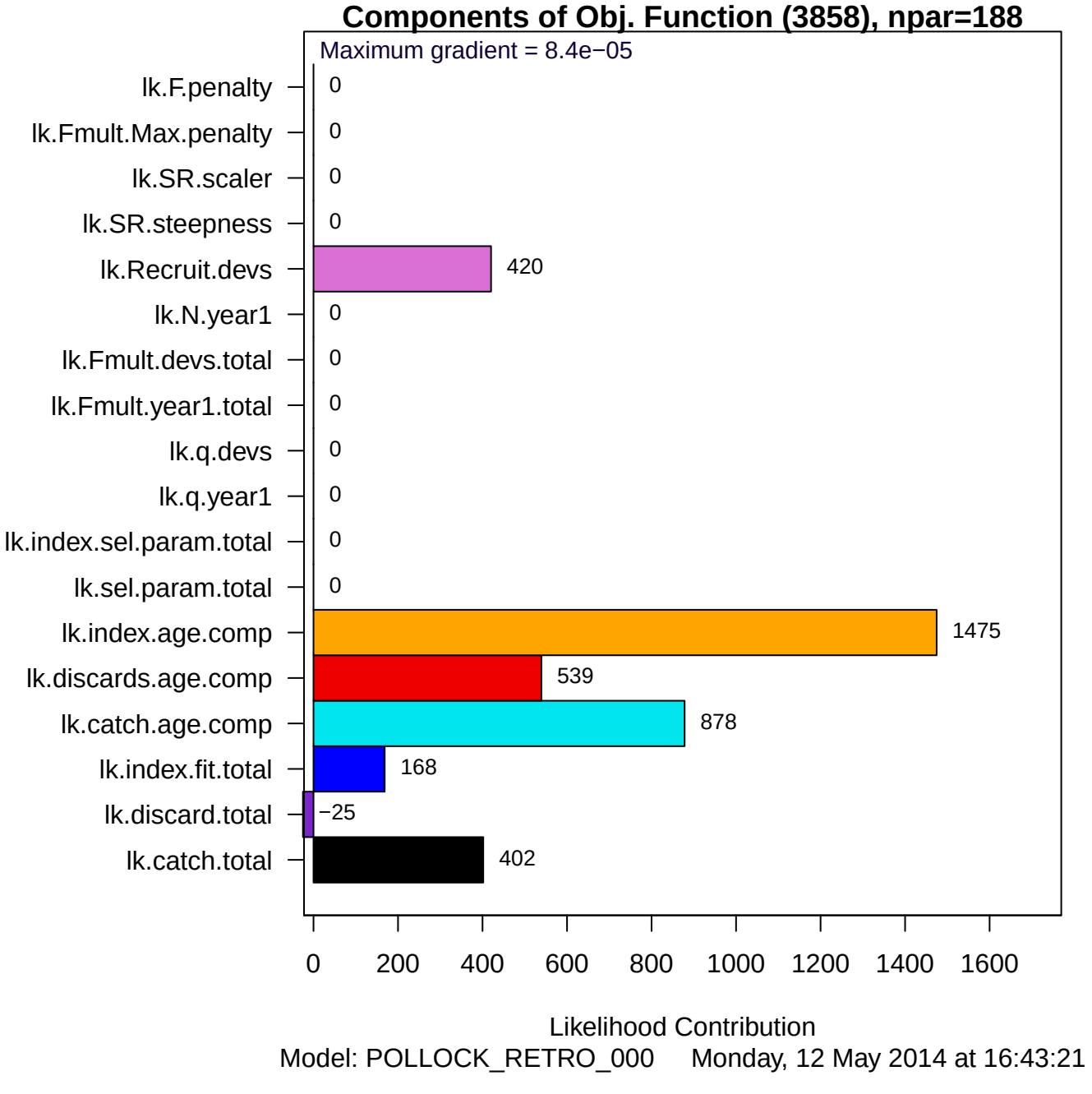
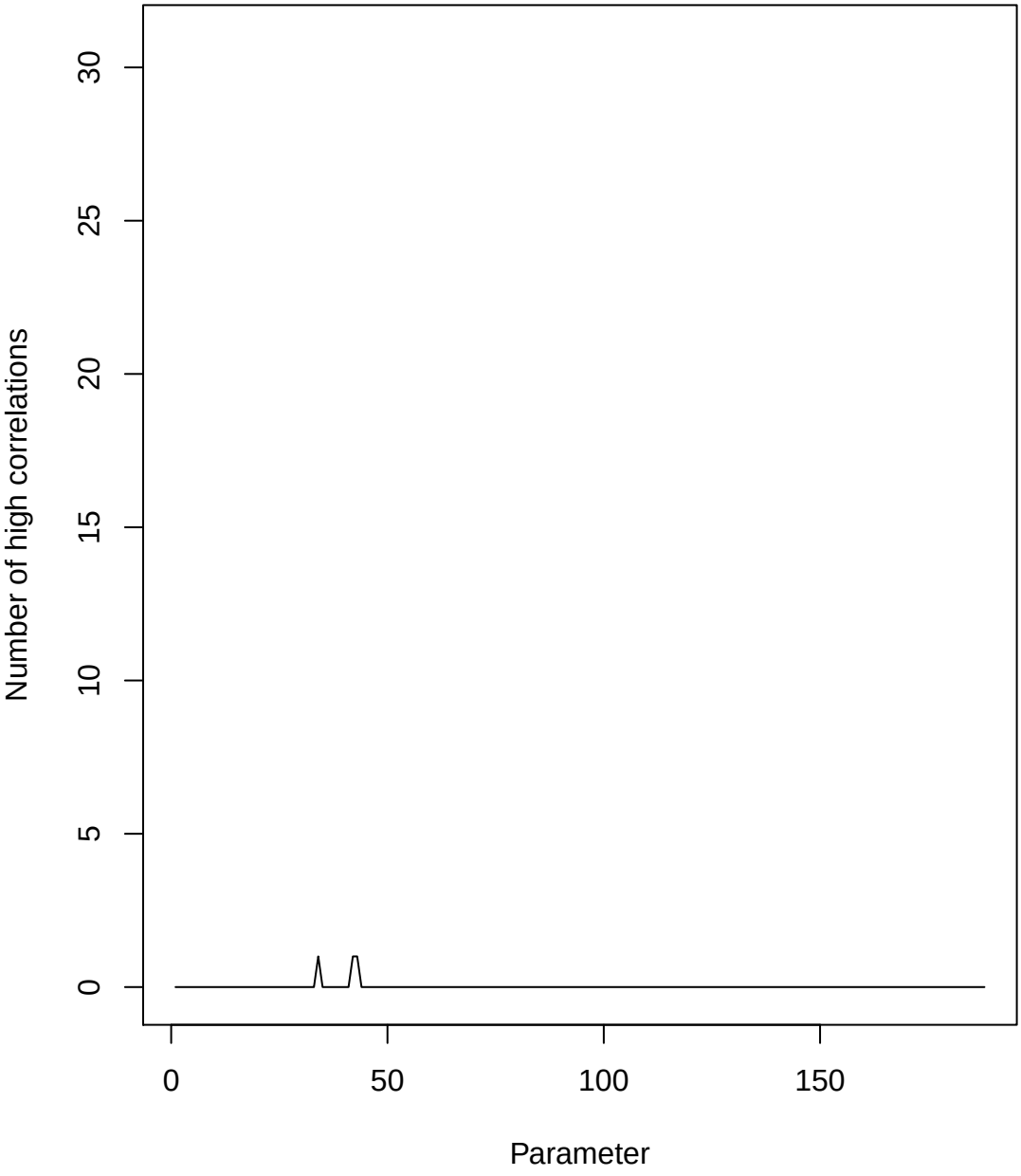
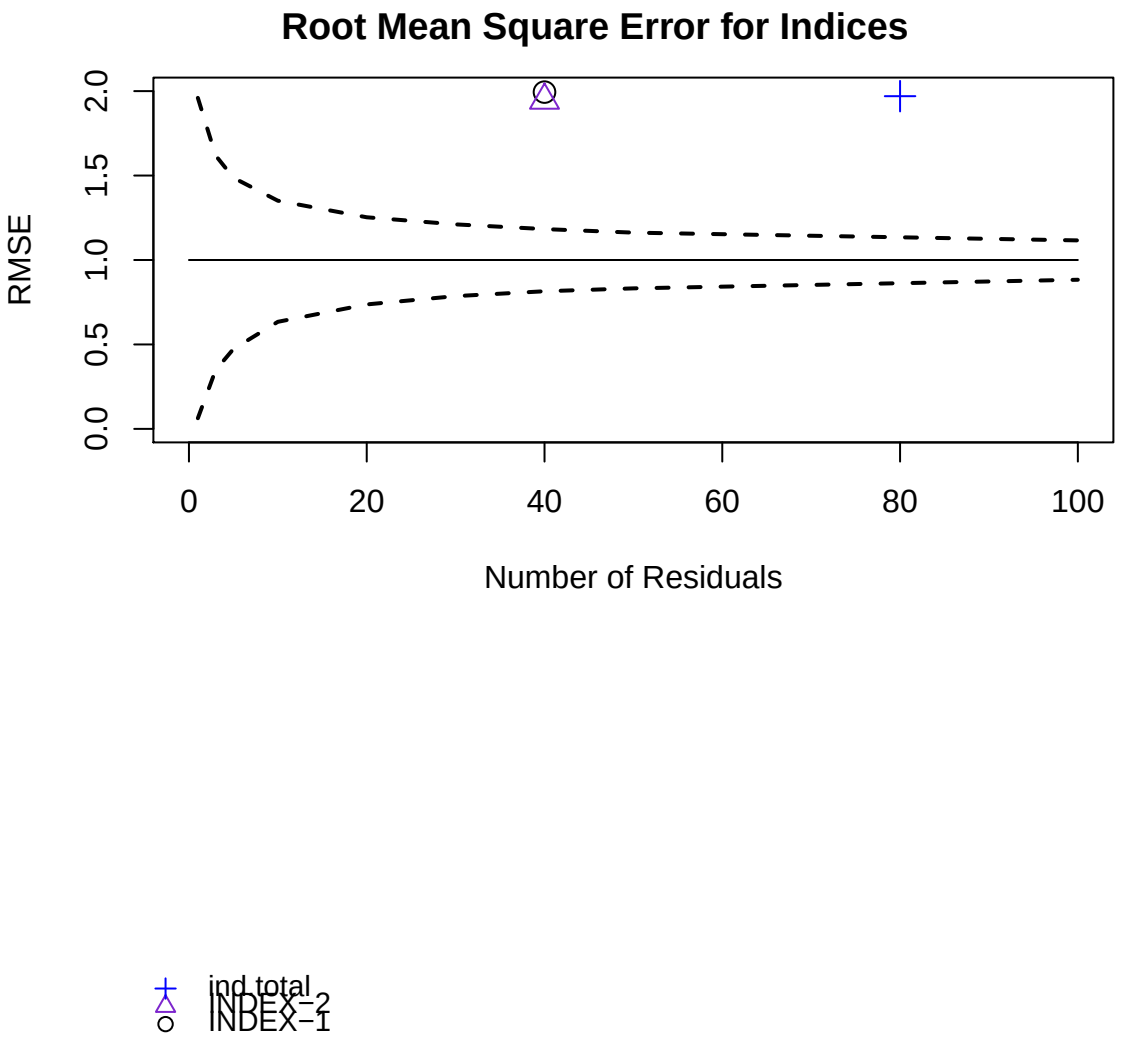
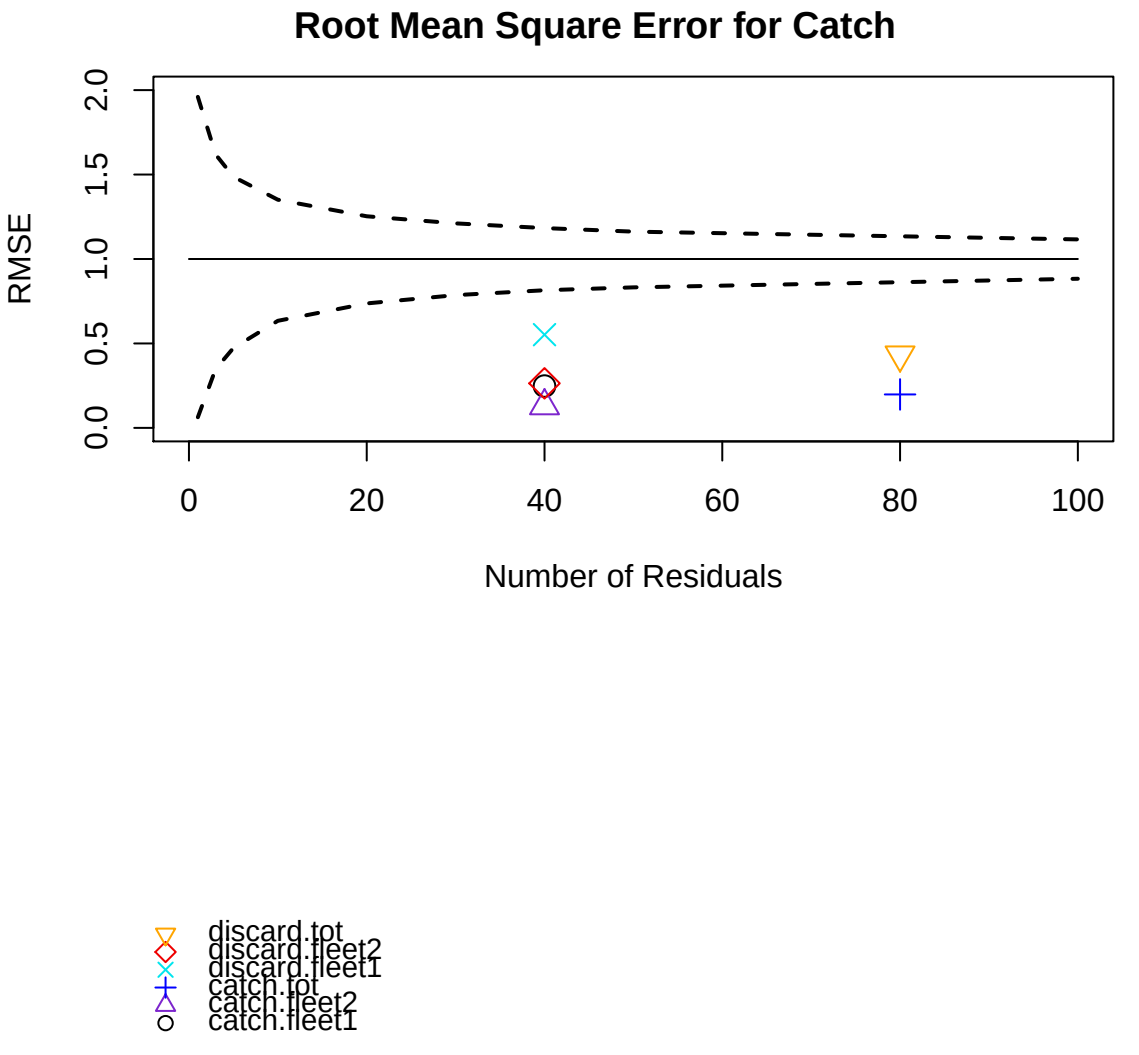

Components of Obj. Function (3858), npar=188
Maximum gradient = 8.4e−05
lk.F.penalty
lk.Fmult.Max.penalty
lk.SR.scaler
lk.SR.steepness
lk.Recruit.devs
lk.N.year1
lk.Fmult.devs.total
lk.Fmult.year1.total
lk.q.devs
lk.q.year1
lk.index.sel.param.total
lk.sel.param.total
lk.index.age.comp
lk.discards.age.comp
lk.catch.age.comp
lk.index.fit.total
lk.discard.total
lk.catch.total
0
0
0
0
420
0
0
0
0
0
0
0
1475
539
878
168
−25
402
0
200
400
600
800
1000
1200
1400
1600
Likelihood Contribution
Model: POLLOCK_RETRO_000 Monday, 12 May 2014 at 16:43:21


Number of high correlations
0
5
10
15
20
25
30
0
50
100
150
Parameter

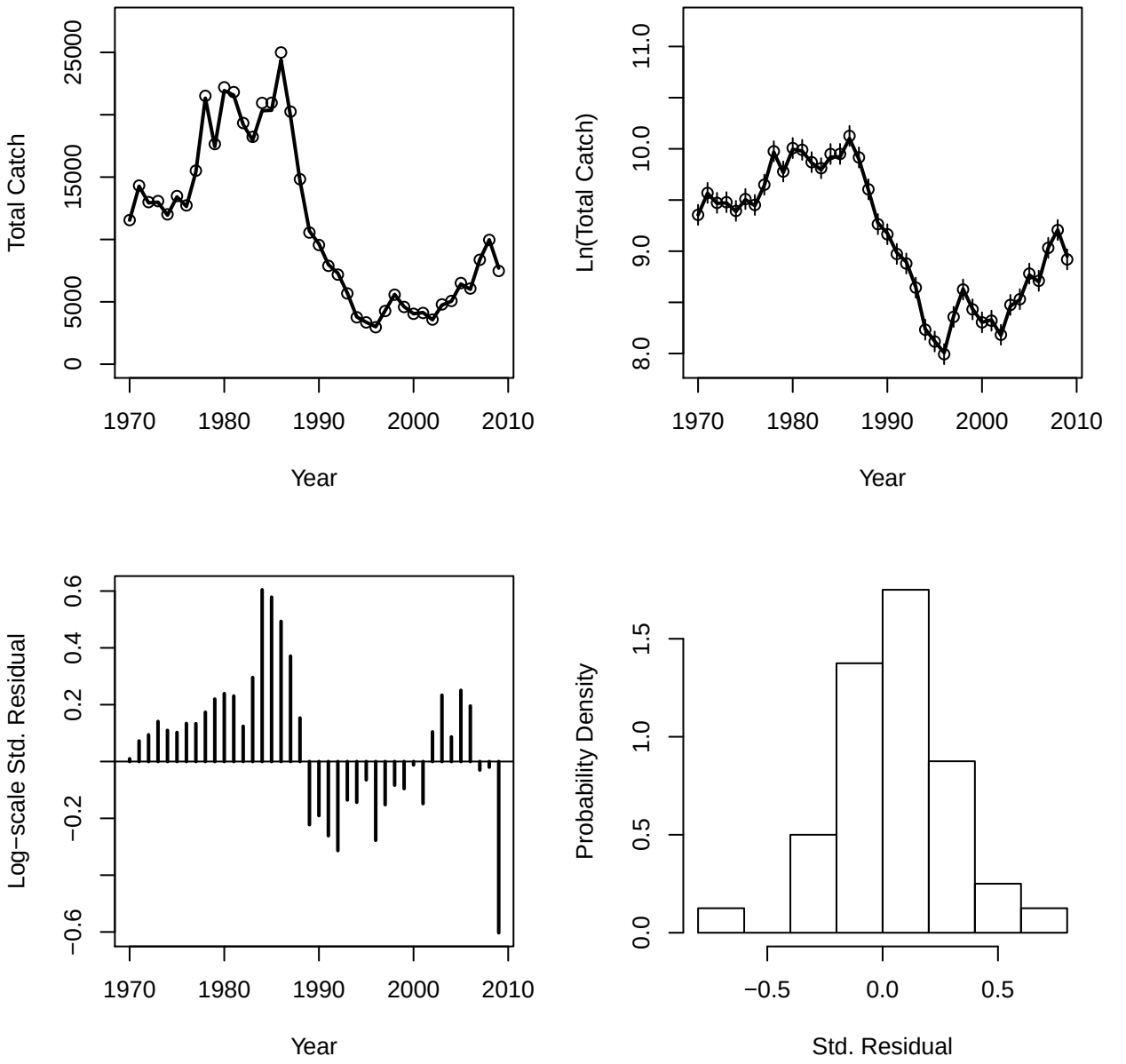
Root Mean Square Error computed from Standardized Residuals

Component	# resids	RMSE
catch.fleet1	40	0.248
catch.fleet2	40	0.13
catch.tot	80	0.198
discard.fleet1	40	0.552
discard.fleet2	40	0.264
discard.tot	80	0.433
ind01	40	1.99
ind02	40	1.95
ind.total	80	1.97
N.year1	0	0
Fmult.year1	0	0
Fmult.devs.fleet1	0	0
Fmult.devs.fleet2	0	0
Fmult.devs.total	0	0
recruit.devs	40	0.983
fleet.sel.params	0	0
index.sel.params	0	0
q.year1	0	0
q.devs	0	0
SR.steepness	0	0
SR.scaler	0	0

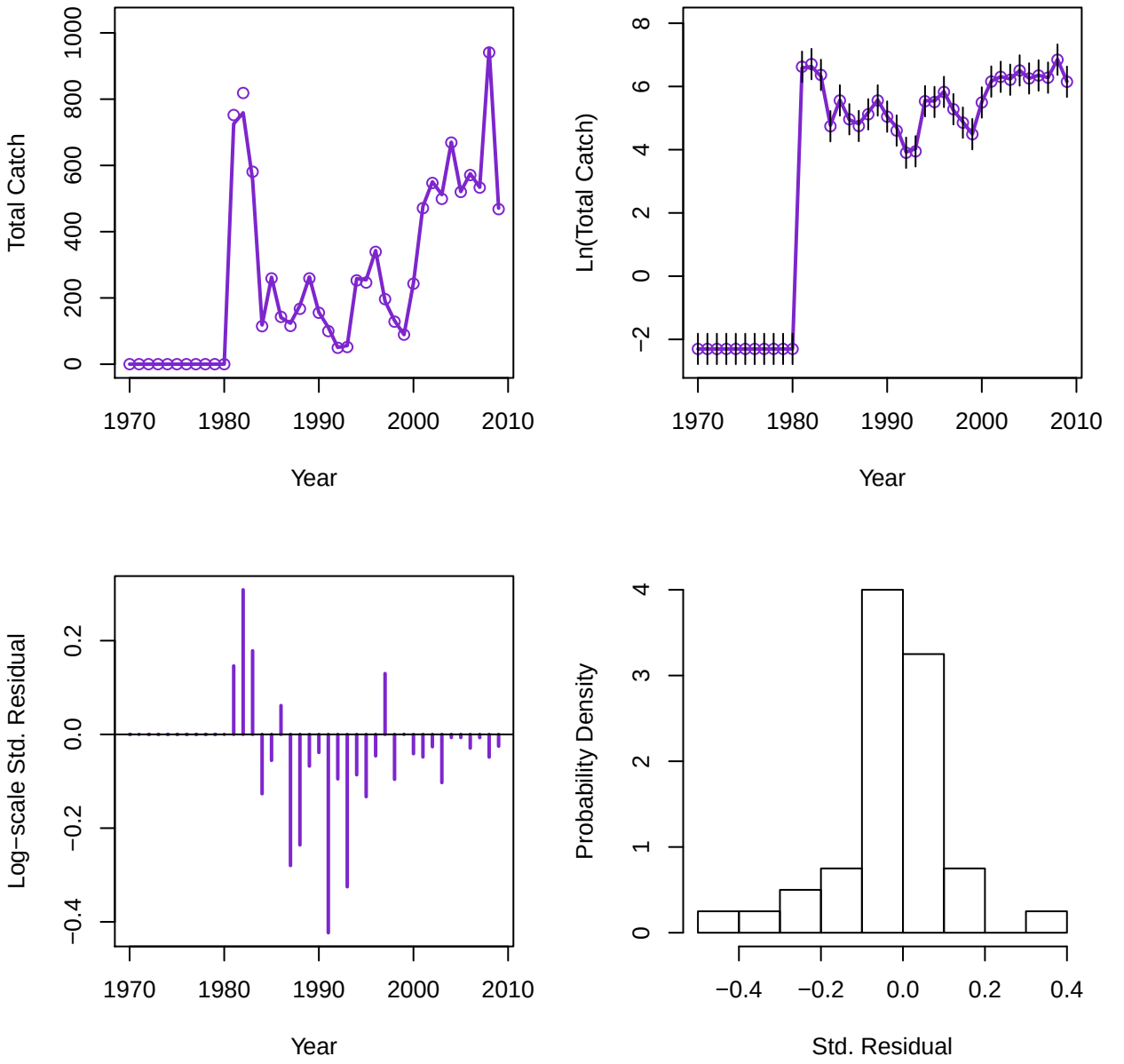

Root Mean Square Error for Indices
RMSE
0.0
0.5
1.0
1.5
2.0
0
20
40
60
80
100
Number of Residuals
ind total
INDEX−2
INDEX−1


Root Mean Square Error for Catch
RMSE
0.0
0.5
1.0
1.5
2.0
0
20
40
60
80
100
Number of Residuals
discard.tot
discard.fleet2
discard.fleet1
catch.tot
catch.fleet2
catch.fleet1

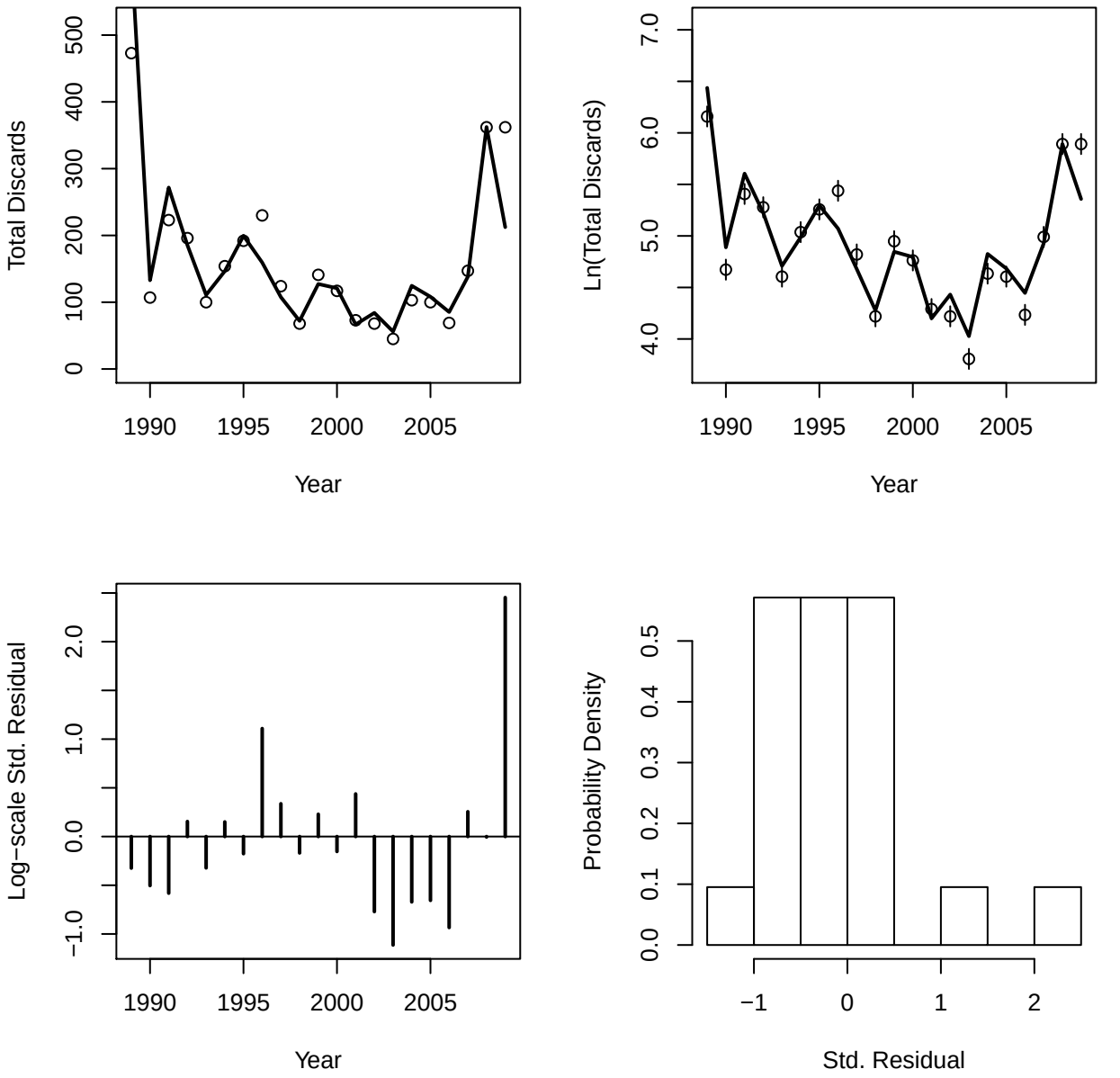
Fleet 1 Catch (FLEET−1)



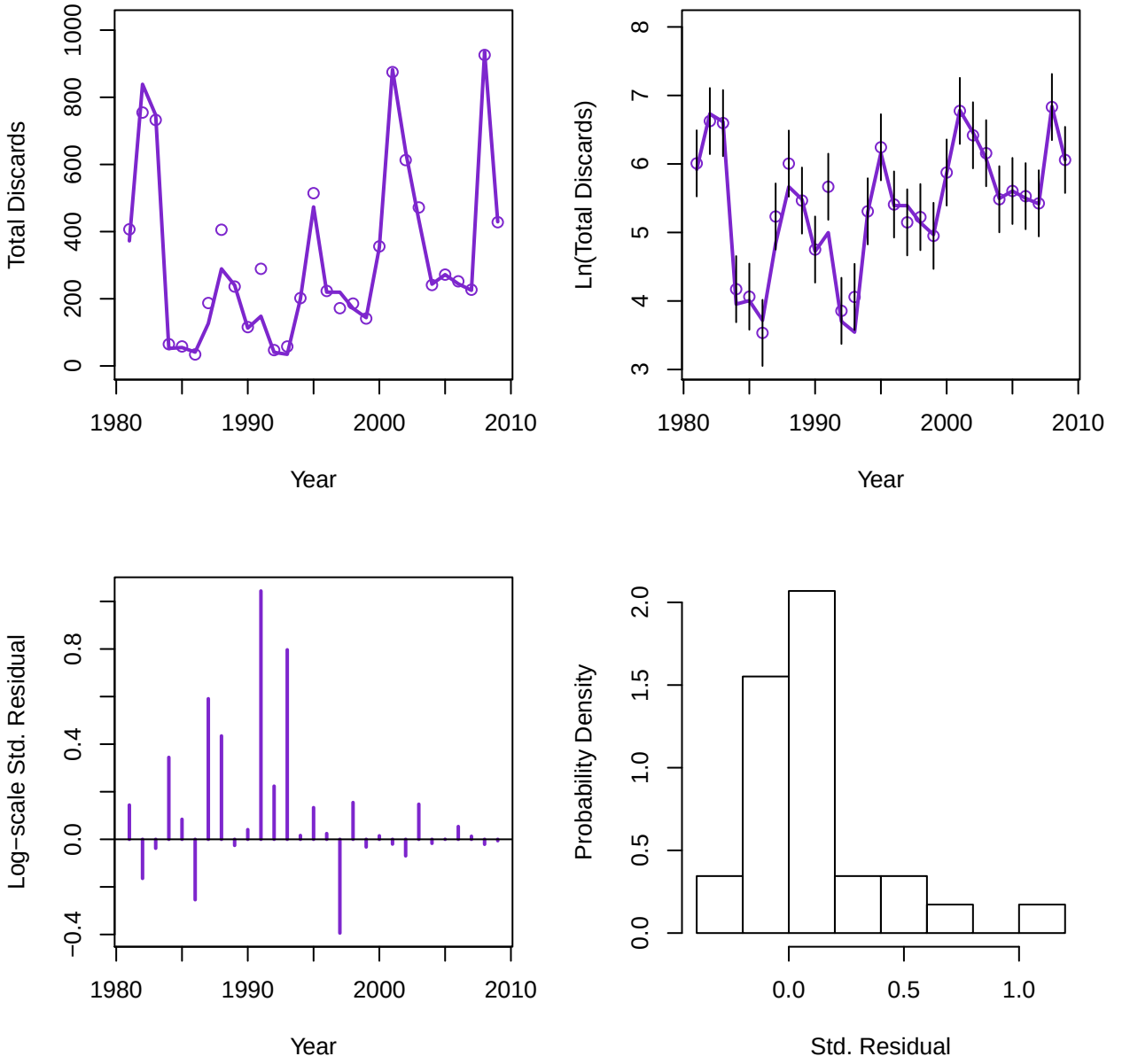
Fleet 2 Catch (FLEET−2)

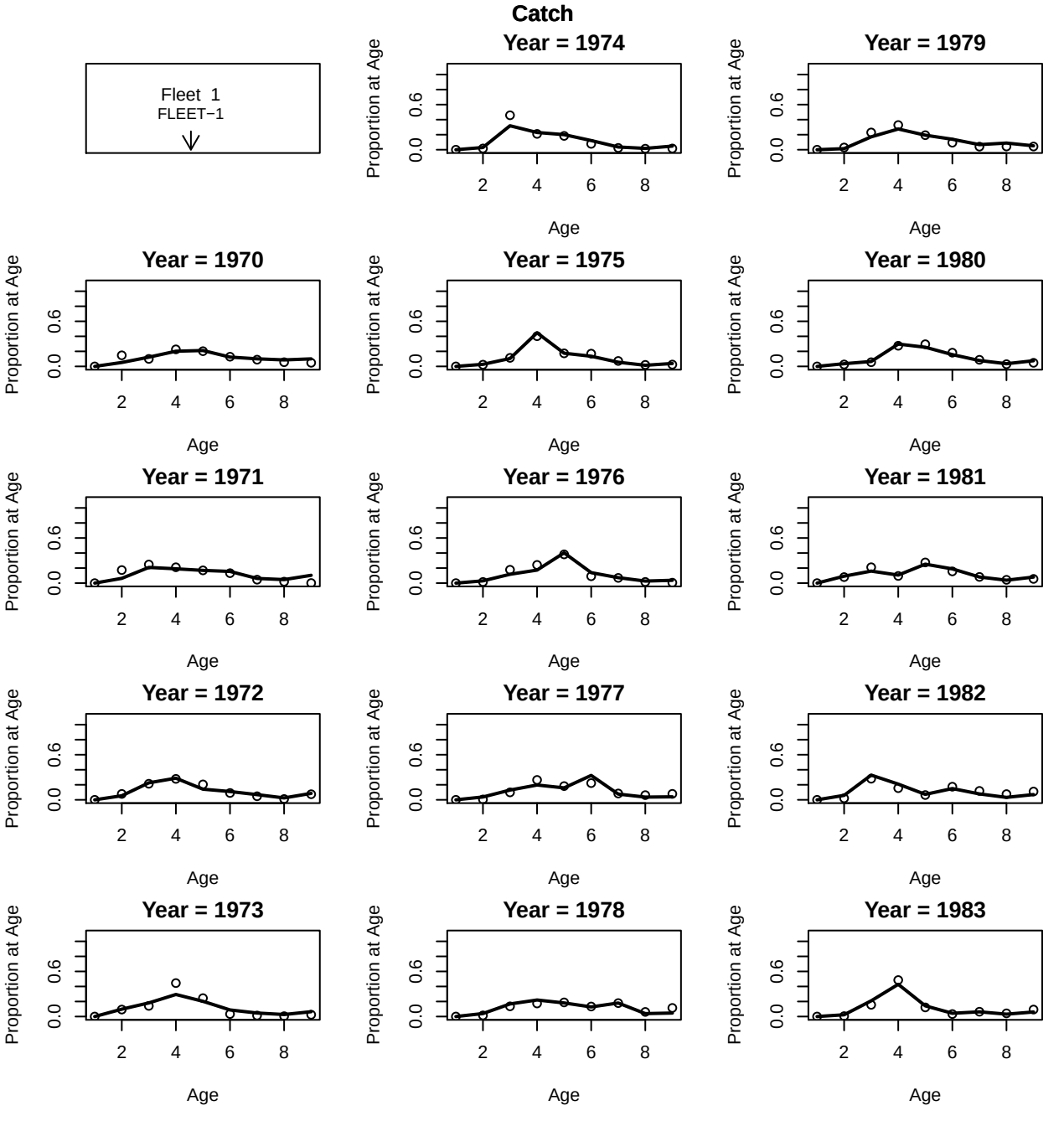


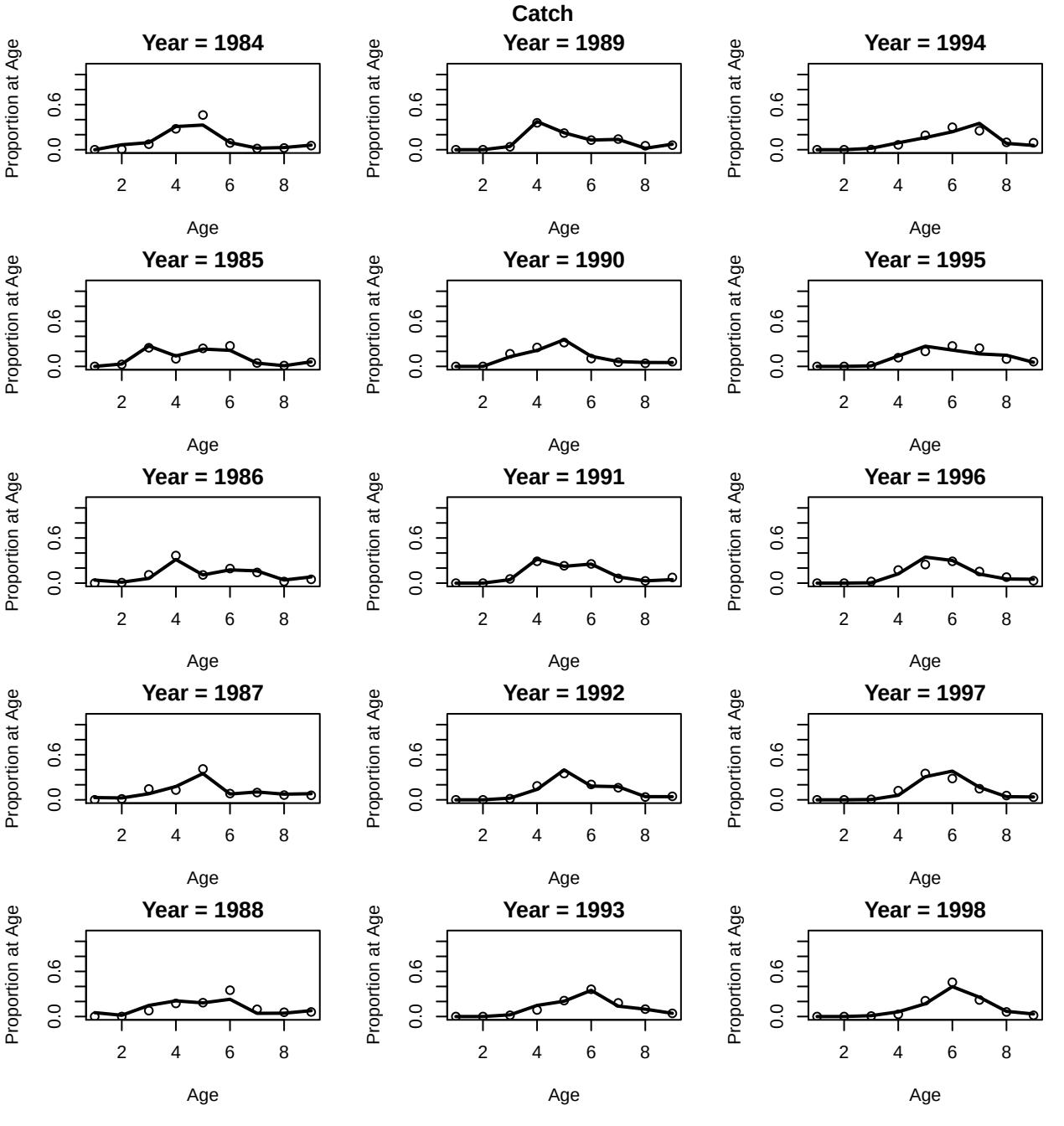
Fleet 1 Discards (FLEET−1)

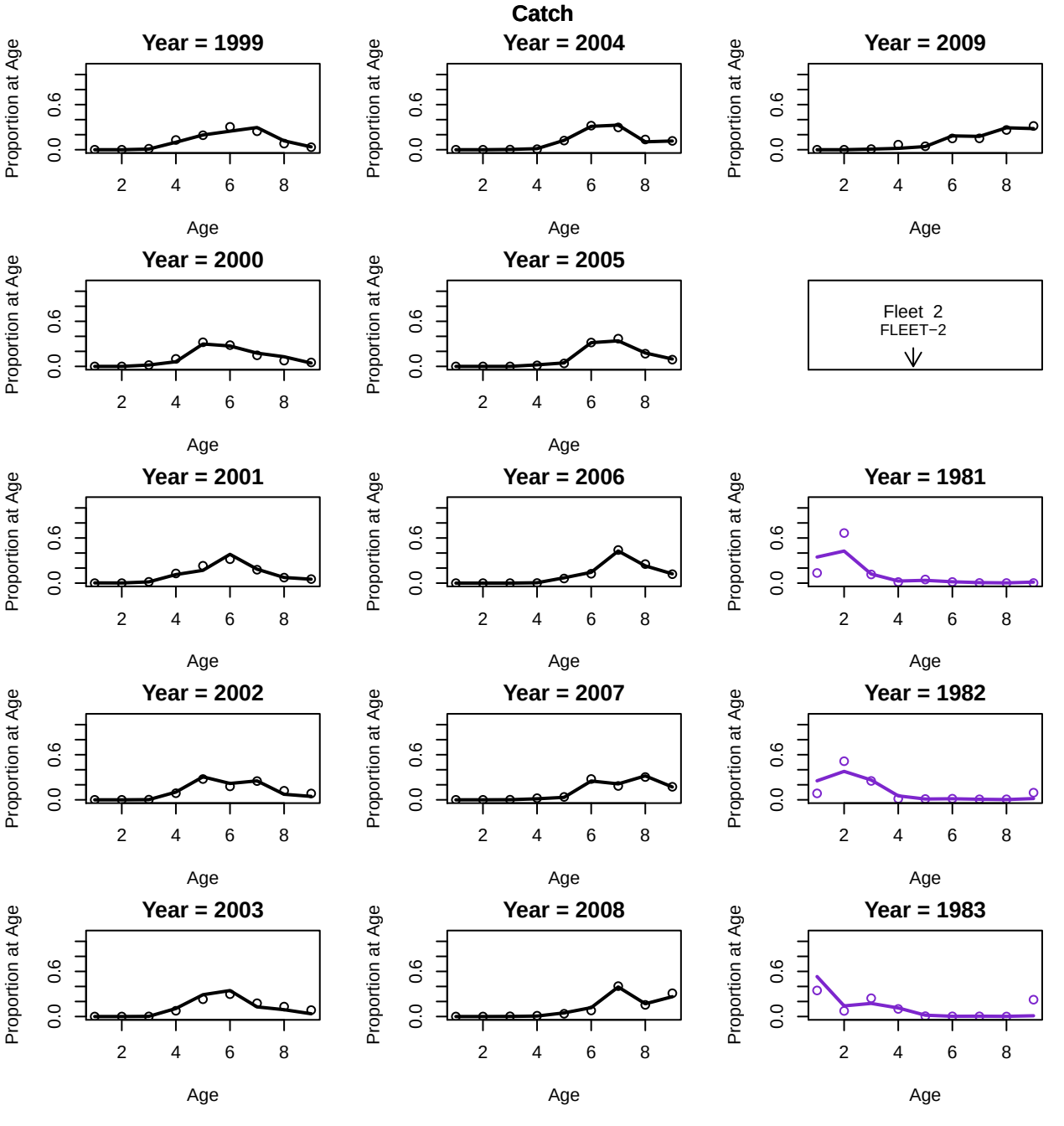


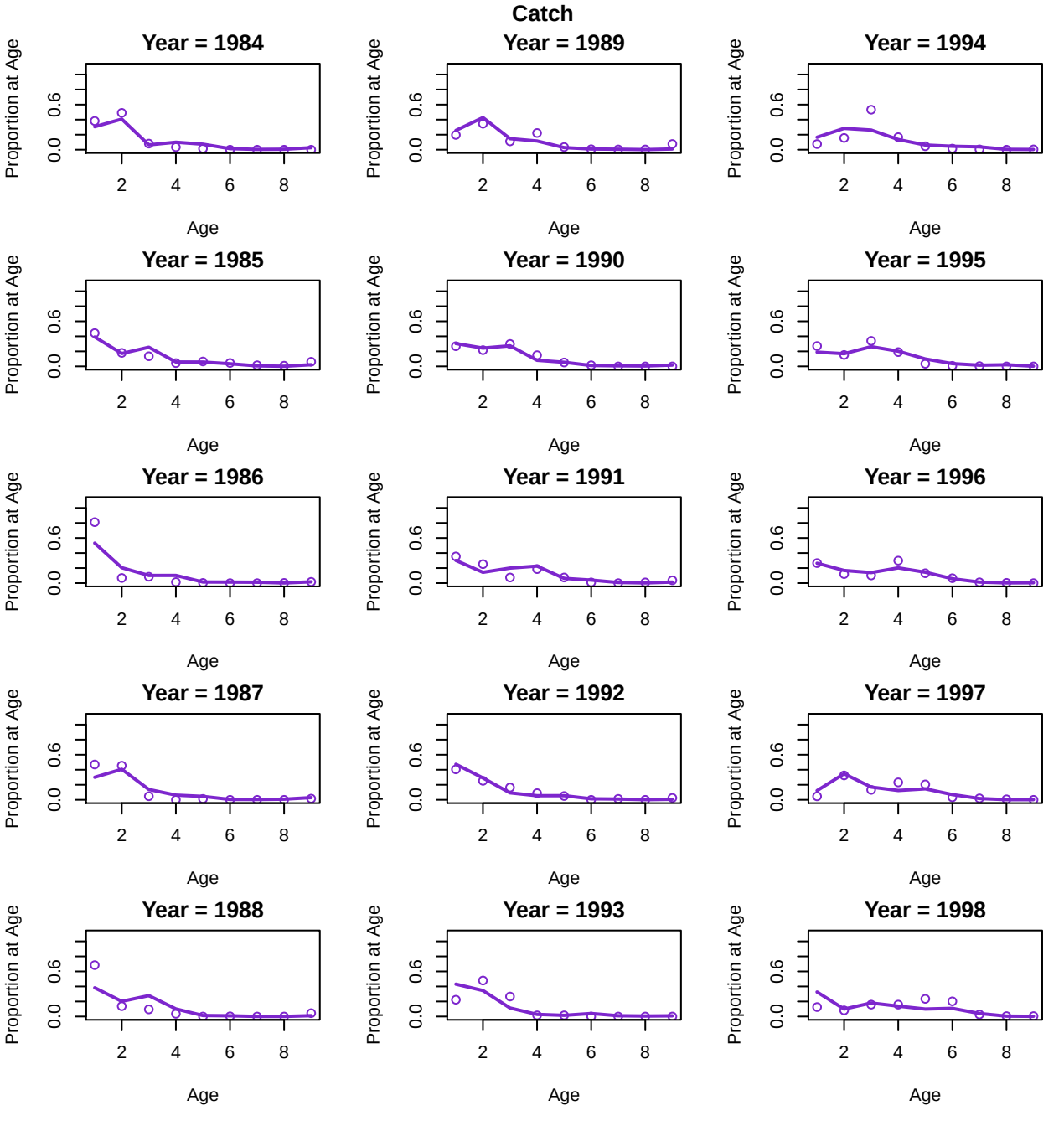
Fleet 2 Discards (FLEET−2)

