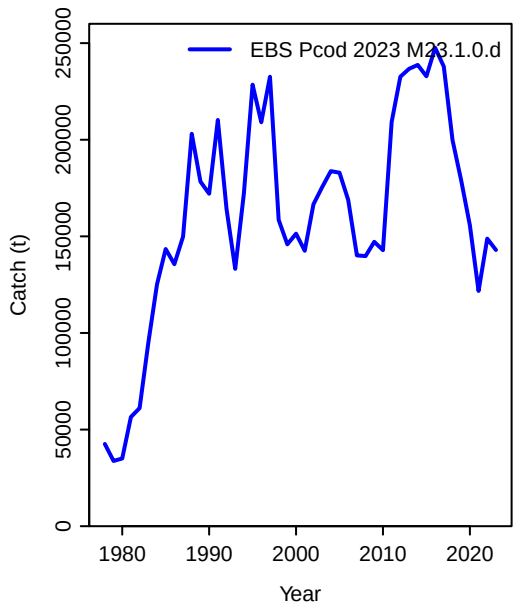

EBS Pcod 2023 M23.1.0.d
SSB/SSB$_{MSY}$
0.0
0.5
1.0
1.5
2.0
2.5
1980
1990
2000
2010
2020
Year

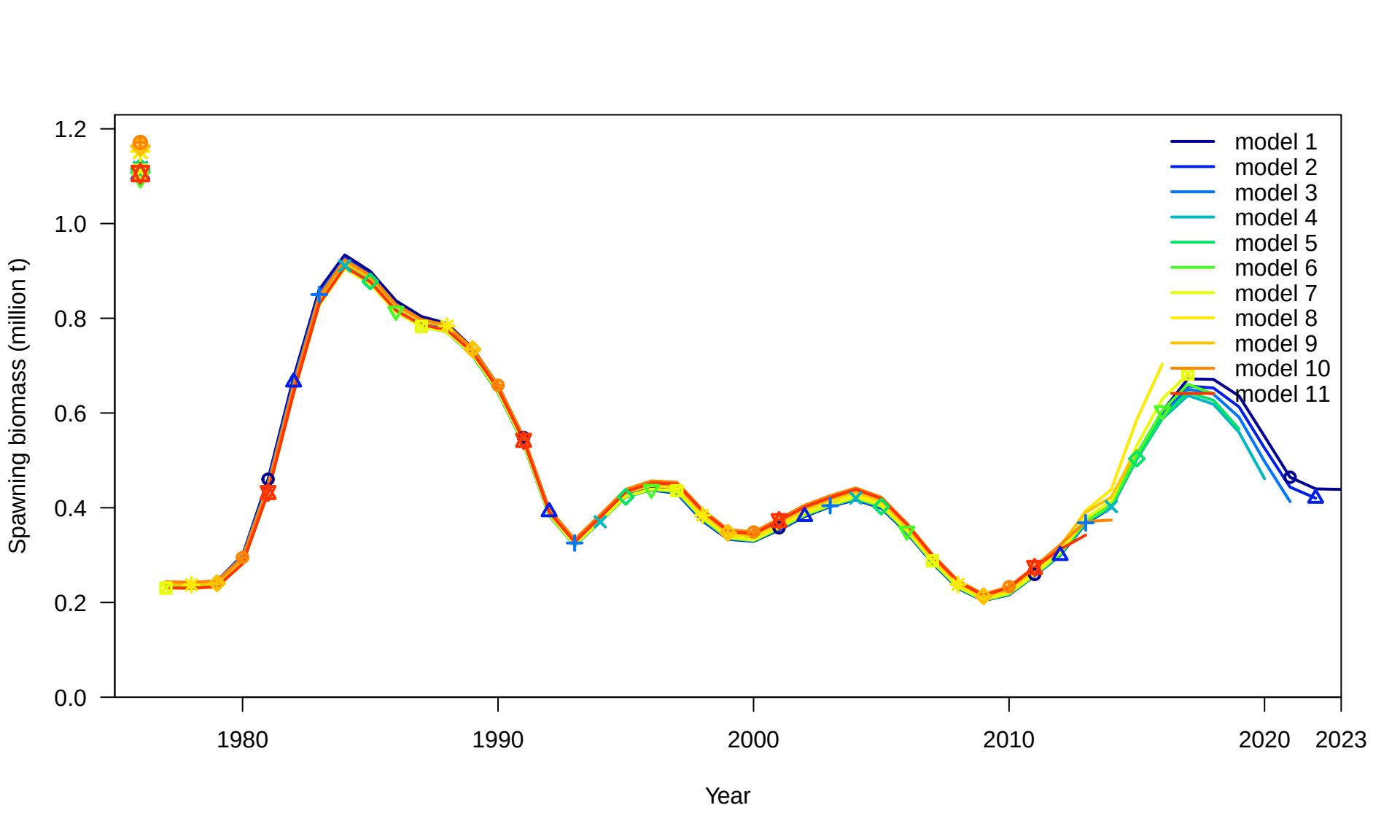

EBS Pcod 2023 M23.1.0.d
F/F$_{MSY}$
0.0
0.5
1.0
1.5
2.0
2.5
1980
1990
2000
2010
2020
Year

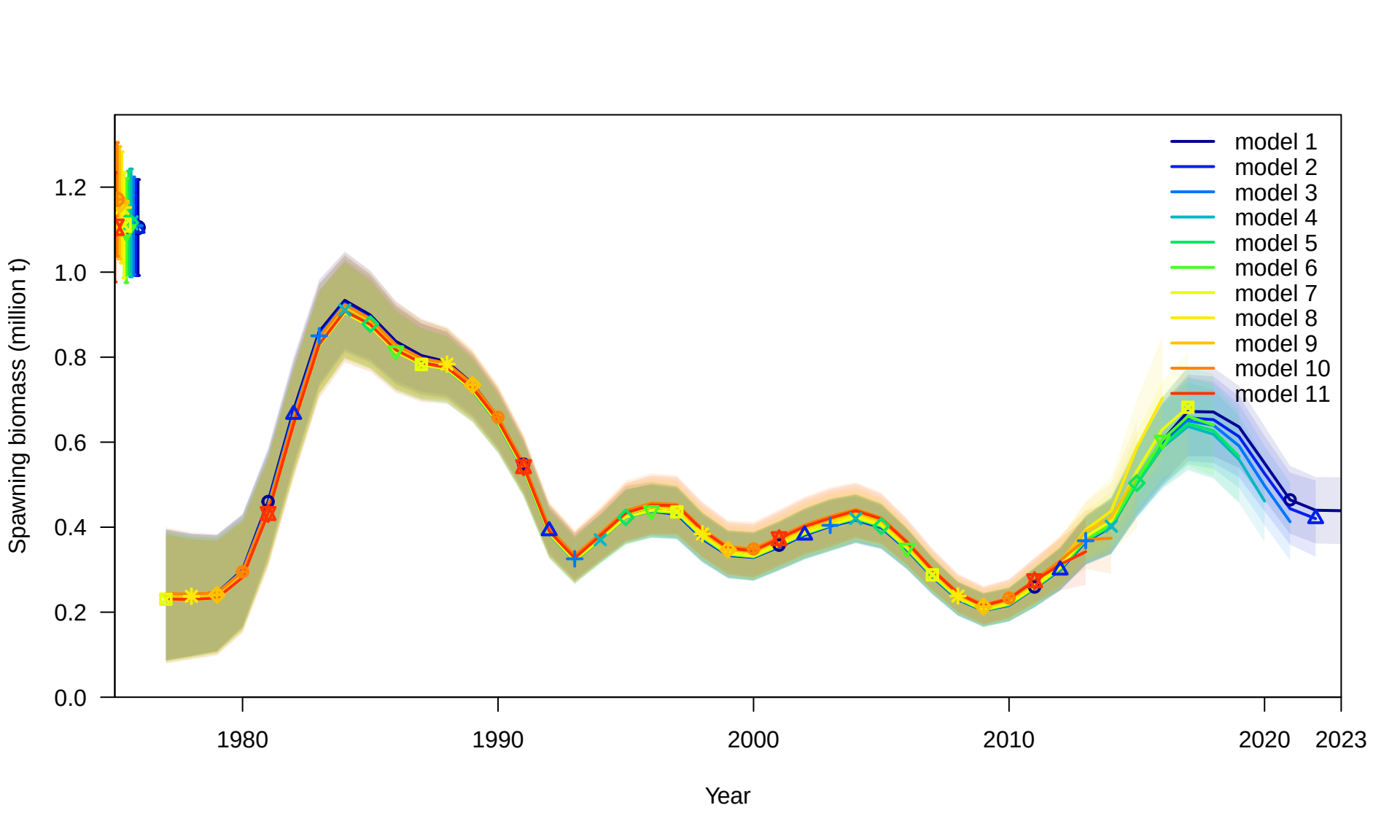

EBS Pcod 2023 M23.1.0.d
SSB (t)
0e+00
2e+05
4e+05
6e+05
8e+05
1e+06
1980
1990
2000
2010
2020
Year