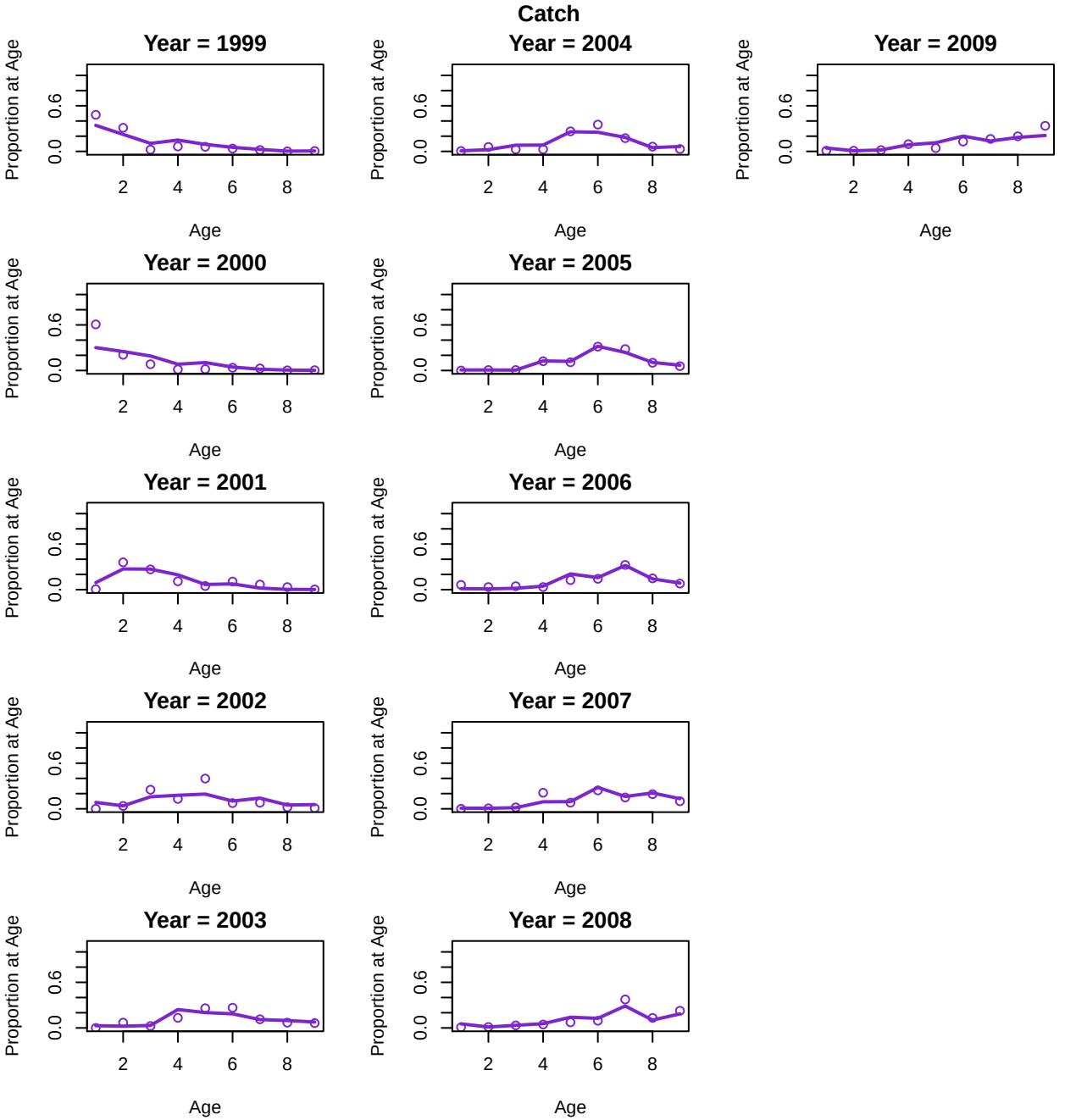


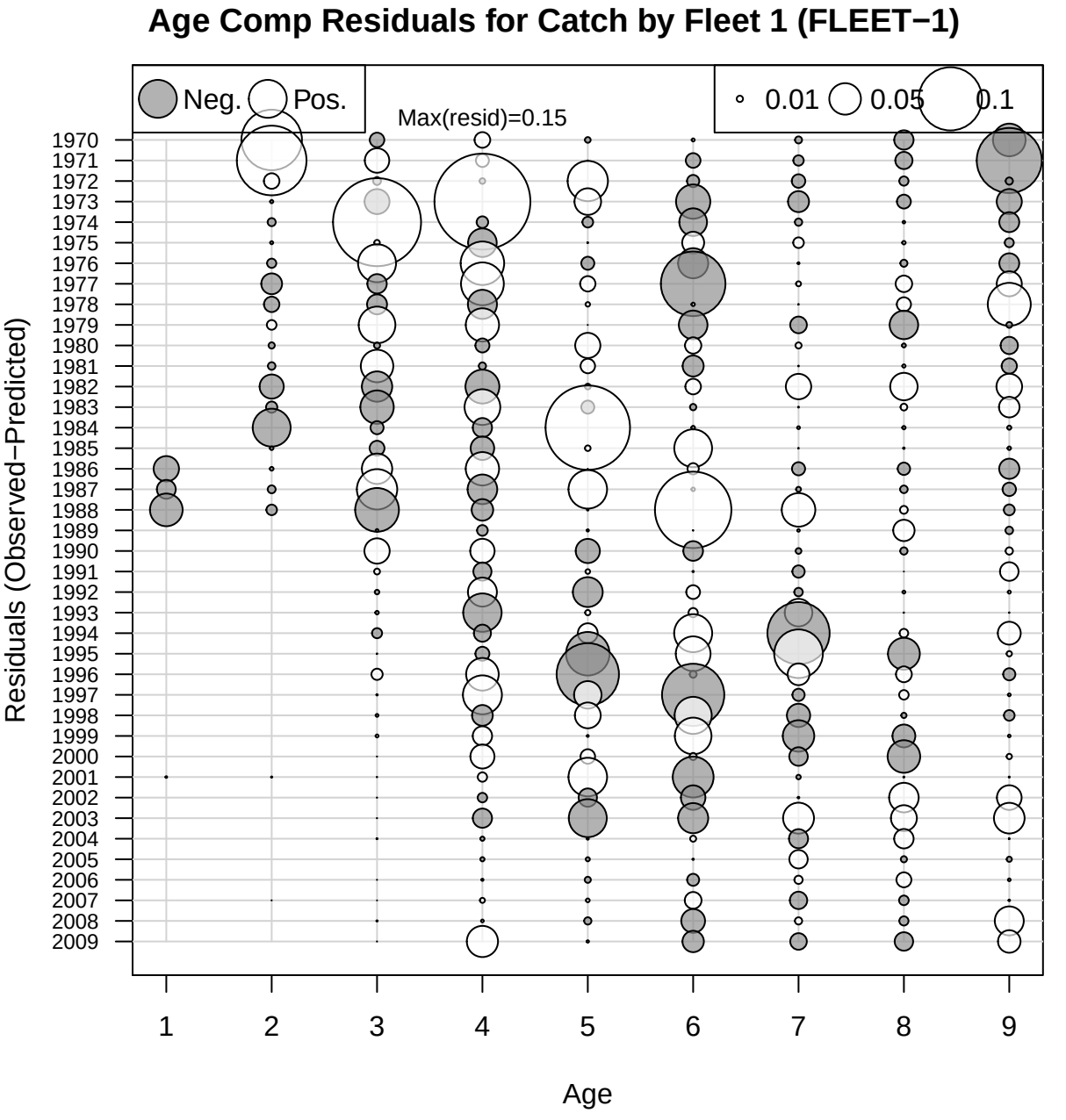

Catch
Fleet 1
FLEET−1
Year = 1974
Year = 1979
Year = 1970
Year = 1975
Year = 1980
Year = 1971
Year = 1976
Year = 1981
Year = 1972
Year = 1977
Year = 1982
Year = 1973
Year = 1978
Year = 1983
Proportion at Age
Age
0.0
0.6
2
4
6
8

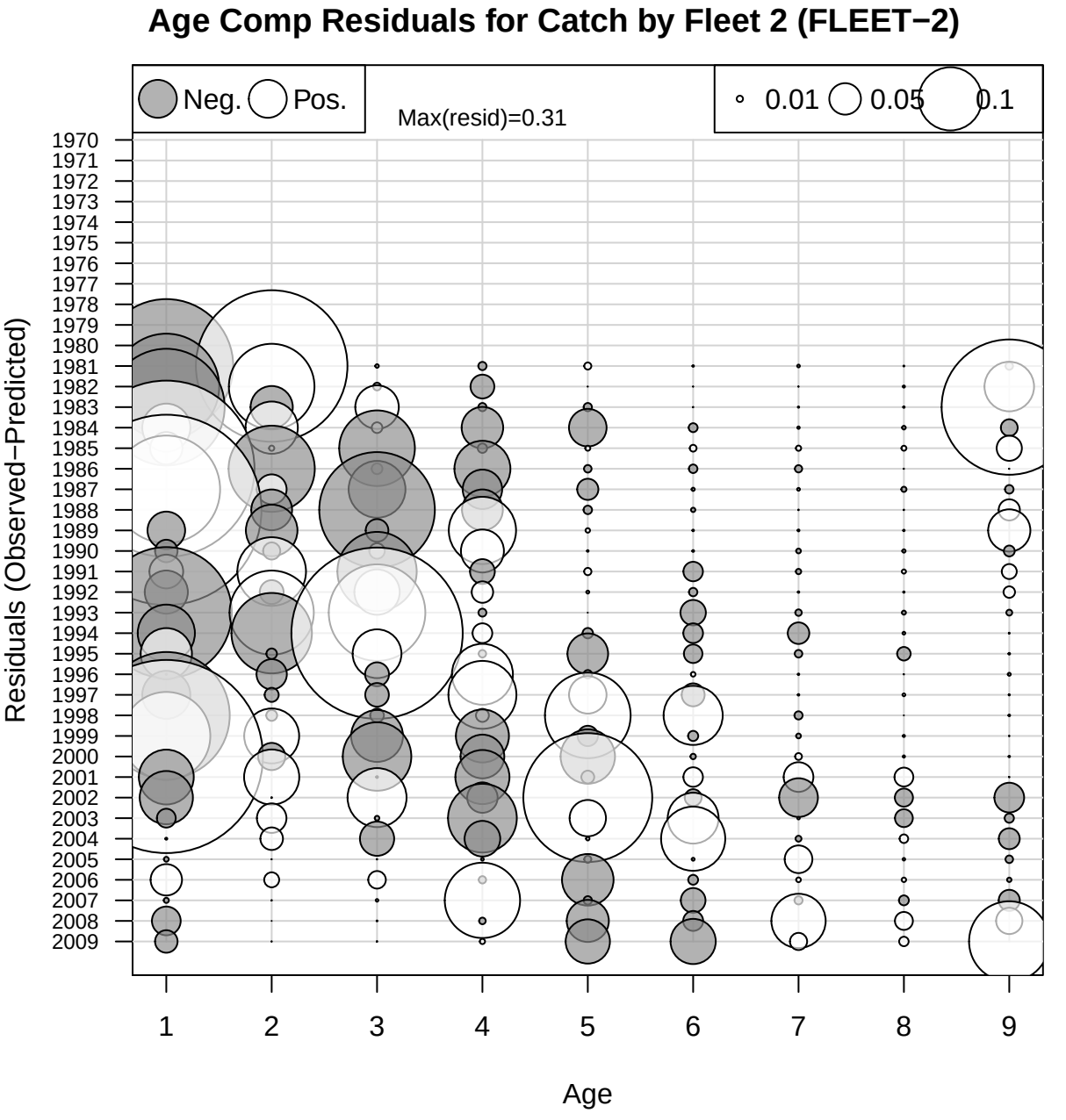

Catch
Year = 1984
Year = 1985
Year = 1986
Year = 1987
Year = 1988
Year = 1989
Year = 1990
Year = 1991
Year = 1992
Year = 1993
Year = 1994
Year = 1995
Year = 1996
Year = 1997
Year = 1998
Proportion at Age
Age
0.0
0.6
2
4
6
8

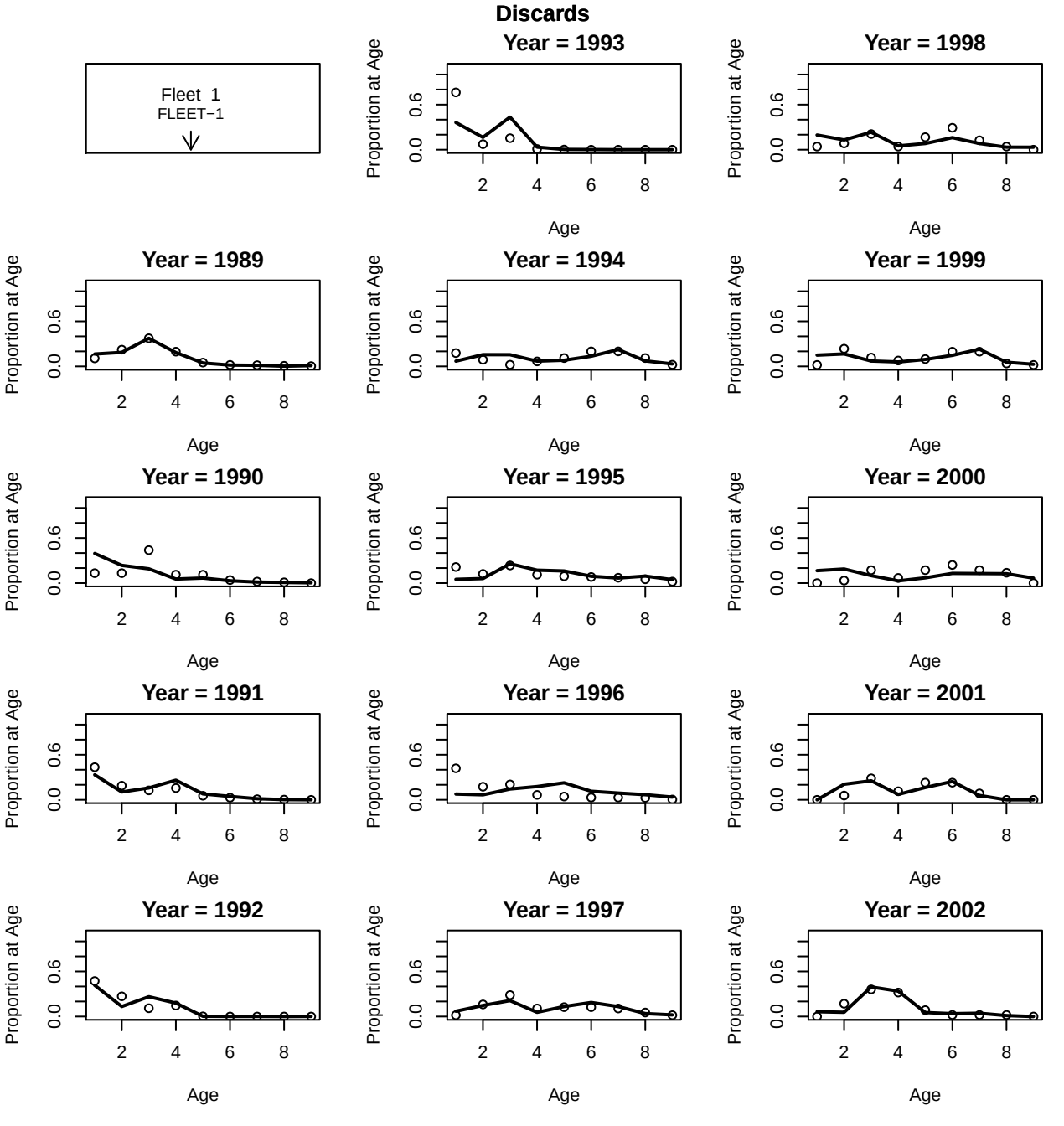

Catch
Year = 1999
Year = 2004
Year = 2009
Year = 2000
Year = 2005
Fleet 2
FLEET−2
Year = 2001
Year = 2006
Year = 1981
Year = 2002
Year = 2007
Year = 1982
Year = 2003
Year = 2008
Year = 1983
Proportion at Age
Age
0.0
0.6
2
4
6
8

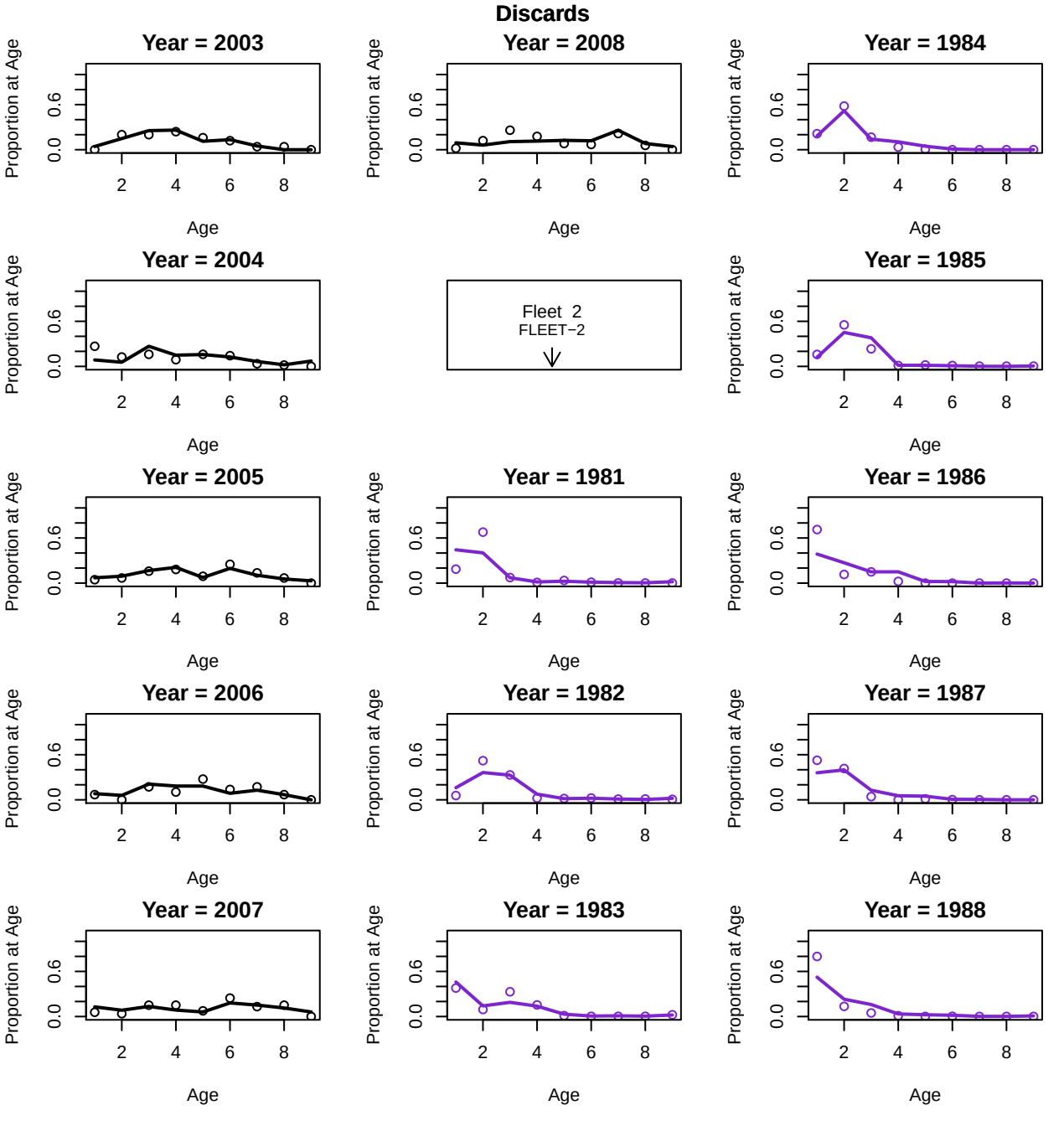

Catch
Year = 1984
Year = 1985
Year = 1986
Year = 1987
Year = 1988
Year = 1989
Year = 1990
Year = 1991
Year = 1992
Year = 1993
Year = 1994
Year = 1995
Year = 1996
Year = 1997
Year = 1998
Proportion at Age
Age
0.0
0.6
2
4
6
8

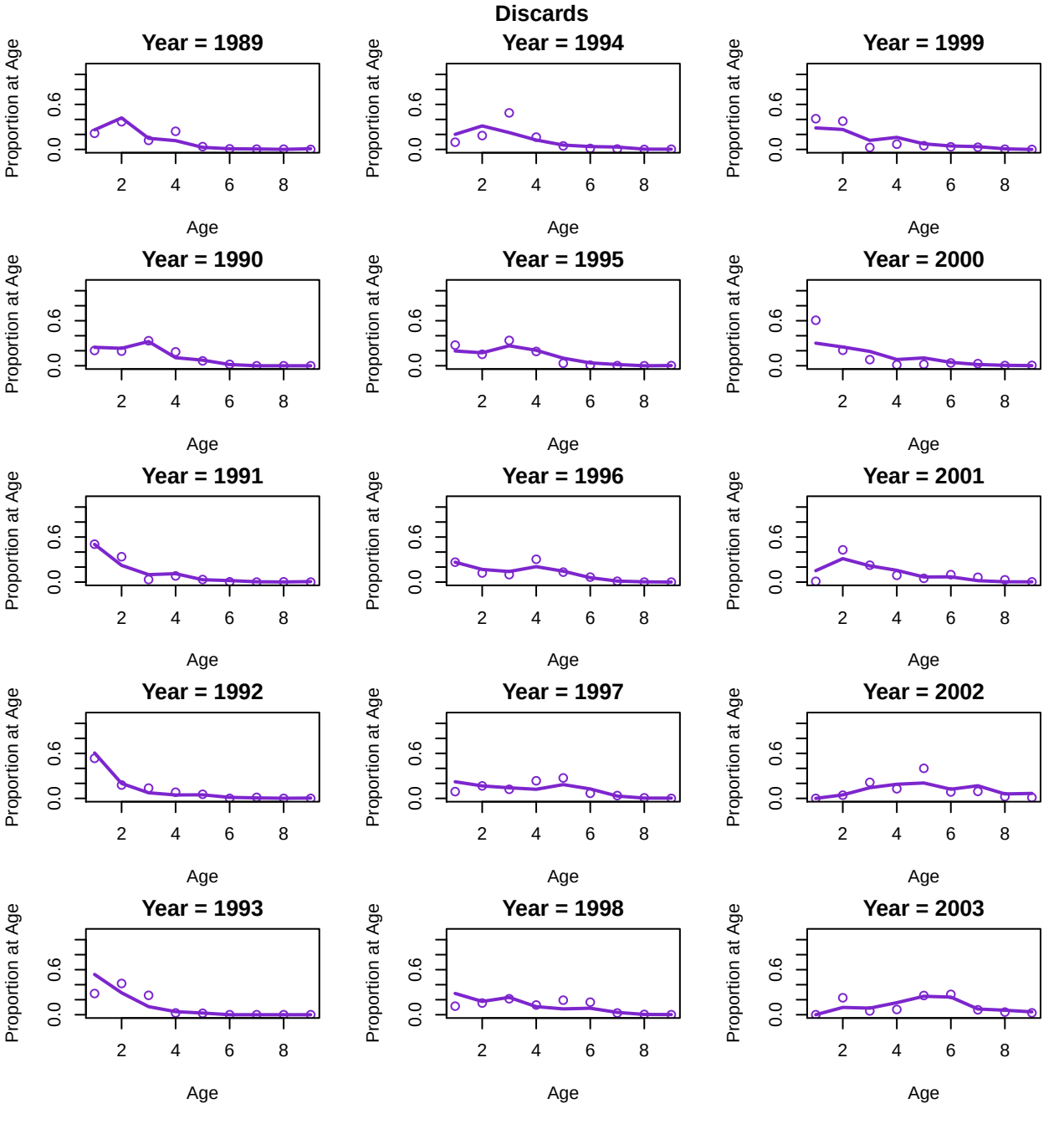

Catch
Year = 1999
Year = 2004
Year = 2009
Year = 2000
Year = 2005
Year = 2001
Year = 2006
Year = 2002
Year = 2007
Year = 2003
Year = 2008
Proportion at Age
Age
0.0
0.6
2
4
6
8

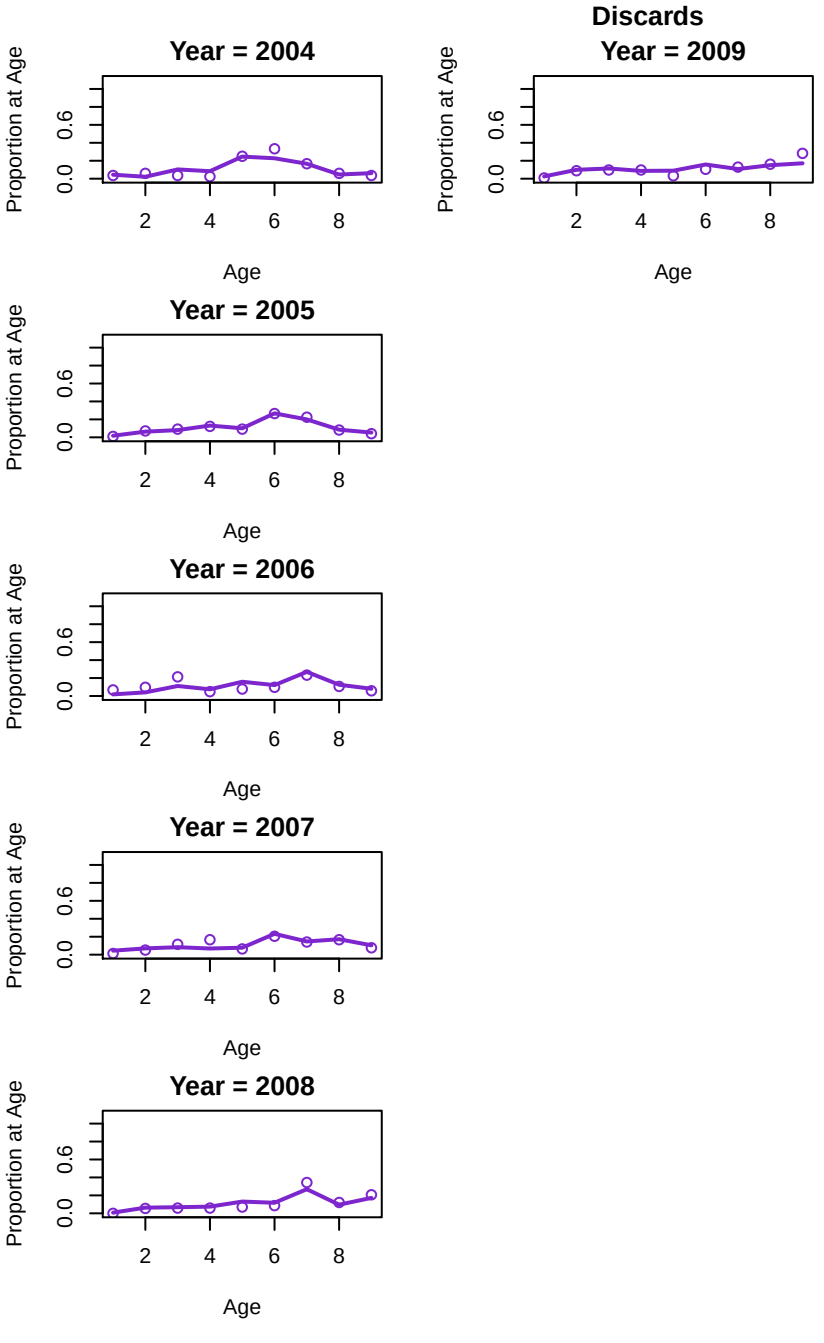

Age Comp Residuals for Catch by Fleet 1 (FLEET−1)
Neg.
Pos.
Max(resid)=0.15
0.01
0.05
0.1
Residuals (Observed−Predicted)
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
1
2
3
4
5
6
7
8
9
Age

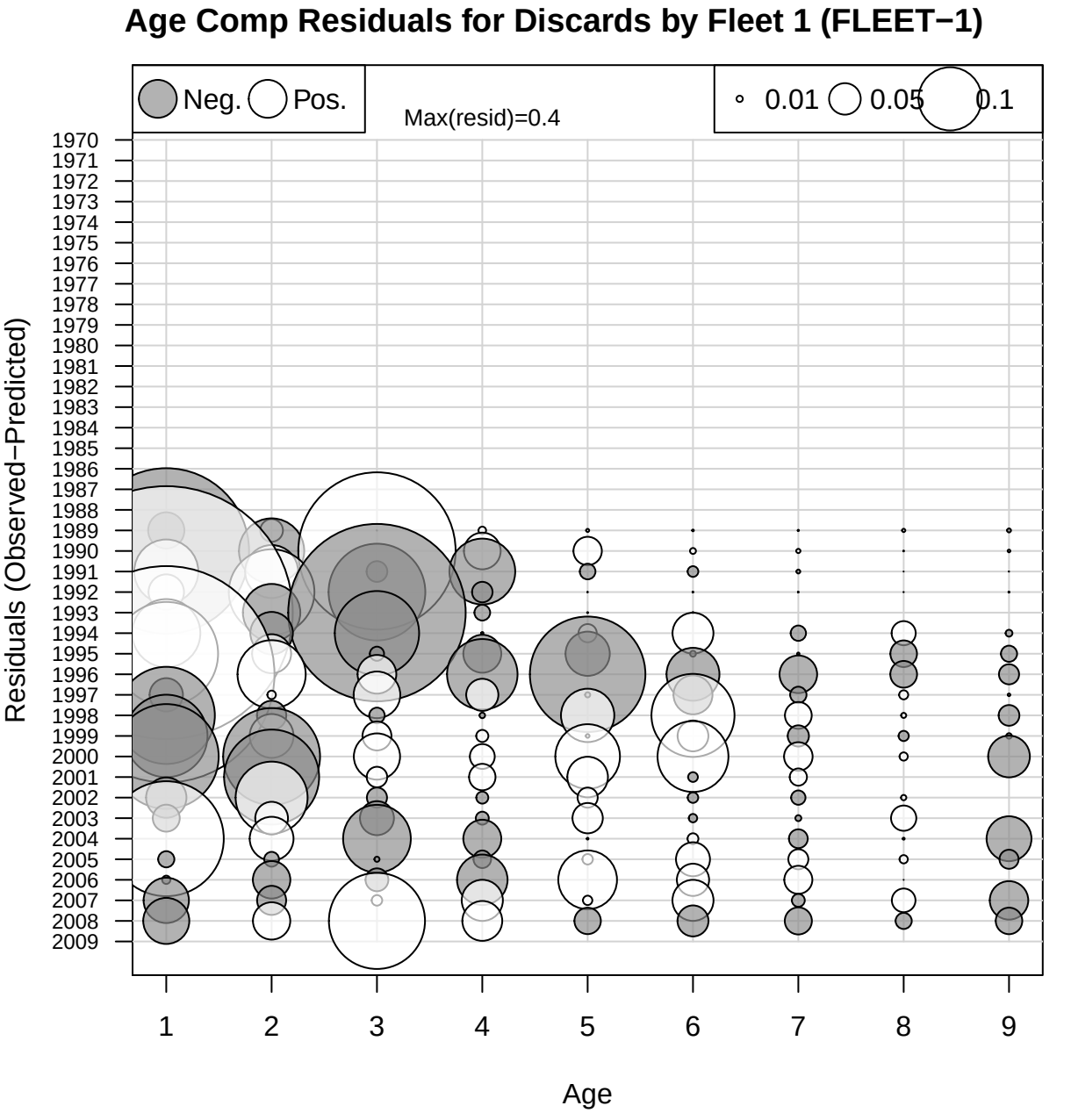

Age Comp Residuals for Catch by Fleet 2 (FLEET−2)
Neg.
Pos.
Max(resid)=0.31
0.01
0.05
0.1
Residuals (Observed−Predicted)
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
1
2
3
4
5
6
7
8
9
Age

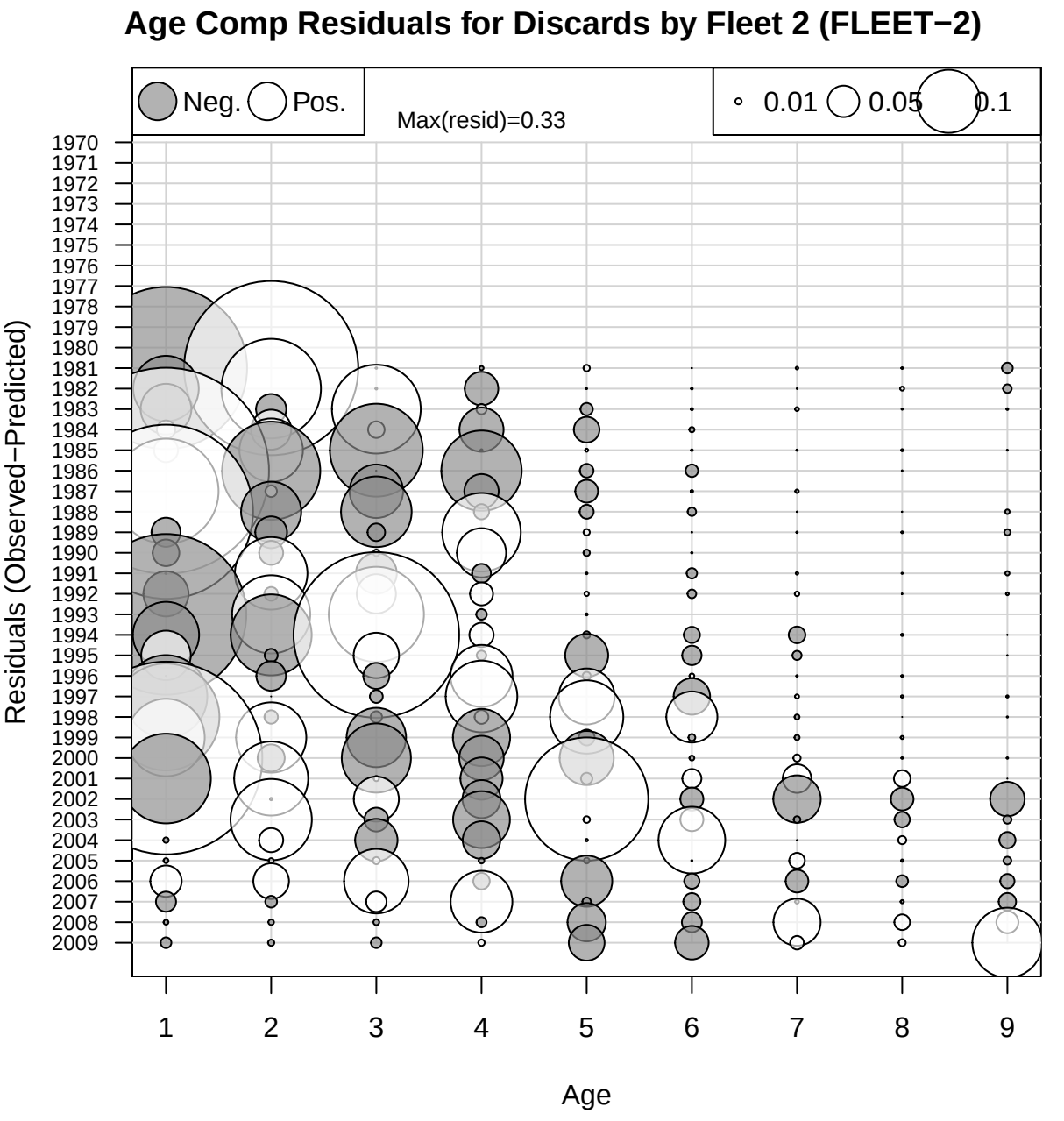

Discards
Fleet 1
FLEET−1
Year = 1993
Year = 1998
Year = 1989
Year = 1994
Year = 1999
Year = 1990
Year = 1995
Year = 2000
Year = 1991
Year = 1996
Year = 2001
Year = 1992
Year = 1997
Year = 2002
Proportion at Age
Age
0.0
0.6
2
4
6
8

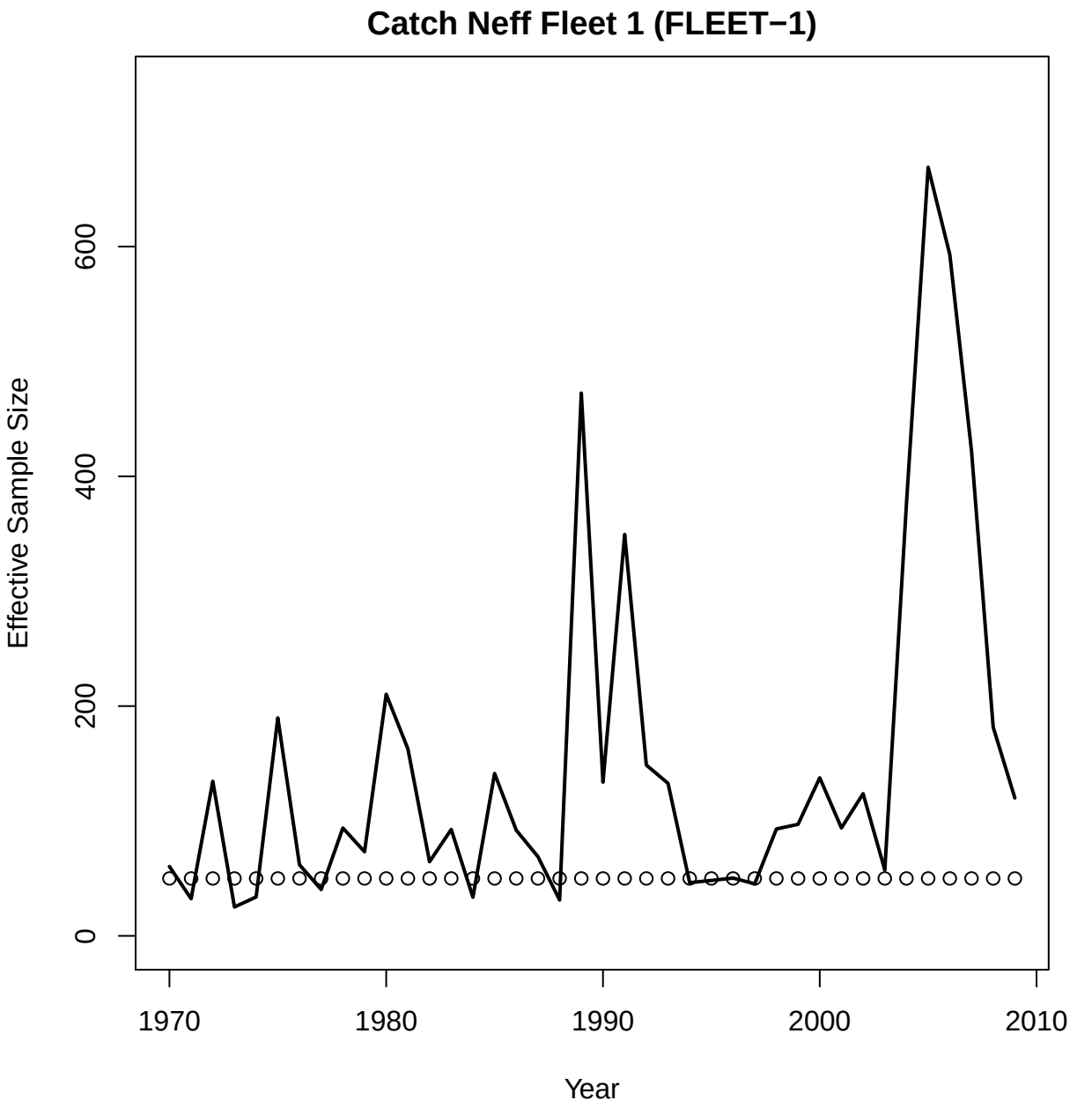

Discards
Year = 2003
Year = 2008
Year = 1984
Year = 2004
Fleet 2
FLEET−2
Year = 1985
Year = 2005
Year = 1981
Year = 1986
Year = 2006
Year = 1982
Year = 1987
Year = 2007
Year = 1983
Year = 1988
Proportion at Age
Age
0.0
0.6
2
4
6
8

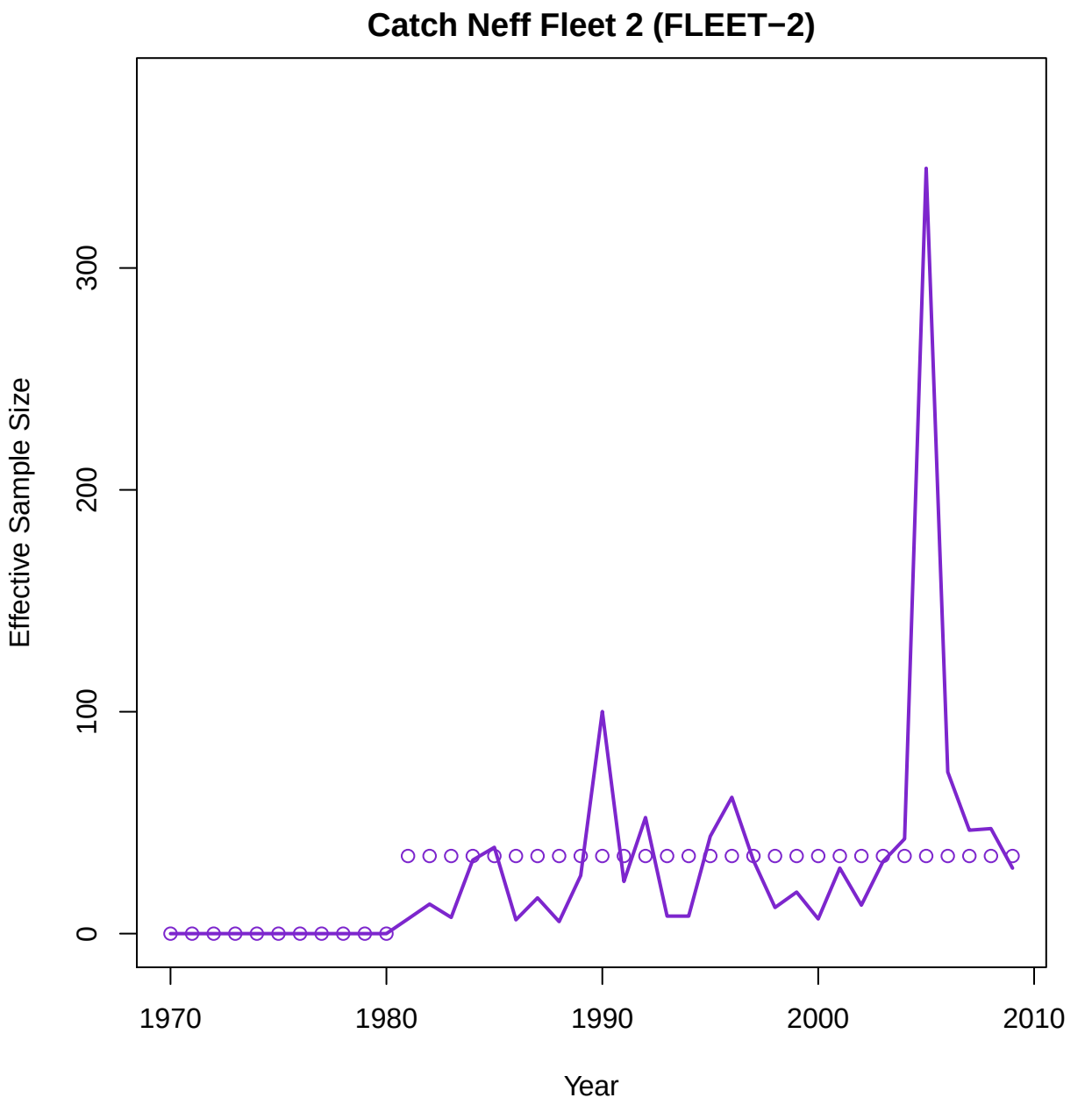

Discards
Year = 1989
Year = 1990
Year = 1991
Year = 1992
Year = 1993
Year = 1994
Year = 1995
Year = 1996
Year = 1997
Year = 1998
Year = 1999
Year = 2000
Year = 2001
Year = 2002
Year = 2003
Proportion at Age
Age
0.0
0.6
2
4
6
8