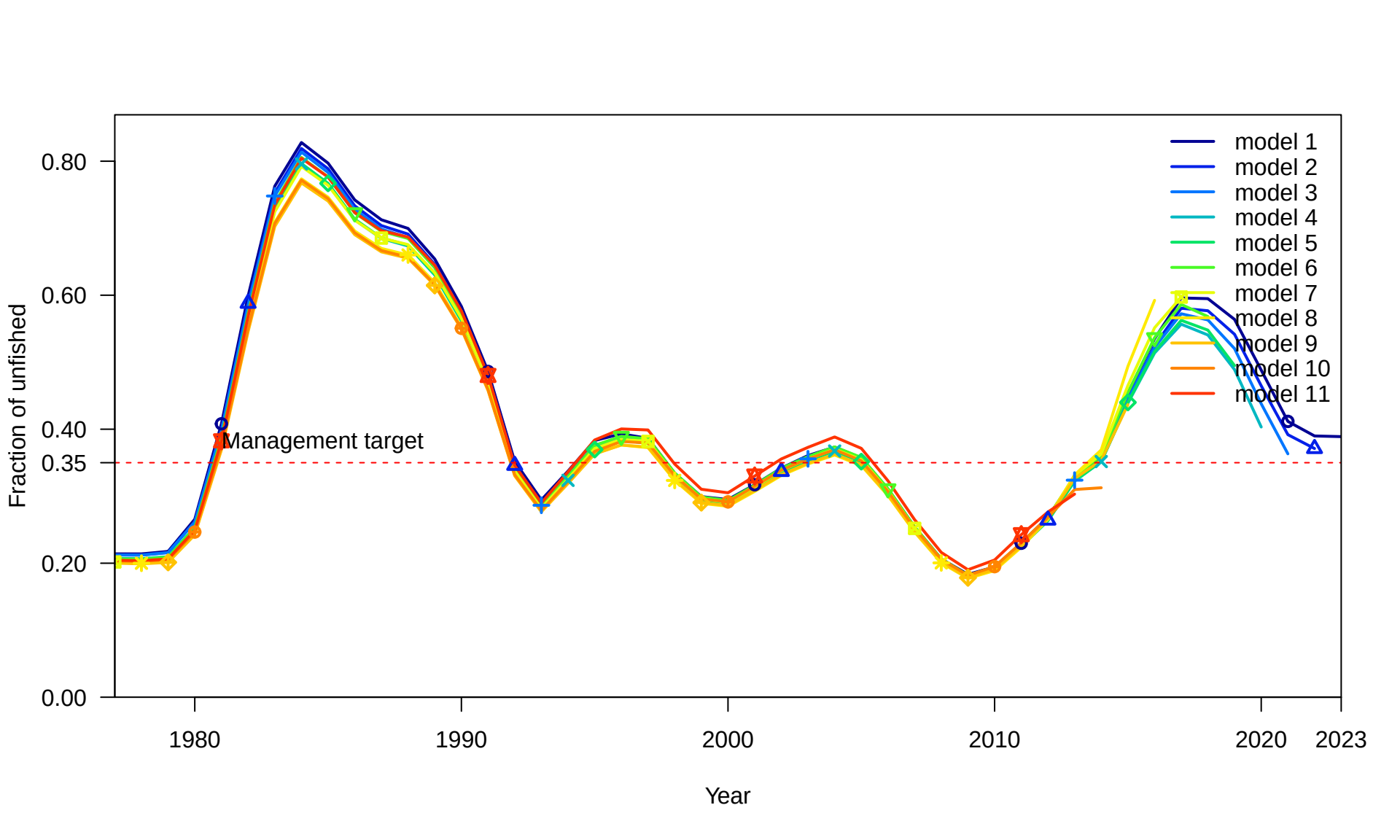

EBS Pcod 2023 M23.1.0.d
Fishing Mortality (F)
0.0
0.2
0.4
0.6
0.8
1980
1990
2000
2010
2020
Year

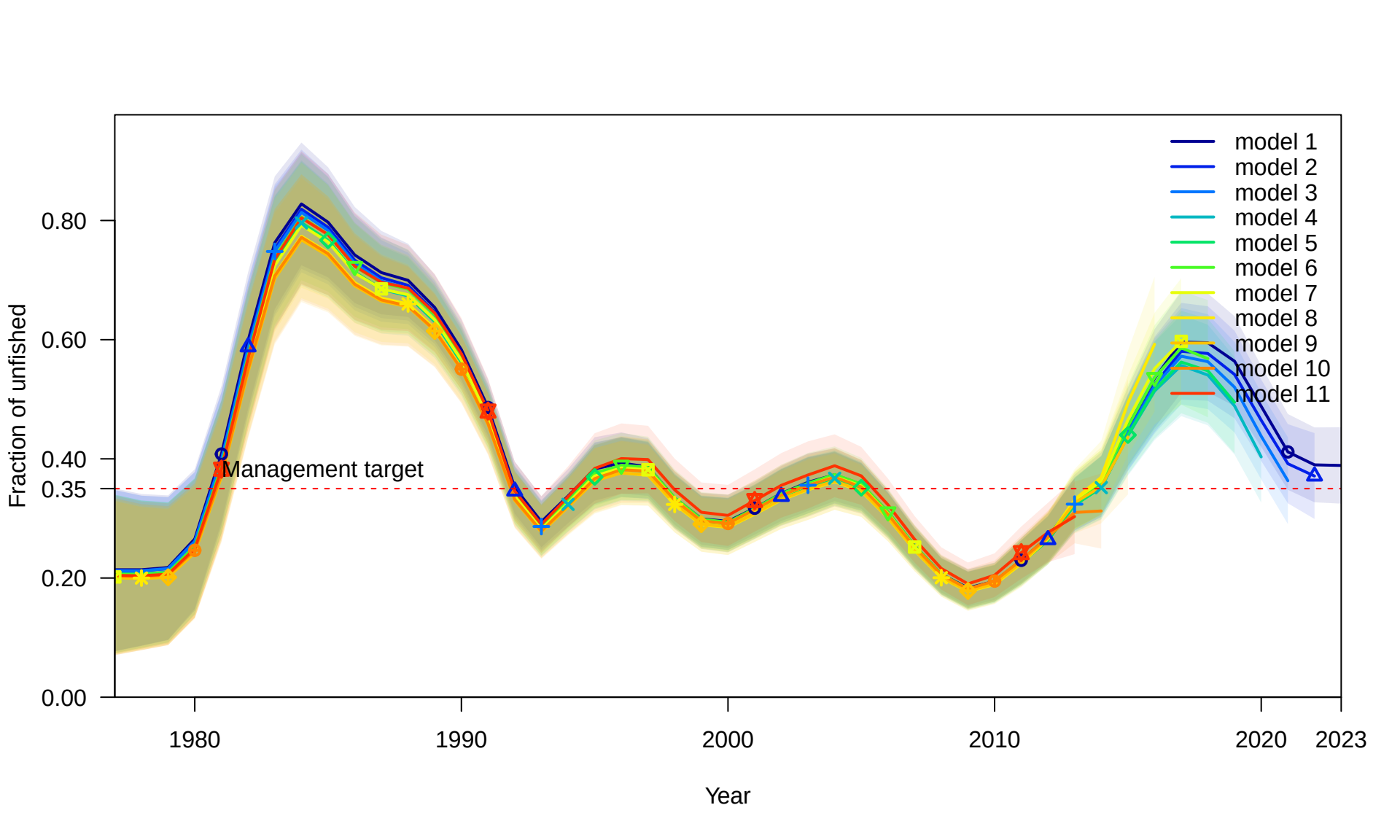

EBS Pcod 2023 M23.1.0.d
Recruits ('000s)
0
500000
1000000
1500000
1980
1990
2000
2010
2020
Year


EBS Pcod 2023 M23.1.0.d
Catch (t)
0
50000
100000
150000
200000
250000
1980
1990
2000
2010
2020
Year