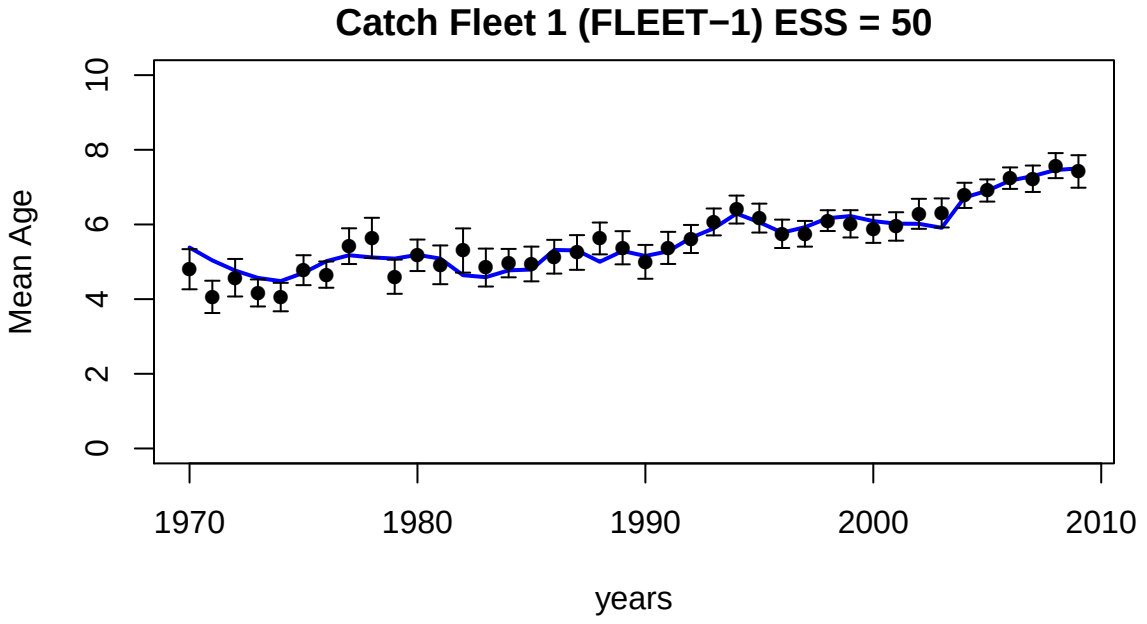

Discards
Year = 2004
Year = 2009
Year = 2005
Year = 2006
Year = 2007
Year = 2008
Proportion at Age
Age
0.0
0.6
2
4
6
8

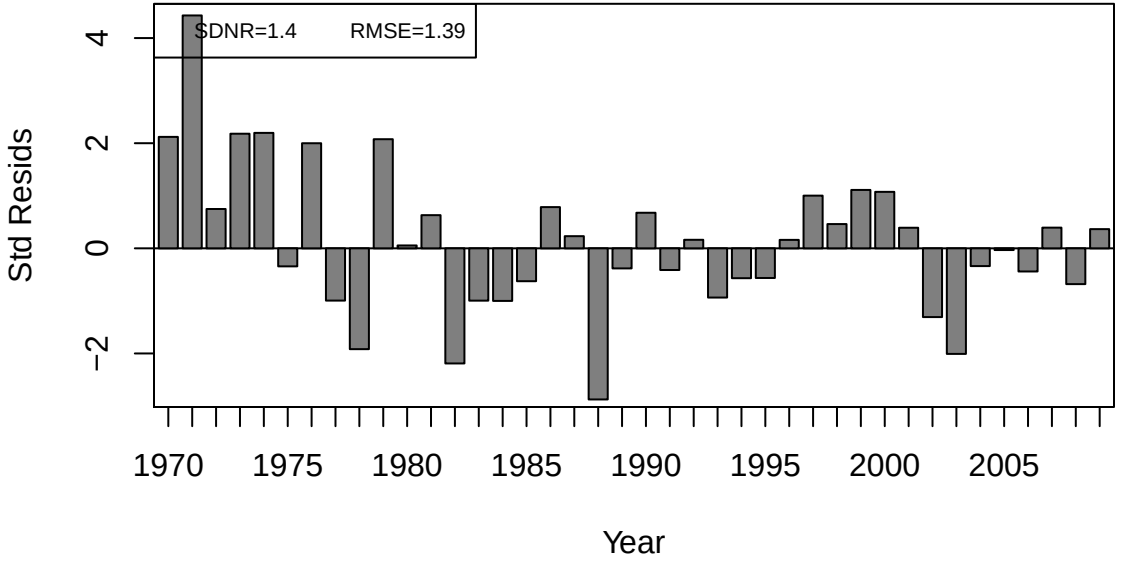

Age Comp Residuals for Discards by Fleet 1 (FLEET−1)
Neg.
Pos.
Max(resid)=0.4
0.01
0.05
0.1
Residuals (Observed−Predicted)
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
1
2
3
4
5
6
7
8
9
Age

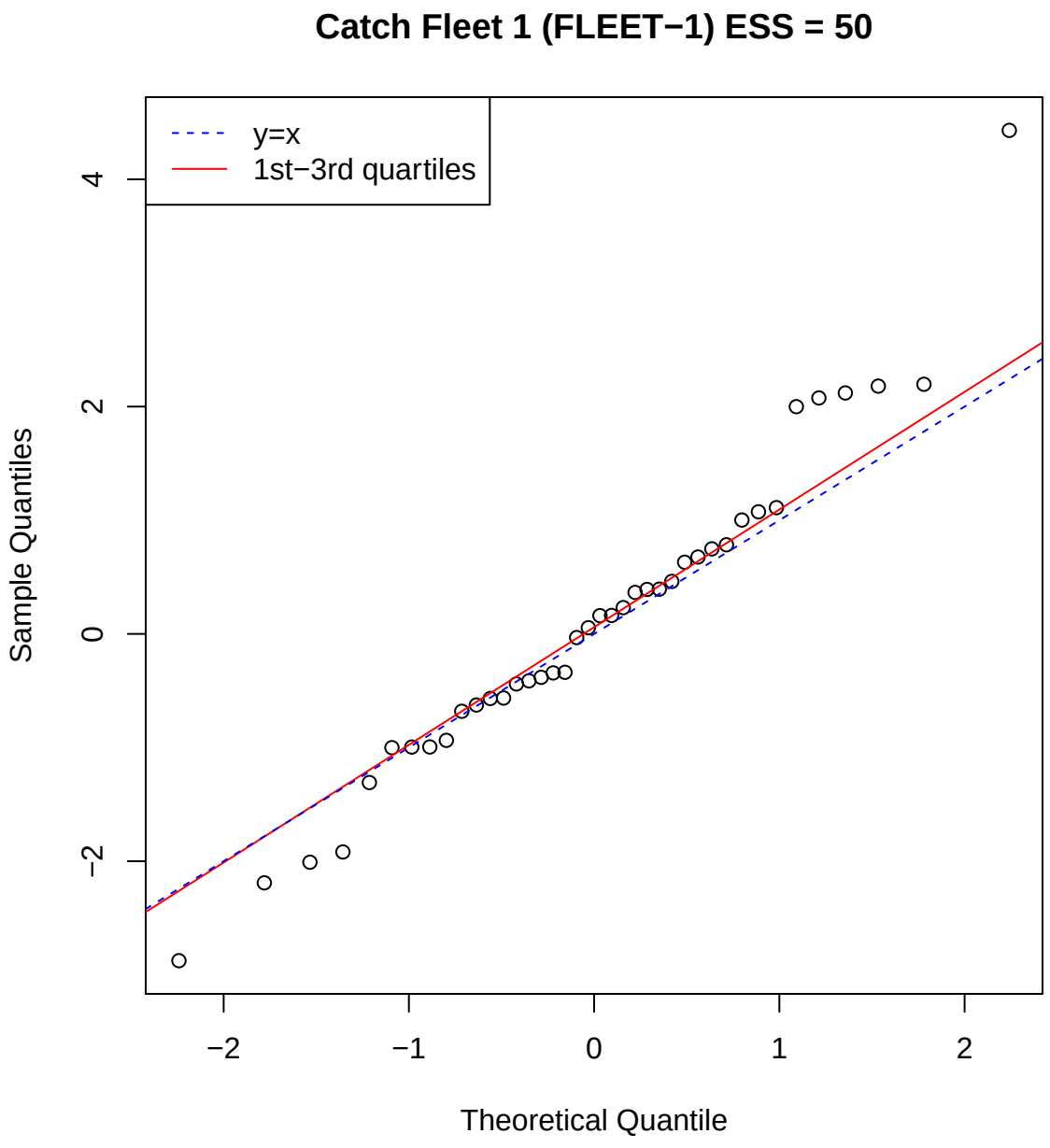

Age Comp Residuals for Discards by Fleet 2 (FLEET−2)
Neg.
Pos.
Max(resid)=0.33
0.01
0.05
0.1
Residuals (Observed−Predicted)
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
1
2
3
4
5
6
7
8
9
Age

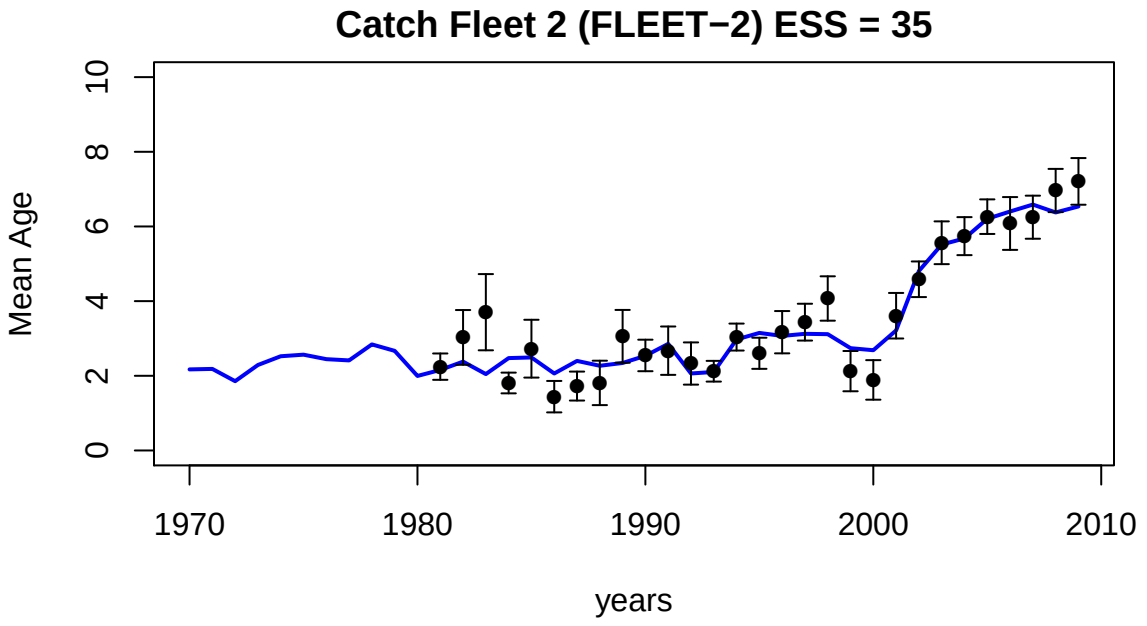

Catch Neff Fleet 1 (FLEET−1)
Effective Sample Size
0
200
400
600
1970
1980
1990
2000
2010
Year

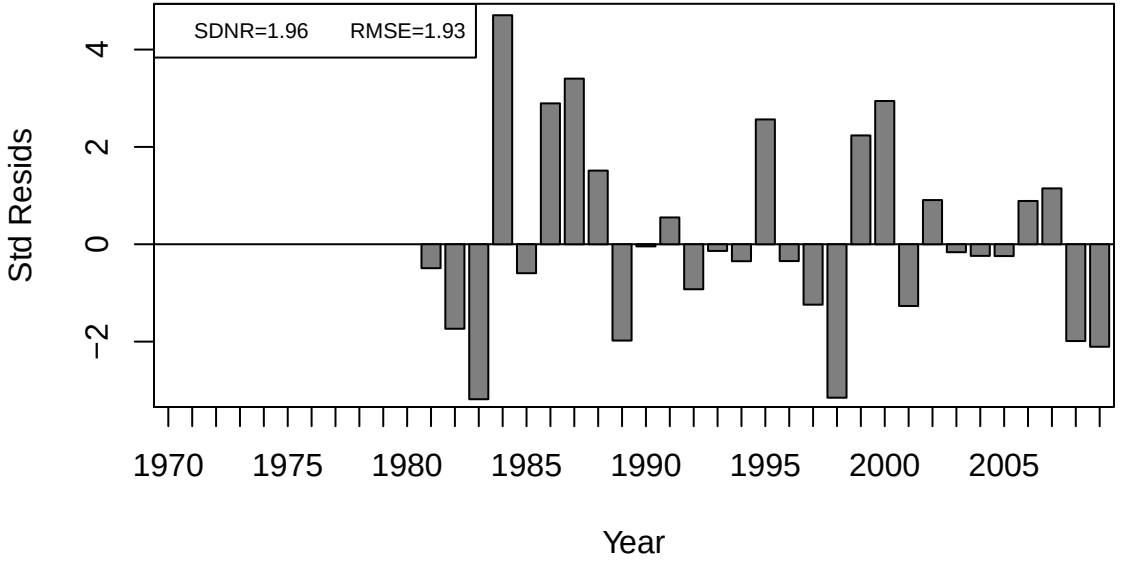

Catch Neff Fleet 2 (FLEET−2)
Effective Sample Size
0
100
200
300
1970
1980
1990
2000
2010
Year

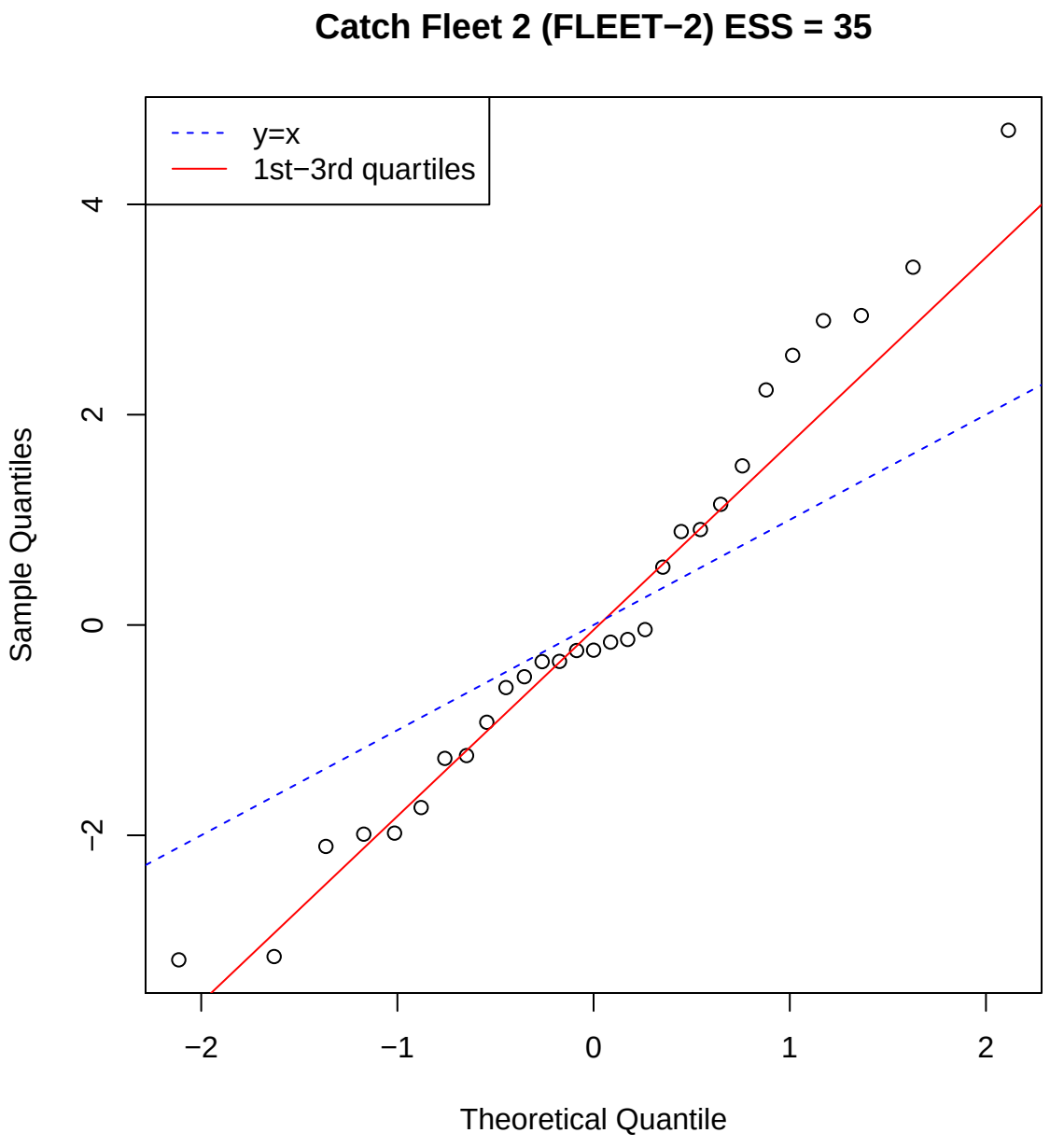

Catch Fleet 1 (FLEET−1) ESS = 50
Mean Age
0
2
4
6
8
10
1970
1980
1990
2000
2010
years

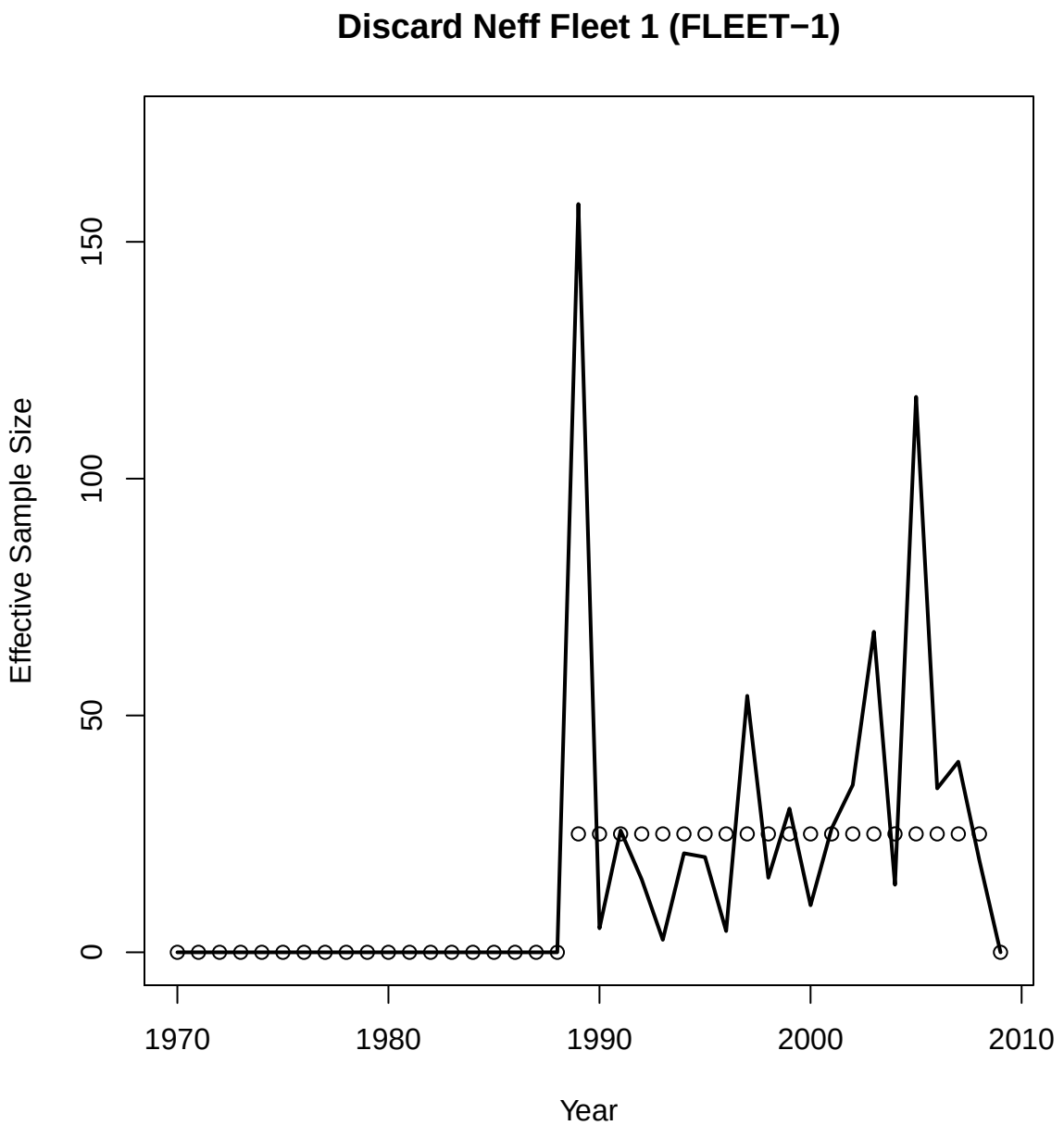

SDNR=1.4
RMSE=1.39
Std Resids
−2
0
2
4
1970
1975
1980
1985
1990
1995
2000
2005
Year

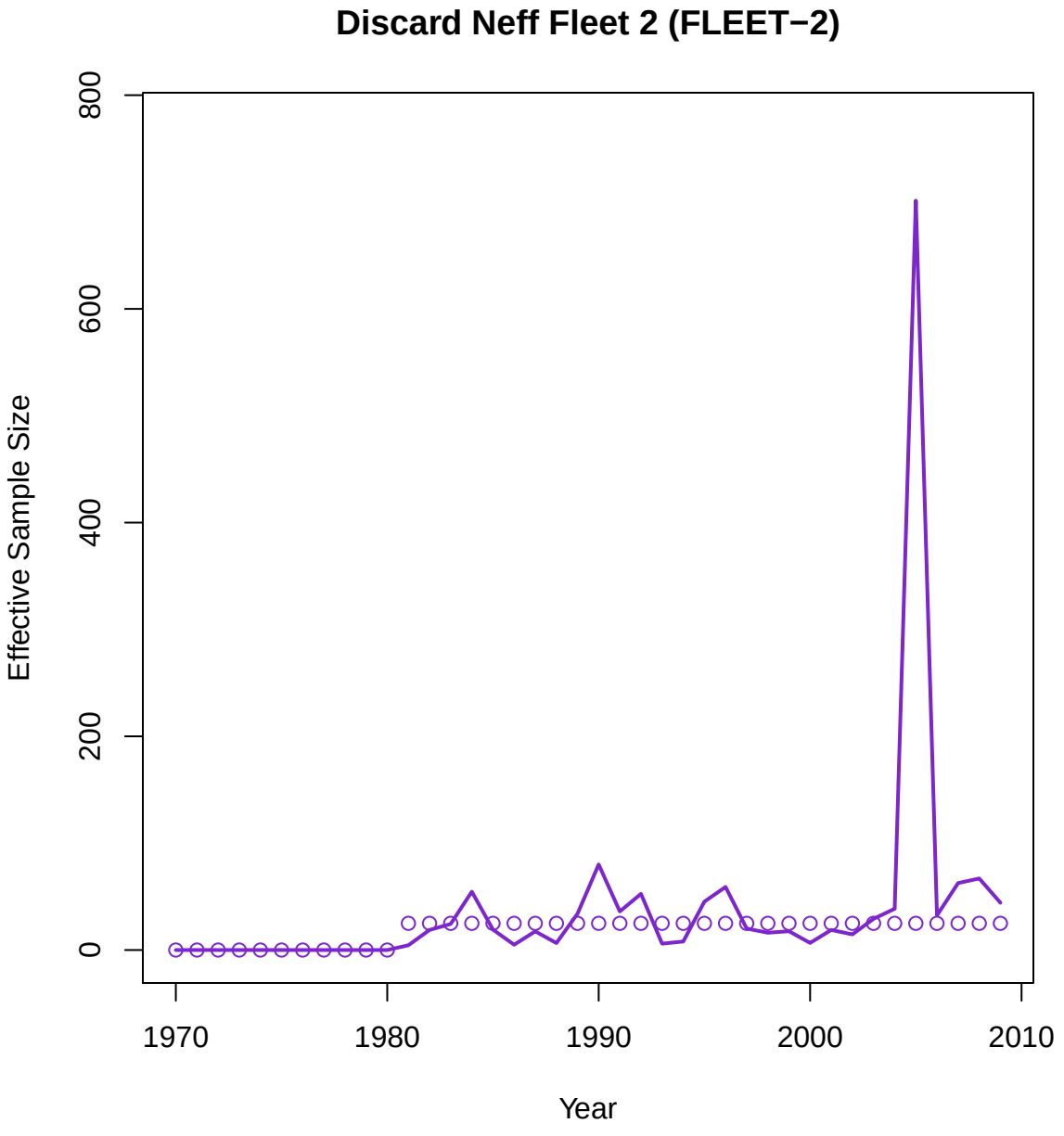

Catch Fleet 1 (FLEET−1) ESS = 50
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
−2
0
2
4
−2
−1
0
1
2

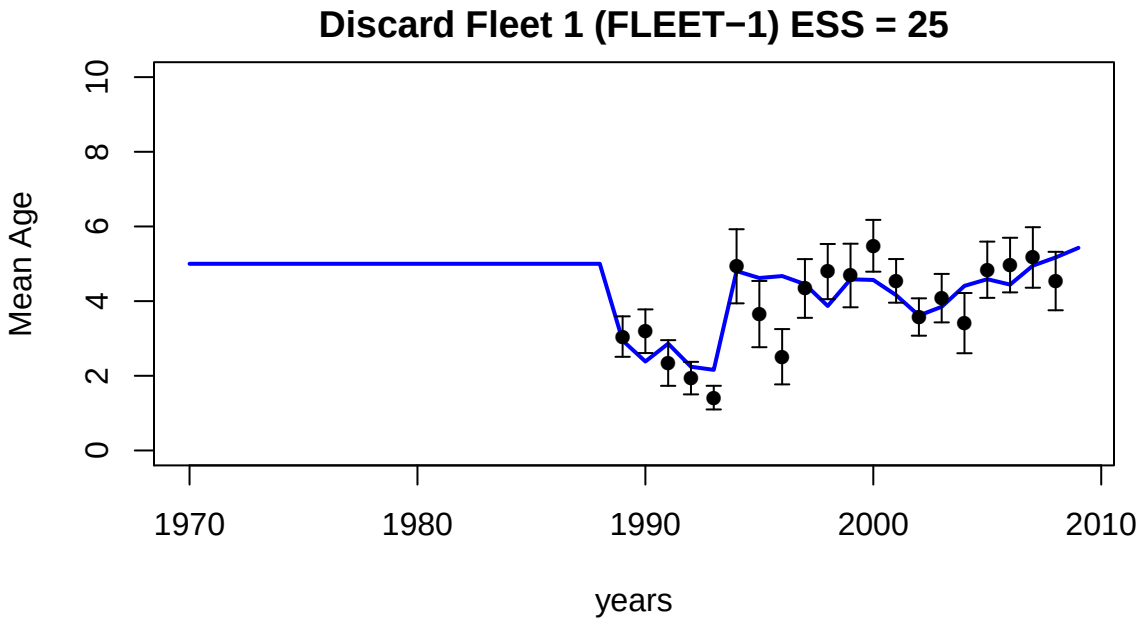

Catch Fleet 2 (FLEET−2) ESS = 35
Mean Age
0
2
4
6
8
10
1970
1980
1990
2000
2010
years

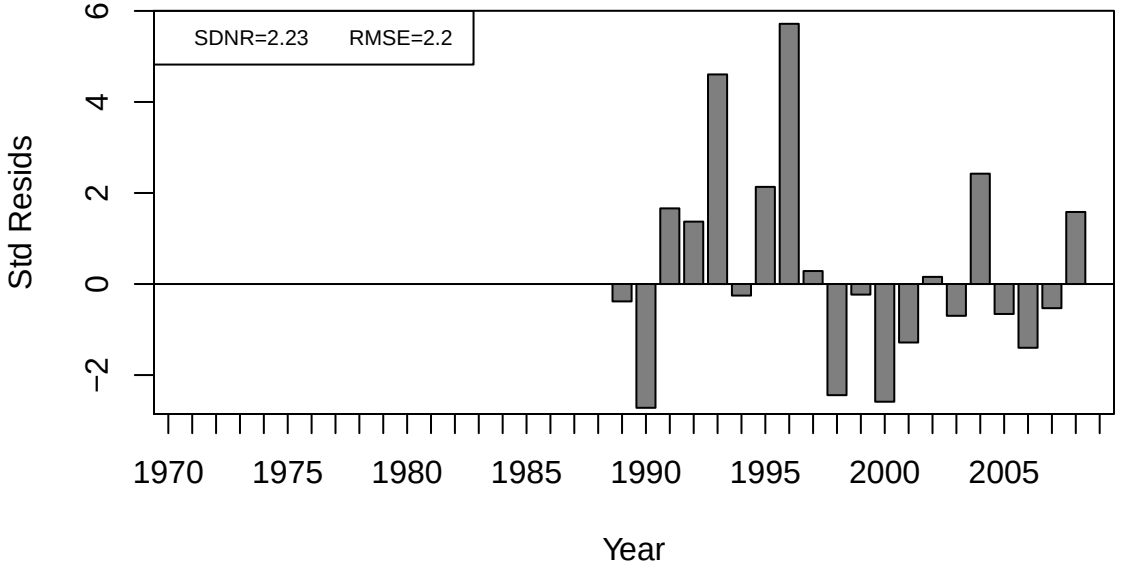

SDNR=1.96
RMSE=1.93
Std Resids
−2
0
2
4
1970
1975
1980
1985
1990
1995
2000
2005
Year

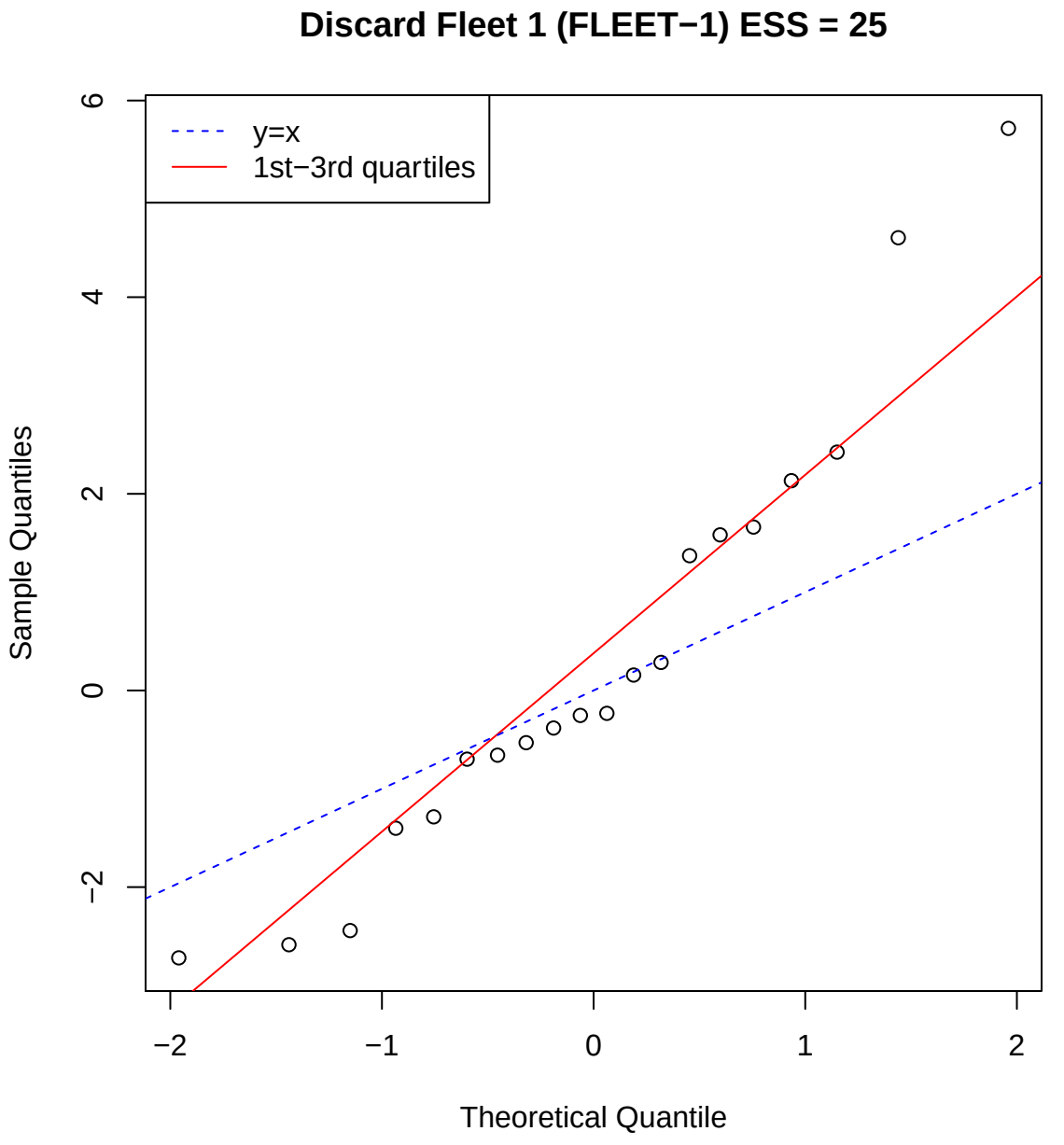

Catch Fleet 2 (FLEET−2) ESS = 35
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
−2
0
2
4
−2
−1
0
1
2

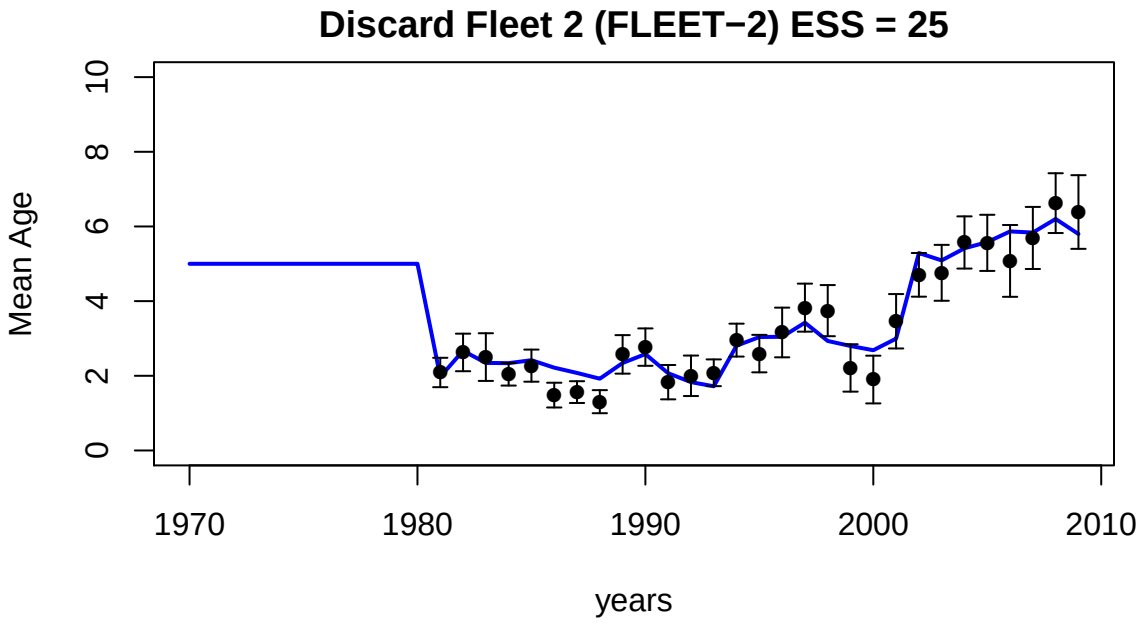

Discard Neff Fleet 1 (FLEET−1)
Effective Sample Size
0
50
100
150
1970
1980
1990
2000
2010
Year

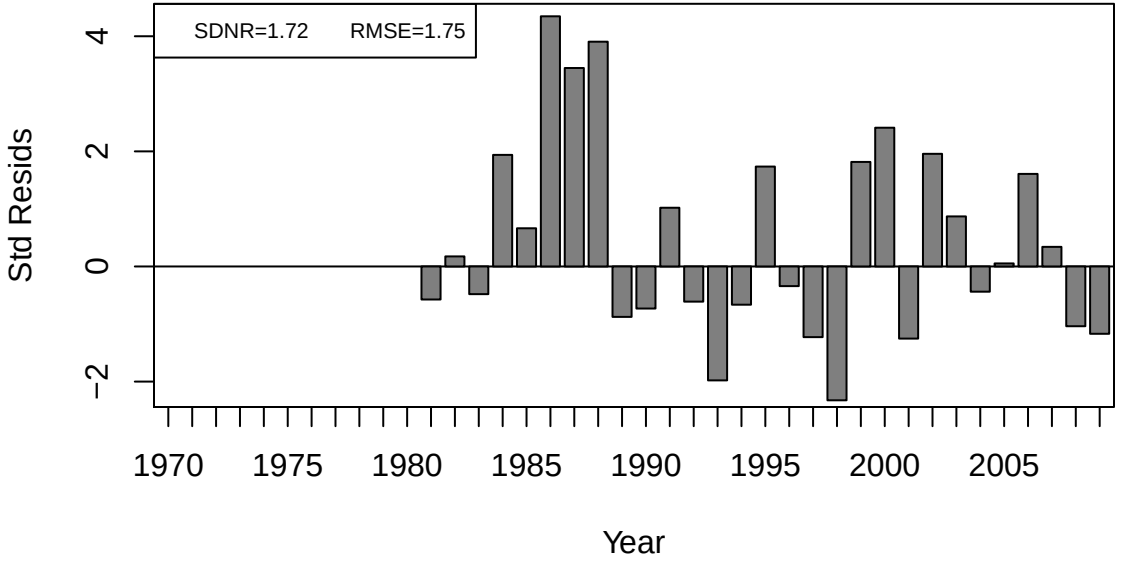

Discard Neff Fleet 2 (FLEET−2)
Effective Sample Size
0
200
400
600
800
1970
1980
1990
2000
2010
Year

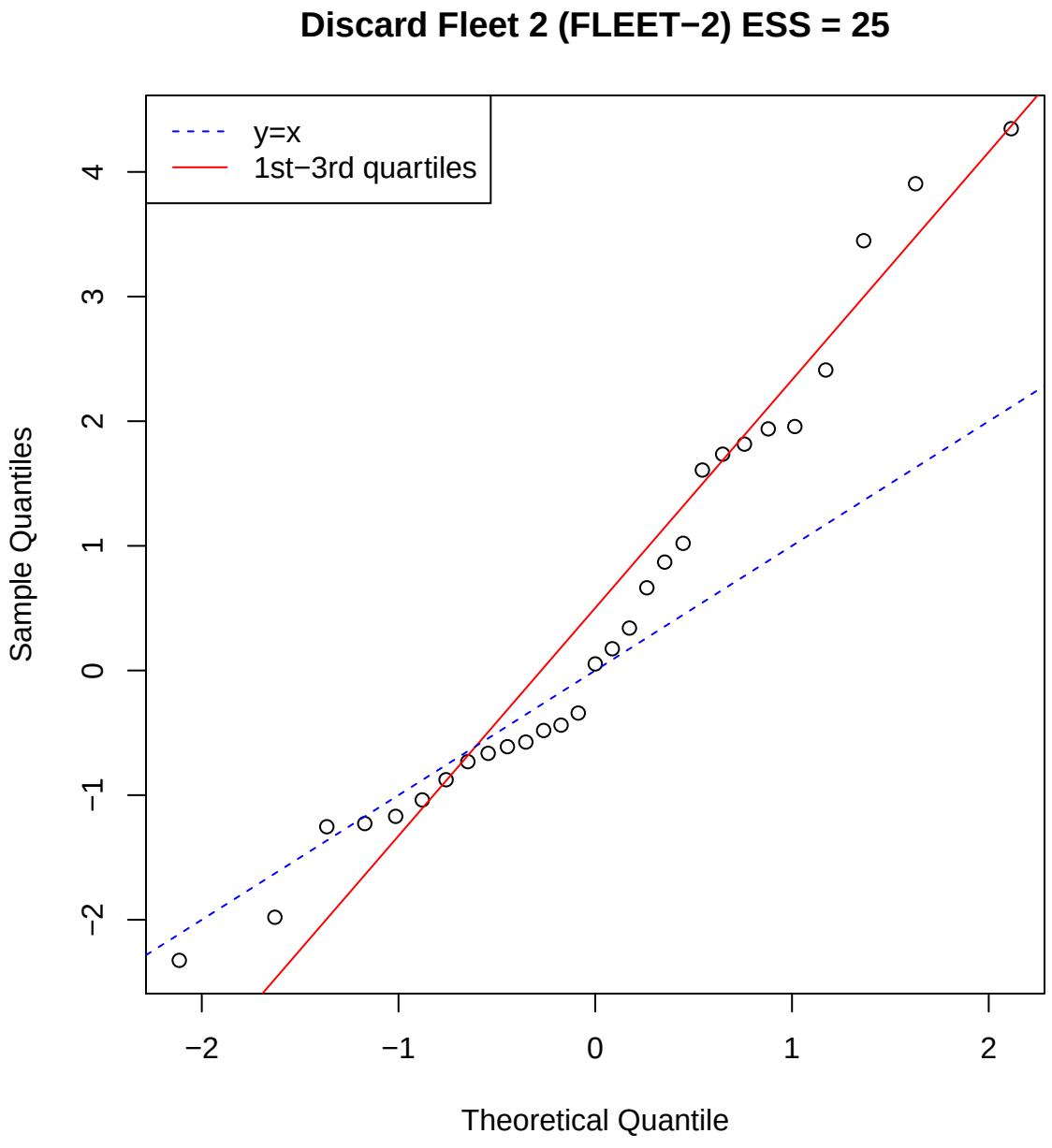

Discard Fleet 1 (FLEET−1) ESS = 25
Mean Age
0
2
4
6
8
10
1970
1980
1990
2000
2010
years