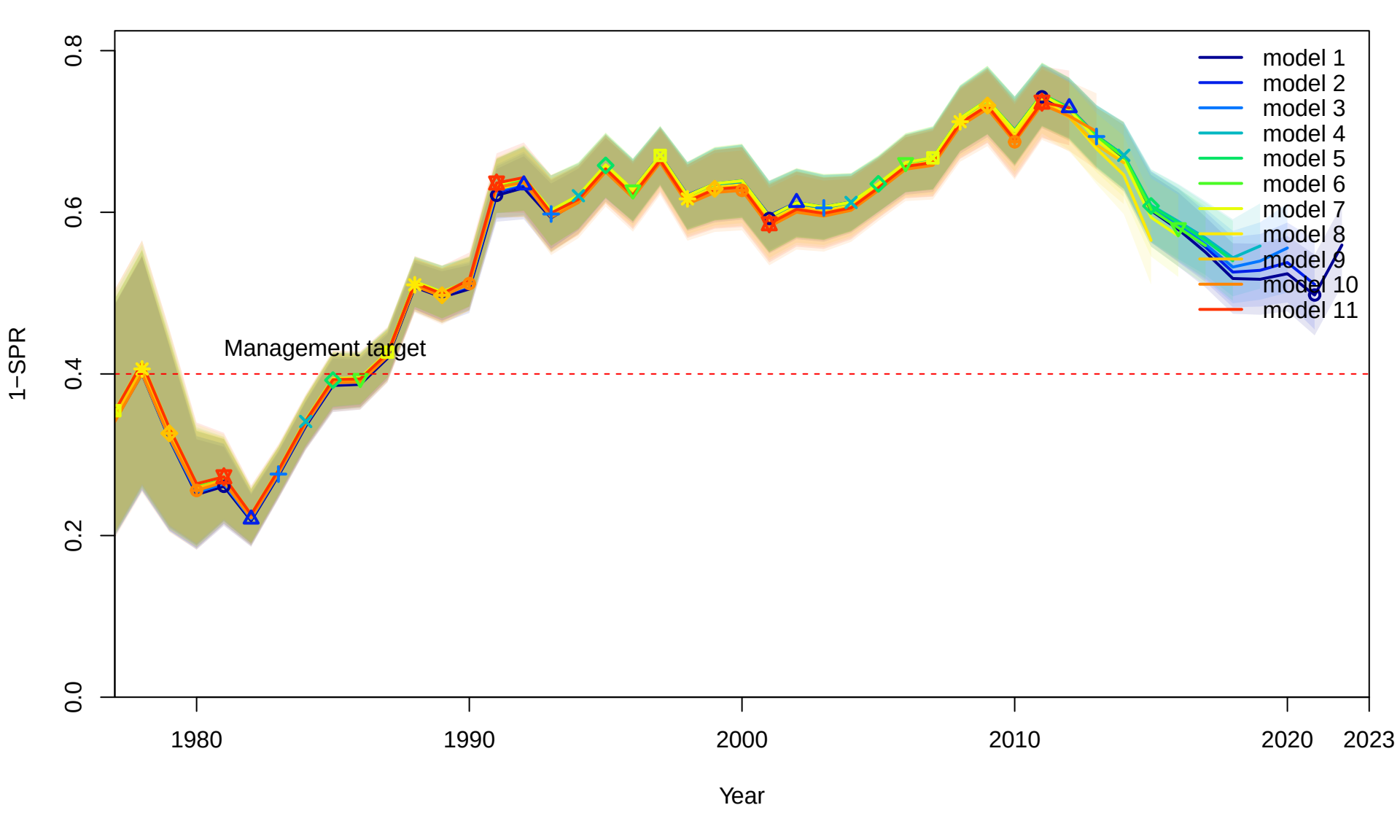

Spawning biomass (million t)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1980
1990
2000
2010
2020
2023
Year
model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11

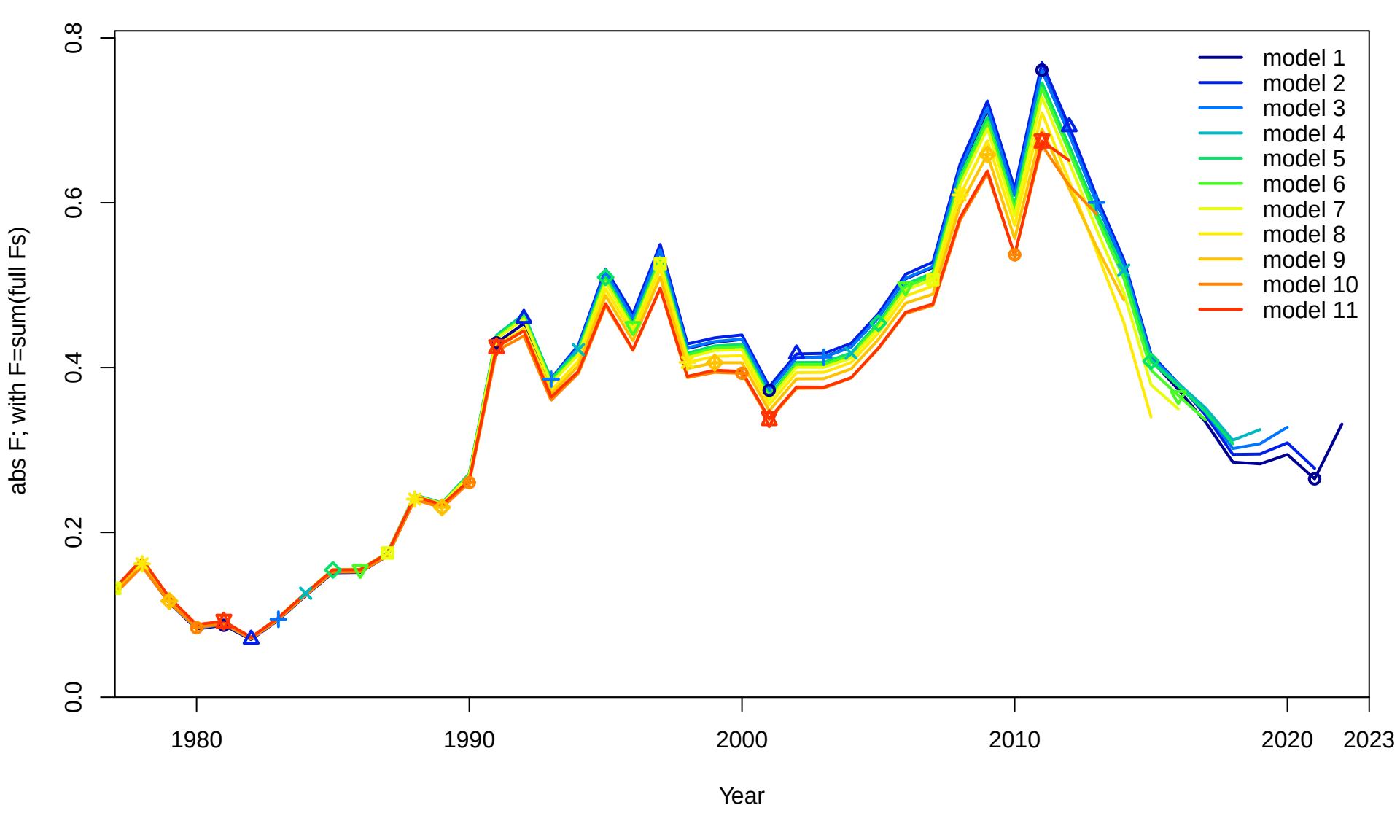

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Spawning biomass (million t)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1980
1990
2000
2010
2020
2023
Year