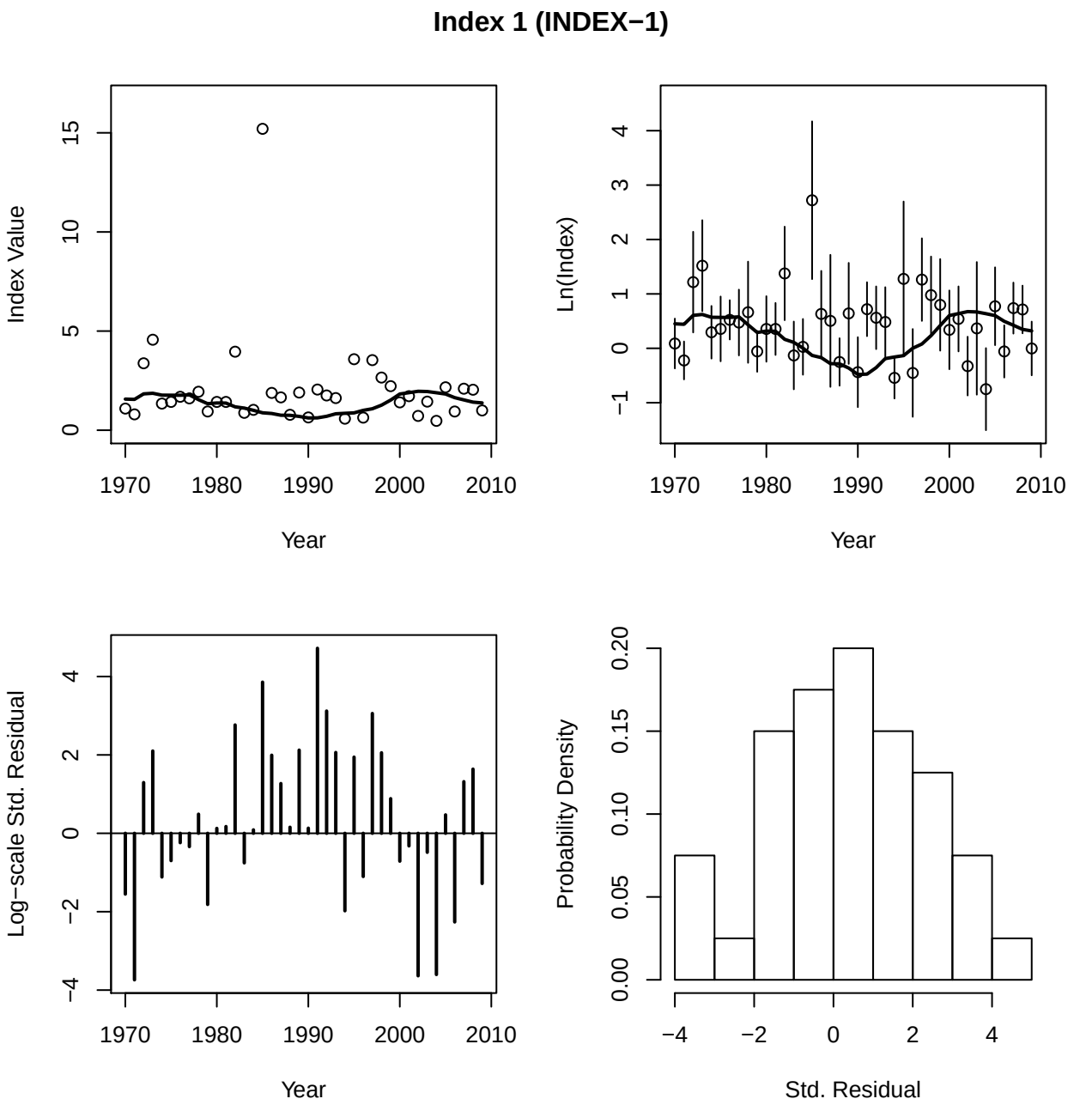

SDNR=2.23
RMSE=2.2
Std Resids
−2
0
2
4
6
1970
1975
1980
1985
1990
1995
2000
2005
Year

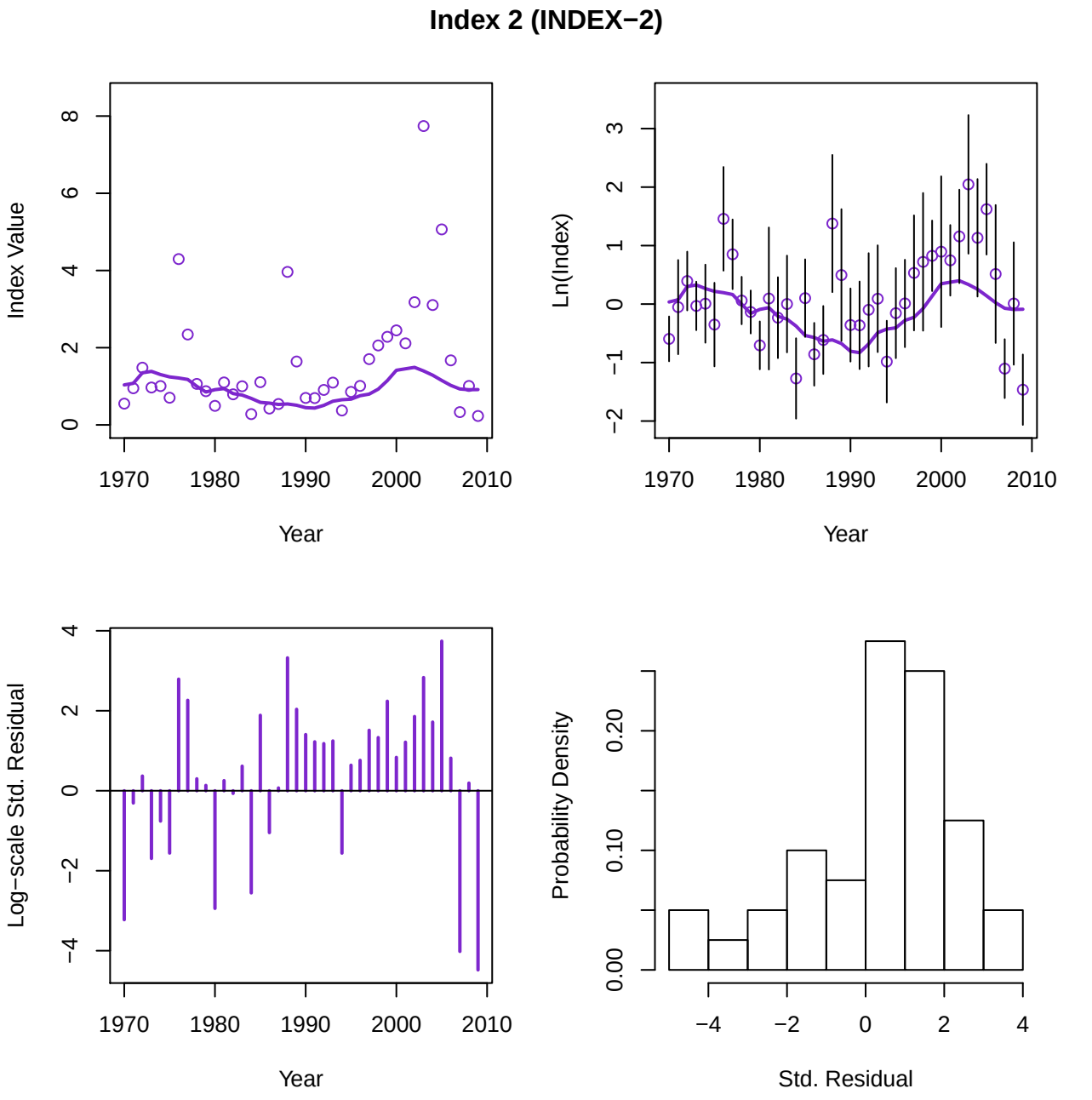

Discard Fleet 1 (FLEET−1) ESS = 25
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
6
4
2
0
−2
−2
−1
0
1
2

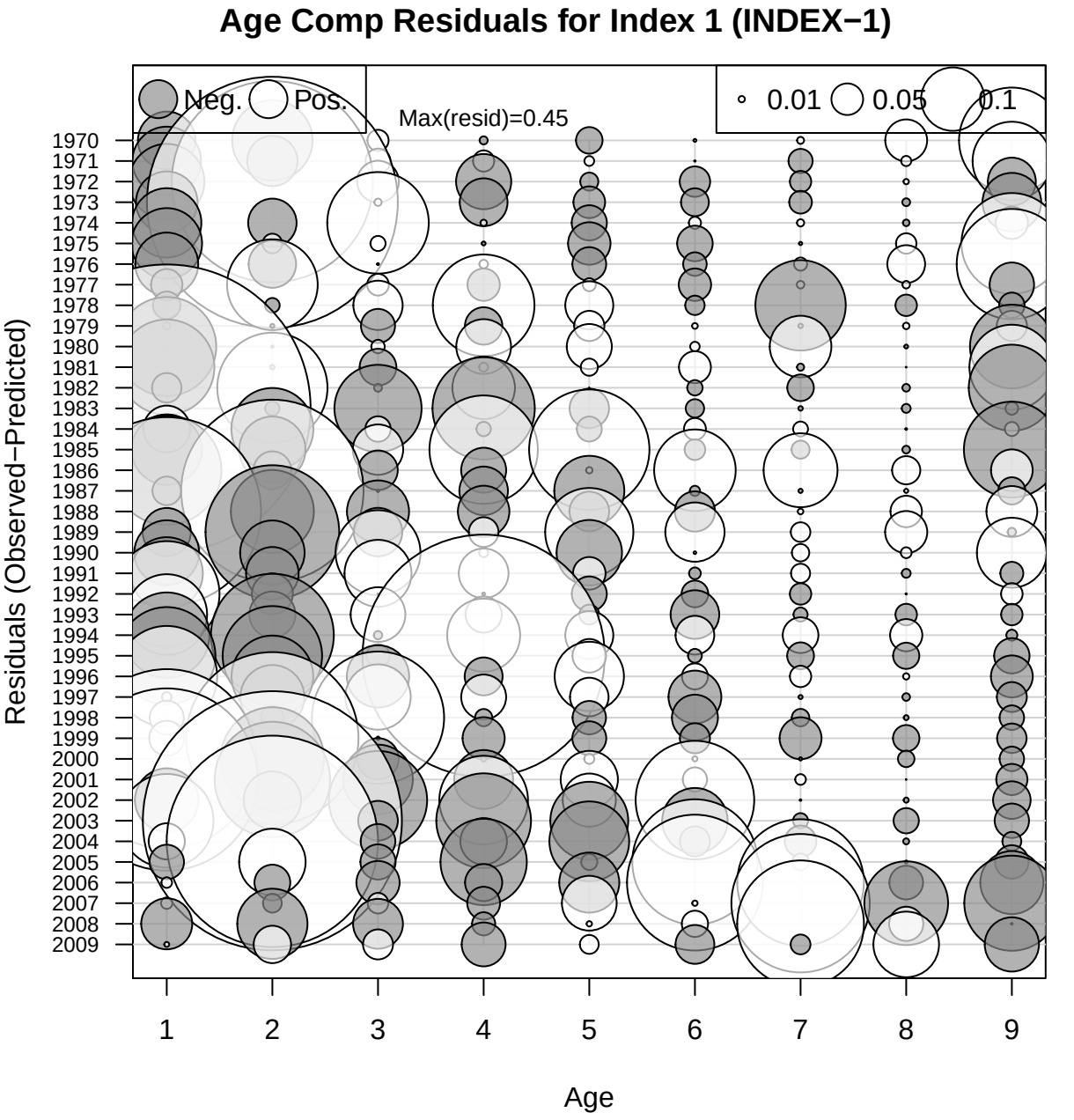

Discard Fleet 2 (FLEET−2) ESS = 25
Mean Age
0
2
4
6
8
10
1970
1980
1990
2000
2010
years

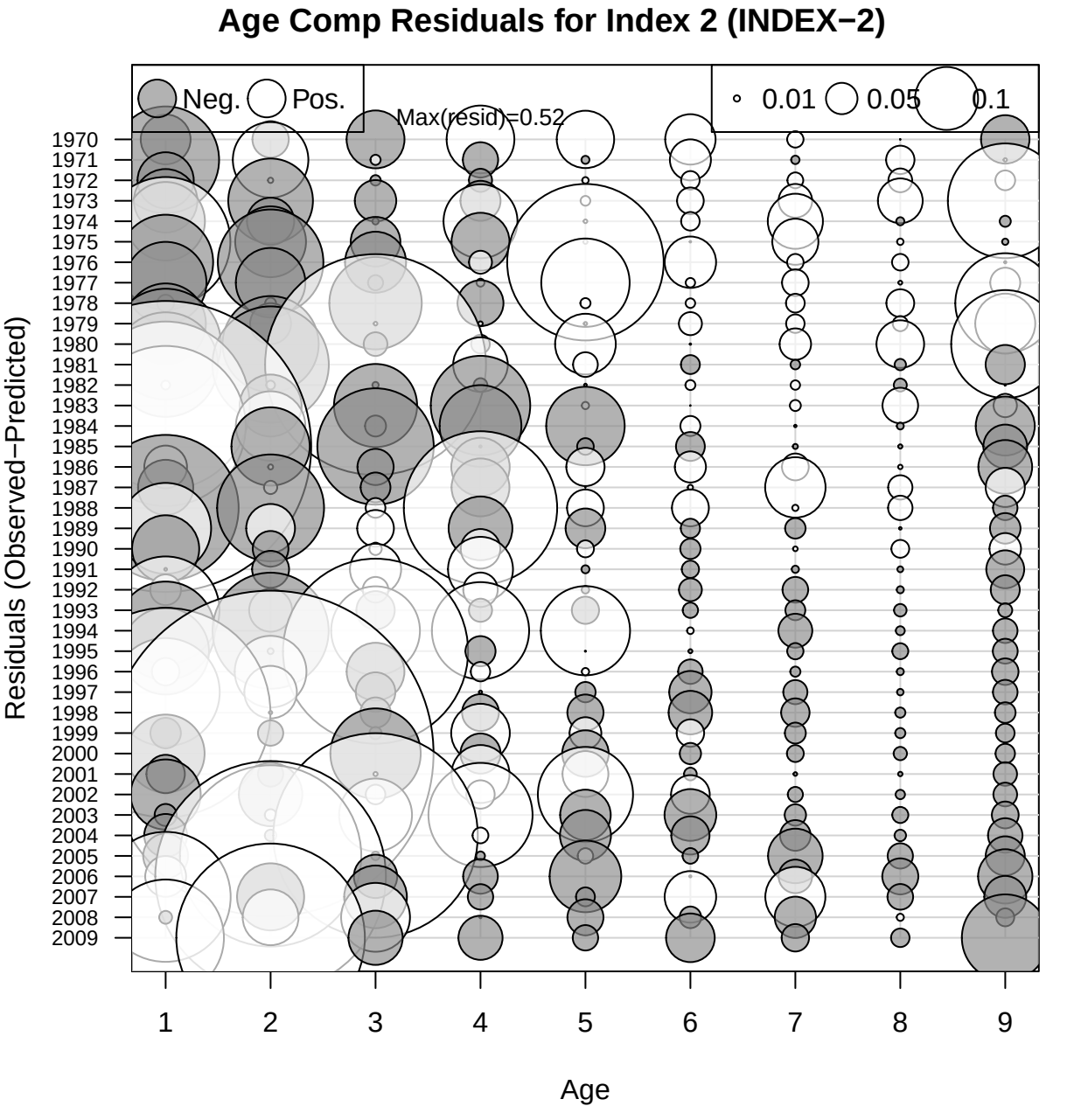

SDNR=1.72
RMSE=1.75
Std Resids
−2
0
2
4
1970
1975
1980
1985
1990
1995
2000
2005
Year

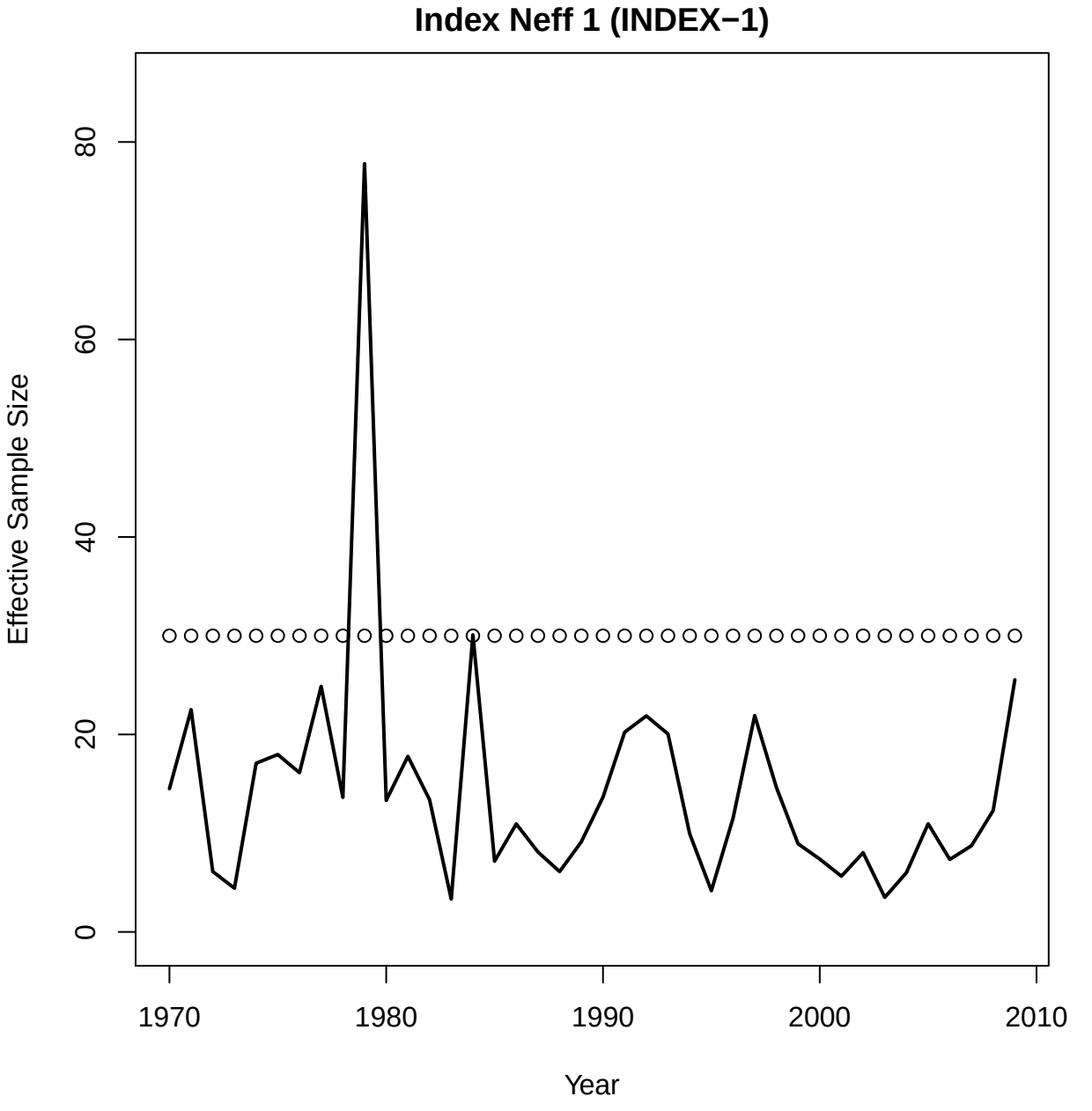

Discard Fleet 2 (FLEET−2) ESS = 25
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
−2
−1
0
1
2
3
4

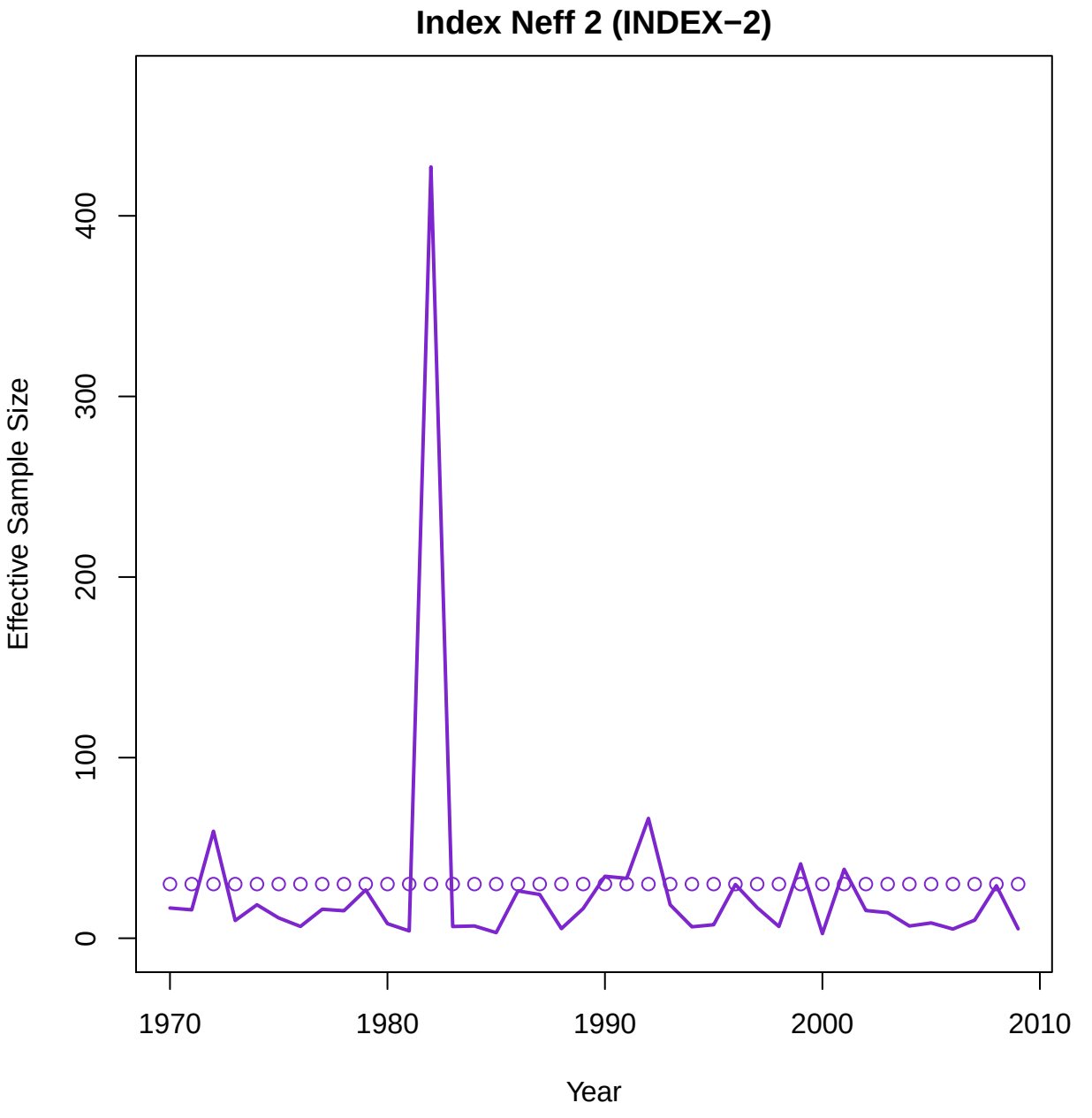

Index 1 (INDEX−1)
Index Value
Year
Ln(Index)
Year
Log−scale Std. Residual
Year
Probability Density
Std. Residual

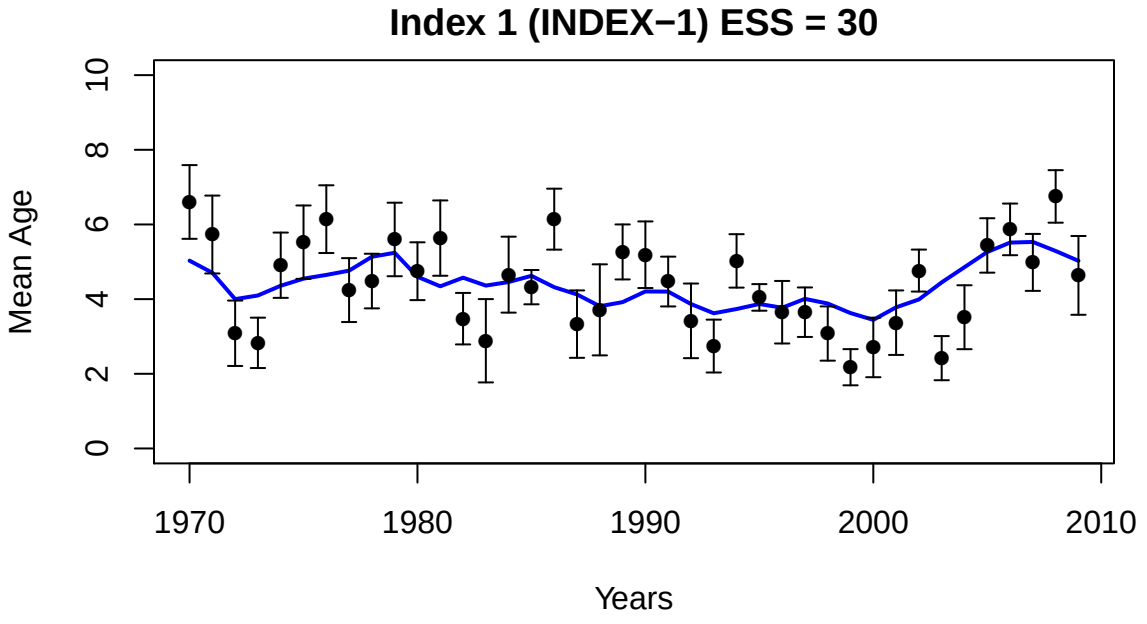

Index 2 (INDEX−2)
Index Value
Year
Ln(Index)
Year
Log−scale Std. Residual
Year
Probability Density
Std. Residual

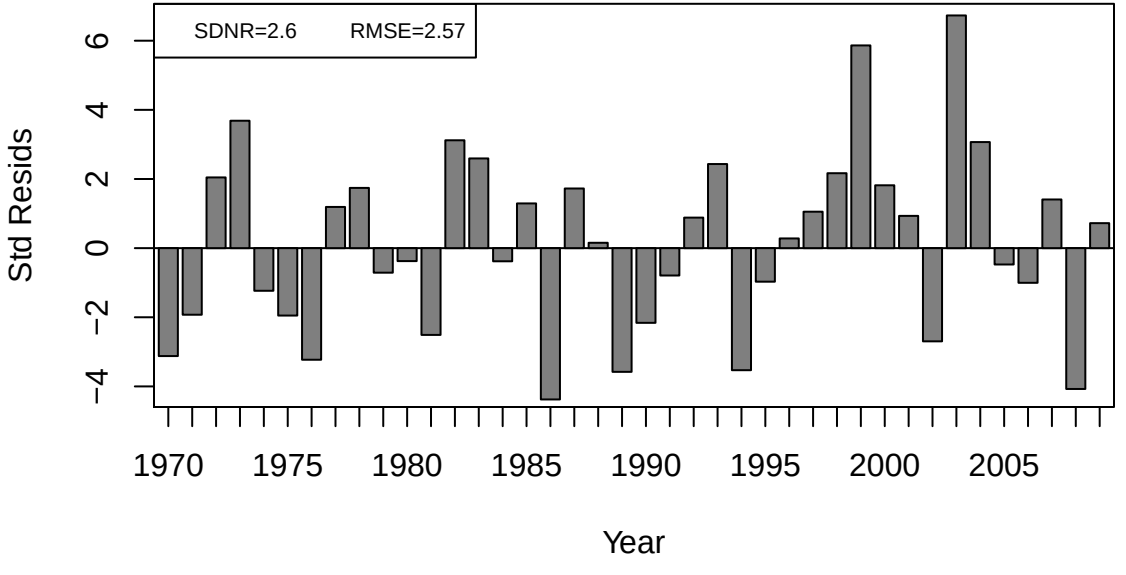

Age Comp Residuals for Index 1 (INDEX−1)
Neg.
Pos.
Max(resid)=0.45
0.01
0.05
0.1
Residuals (Observed−Predicted)
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
1
2
3
4
5
6
7
8
9
Age

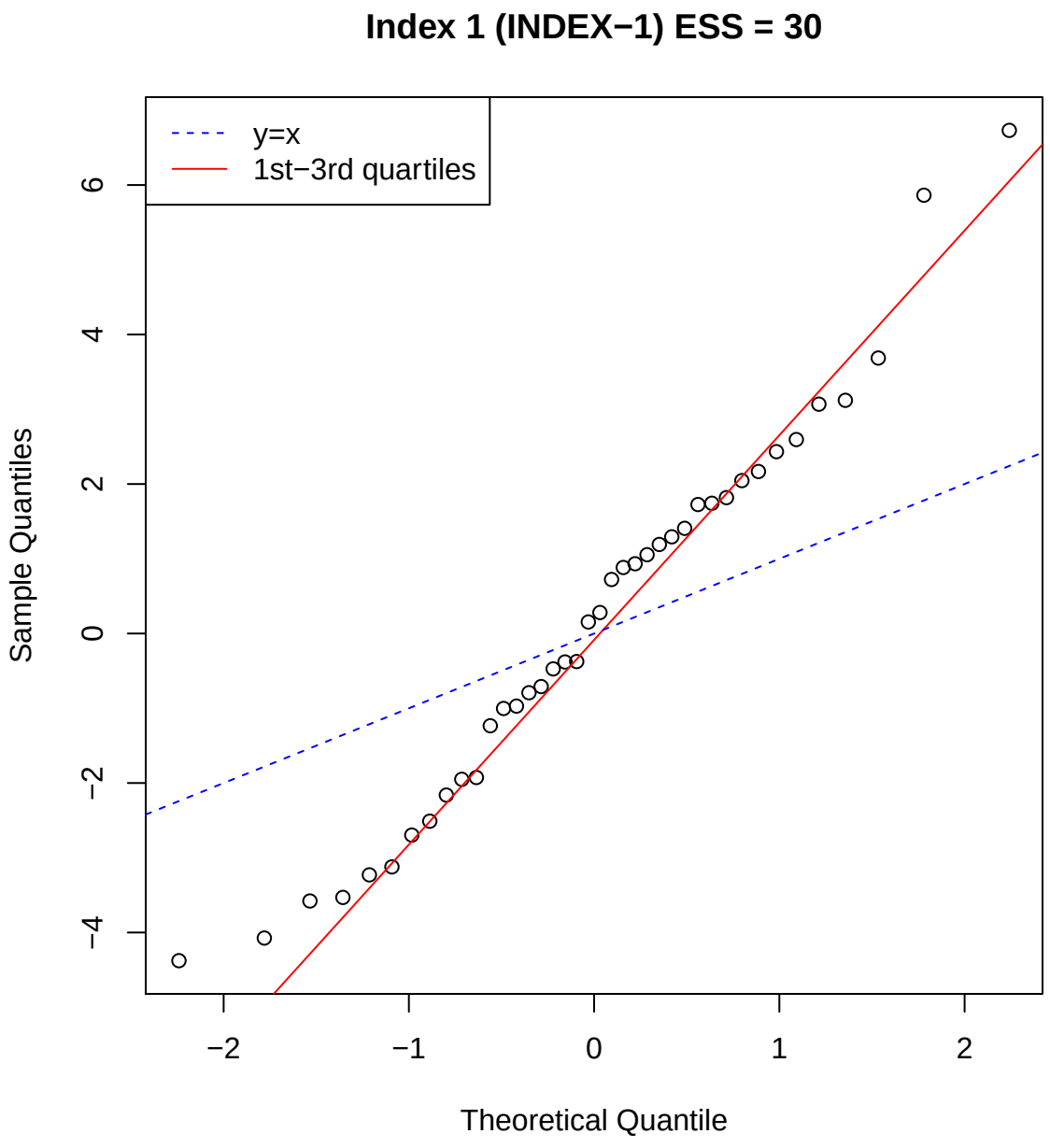

Age Comp Residuals for Index 2 (INDEX−2)
Neg.
Pos.
Max(resid)=0.52
0.01
0.05
0.1
Residuals (Observed−Predicted)
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
1
2
3
4
5
6
7
8
9
Age

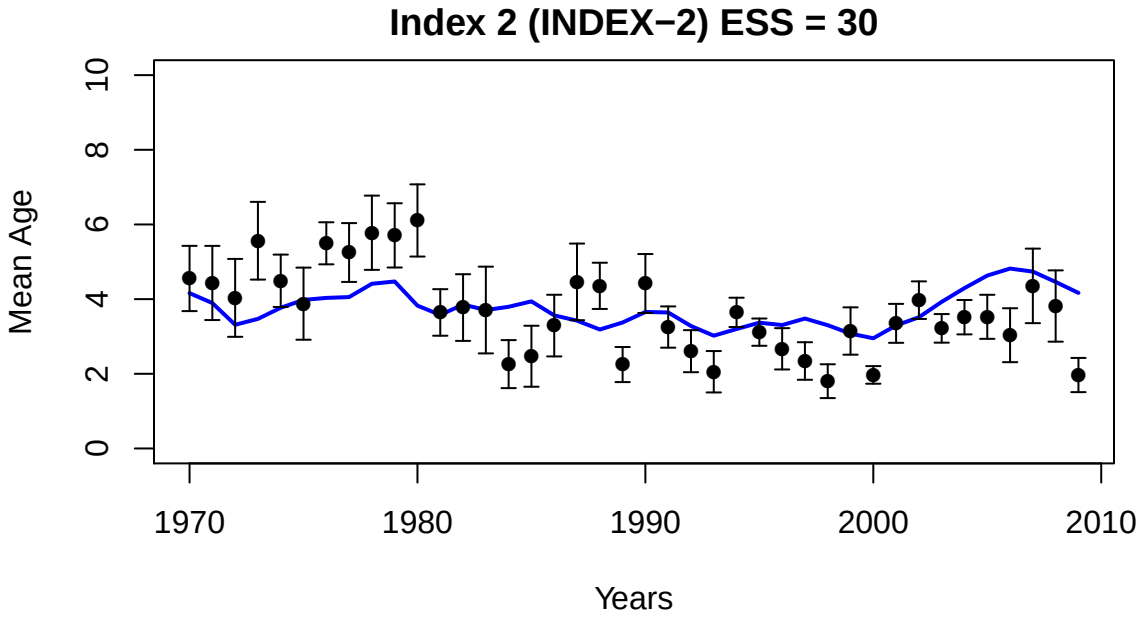

Index Neff 1 (INDEX−1)
Effective Sample Size
0
20
40
60
80
1970
1980
1990
2000
2010
Year

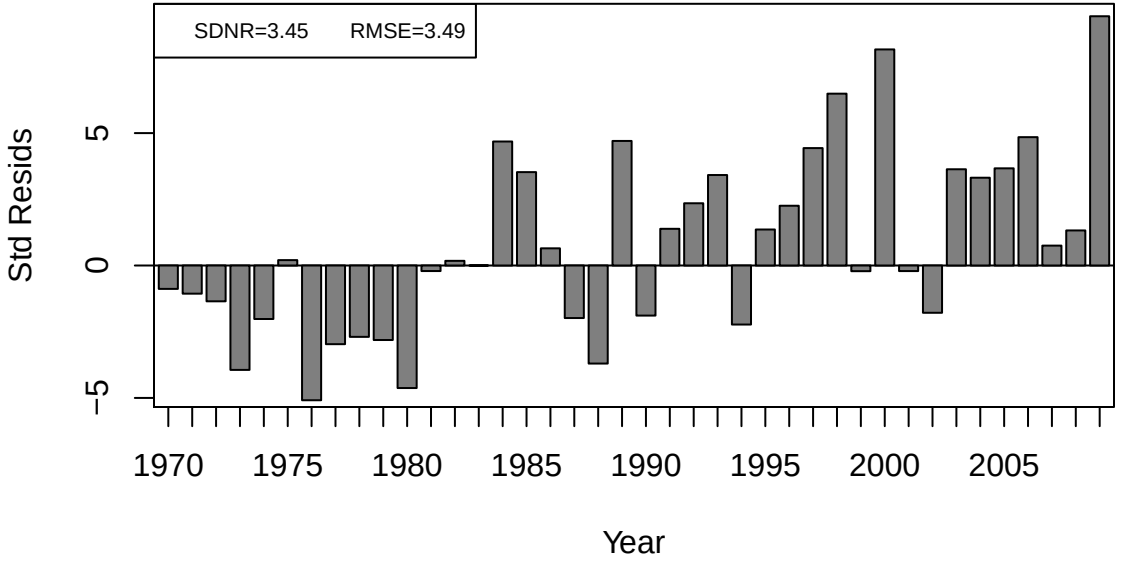

Index Neff 2 (INDEX−2)
Effective Sample Size
0
100
200
300
400
1970
1980
1990
2000
2010
Year

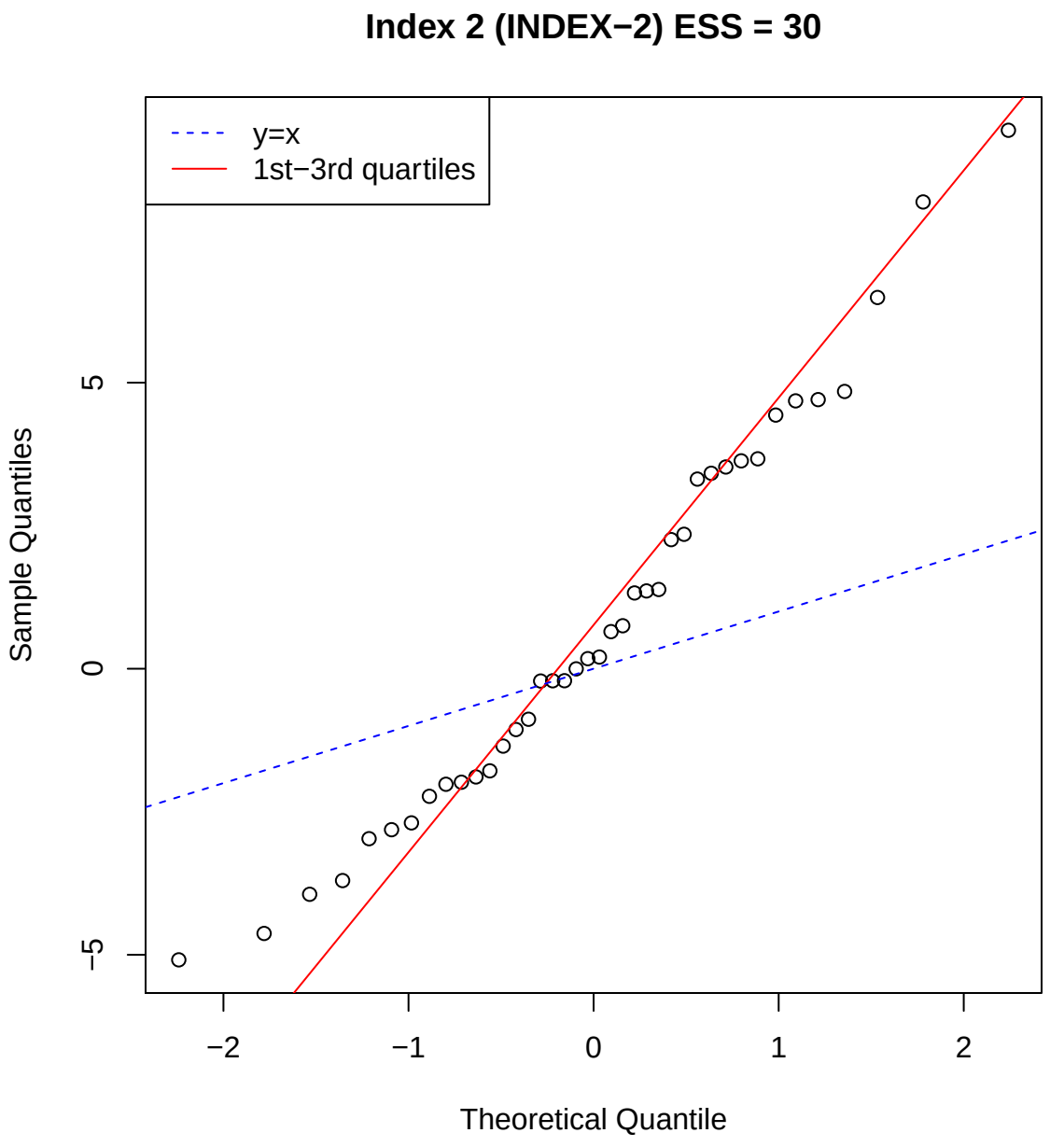

Index 1 (INDEX−1) ESS = 30
Mean Age
0
2
4
6
8
10
1970
1980
1990
2000
2010
Years

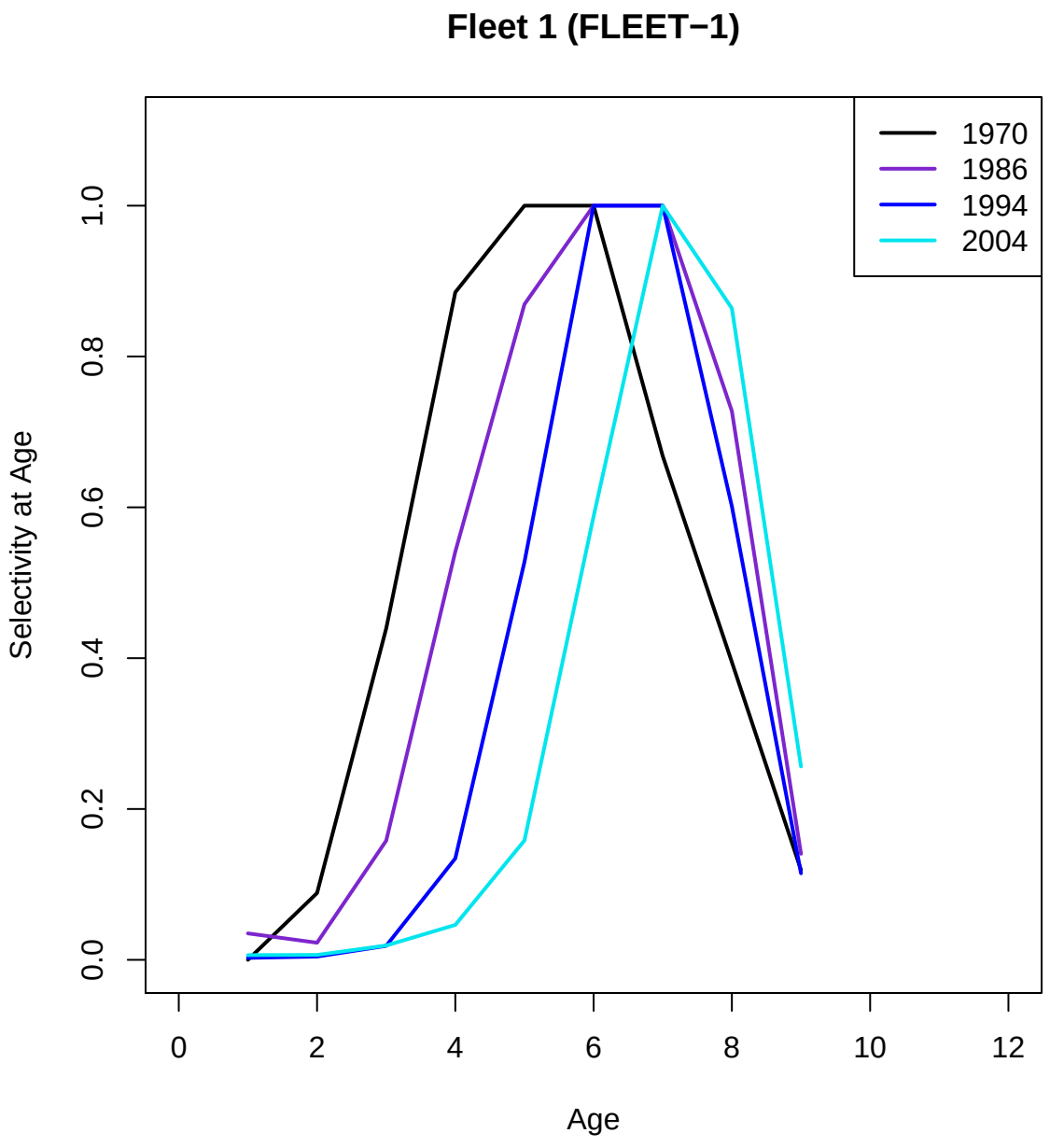

SDNR=2.6
RMSE=2.57
Std Resids
−4
−2
0
2
4
6
1970
1975
1980
1985
1990
1995
2000
2005
Year