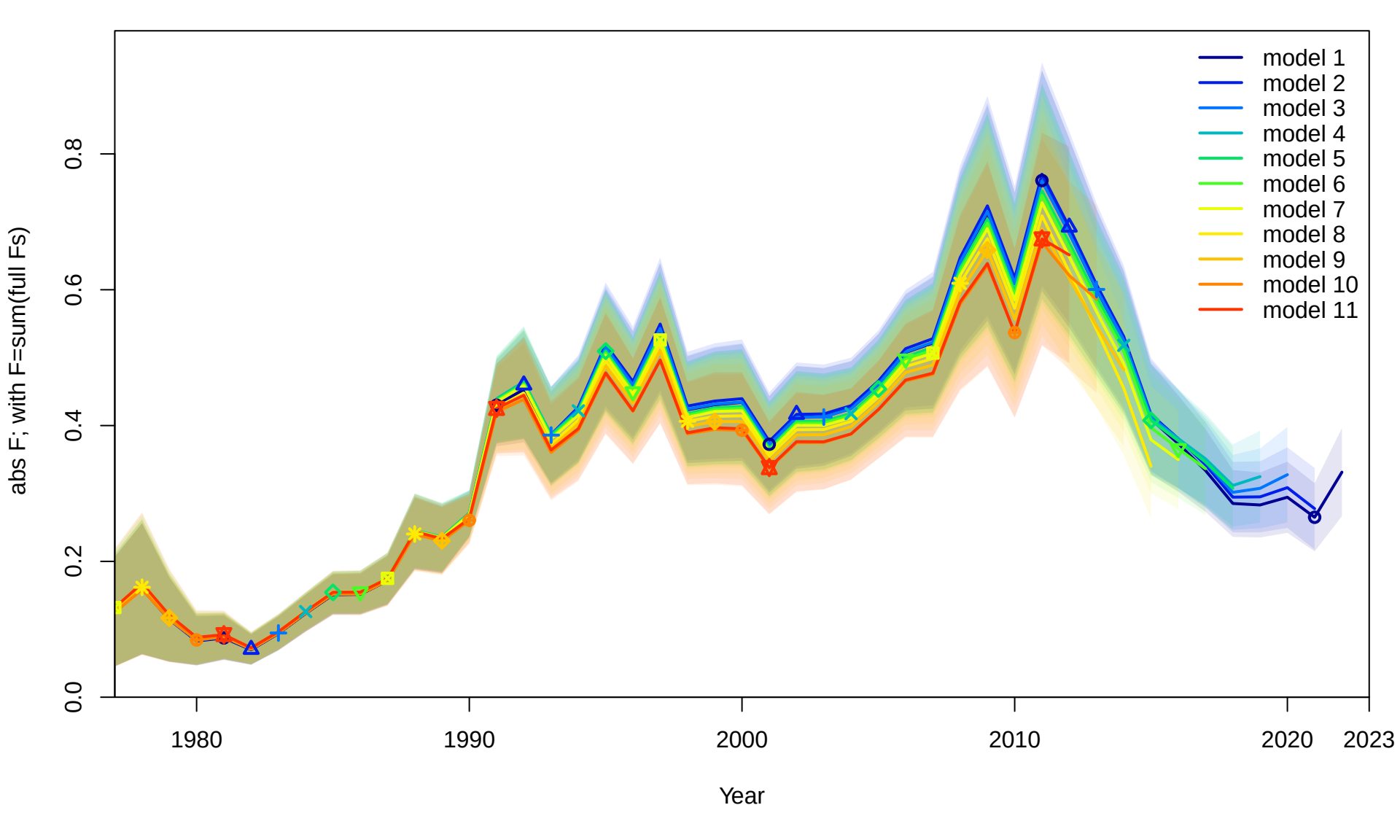

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Management target
Fraction of unfished
0.00
0.20
0.35
0.40
0.60
0.80
1980
1990
2000
2010
2020
2023
Year

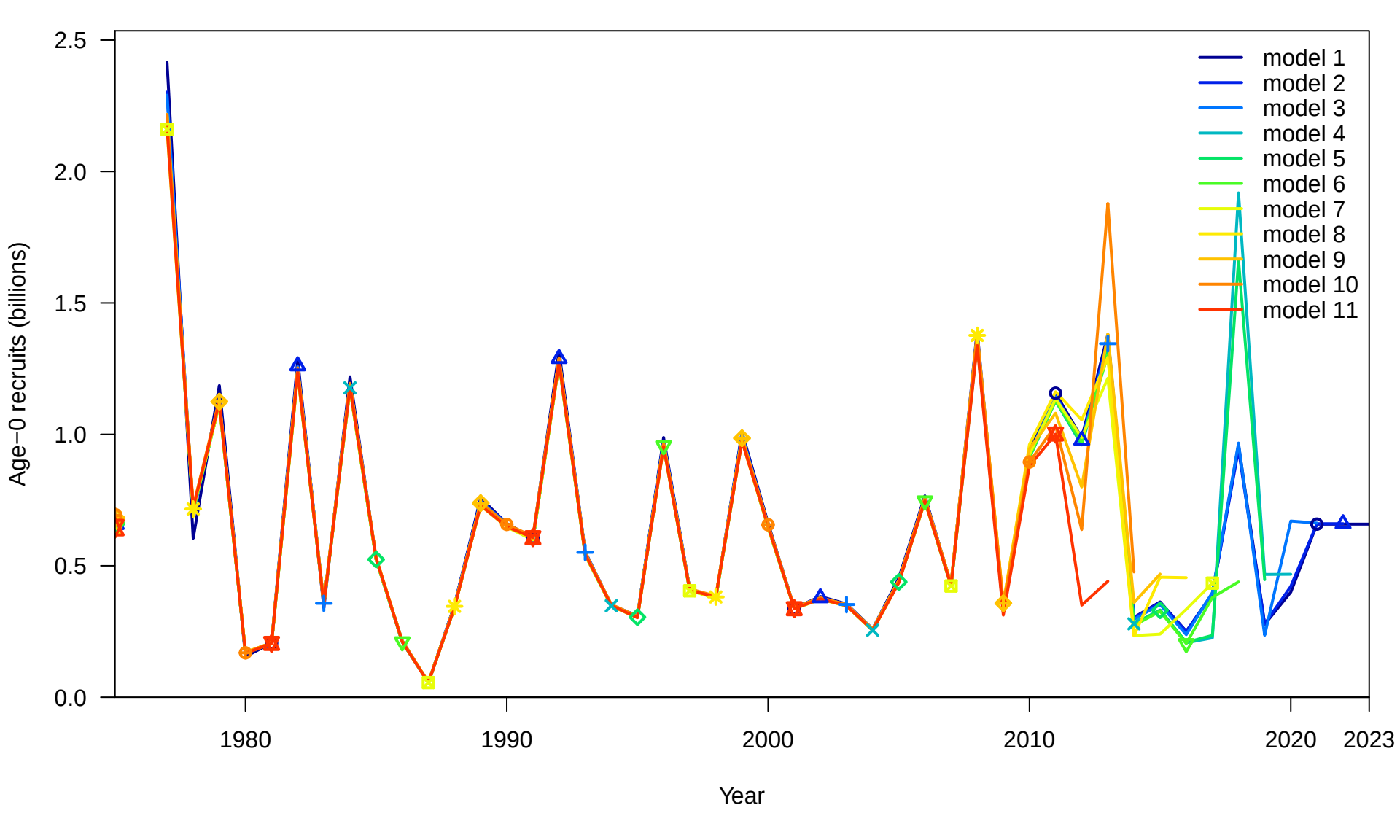

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Management target
Fraction of unfished
0.00
0.20
0.35
0.40
0.60
0.80
1980
1990
2000
2010
2020
2023
Year

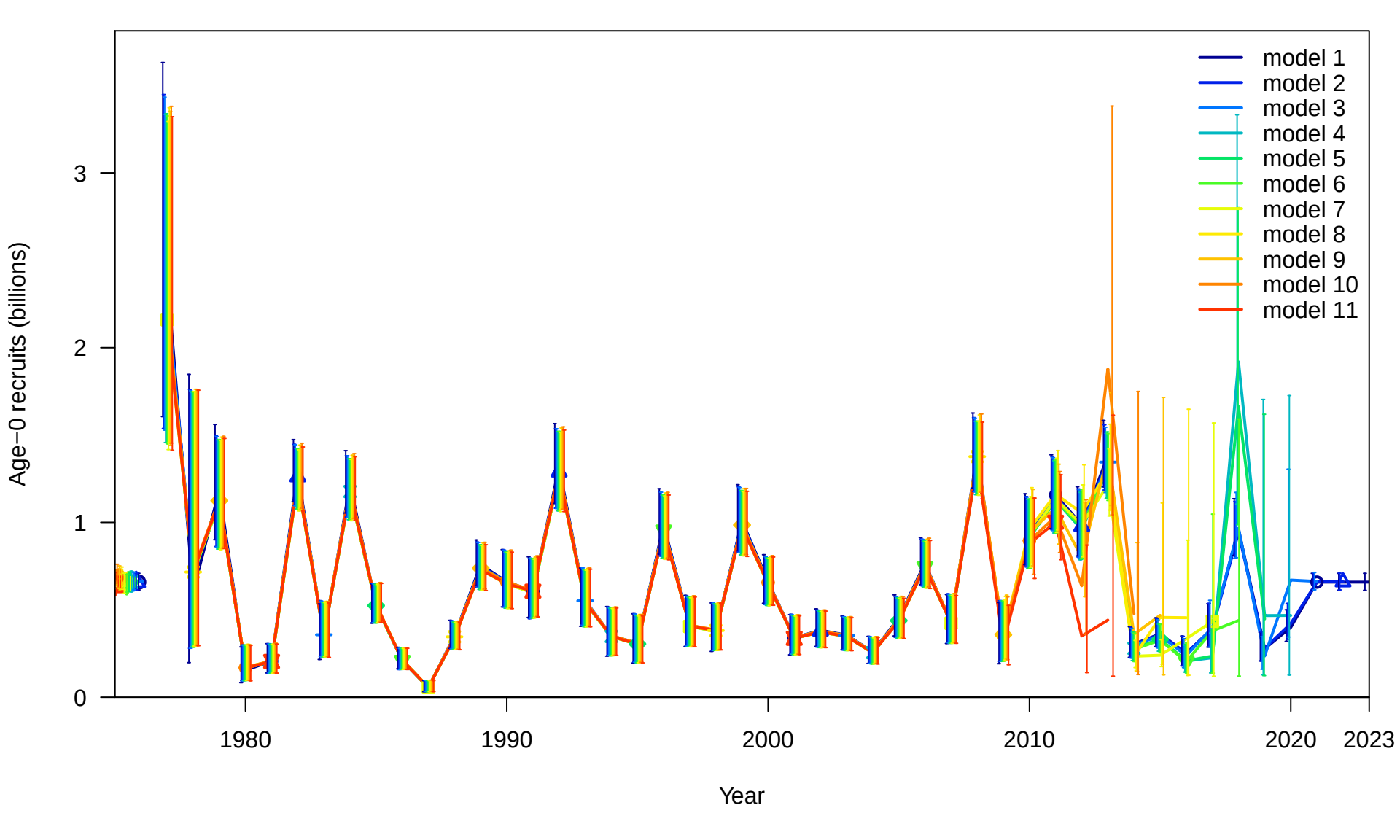
model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Management target
1−SPR
0.0
0.2
0.4
0.6
1980
1990
2000
2010
2020
2023
Year