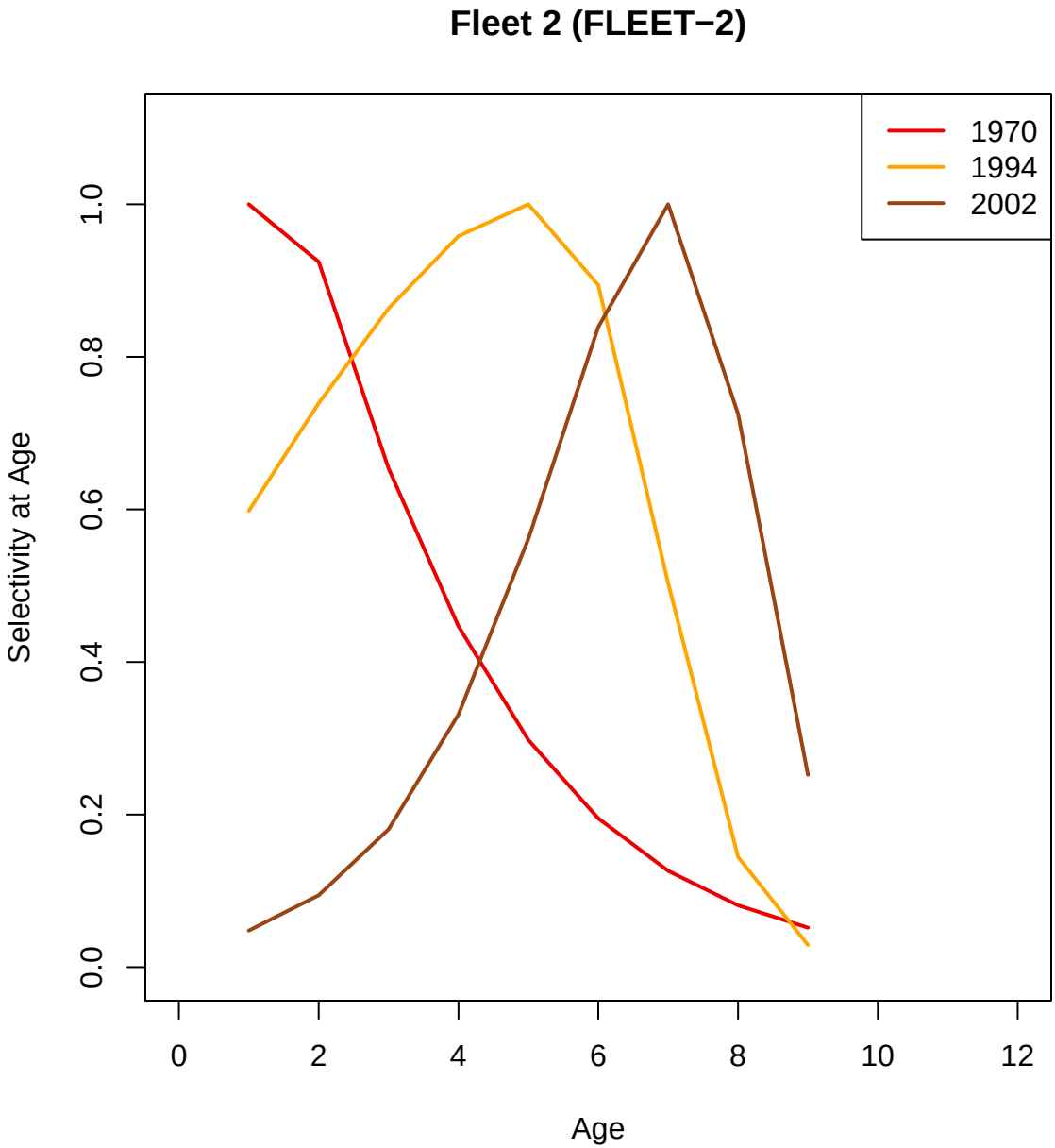

Index 1 (INDEX−1) ESS = 30
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
−4
−2
0
2
4
6
−2
−1
0
1
2

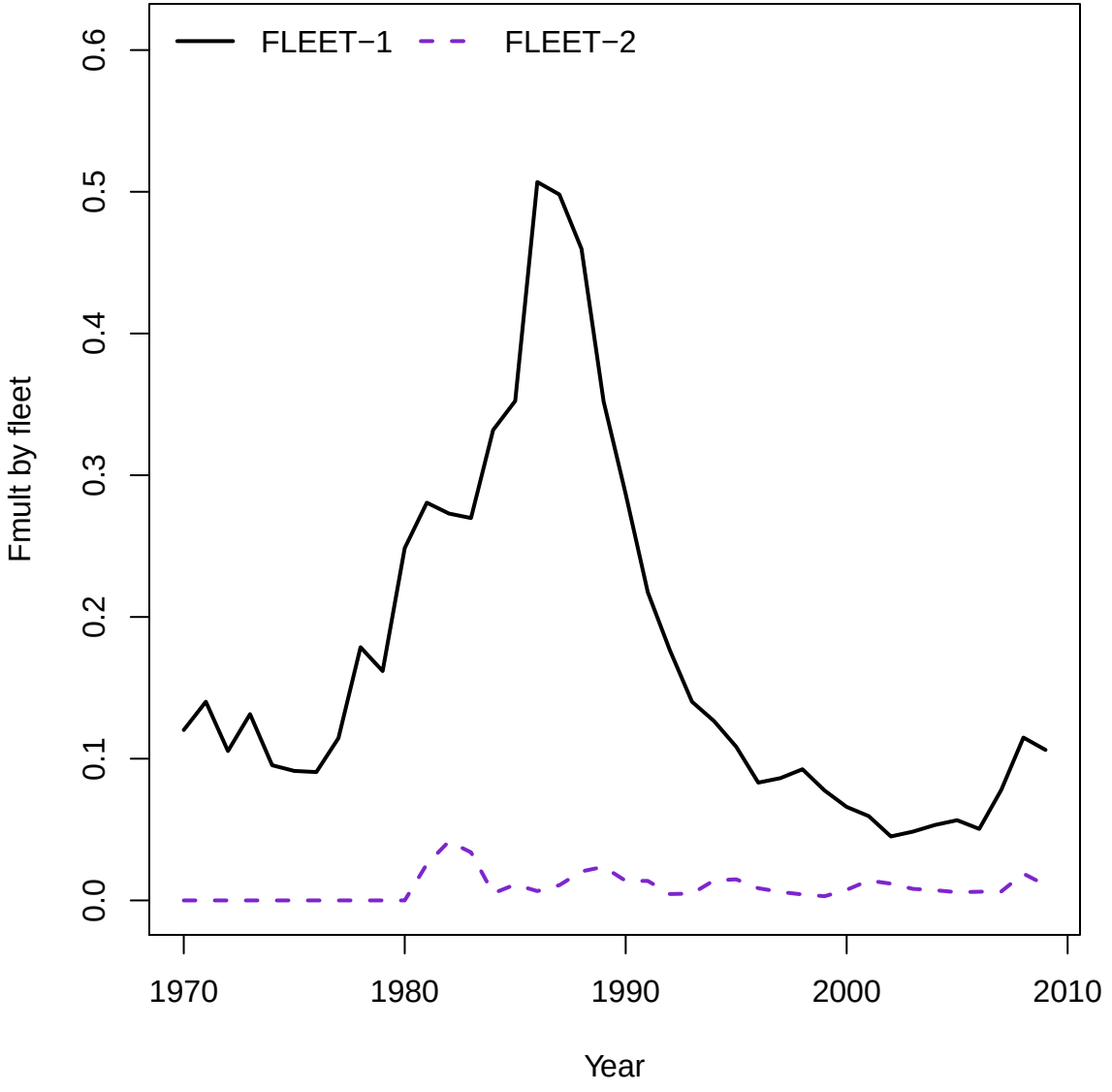

Index 2 (INDEX−2) ESS = 30
Mean Age
0
2
4
6
8
10
1970
1980
1990
2000
2010
Years

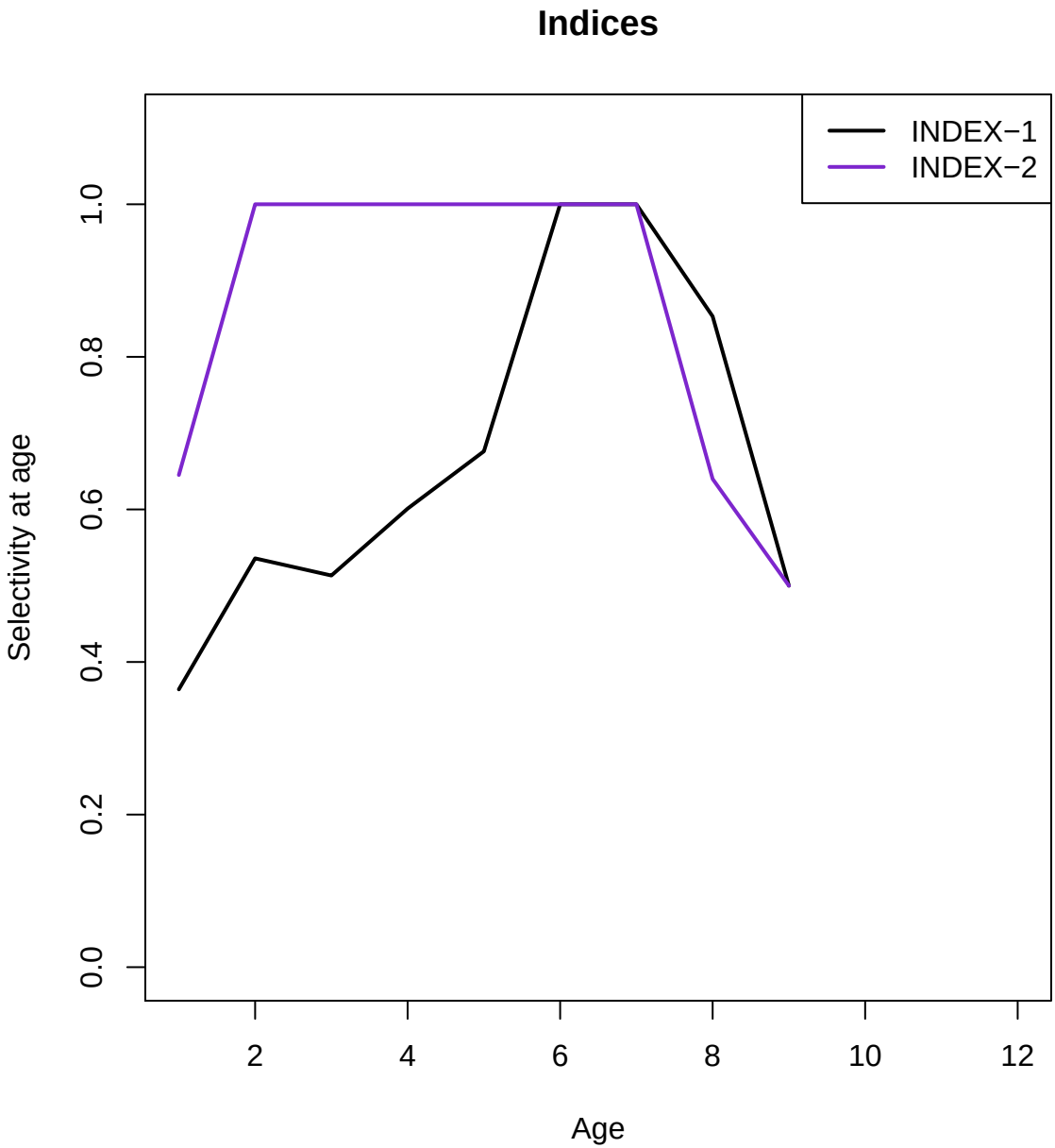

SDNR=3.45
RMSE=3.49
Std Resids
−5
0
5
1970
1975
1980
1985
1990
1995
2000
2005
Year

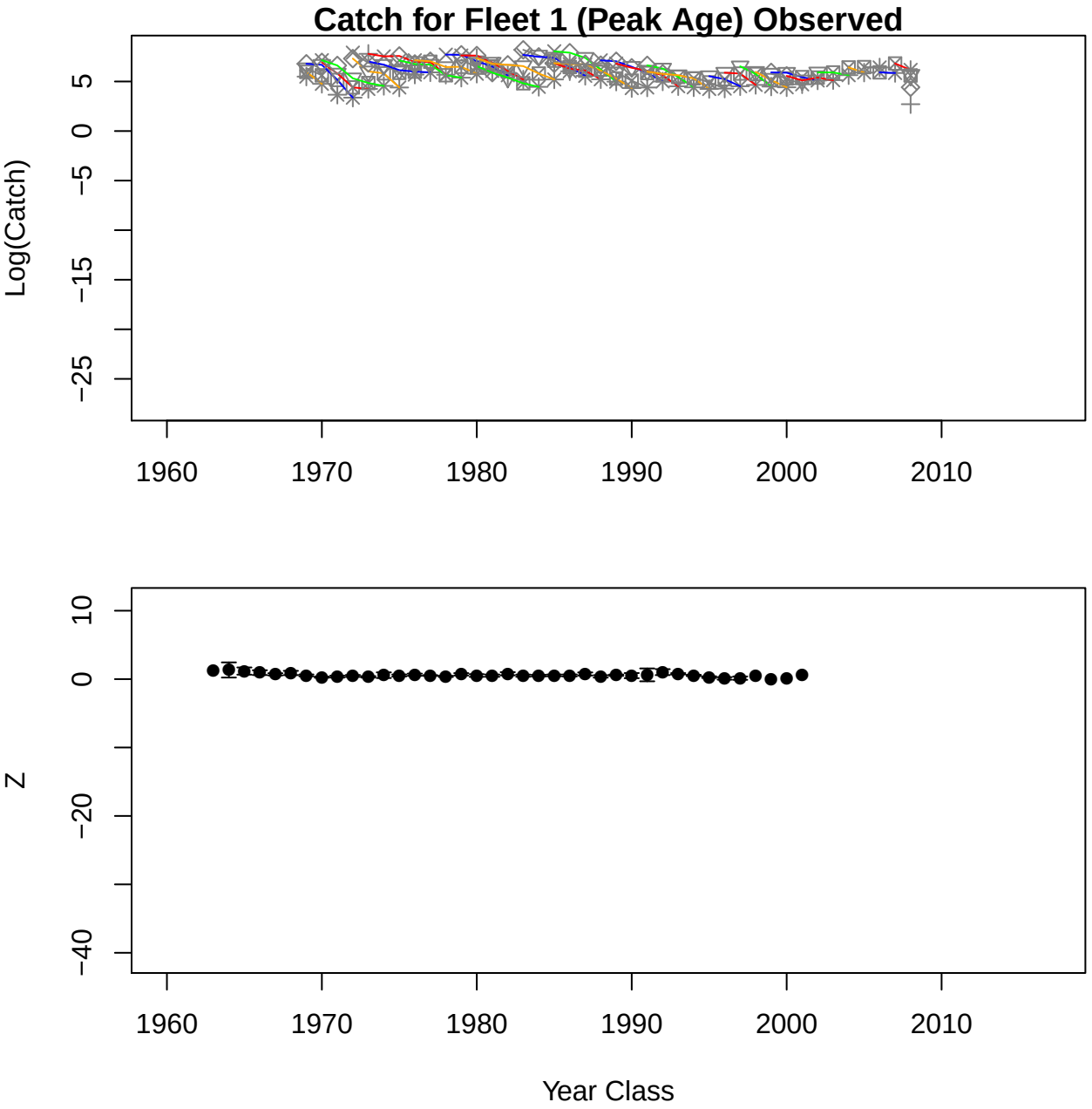

Index 2 (INDEX−2) ESS = 30
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
−5
0
5
−2
−1
0
1
2

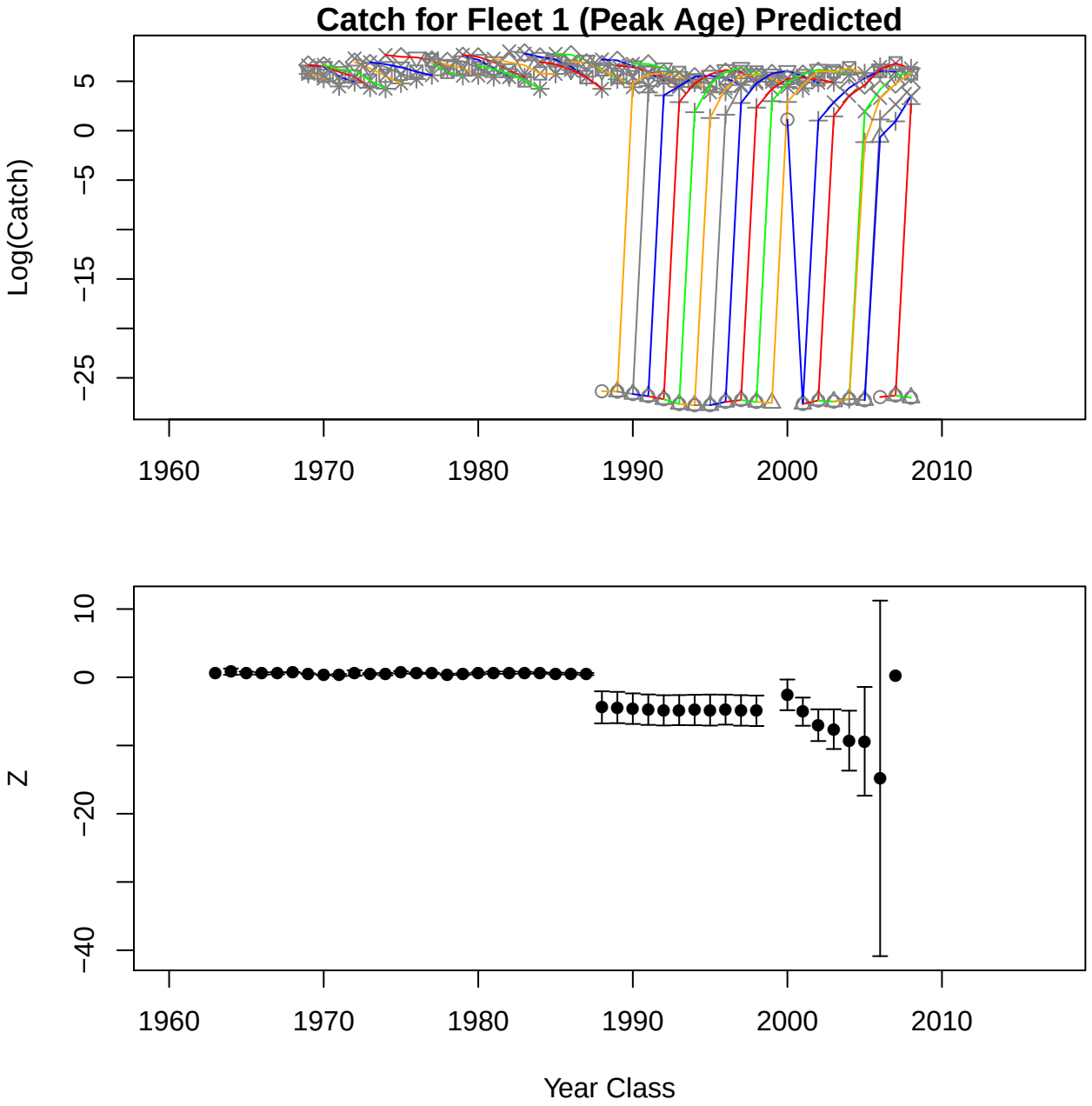

Fleet 1 (FLEET−1)
1970
1986
1994
2004
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
Age

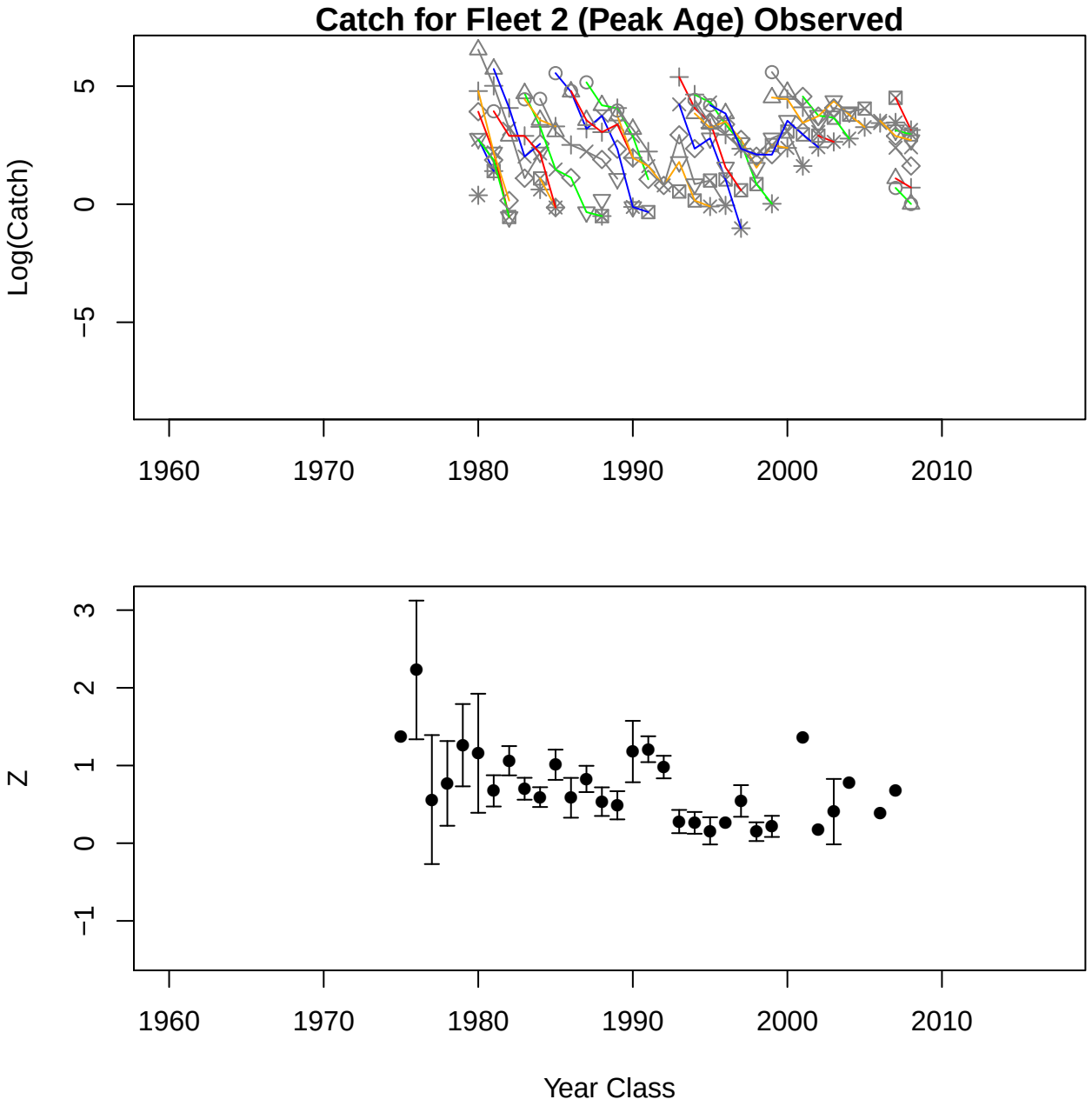

Fleet 2 (FLEET−2)
1970
1994
2002
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
Age

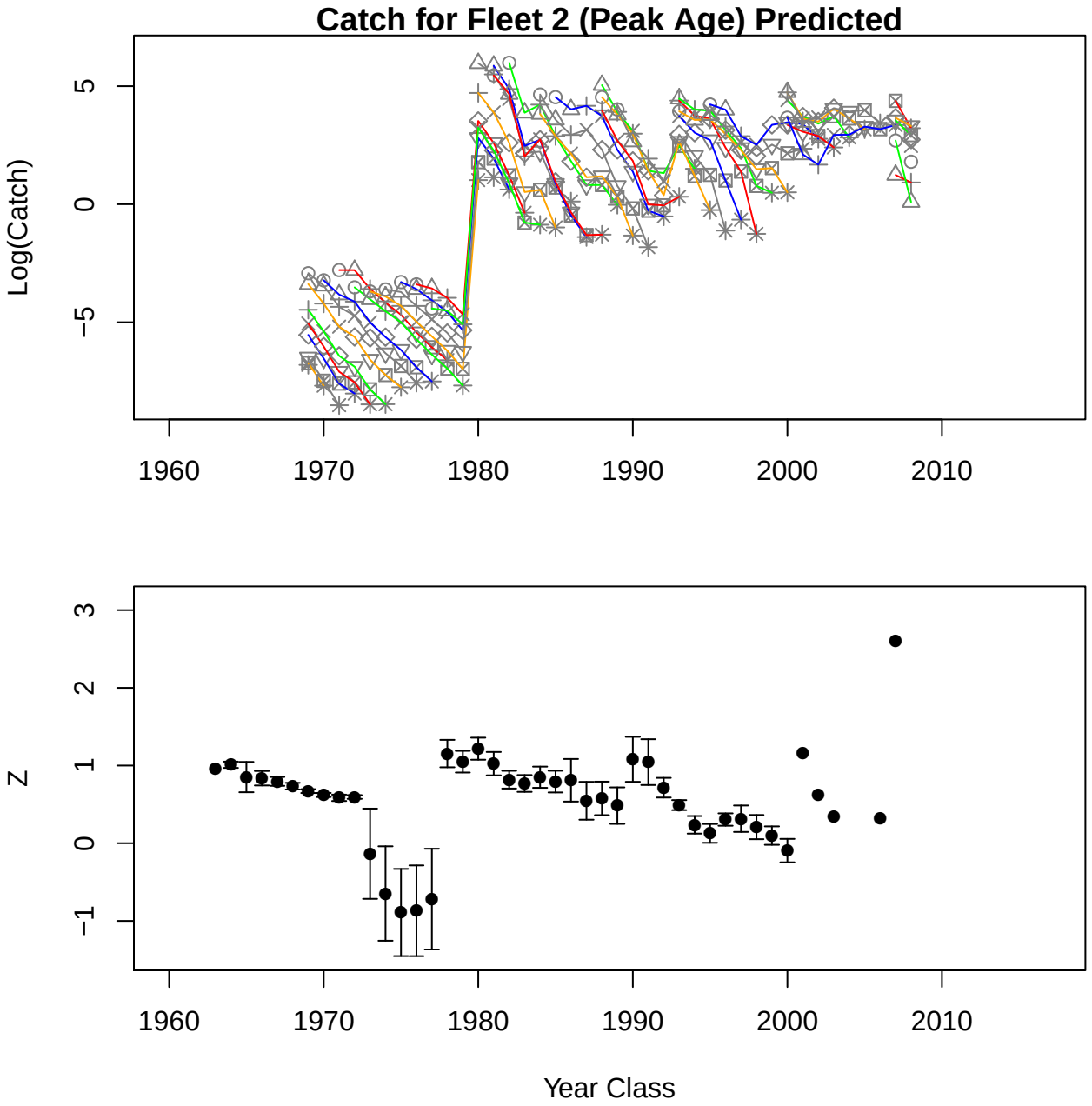

FLEET−1
FLEET−2
Fmult by fleet
0.0
0.1
0.2
0.3
0.4
0.5
0.6
1970
1980
1990
2000
2010
Year

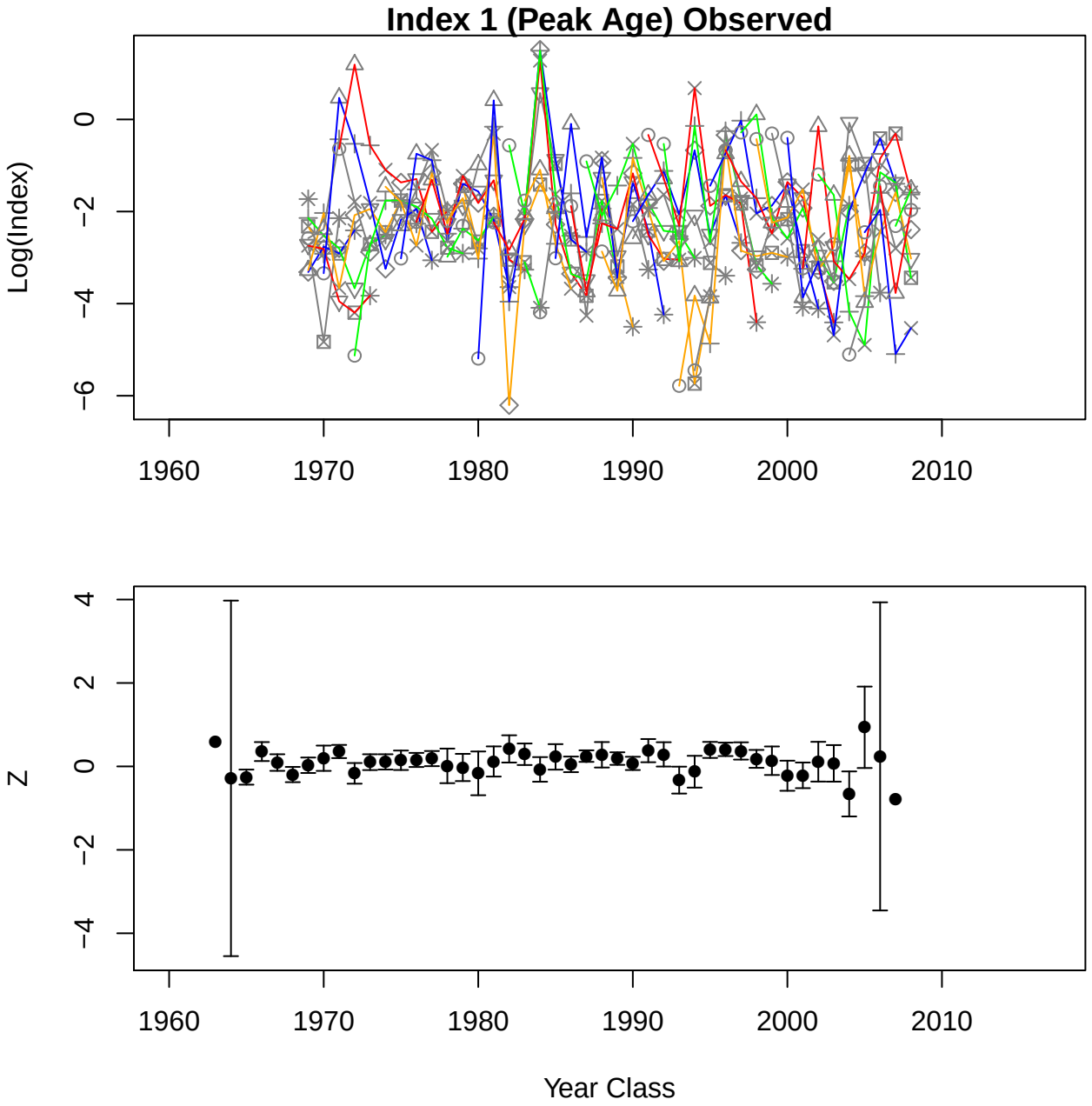

Indices
INDEX−1
INDEX−2
Selectivity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
Age

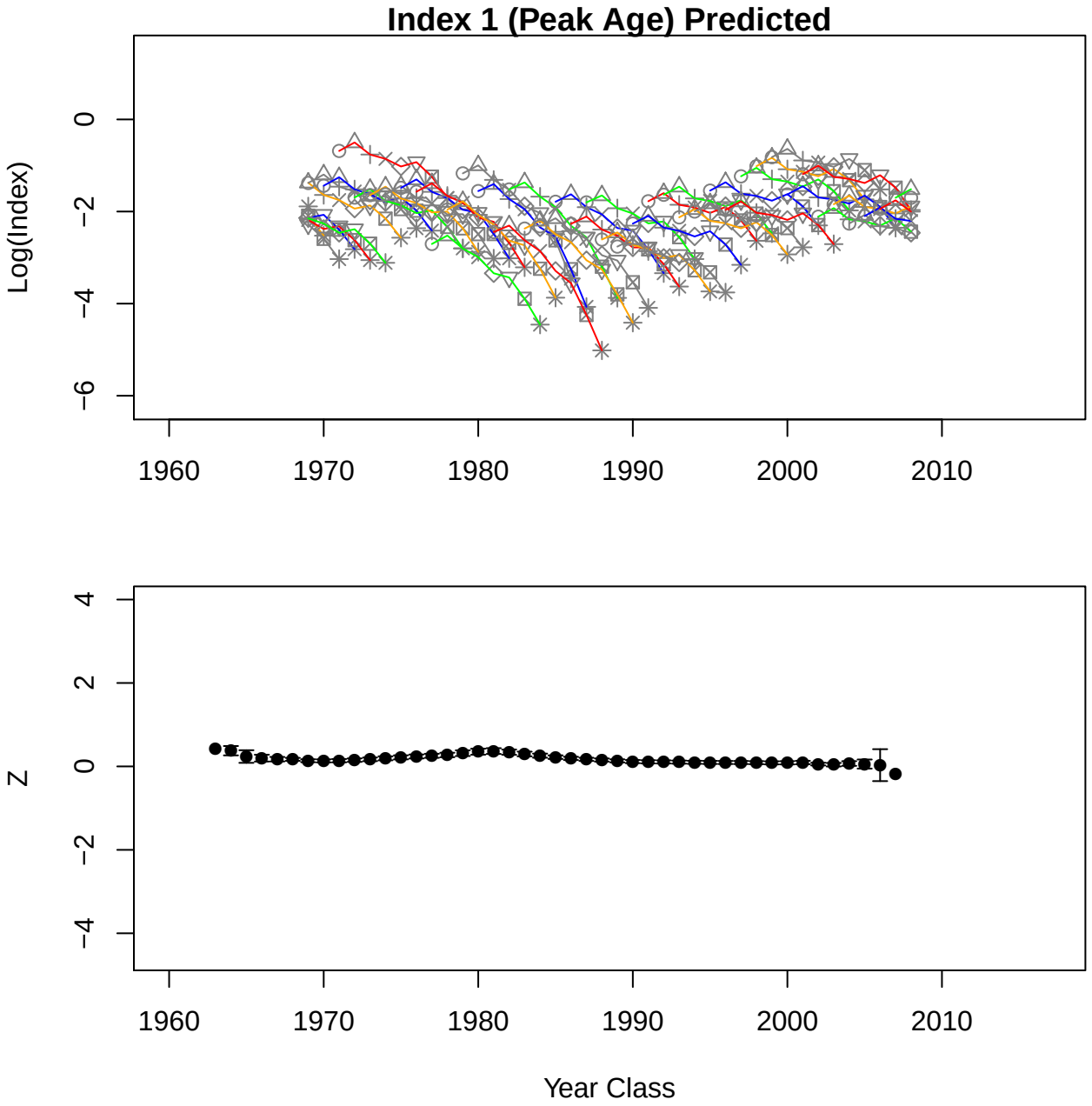

Catch for Fleet 1 (Peak Age) Observed
Log(Catch)
5
0
−5
−15
−25
1960
1970
1980
1990
2000
2010
Z
10
0
−20
−40
1960
1970
1980
1990
2000
2010
Year Class

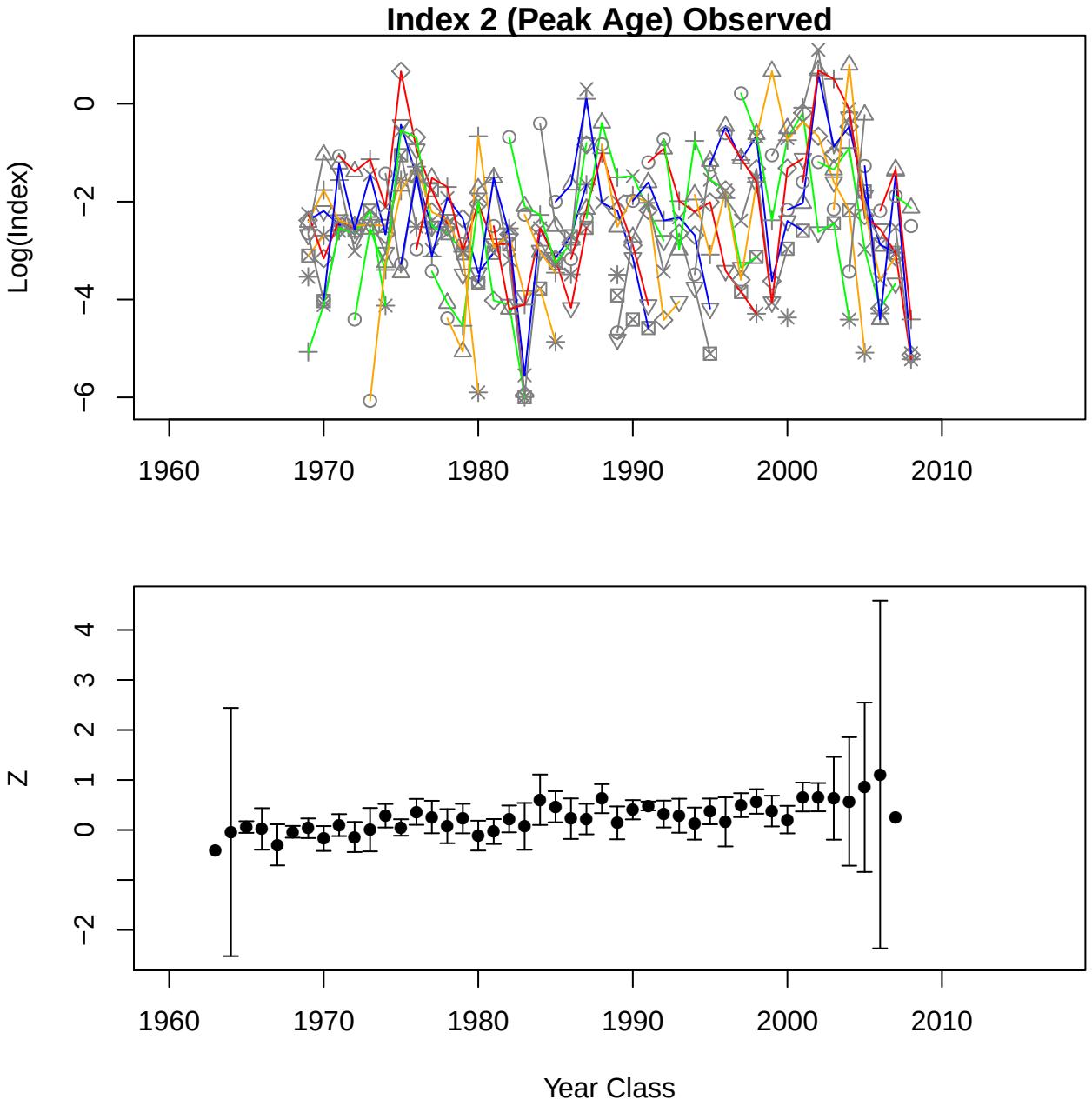

Catch for Fleet 1 (Peak Age) Predicted
Log(Catch)
5
0
−5
−15
−25
1960
1970
1980
1990
2000
2010
Z
10
0
−20
−40
1960
1970
1980
1990
2000
2010
Year Class

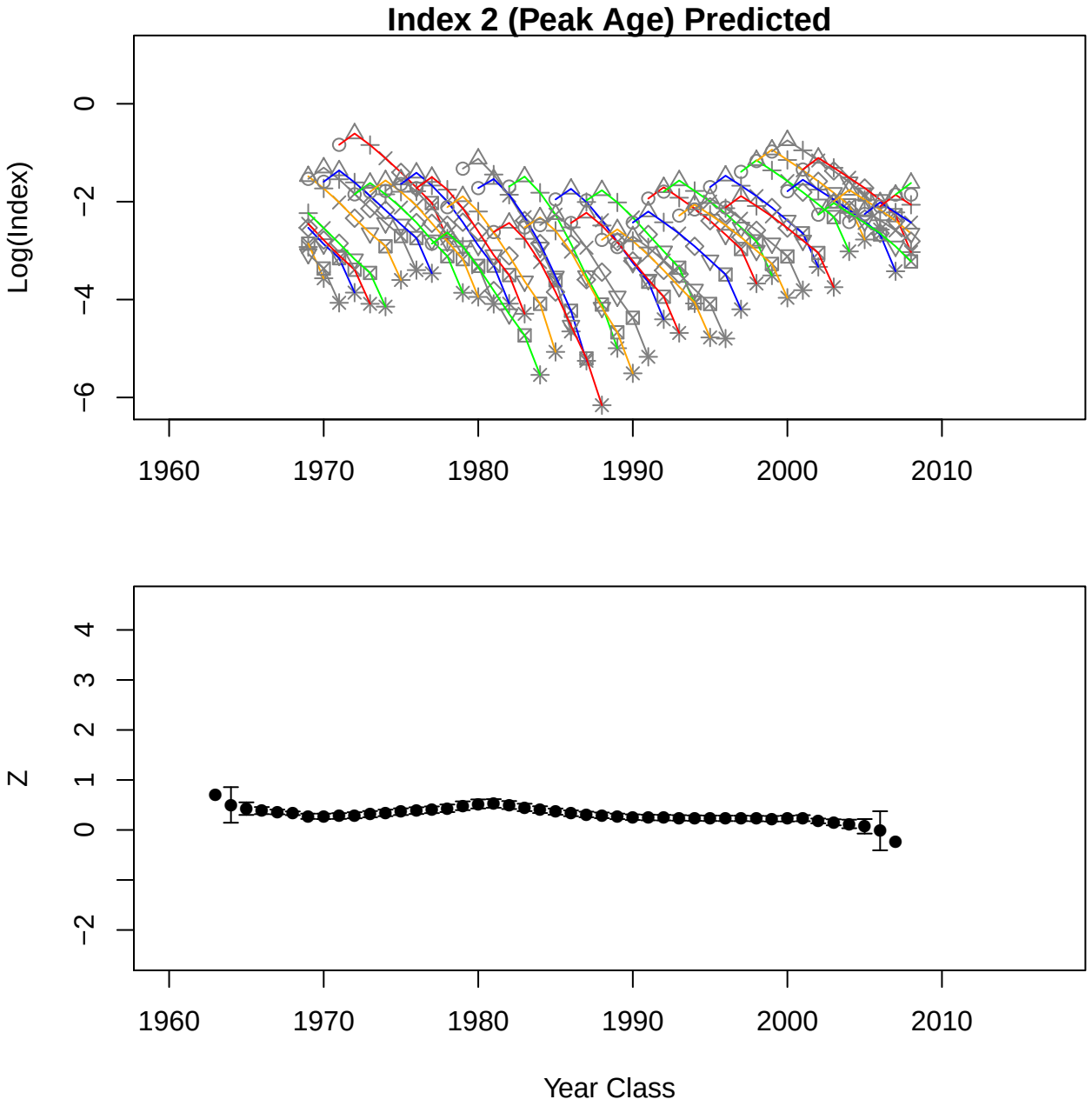

Catch for Fleet 2 (Peak Age) Observed
Log(Catch)
5
0
−5
1960
1970
1980
1990
2000
2010
Z
3
2
1
0
−1
1960
1970
1980
1990
2000
2010
Year Class


Catch for Fleet 2 (Peak Age) Predicted
Log(Catch)
5
0
−5
1960
1970
1980
1990
2000
2010
Z
3
2
1
0
−1
1960
1970
1980
1990
2000
2010
Year Class

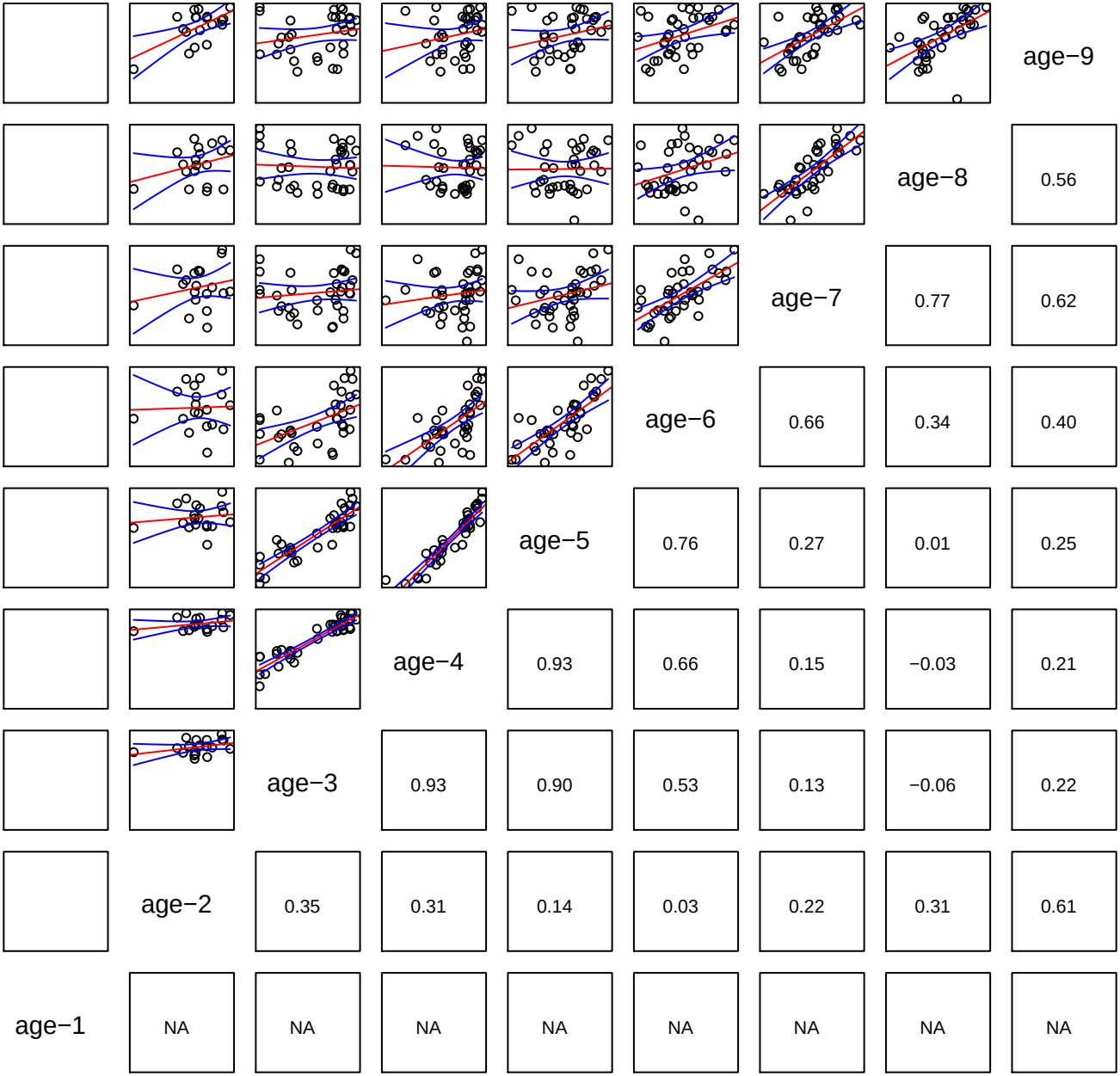

Index 1 (Peak Age) Observed
Log(Index)
0
−2
−4
−6
1960
1970
1980
1990
2000
2010
Z
4
2
0
−2
−4
1960
1970
1980
1990
2000
2010
Year Class