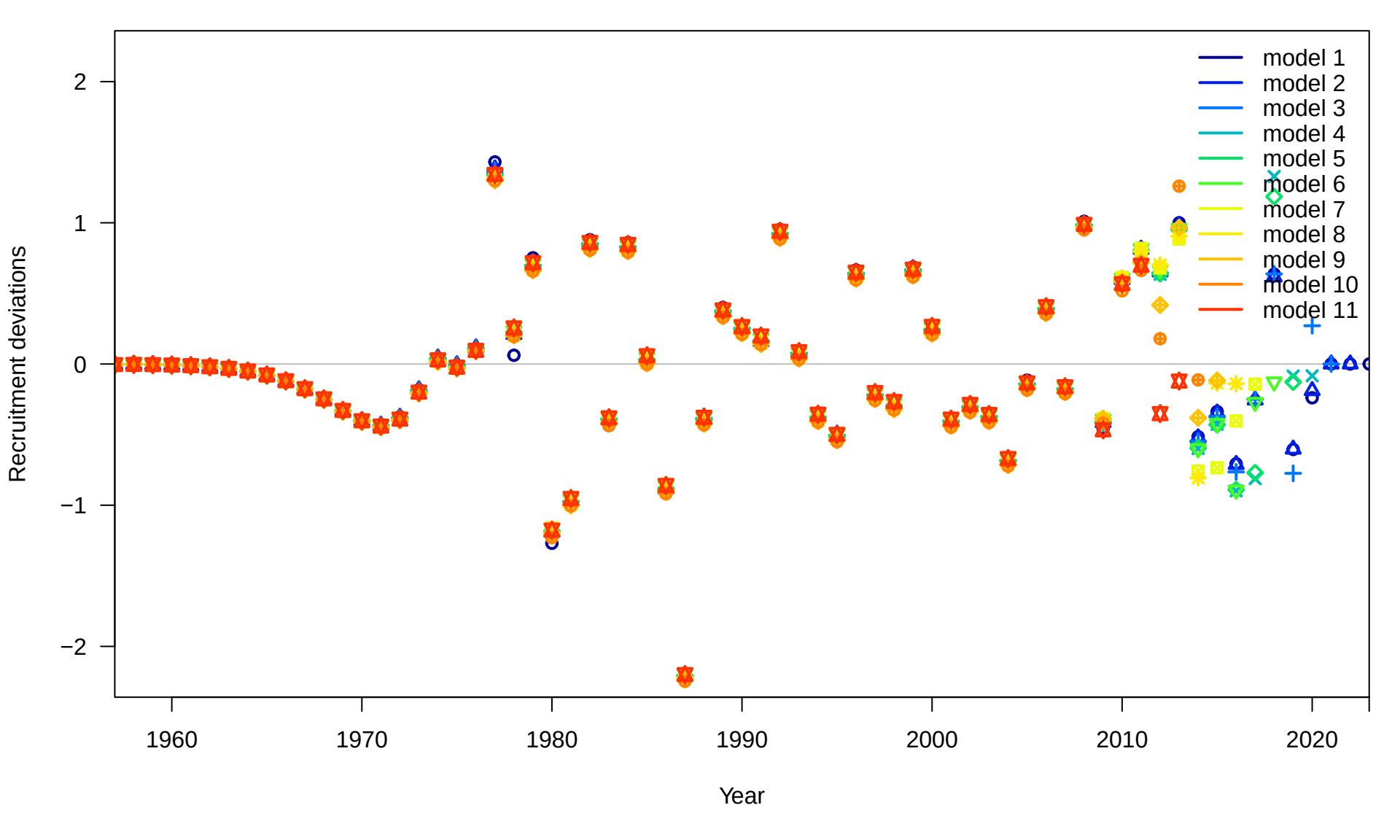

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Management target
1−SPR
0.0
0.2
0.4
0.6
0.8
1980
1990
2000
2010
2020
2023
Year

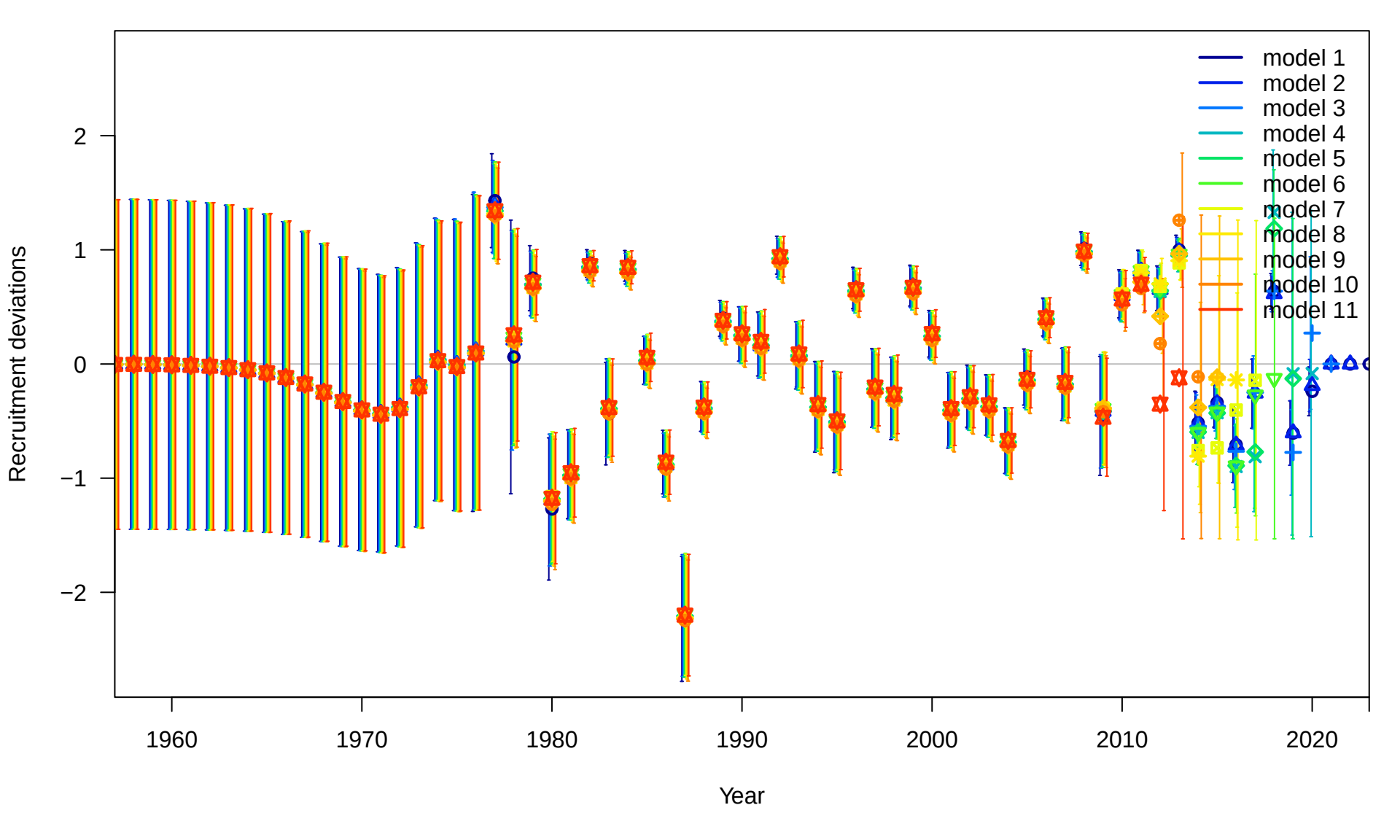

abs F; with F=sum(full Fs)
0.0
0.2
0.4
0.6
0.8
1980
1990
2000
2010
2020
2023
Year
model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11