Index 1 (Peak Age) Predicted
Log(Index)
0
−2
−4
−6
1960
1970
1980
1990
2000
2010
Z
4
2
0
−2
−4
1960
1970
1980
1990
2000
2010
Year Class

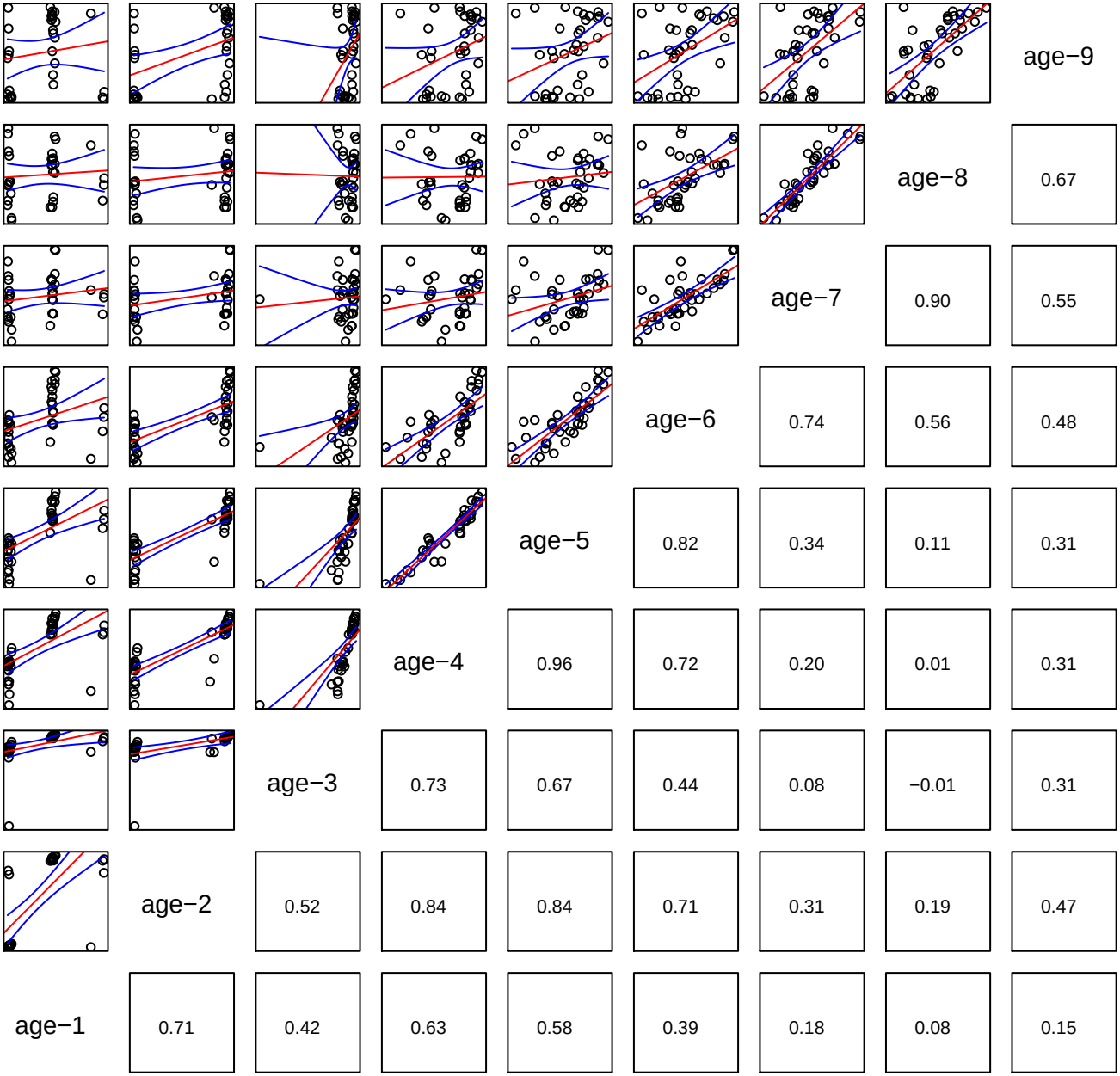

Index 2 (Peak Age) Observed
Log(Index)
0
−2
−4
−6
1960
1970
1980
1990
2000
2010
Z
4
3
2
1
0
−2
1960
1970
1980
1990
2000
2010
Year Class


Index 2 (Peak Age) Predicted
Log(Index)
0
−2
−4
−6
1960
1970
1980
1990
2000
2010
Z
4
3
2
1
0
−2
1960
1970
1980
1990
2000
2010
Year Class

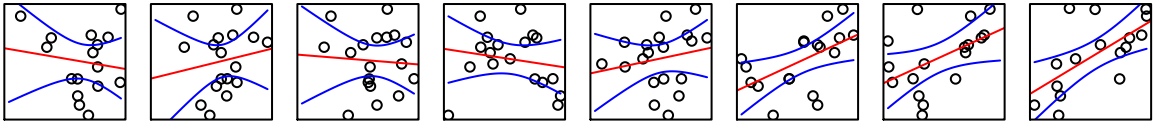
Catch for Fleet 1 Observed



Catch for Fleet 1 Predicted

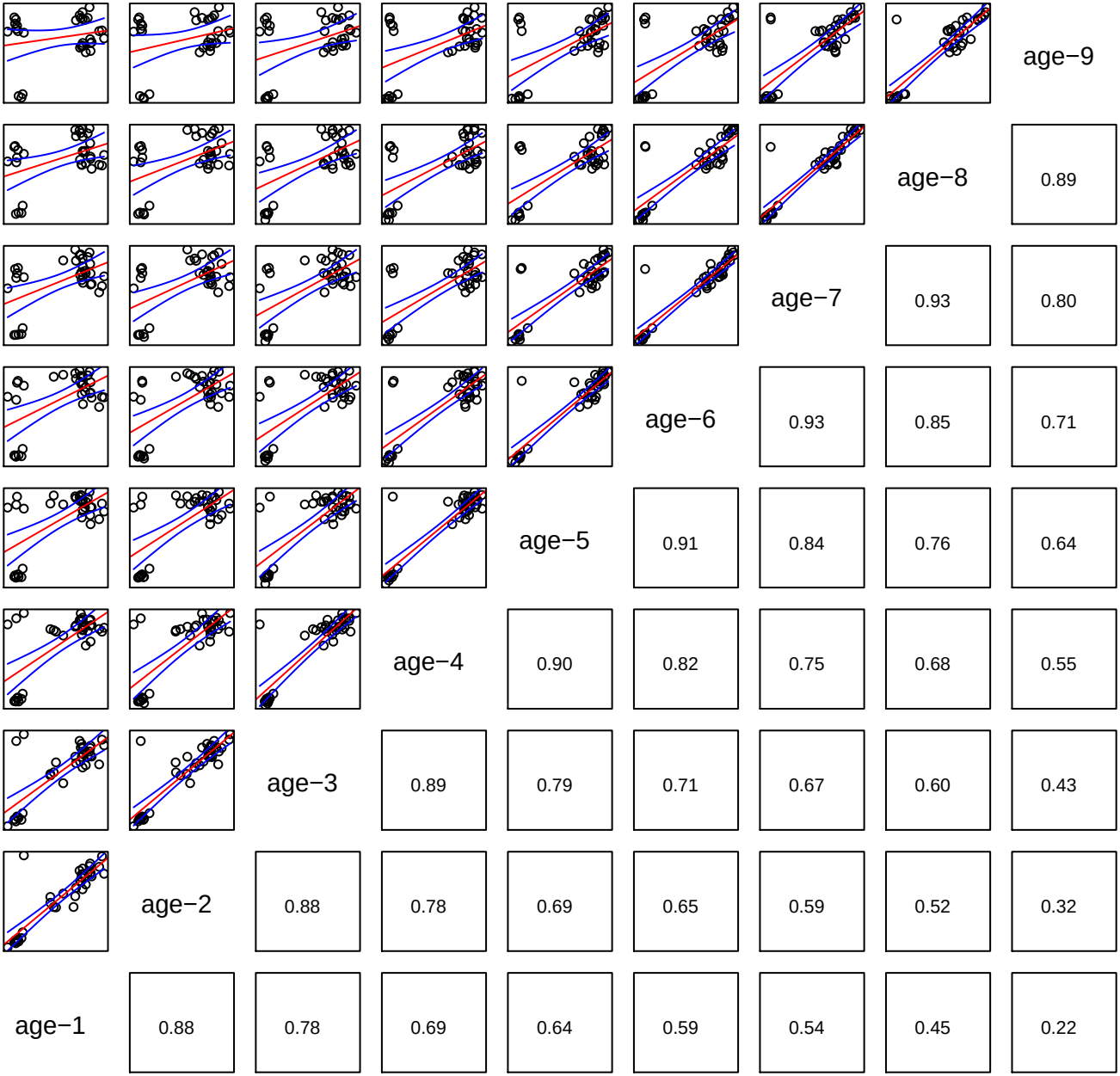


Catch for Fleet 2 Observed

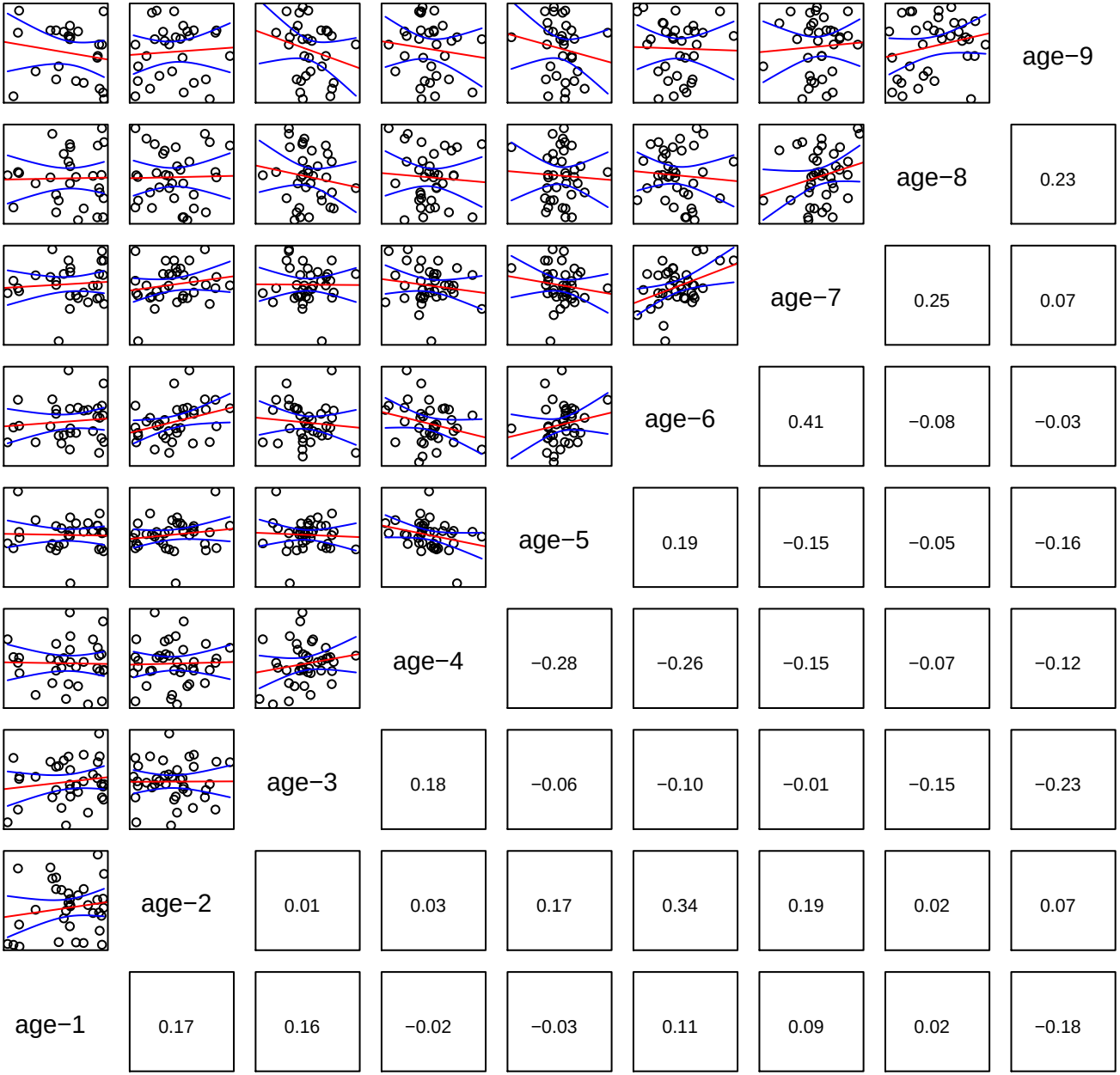


								age−9
							age−8	0.65
						age−7	0.89	0.50
					age−6	0.81	0.66	0.55
				age−5	0.52	0.43	0.64	0.20
			age−4	0.40	0.18	0.01	0.05	−0.17
		age−3	0.54	0.04	−0.09	−0.29	−0.23	−0.07
	age−2	0.72	0.15	−0.06	−0.22	−0.38	0.06	0.17
age−1	0.79	0.46	−0.02	−0.27	−0.34	−0.30	−0.25	−0.15