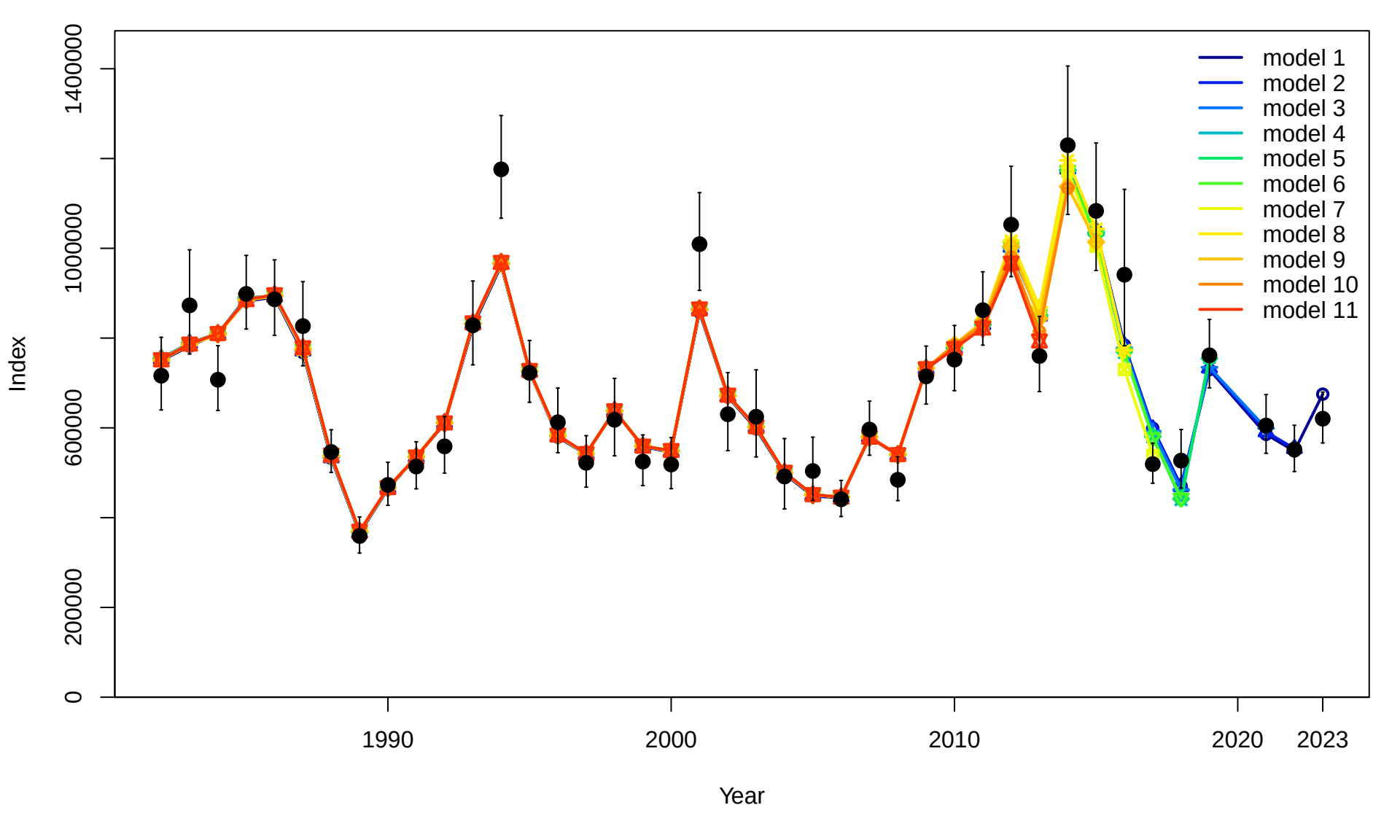

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
abs F; with F=sum(full Fs)
0.0
0.2
0.4
0.6
0.8
1980
1990
2000
2010
2020
2023
Year

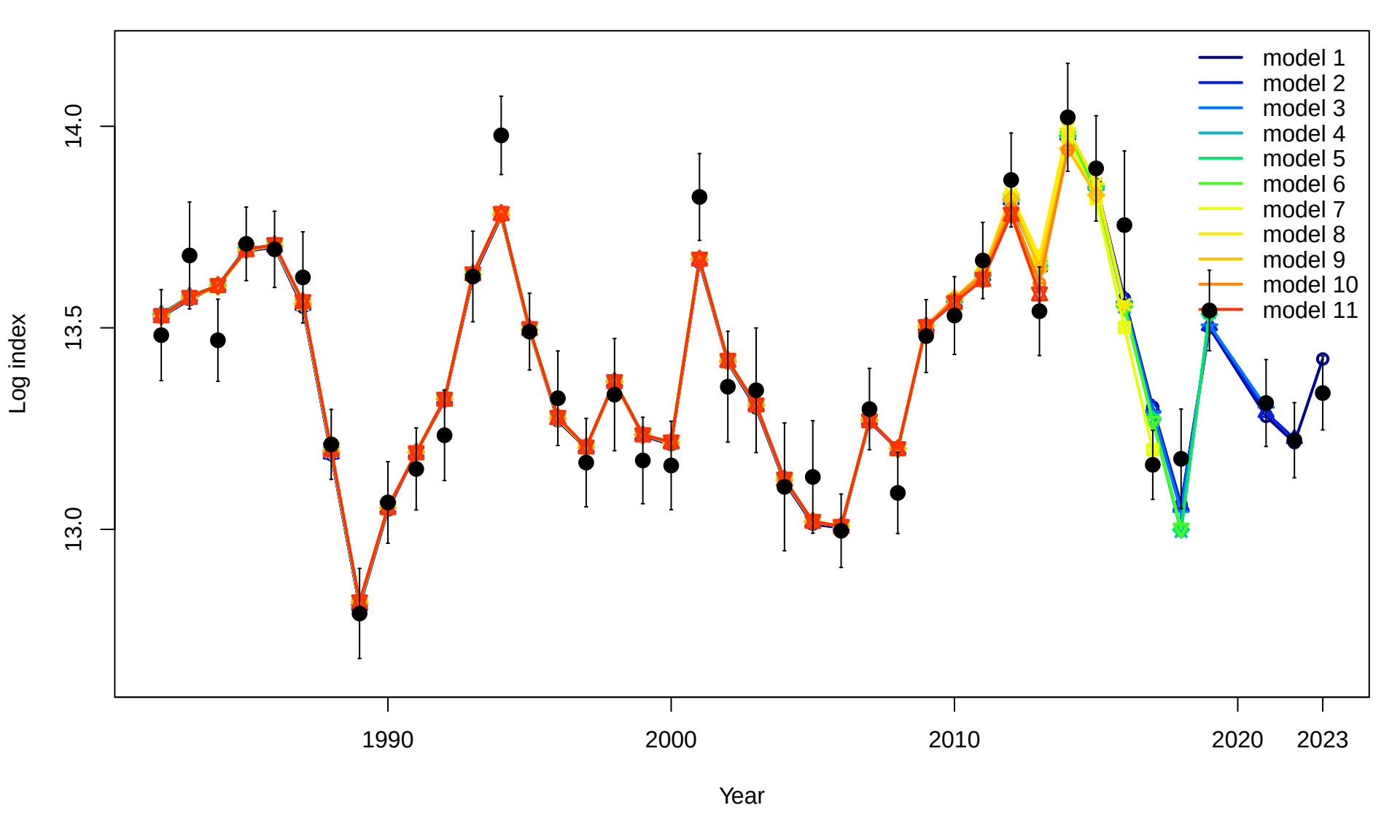

Age−0 recruits (billions)
2.5
2.0
1.5
1.0
0.5
0.0
1980
1990
2000
2010
2020
2023
Year
model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11

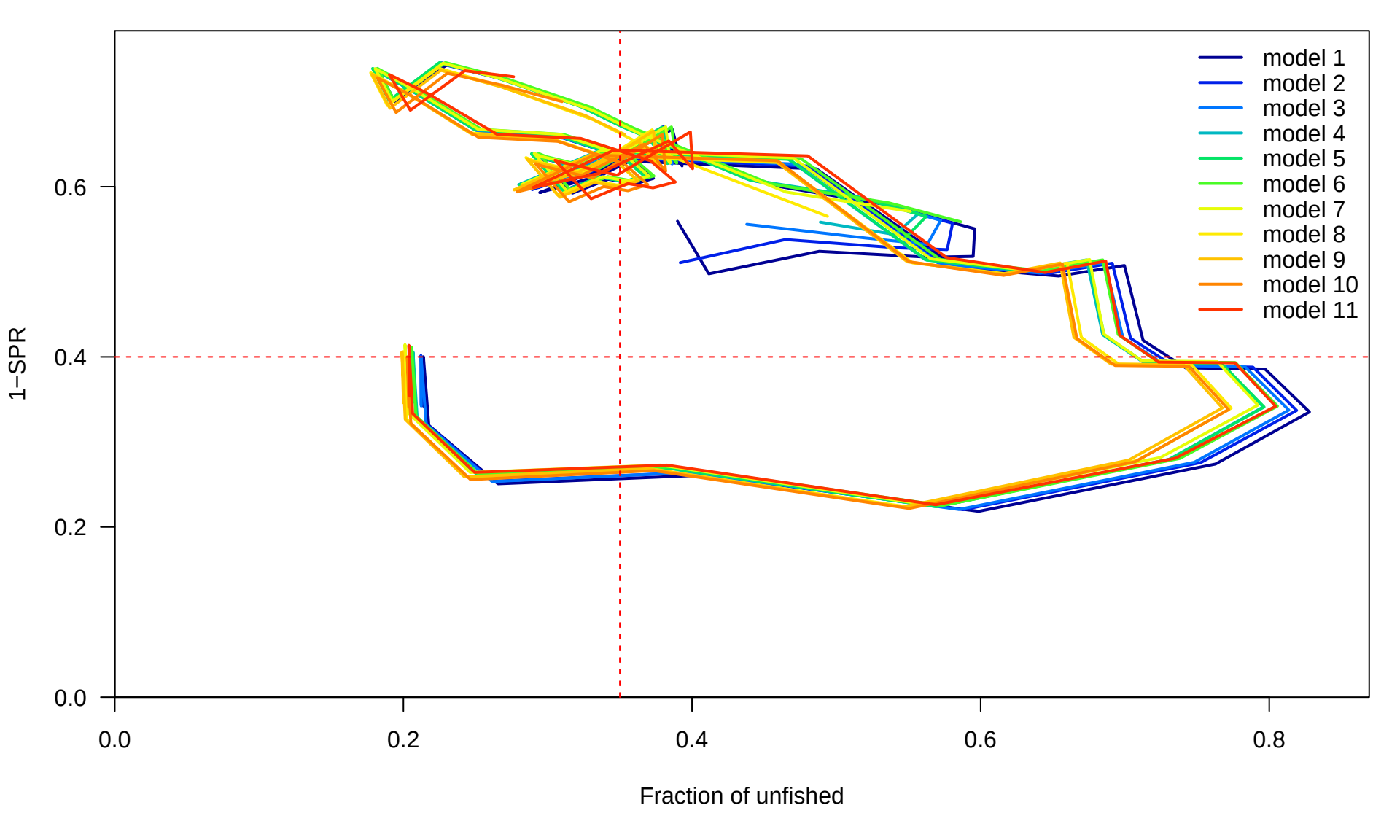

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Age−0 recruits (billions)
0
1
2
3
1980
1990
2000
2010
2020
2023
Year

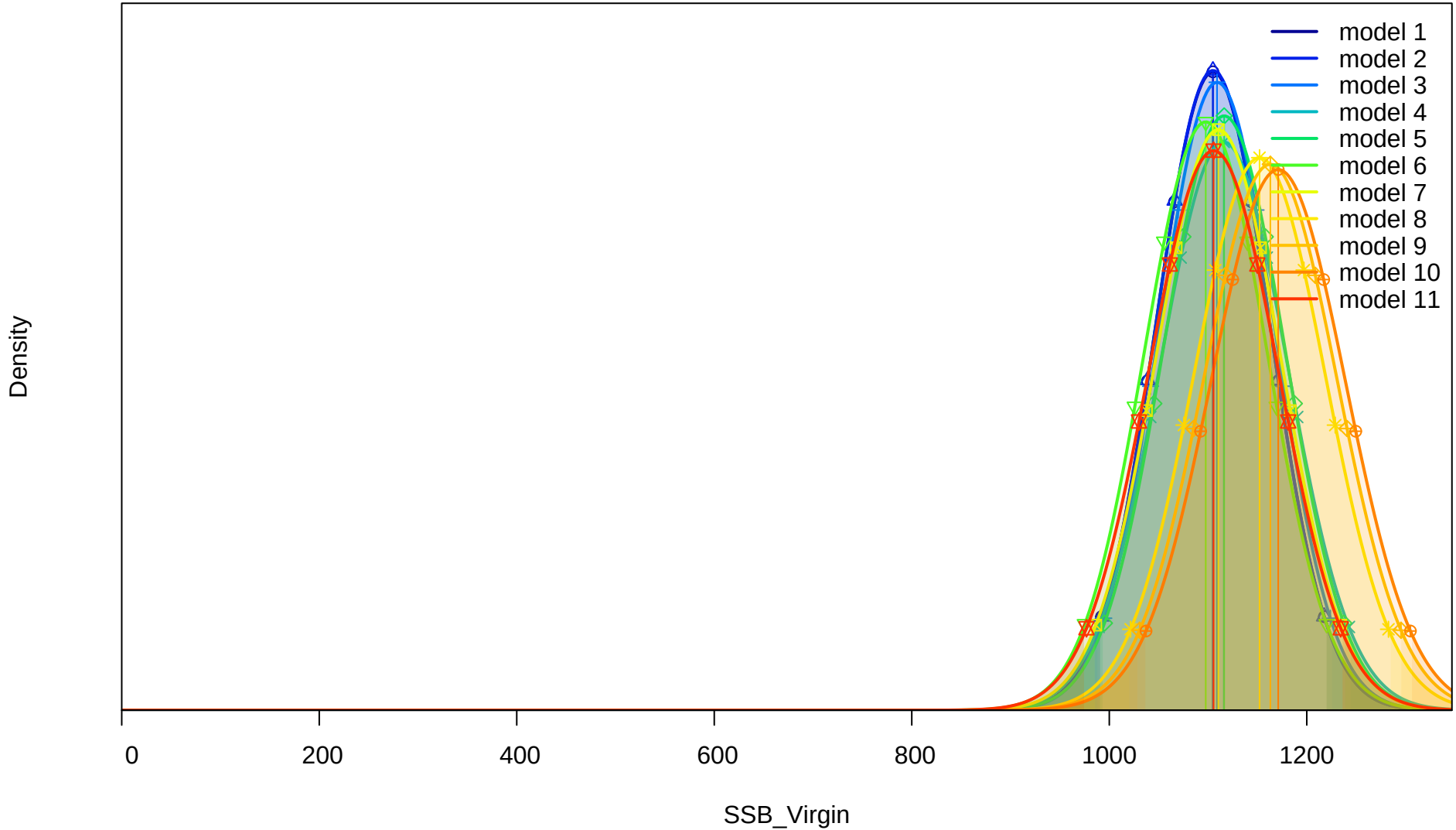

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Recruitment deviations
2
1
0
−1
−2
1960
1970
1980
1990
2000
2010
2020
Year

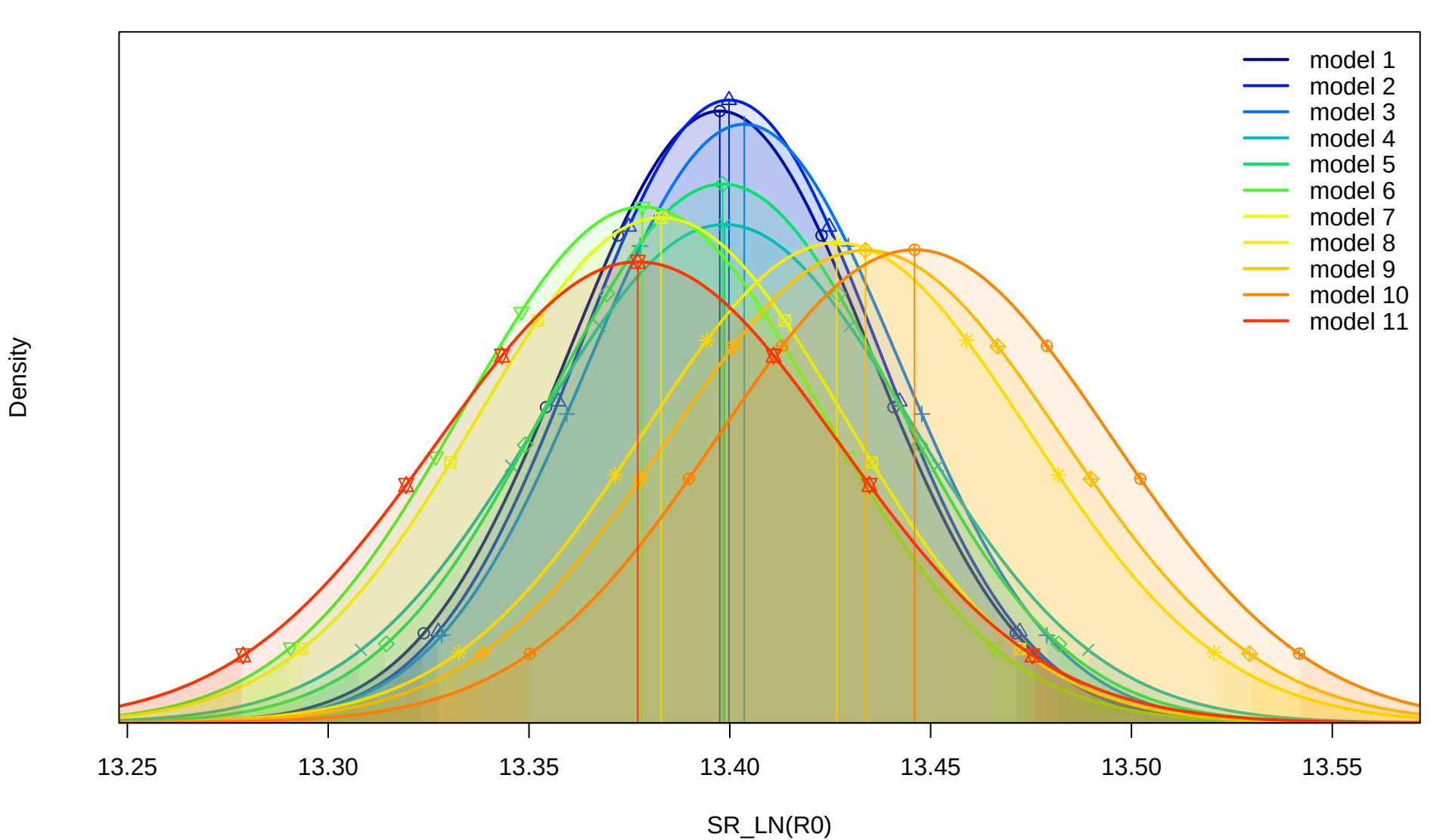

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Recruitment deviations
2
1
0
−1
−2
1960
1970
1980
1990
2000
2010
2020
Year