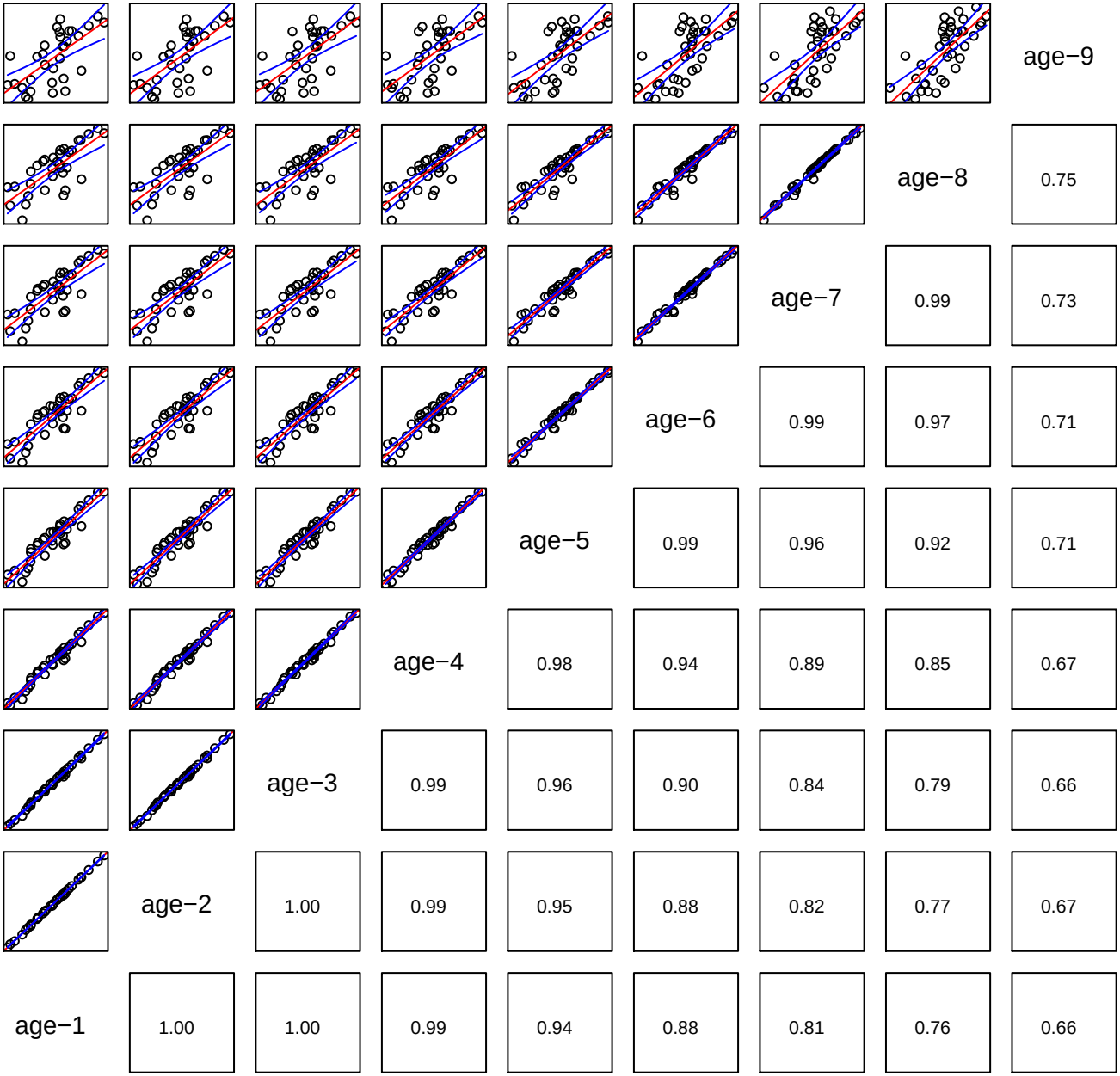
Catch for Fleet 2 Predicted



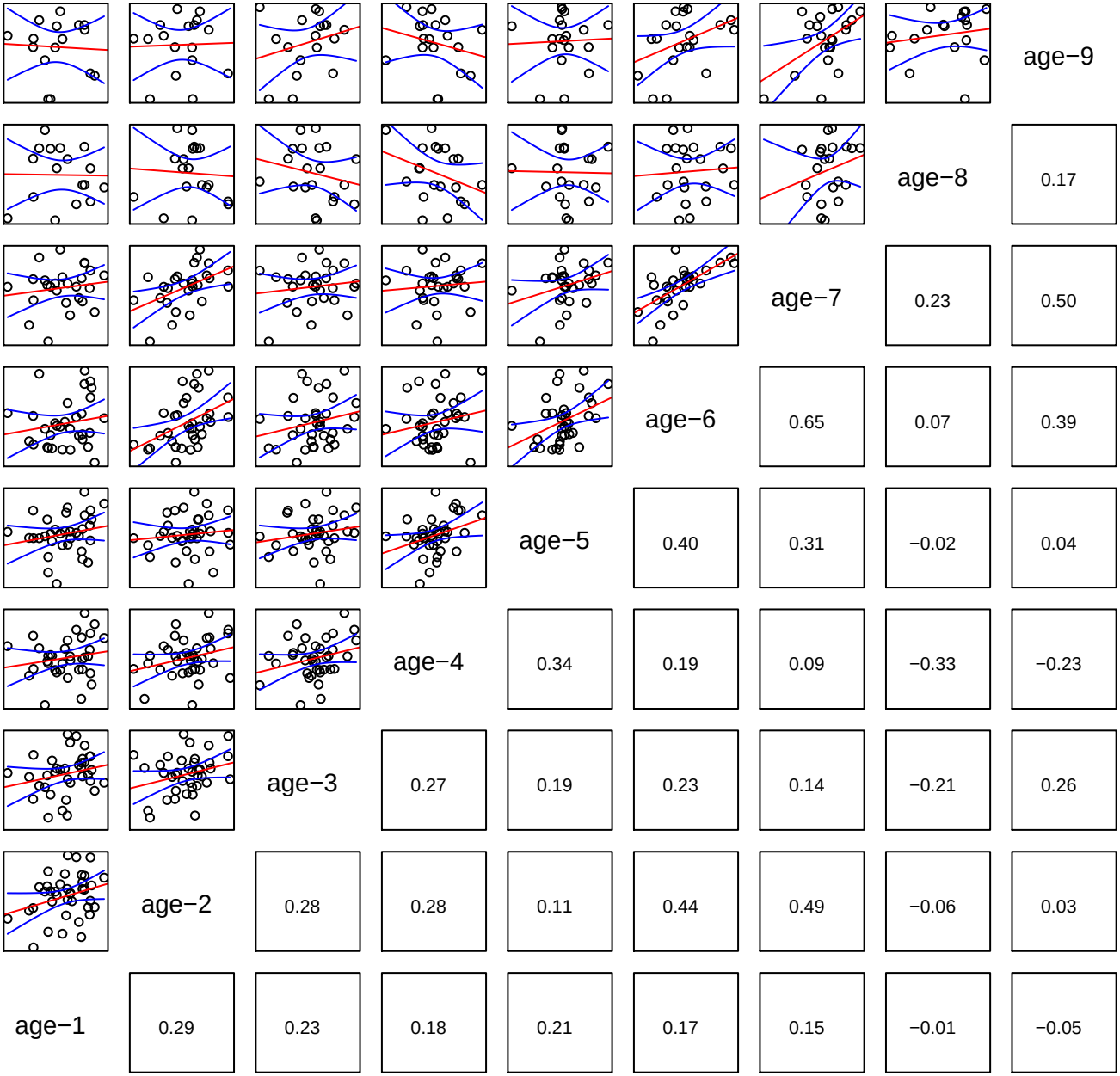
Index 1 Observed



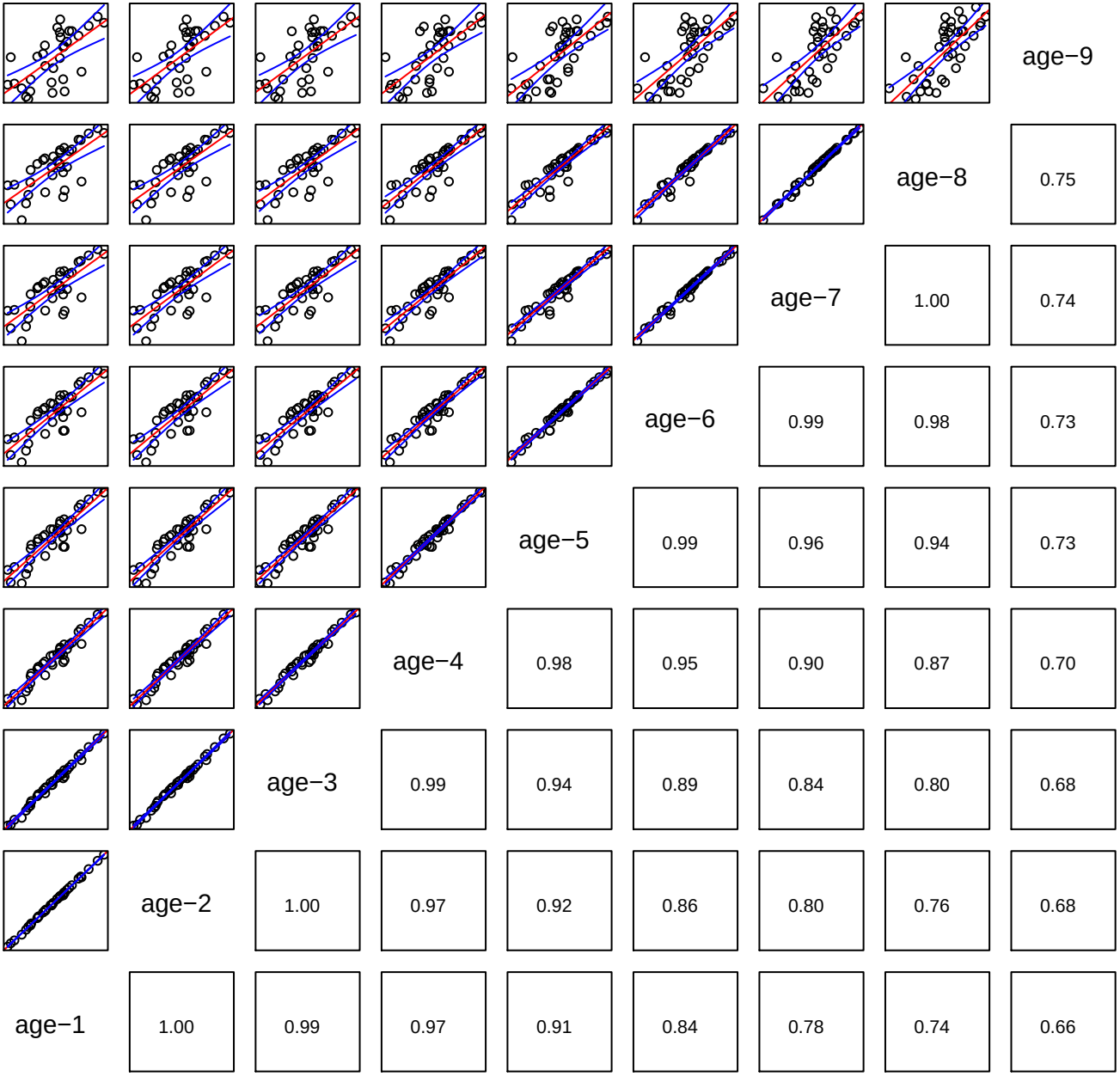
Index 1 Predicted

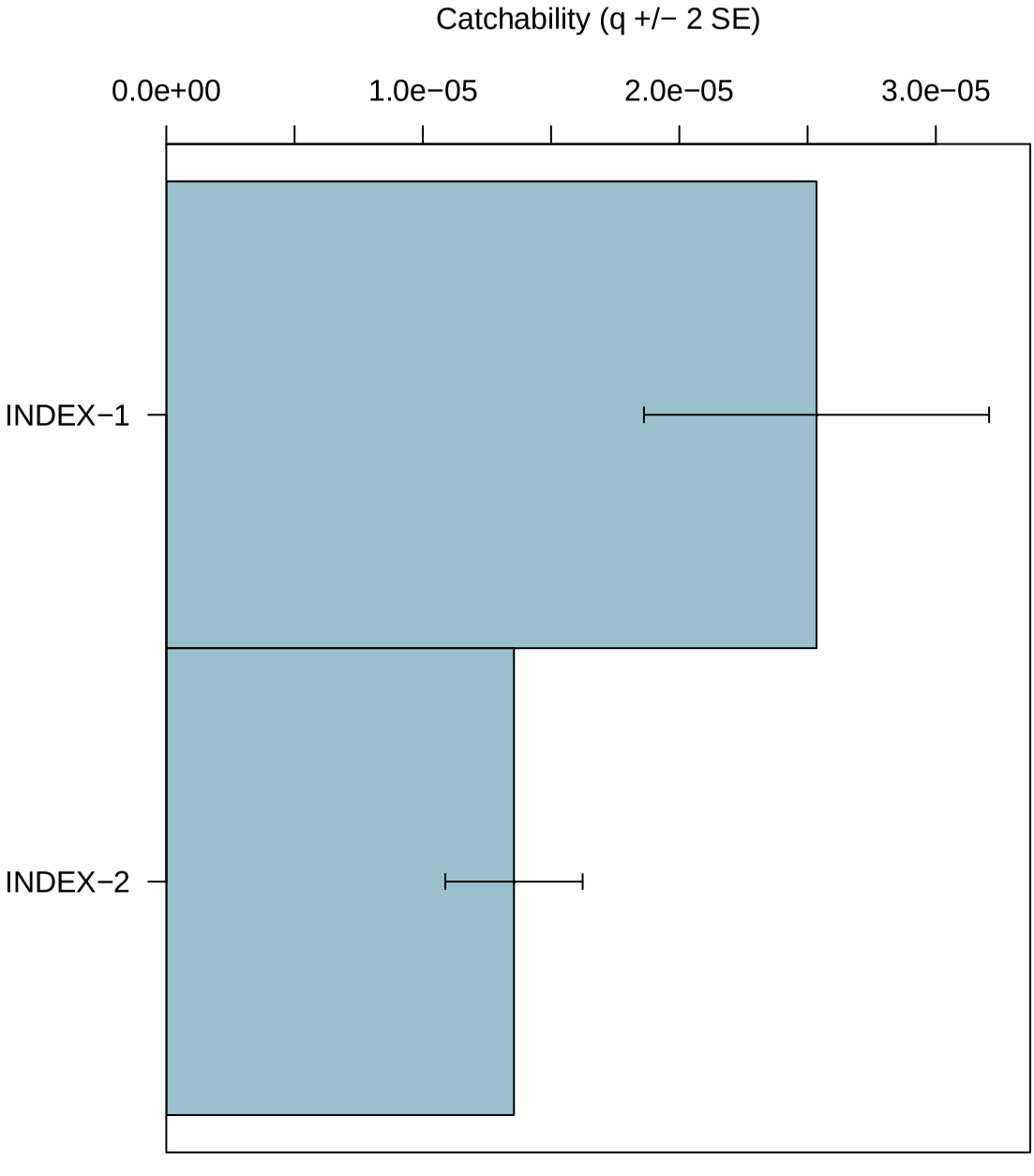


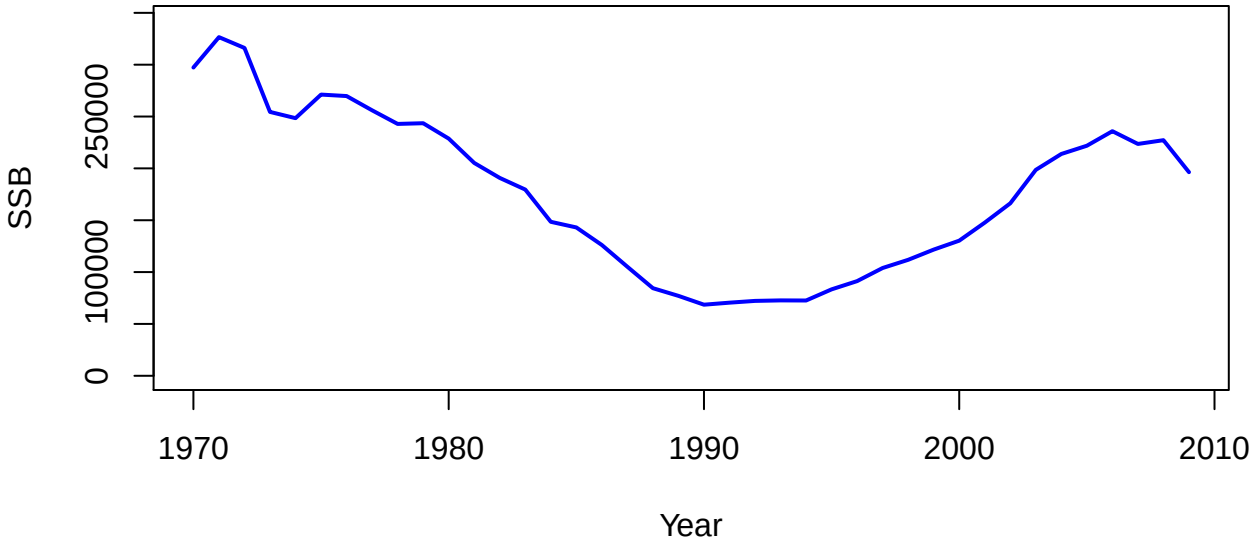
Index 2 Observed

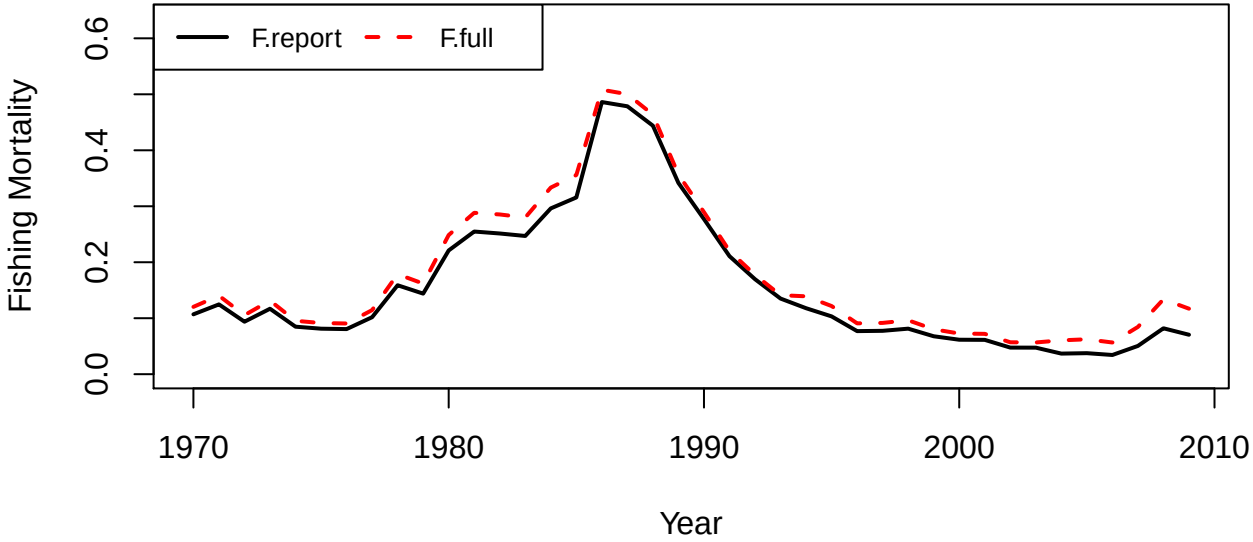


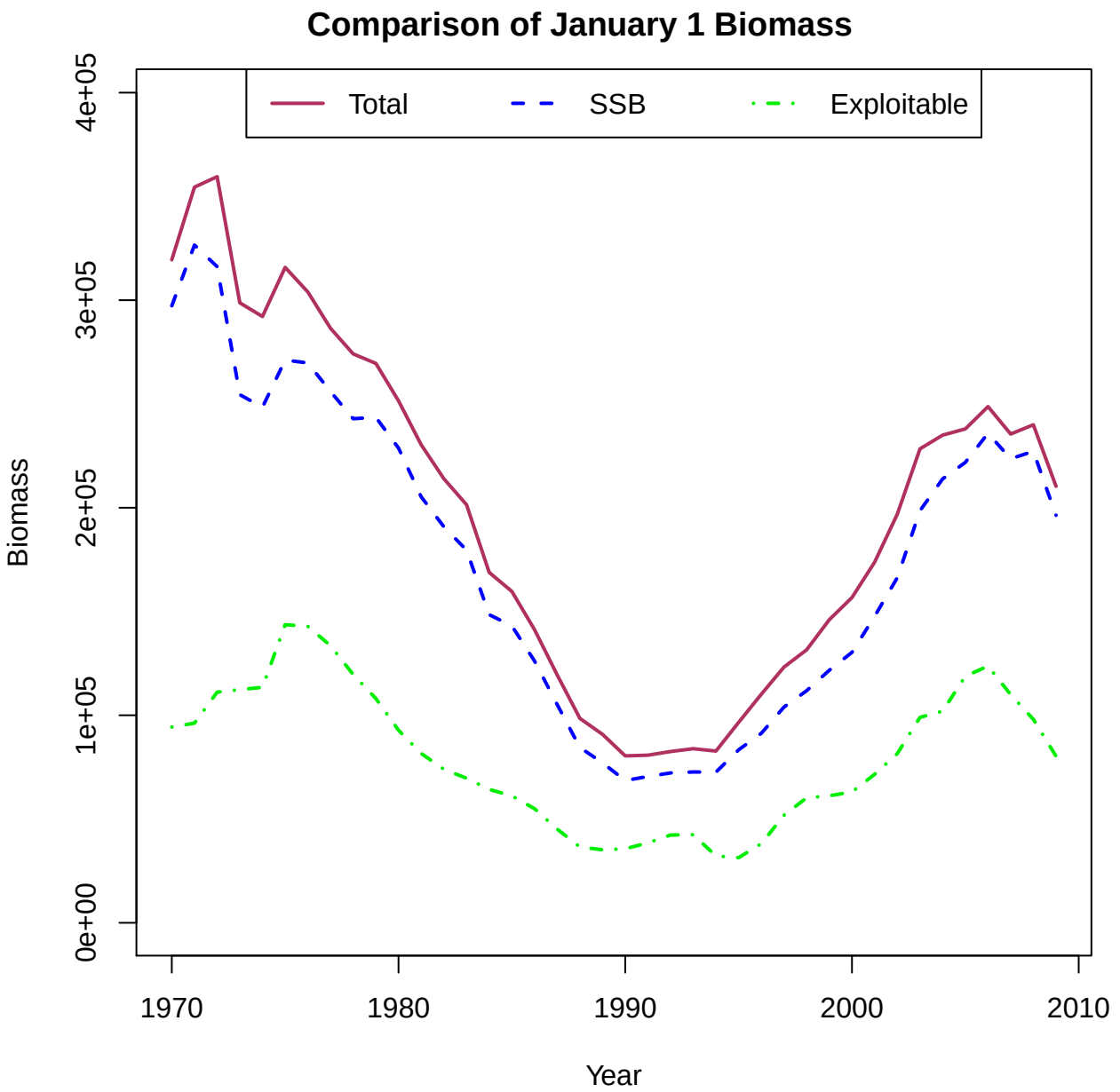
Index 2 Predicted

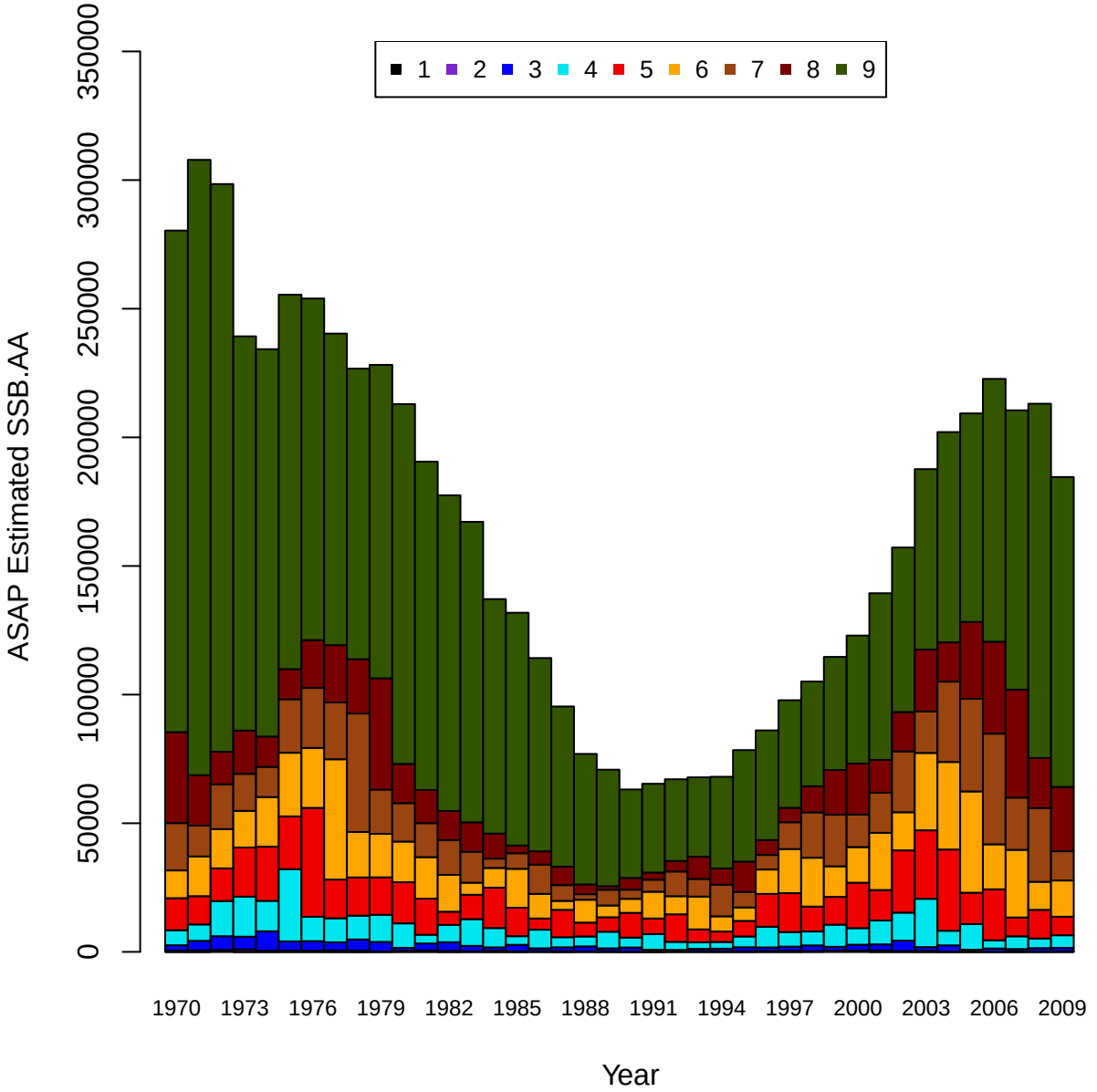


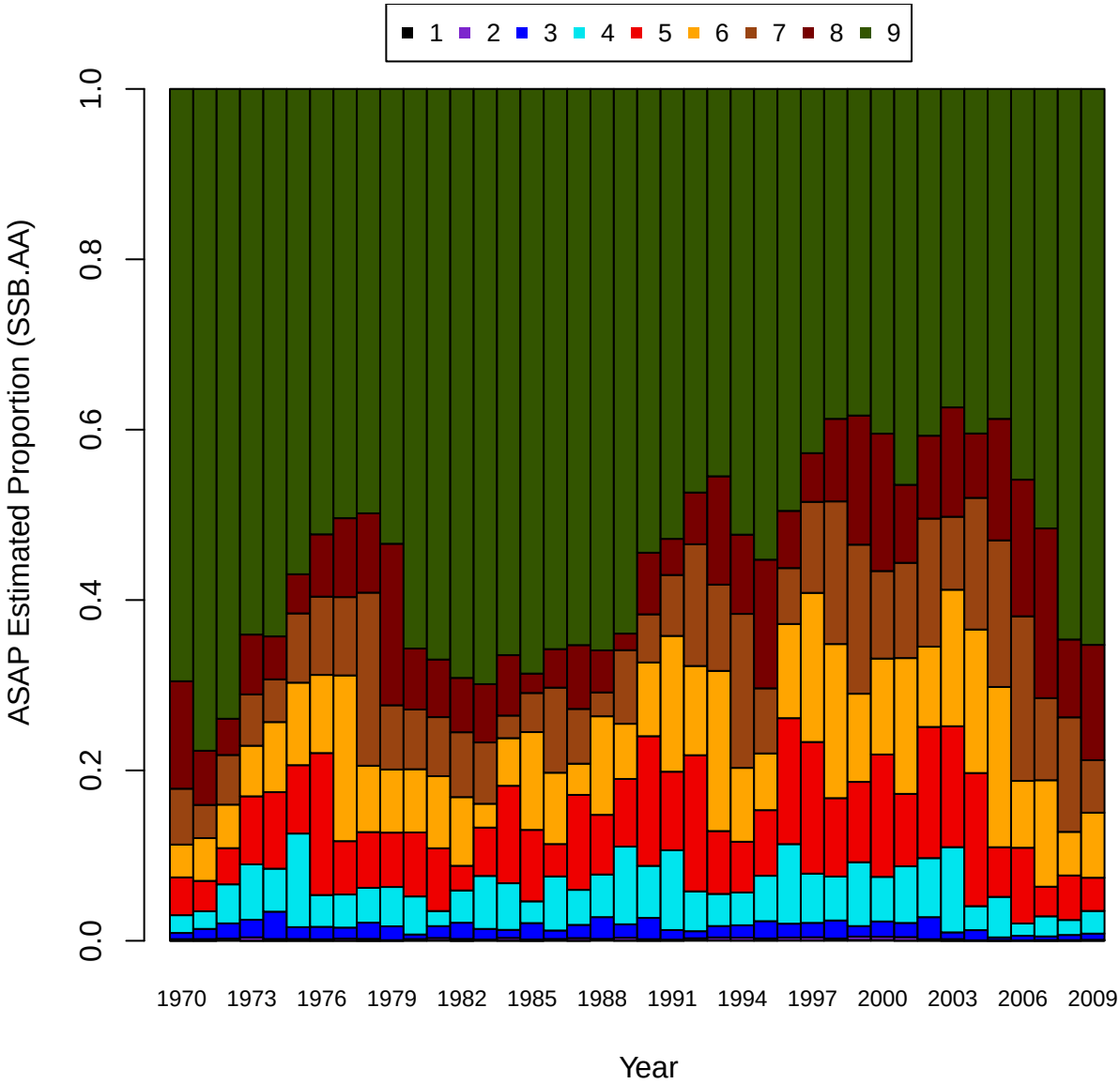

Catchability (q +/− 2 SE)
0.0e+00
1.0e−05
2.0e−05
3.0e−05
INDEX−1
INDEX−2

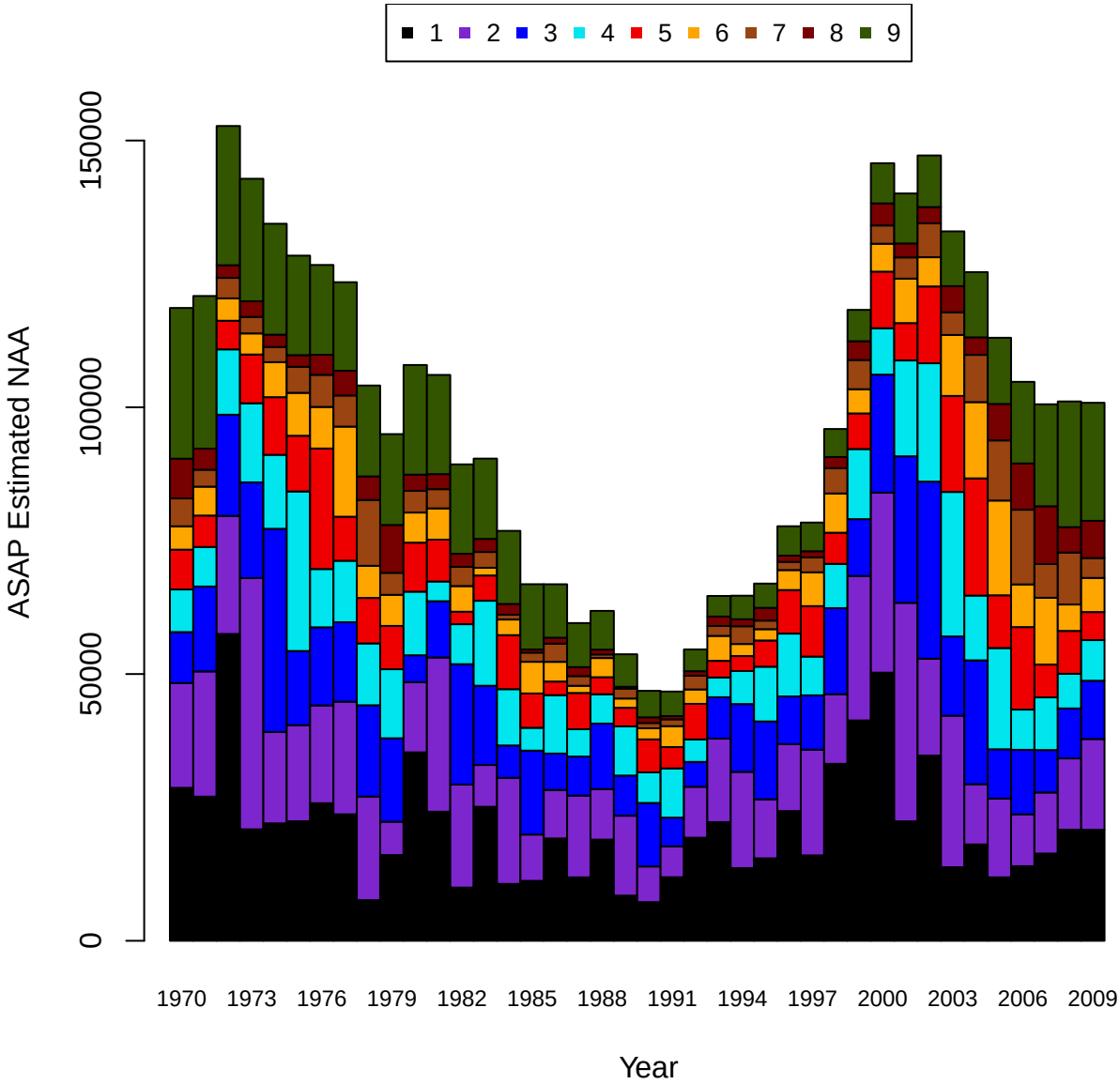

SSB
0
100000
250000
1970
1980
1990
2000
2010
Year

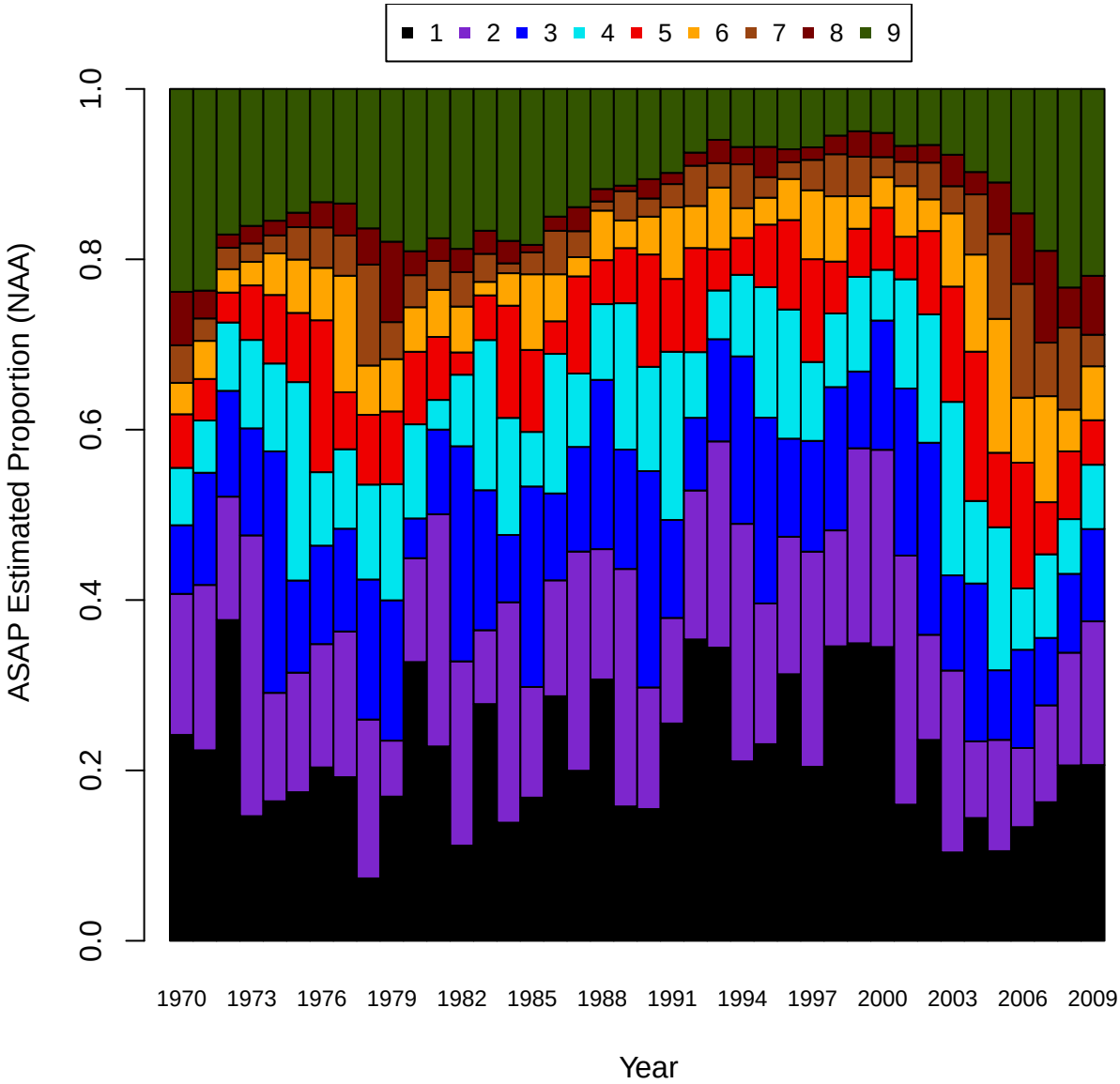

F.report
F.full
Fishing Mortality
0.0
0.2
0.4
0.6
1970
1980
1990
2000
2010
Year

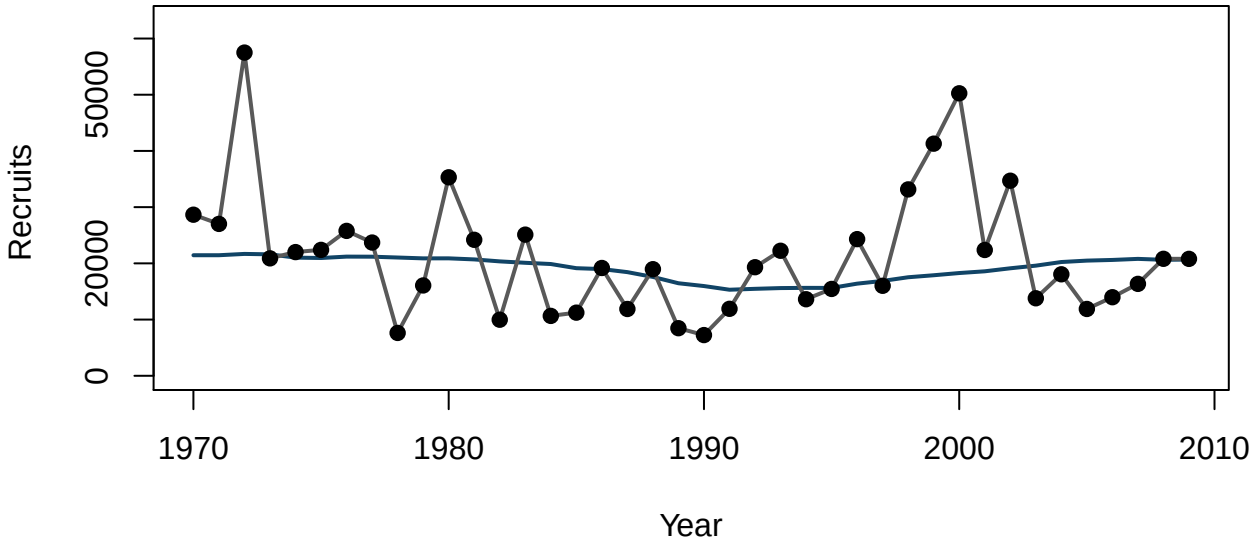

Comparison of January 1 Biomass
Total
SSB
Exploitable
Biomass
0e+00
1e+05
2e+05
3e+05
4e+05
1970
1980
1990
2000
2010
Year

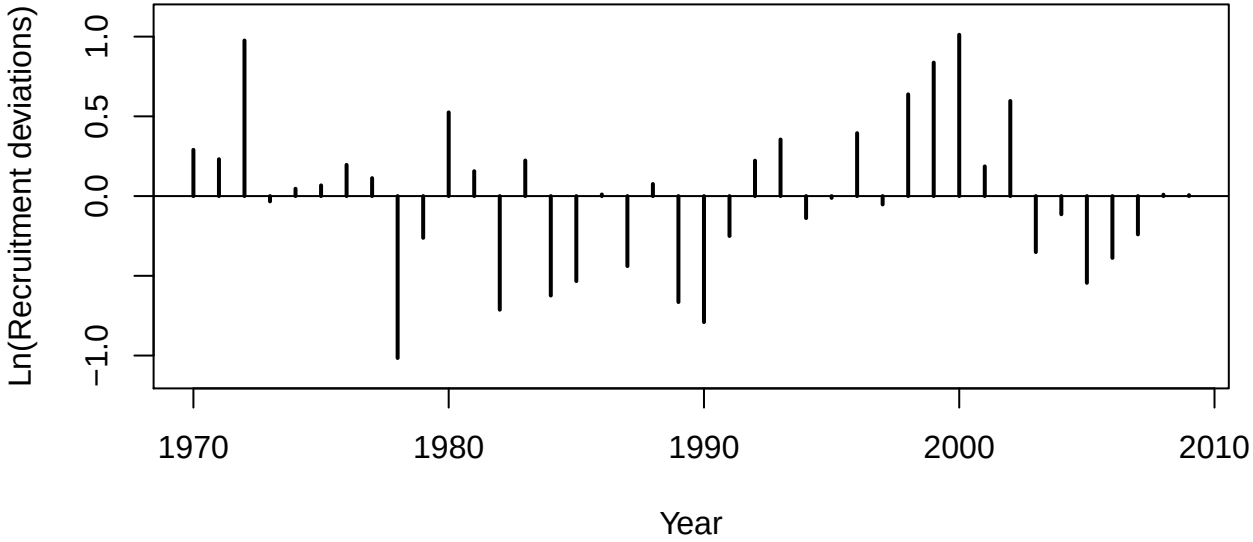

1 2 3 4 5 6 7 8 9
ASAP Estimated SSB.AA
0
50000
100000
150000
200000
250000
300000
350000
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
2006
2009
Year

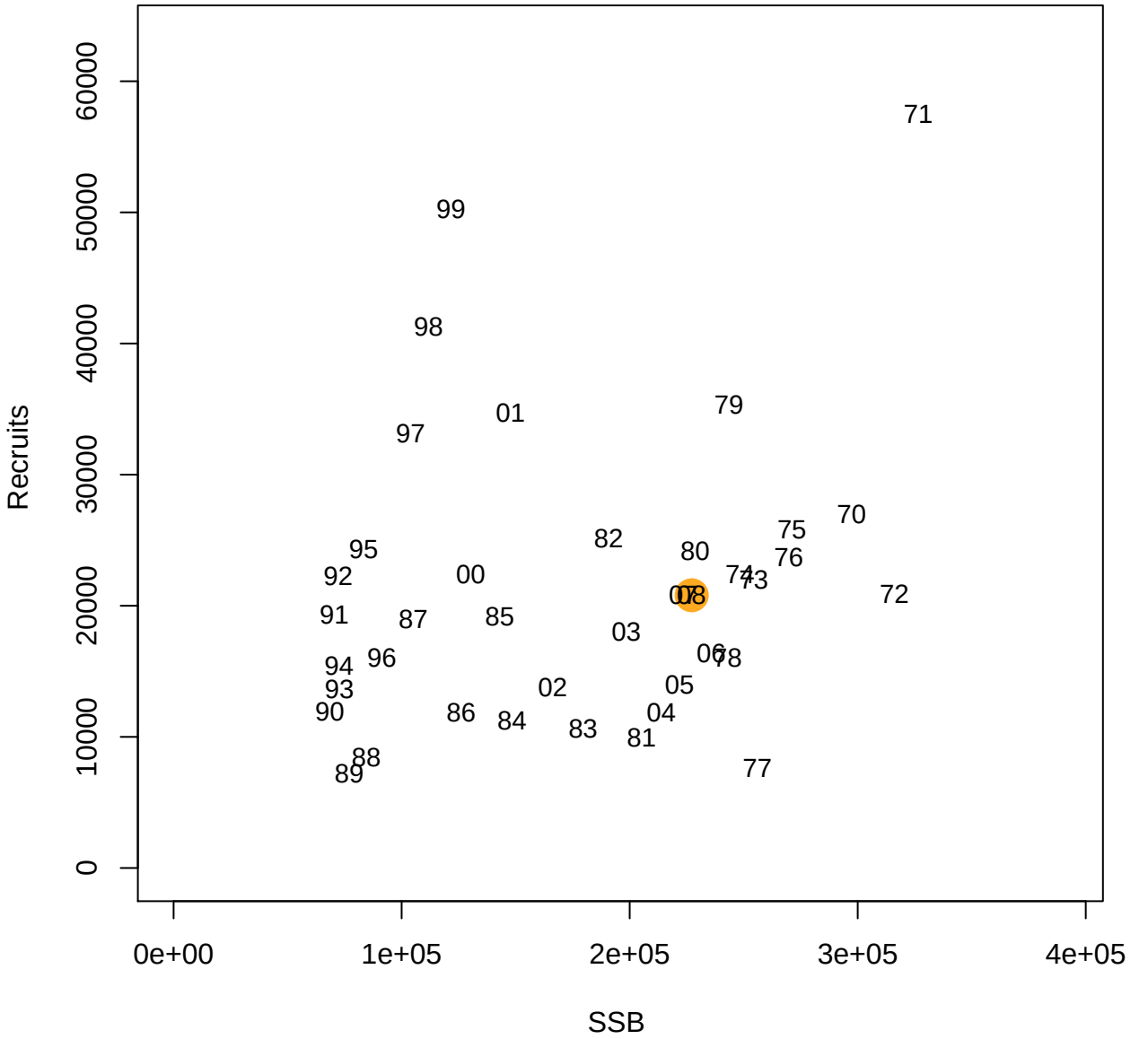

1
2
3
4
5
6
7
8
9
ASAP Estimated Proportion (SSB.AA)
0.0
0.2
0.4
0.6
0.8
1.0
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
2006
2009
Year

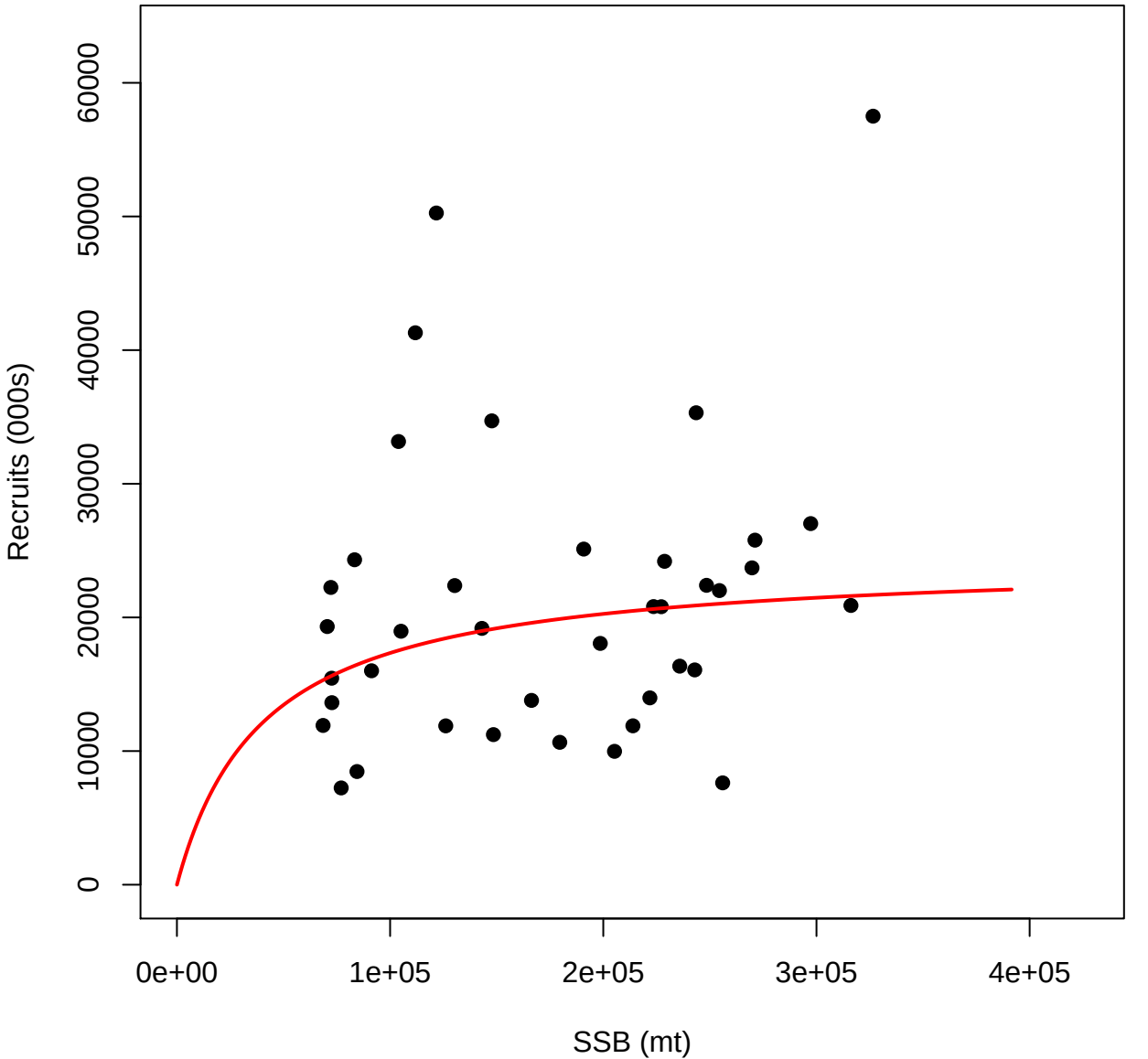

1 2 3 4 5 6 7 8 9
ASAP Estimated NAA
0
50000
100000
150000
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
2006
2009
Year

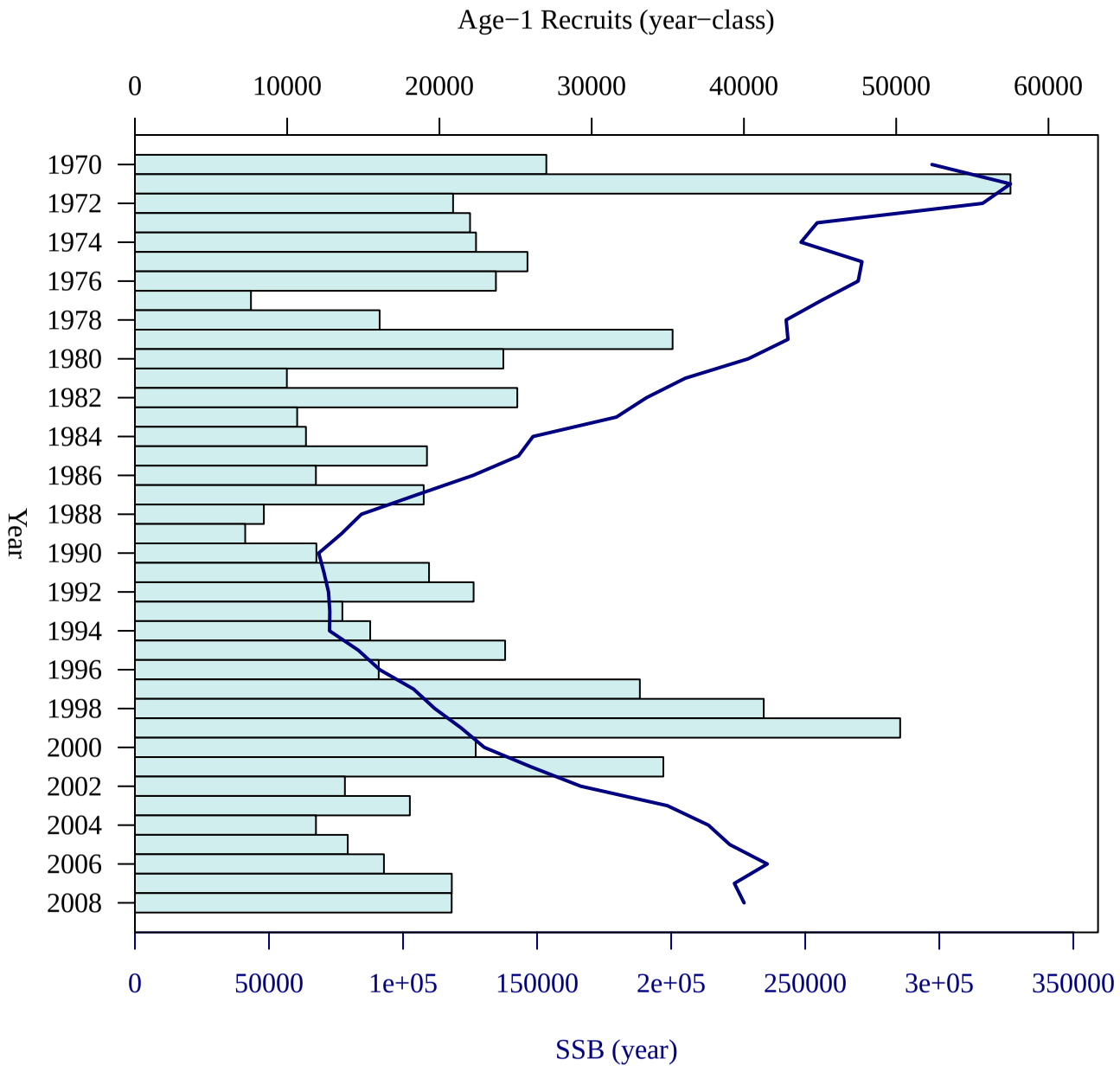

1 2 3 4 5 6 7 8 9
ASAP Estimated Proportion (NAA)
0.0
0.2
0.4
0.6
0.8
1.0
1970 1973 1976 1979 1982 1985 1988 1991 1994 1997 2000 2003 2006 2009
Year

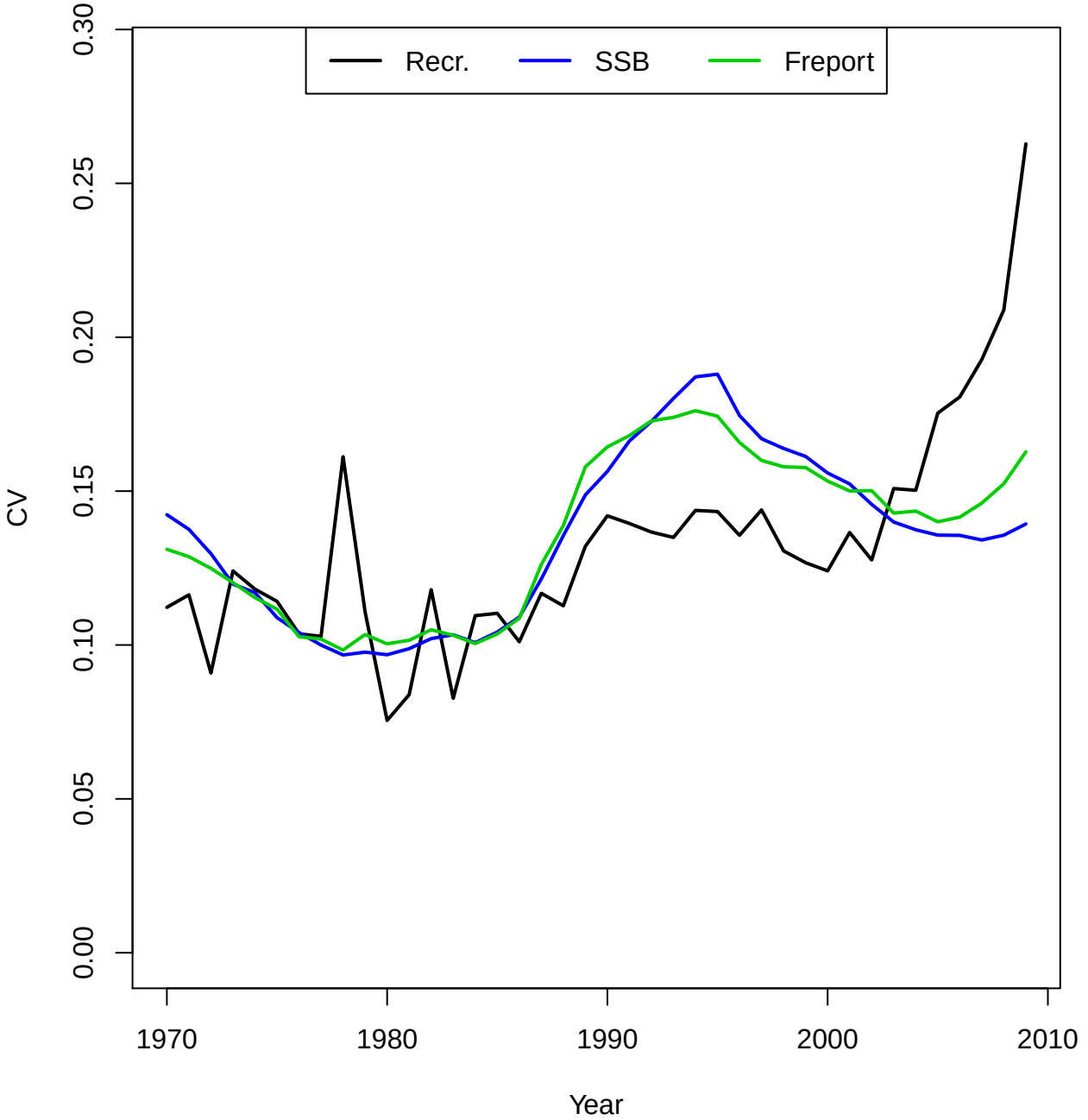

Recruits
0
20000
50000
1970
1980
1990
2000
2010
Year


Ln(Recruitment deviations)
−1.0
0.0
0.5
1.0
1970
1980
1990
2000
2010
Year

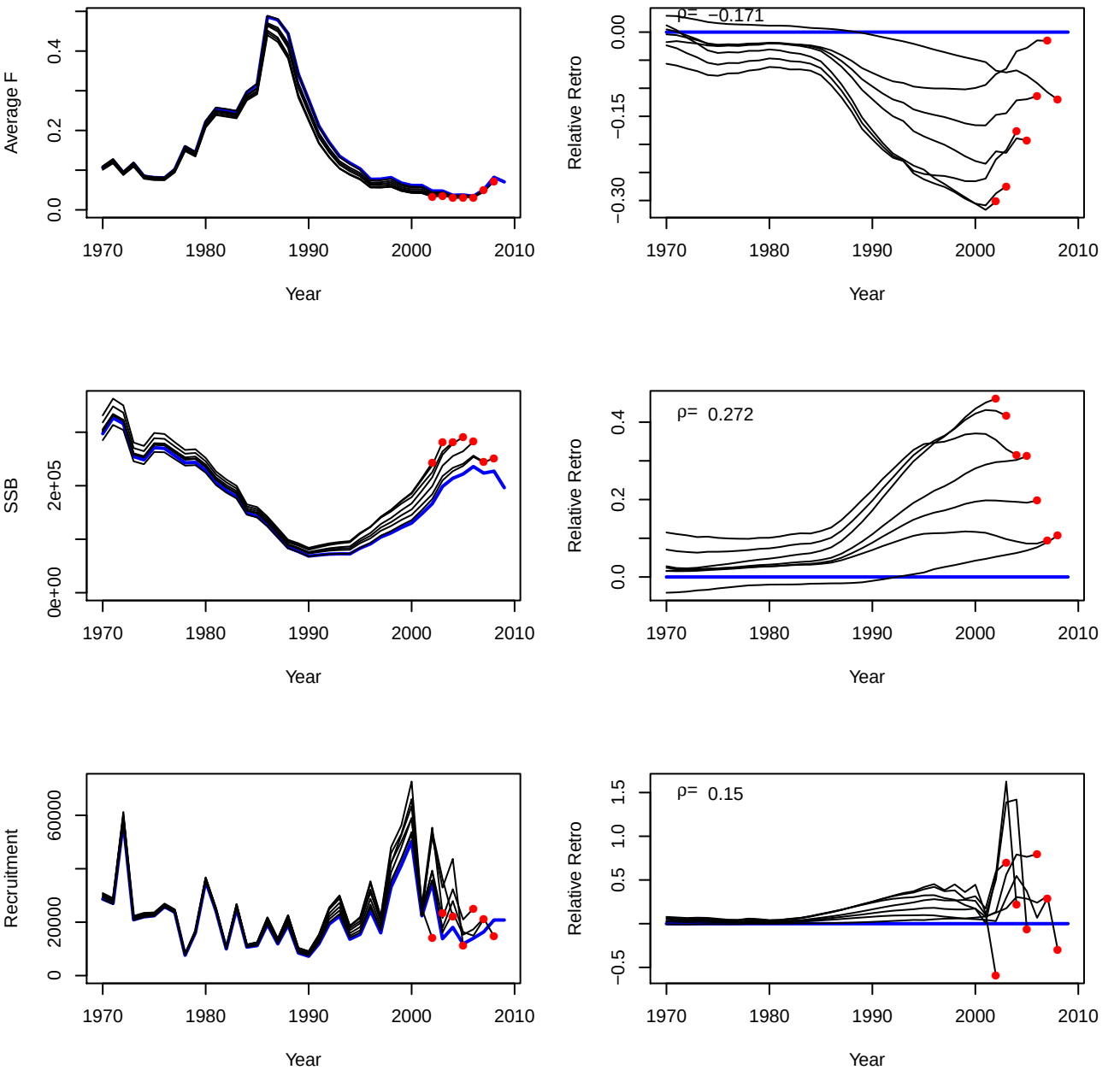

Recruits
0
10000
20000
30000
40000
50000
60000
SSB
0e+00
1e+05
2e+05
3e+05
4e+05
71
99
98
01
79
97
70
75
82
95
80
76
92
00
74
73
72
91
87
85
03
94
96
06
78
93
02
05
90
86
84
04
83
81
88
89
77

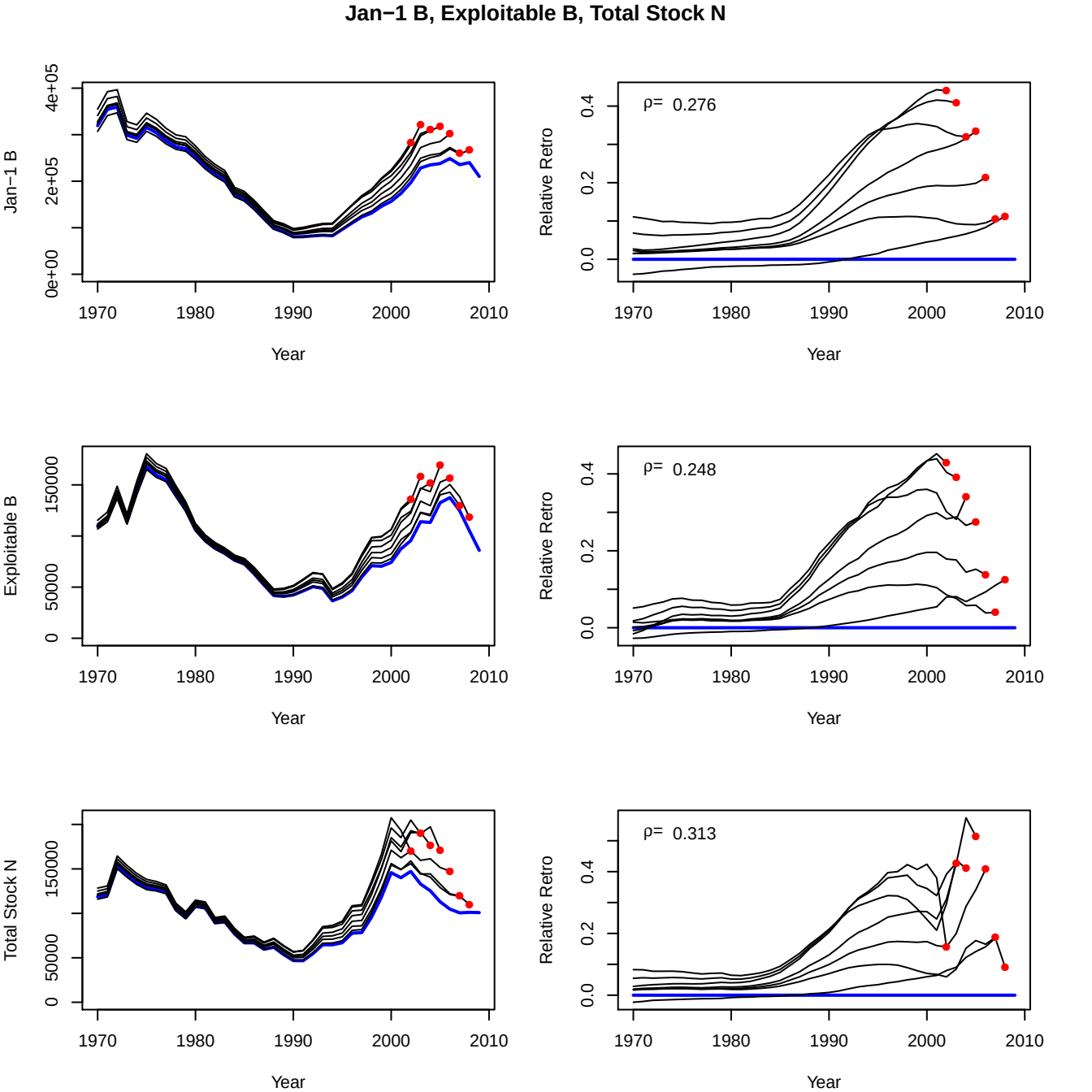

Recruits (000s)
0
10000
20000
30000
40000
50000
60000
0e+00
1e+05
2e+05
3e+05
4e+05
SSB (mt)


Age−1 Recruits (year−class)
0
10000
20000
30000
40000
50000
60000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
Year
0
50000
1e+05
150000
2e+05
250000
3e+05
350000
SSB (year)

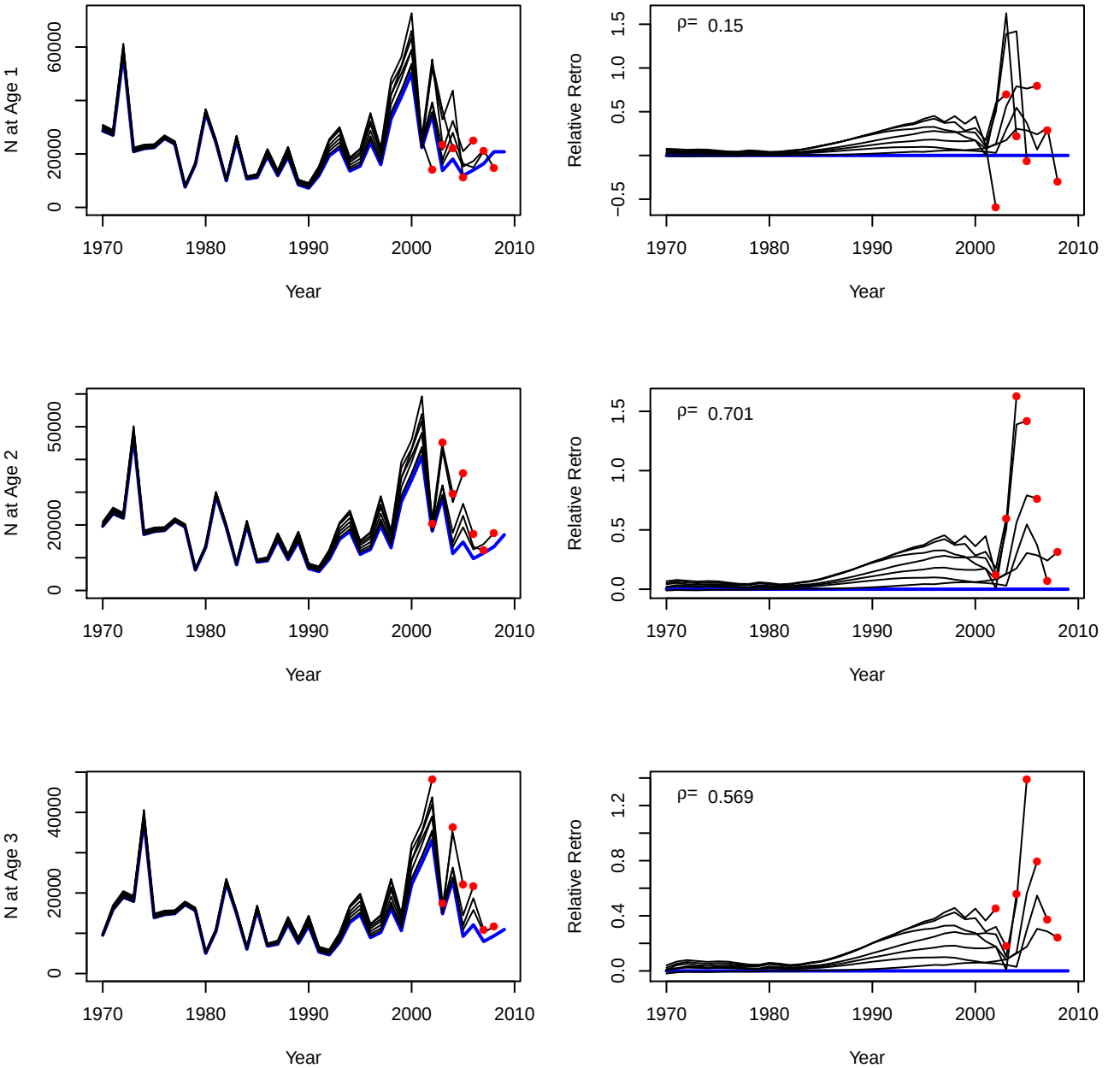

Recr.
SSB
Freport
CV
0.00
0.05
0.10
0.15
0.20
0.25
0.30
1970
1980
1990
2000
2010
Year

F, SSB, R

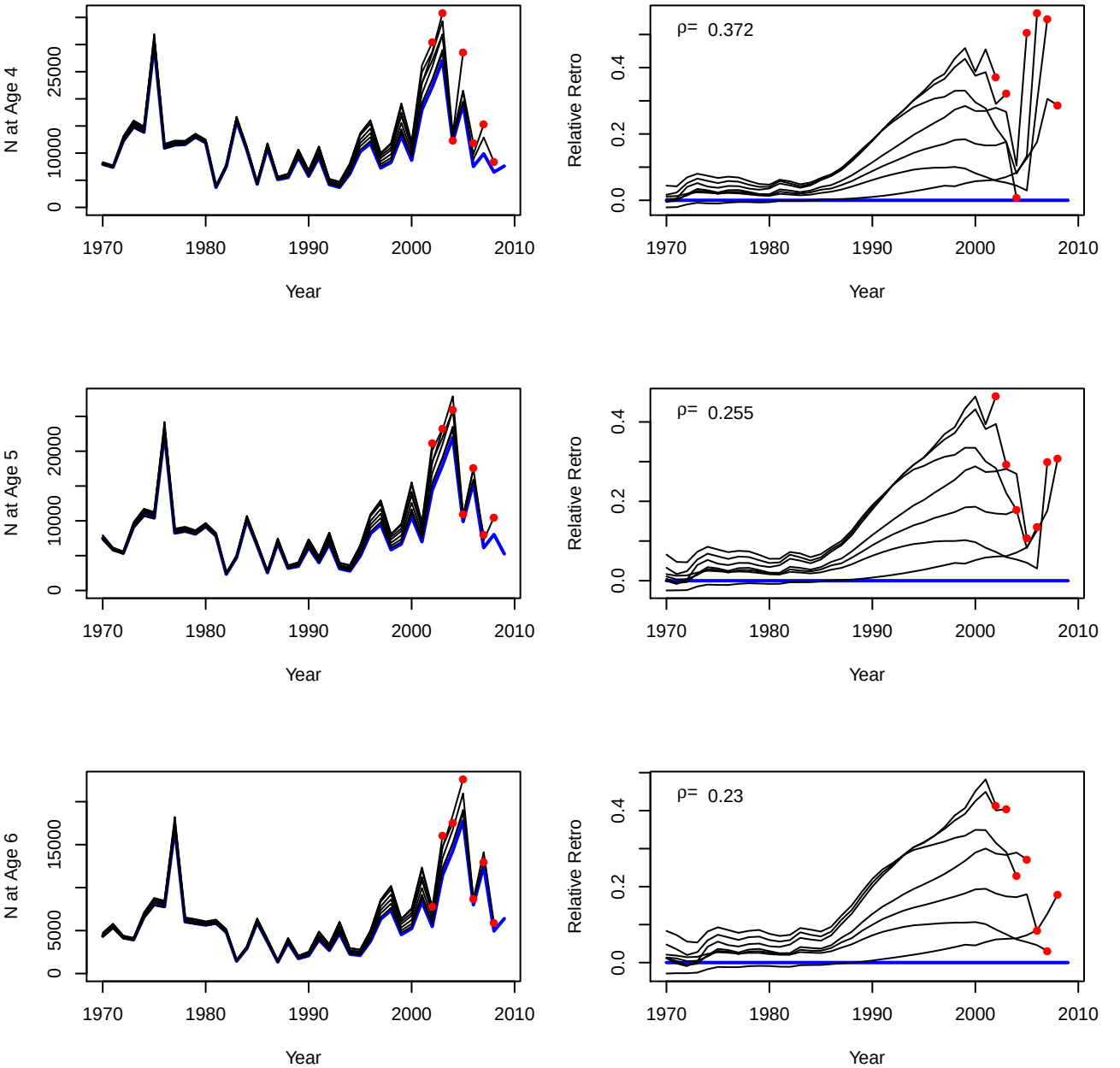

Average F
0.0
0.2
0.4
1970
1980
1990
2000
2010
Year
Relative Retro
ρ= −0.171
0.00
−0.15
−0.30
Year
SSB
0e+00
2e+05
Year
Relative Retro
ρ= 0.272
0.0
0.2
0.4
Year
Recruitment
0
20000
60000
Year
Relative Retro
ρ= 0.15
−0.5
0.5
1.0
1.5
Year


Jan−1 B, Exploitable B, Total Stock N
Jan−1 B
0e+00
2e+05
4e+05
Exploitable B
0
50000
150000
Total Stock N
0
50000
150000
Relative Retro
0.0
0.2
0.4
ρ= 0.276
ρ= 0.248
ρ= 0.313
1970
1980
1990
2000
2010
Year