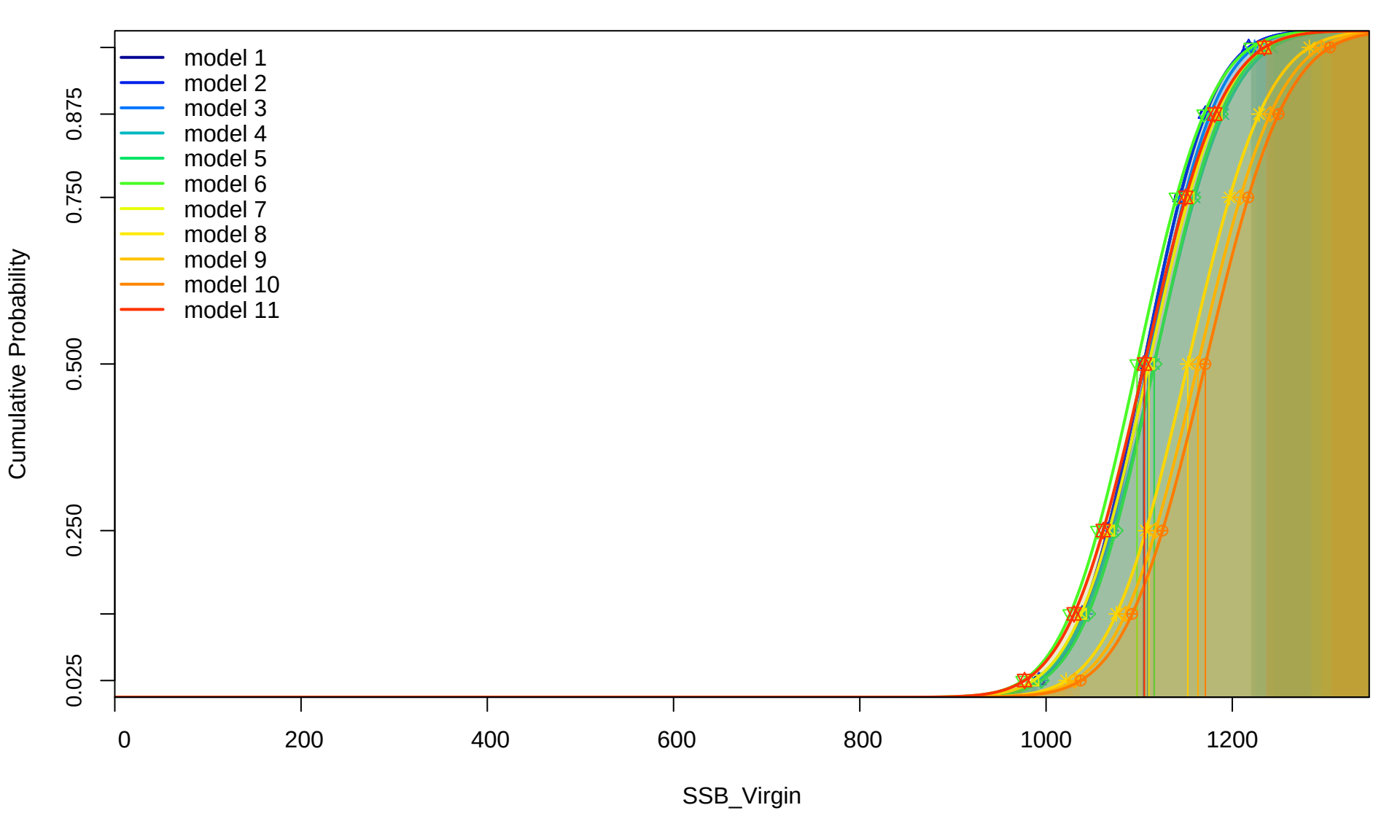

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Index
0
200000
600000
1000000
1400000
1990
2000
2010
2020
2023
Year

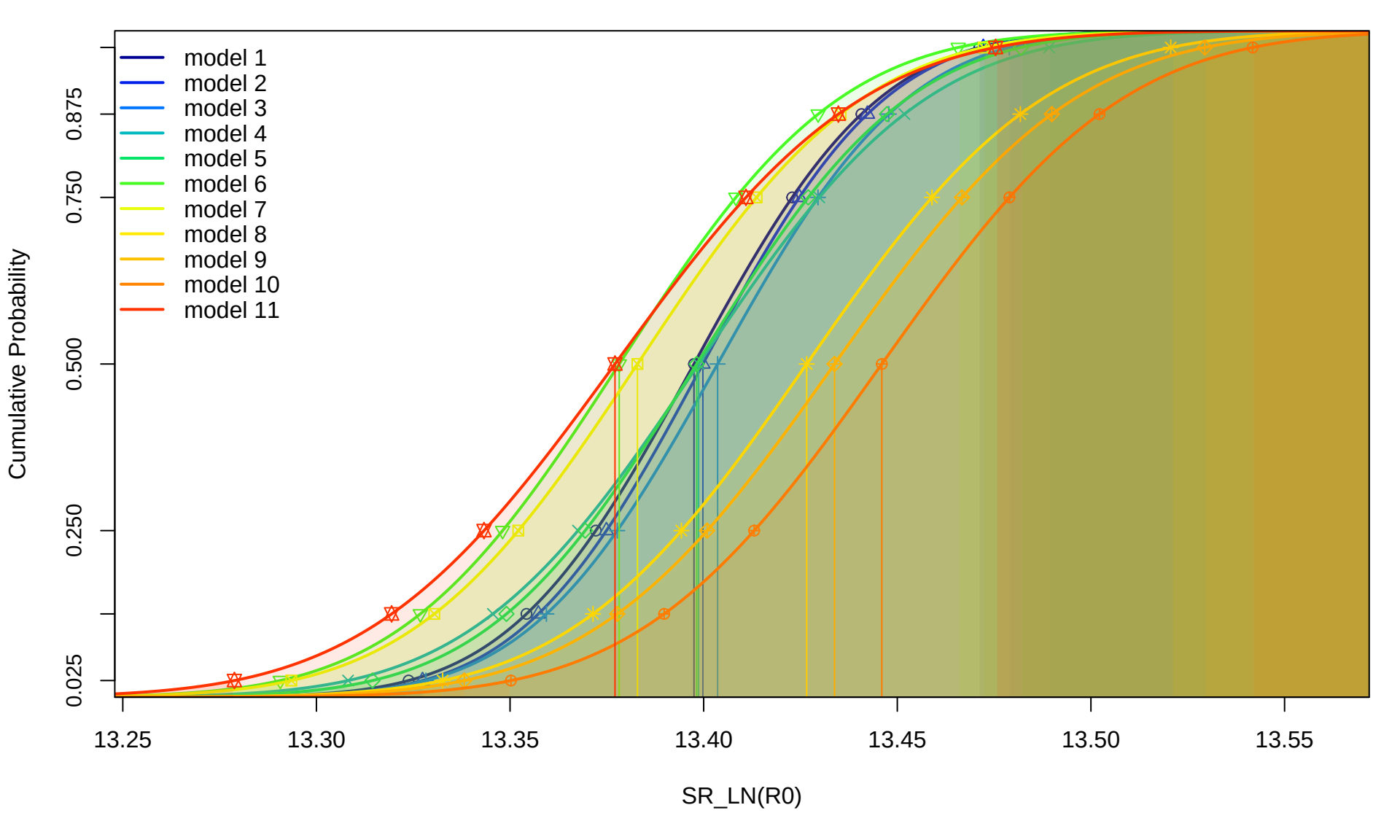

model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Log index
14.0
13.5
13.0
1990
2000
2010
2020
2023
Year


model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
1−SPR
0.0
0.2
0.4
0.6
0.0
0.2
0.4
0.6
0.8
Fraction of unfished


model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Density
0
200
400
600
800
1000
1200
SSB_Virgin


model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Density
13.25
13.30
13.35
13.40
13.45
13.50
13.55
SR_LN(R0)


model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Cumulative Probability
0.025
0.250
0.500
0.750
0.875
0
200
400
600
800
1000
1200
SSB_Virgin


model 1
model 2
model 3
model 4
model 5
model 6
model 7
model 8
model 9
model 10
model 11
Cumulative Probability
0.025
0.250
0.500
0.750
0.875
13.25
13.30
13.35
13.40
13.45
13.50
13.55
SR_LN(R0)