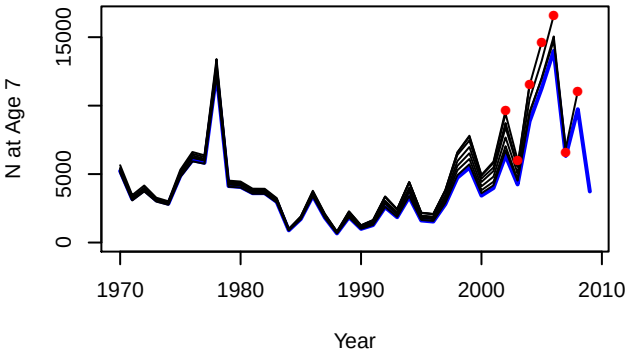
Stock Numbers at Age

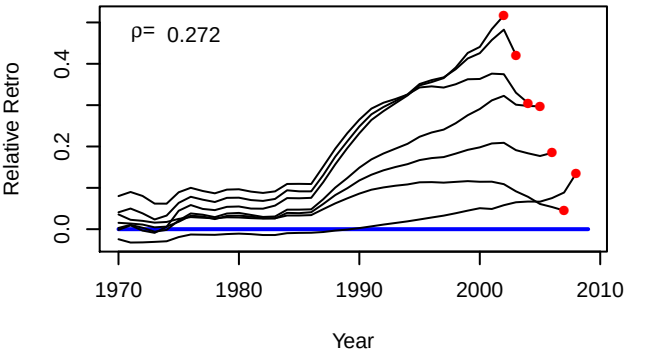


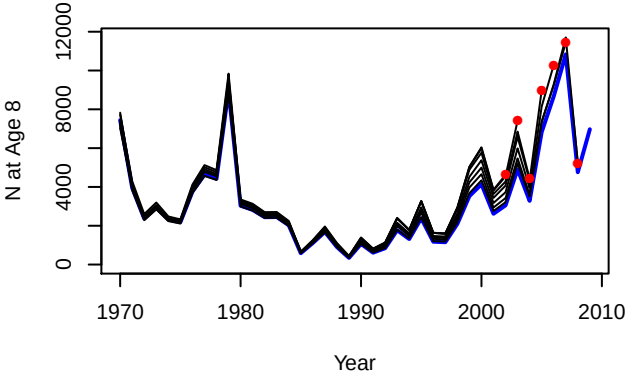
Stock Numbers at Age

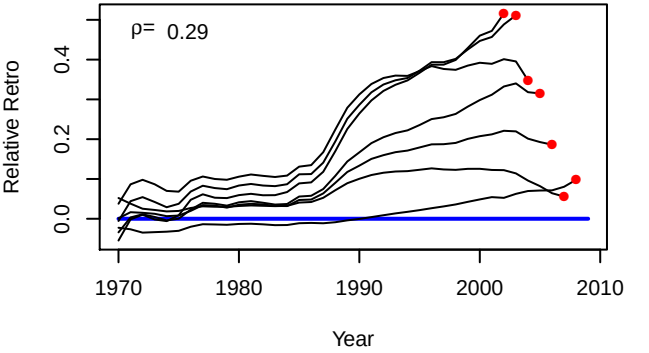


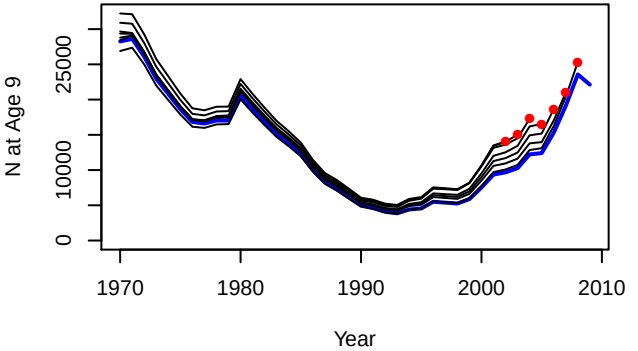
Stock Numbers at Age

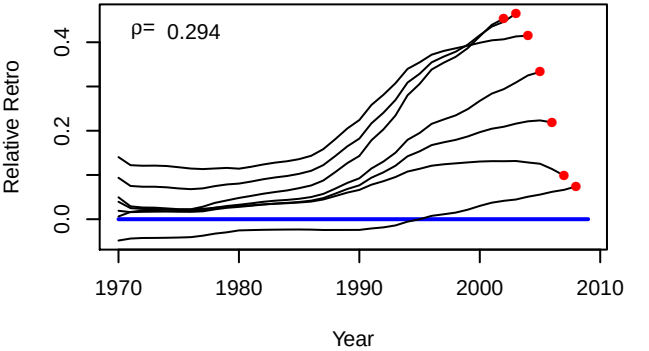


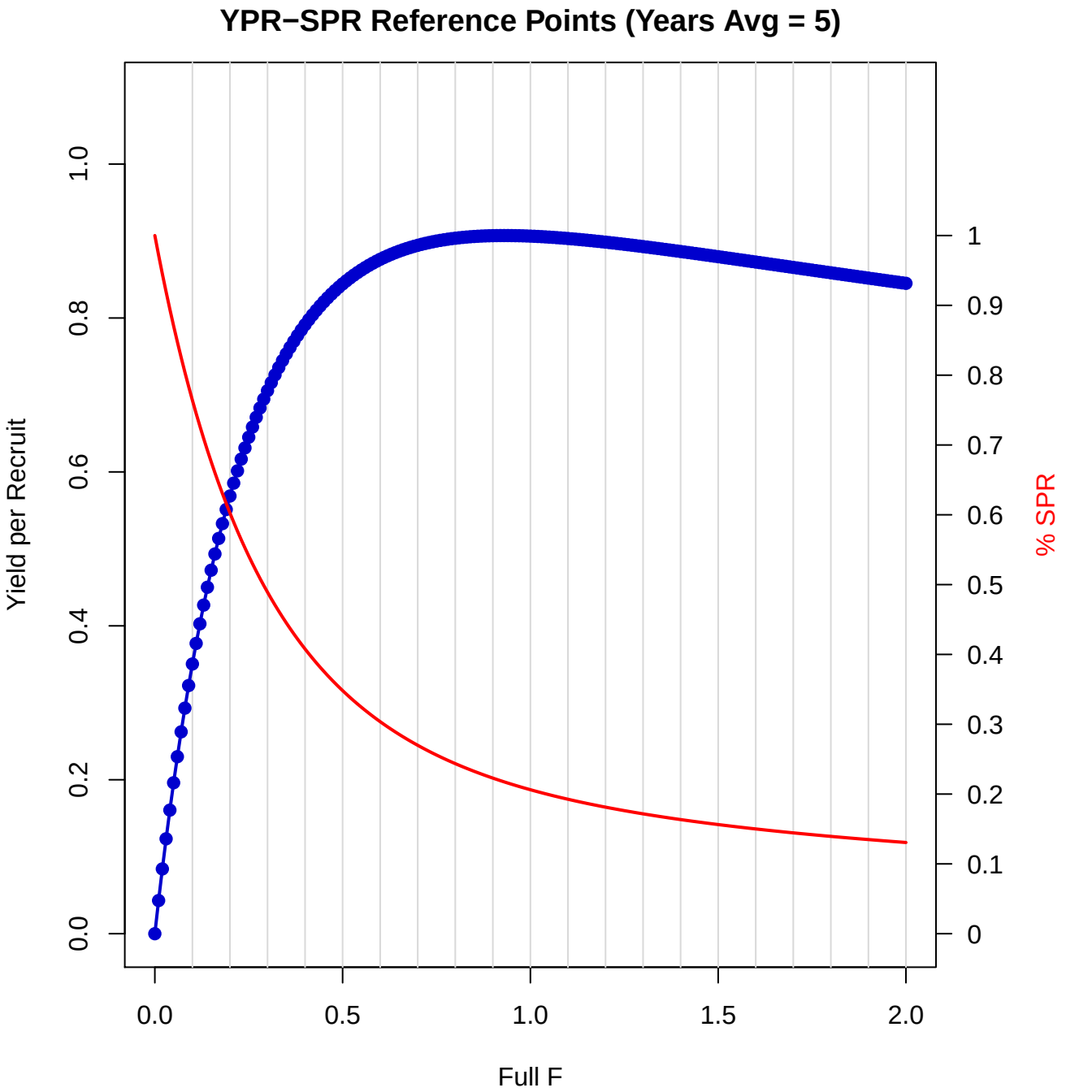






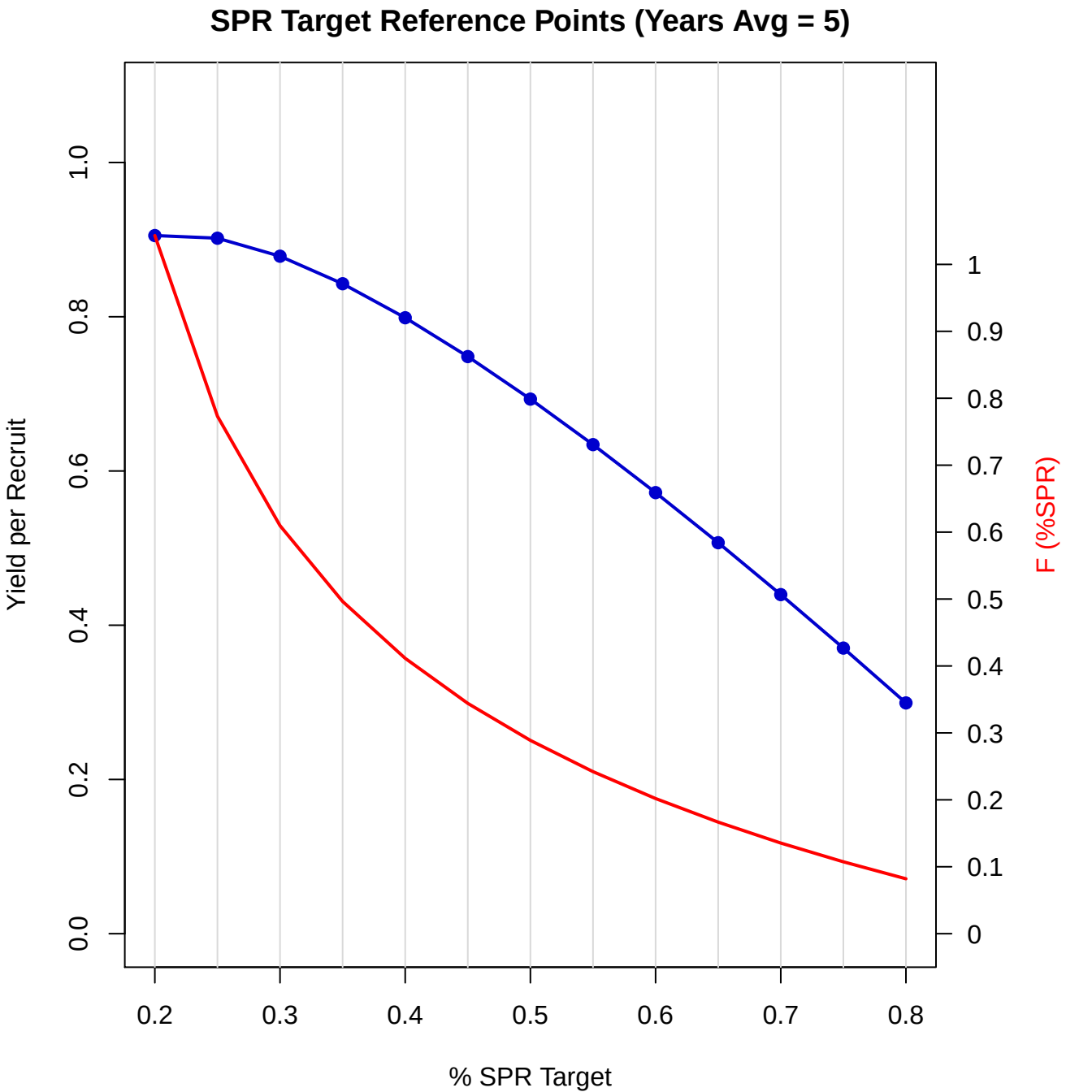





YPR−SPR Reference Points (Years Avg = 5)
Yield per Recruit
% SPR
Full F
0.0
0.2
0.4
0.6
0.8
1.0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.0
0.5
1.0
1.5
2.0

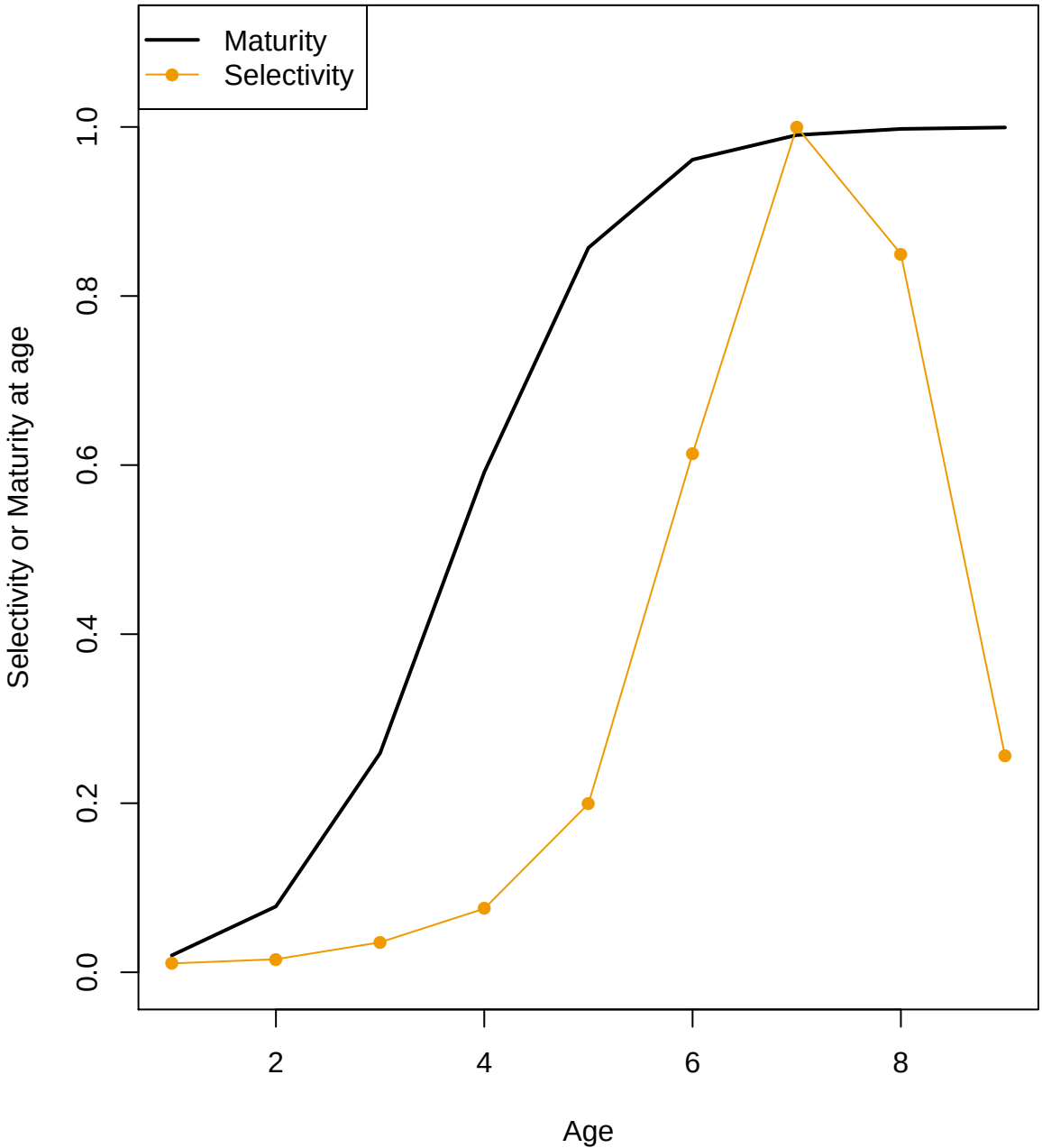
YPR−SPR Reference Points (Years Avg = 5)

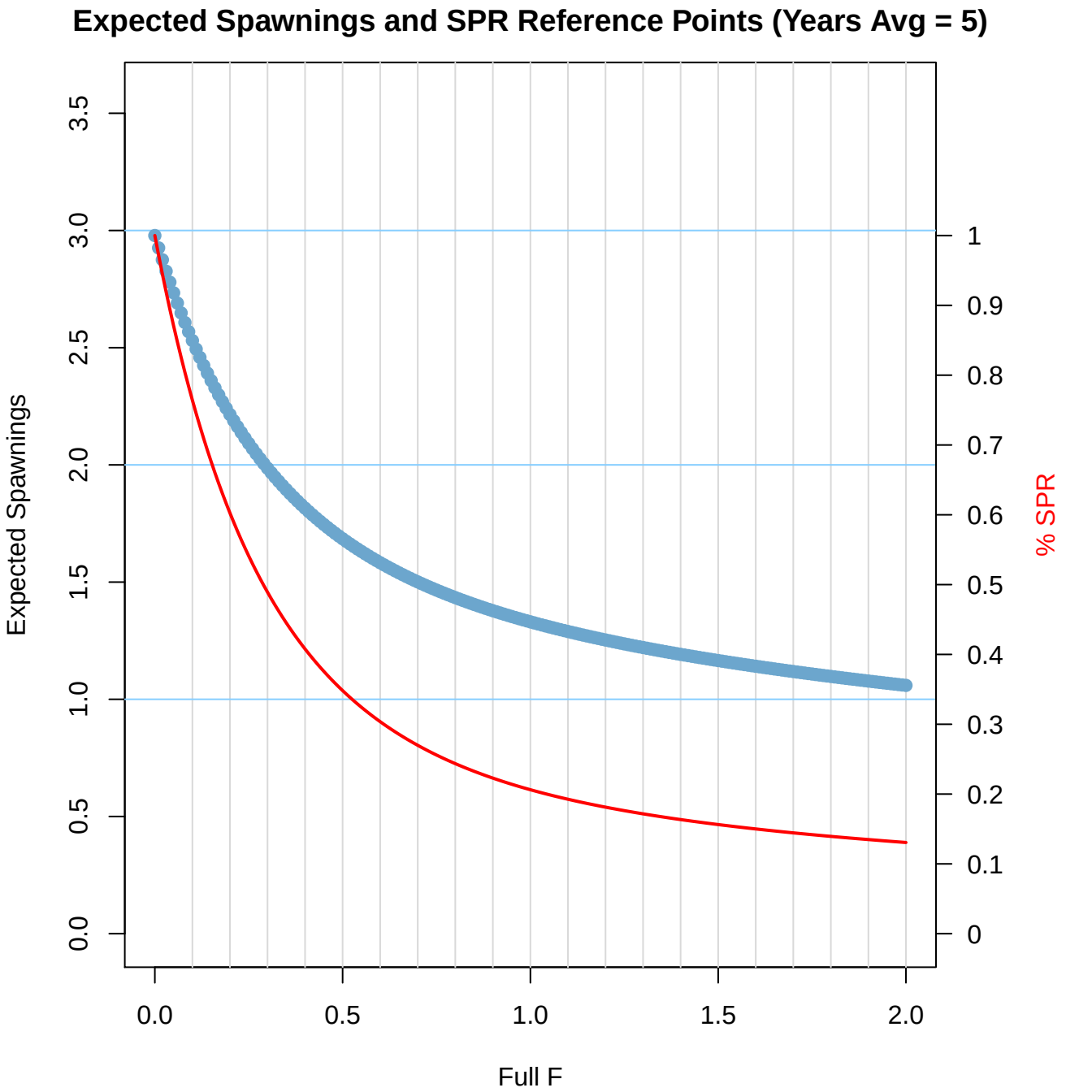
F	YPR	SPR	F	YPR	SPR	F	YPR	SPR
0	0	1	0.35	0.7534	0.4452	0.7	0.8945	0.2698
0.01	0.0431	0.972	0.36	0.7617	0.4372	0.71	0.8957	0.2669
0.02	0.0842	0.9451	0.37	0.7697	0.4295	0.72	0.8969	0.264
0.03	0.1233	0.9193	0.38	0.7772	0.422	0.73	0.898	0.2613
0.04	0.1606	0.8944	0.39	0.7844	0.4148	0.74	0.899	0.2585
0.05	0.1961	0.8706	0.4	0.7913	0.4078	0.75	0.9	0.2559
0.06	0.23	0.8476	0.41	0.7978	0.401	0.76	0.9008	0.2533
0.07	0.2623	0.8255	0.42	0.804	0.3944	0.77	0.9016	0.2508
0.08	0.2931	0.8043	0.43	0.81	0.388	0.78	0.9024	0.2483
0.09	0.3225	0.7838	0.44	0.8156	0.3818	0.79	0.9031	0.2459
0.1	0.3505	0.7641	0.45	0.821	0.3757	0.8	0.9037	0.2436
0.11	0.3772	0.7452	0.46	0.8262	0.3699	0.81	0.9042	0.2413
0.12	0.4027	0.7269	0.47	0.831	0.3642	0.82	0.9047	0.239
0.13	0.427	0.7093	0.48	0.8357	0.3587	0.83	0.9052	0.2369
0.14	0.4502	0.6923	0.49	0.8401	0.3534	0.84	0.9056	0.2347
0.15	0.4723	0.676	0.5	0.8443	0.3482	0.85	0.9059	0.2326
0.16	0.4934	0.6602	0.51	0.8483	0.3431	0.86	0.9062	0.2306
0.17	0.5136	0.645	0.52	0.8521	0.3382	0.87	0.9065	0.2286
0.18	0.5328	0.6304	0.53	0.8557	0.3335	0.88	0.9067	0.2266
0.19	0.5512	0.6162	0.54	0.8591	0.3289	0.89	0.9068	0.2247
0.2	0.5687	0.6026	0.55	0.8624	0.3244	0.9	0.907	0.2229
0.21	0.5854	0.5894	0.56	0.8655	0.32	0.91	0.9071	0.221
0.22	0.6014	0.5766	0.57	0.8684	0.3157	0.92	0.9071	0.2192
0.23	0.6166	0.5644	0.58	0.8712	0.3116	0.93	0.9071	0.2175
0.24	0.6312	0.5525	0.59	0.8738	0.3076	0.94	0.9071	0.2158
0.25	0.6451	0.541	0.6	0.8763	0.3037	0.95	0.9071	0.2141
0.26	0.6583	0.5299	0.61	0.8786	0.2999	0.96	0.907	0.2124
0.27	0.671	0.5192	0.62	0.8808	0.2962	0.97	0.9069	0.2108
0.28	0.683	0.5088	0.63	0.8829	0.2926	0.98	0.9067	0.2093
0.29	0.6946	0.4988	0.64	0.8849	0.2891	0.99	0.9066	0.2077
0.3	0.7056	0.4891	0.65	0.8867	0.2856	1	0.9064	0.2062
0.31	0.7161	0.4798	0.66	0.8885	0.2823	1.01	0.9062	0.2047
0.32	0.7261	0.4707	0.67	0.8901	0.2791	1.02	0.9059	0.2033
0.33	0.7356	0.4619	0.68	0.8917	0.2759	1.03	0.9057	0.2018
0.34	0.7447	0.4534	0.69	0.8931	0.2728	1.04	0.9054	0.2004


SPR Target Reference Points (Years Avg = 5)
Yield per Recruit
F (%SPR)
% SPR Target
0.0
0.2
0.4
0.6
0.8
1.0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.2
0.3
0.4
0.5
0.6
0.7
0.8

SPR Target Reference Points (Years Avg = 5)

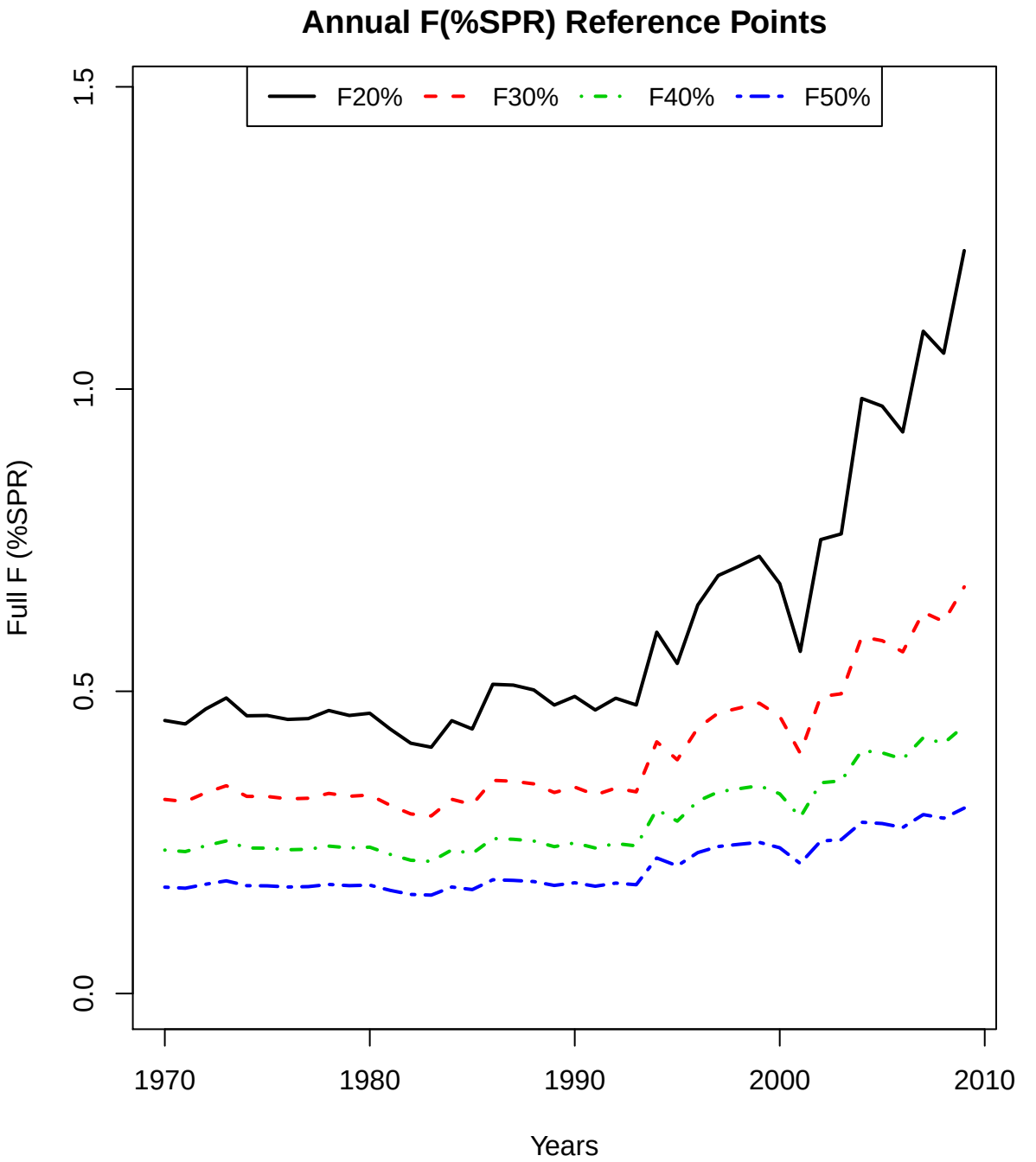
% SPR	F(%SPR)	YPR
0.2	1.0431	0.9053
0.25	0.7732	0.9019
0.3	0.6097	0.8785
0.35	0.4965	0.8428
0.4	0.4114	0.7987
0.45	0.3441	0.7484
0.5	0.2888	0.6932
0.55	0.2421	0.6342
0.6	0.2019	0.572
0.65	0.1667	0.507
0.7	0.1354	0.4397
0.75	0.1074	0.3704
0.8	0.0821	0.2992

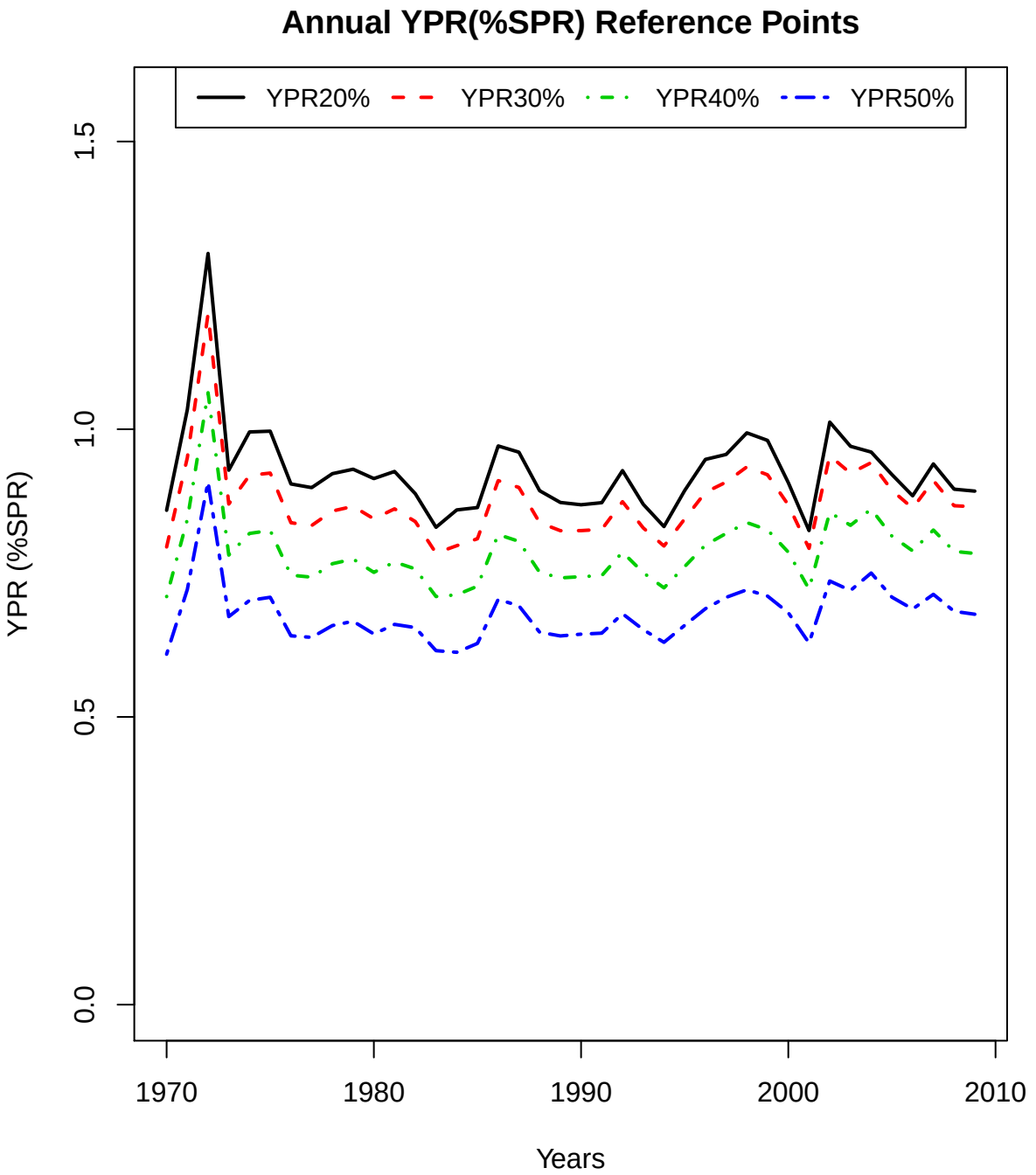

Maturity
Selectivity
Selectivity or Maturity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
Age

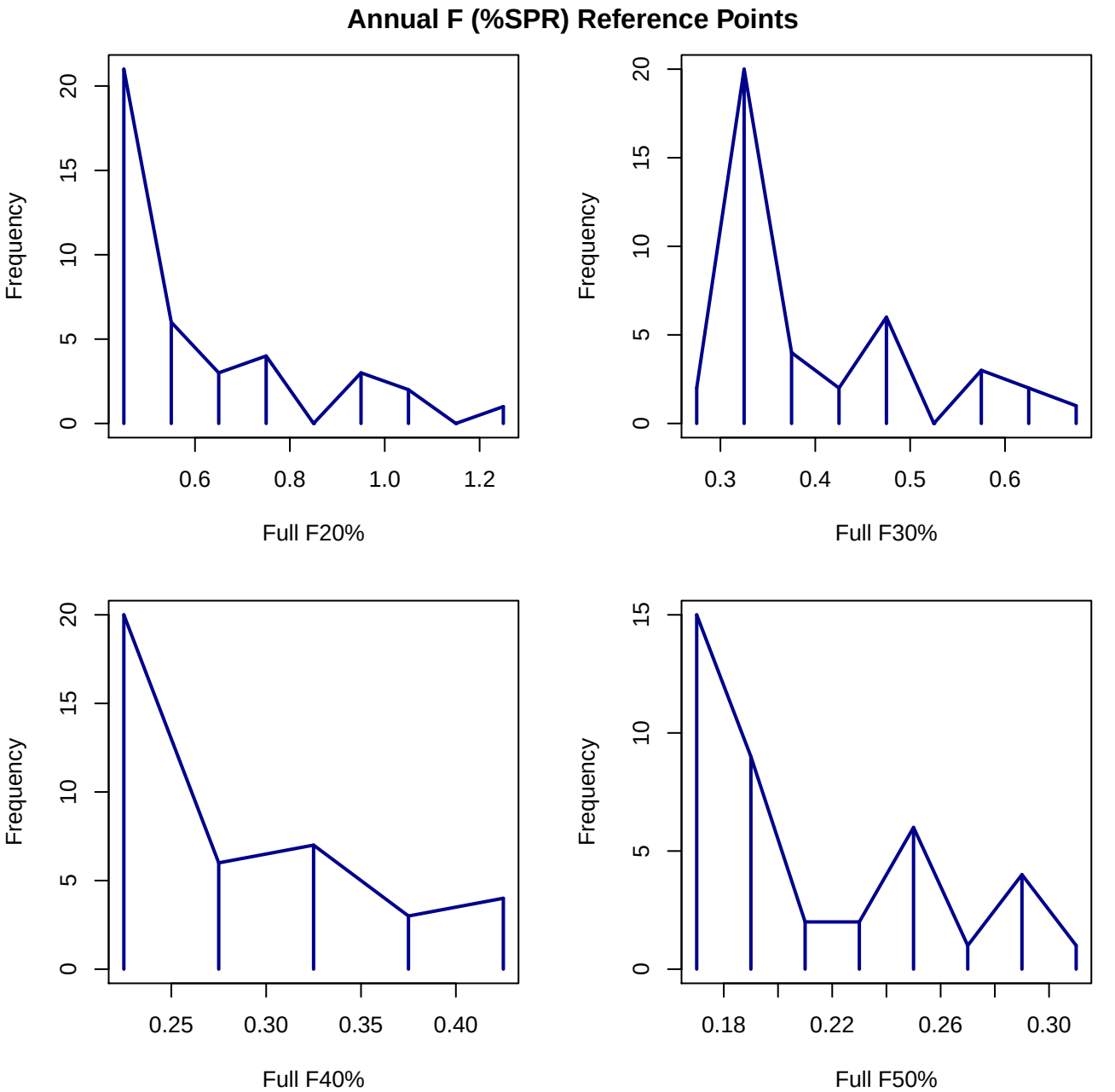

Expected Spawnings and SPR Reference Points (Years Avg = 5)
Expected Spawnings
% SPR
Full F
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

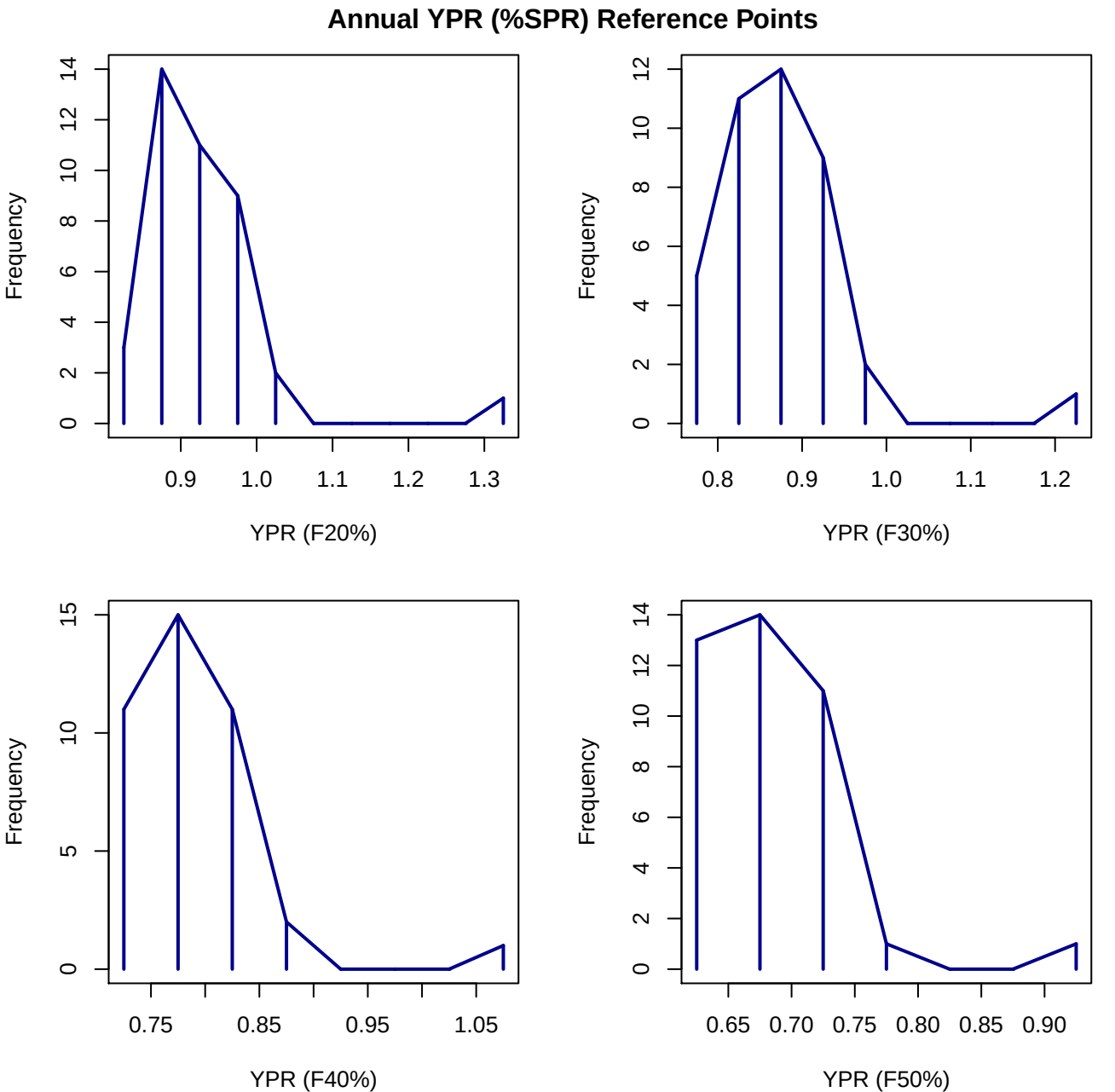
Expected Spawnings & SPR Reference Points (Years Avg = 5)

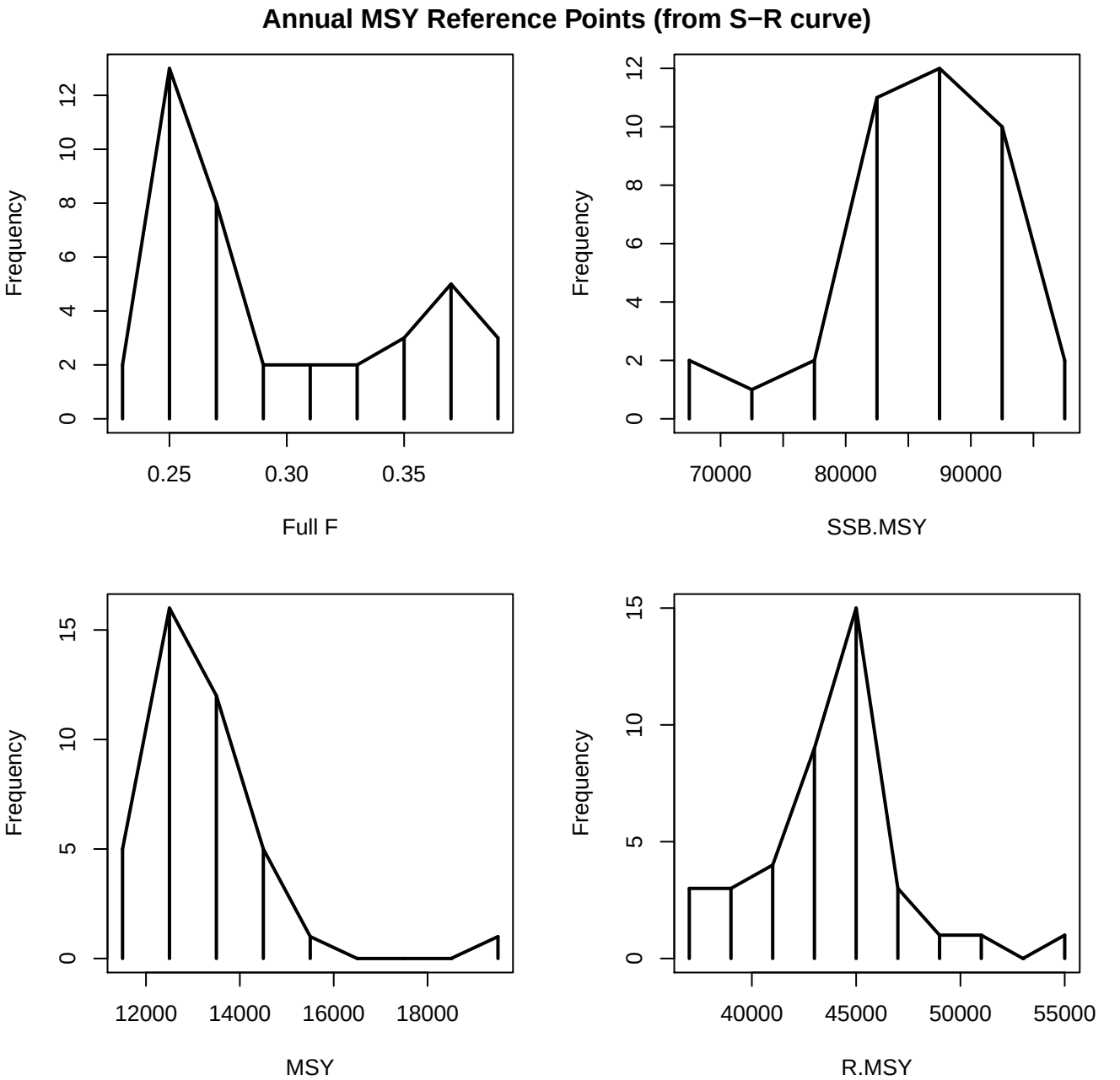
F	E[Sp]	SPR	F	E[Sp]	SPR	F	E[Sp]	SPR
0	2.9784	1	0.35	1.8947	0.4452	0.7	1.5009	0.2698
0.01	2.9258	0.972	0.36	1.8779	0.4372	0.71	1.4936	0.2669
0.02	2.8752	0.9451	0.37	1.8616	0.4295	0.72	1.4865	0.264
0.03	2.8264	0.9193	0.38	1.8457	0.422	0.73	1.4795	0.2613
0.04	2.7793	0.8944	0.39	1.8303	0.4148	0.74	1.4726	0.2585
0.05	2.734	0.8706	0.4	1.8153	0.4078	0.75	1.4659	0.2559
0.06	2.6903	0.8476	0.41	1.8007	0.401	0.76	1.4592	0.2533
0.07	2.6482	0.8255	0.42	1.7865	0.3944	0.77	1.4527	0.2508
0.08	2.6076	0.8043	0.43	1.7726	0.388	0.78	1.4464	0.2483
0.09	2.5683	0.7838	0.44	1.7591	0.3818	0.79	1.4401	0.2459
0.1	2.5304	0.7641	0.45	1.7459	0.3757	0.8	1.434	0.2436
0.11	2.4939	0.7452	0.46	1.7331	0.3699	0.81	1.4279	0.2413
0.12	2.4585	0.7269	0.47	1.7206	0.3642	0.82	1.422	0.239
0.13	2.4244	0.7093	0.48	1.7084	0.3587	0.83	1.4162	0.2369
0.14	2.3914	0.6923	0.49	1.6965	0.3534	0.84	1.4104	0.2347
0.15	2.3595	0.676	0.5	1.6849	0.3482	0.85	1.4048	0.2326
0.16	2.3286	0.6602	0.51	1.6735	0.3431	0.86	1.3993	0.2306
0.17	2.2988	0.645	0.52	1.6625	0.3382	0.87	1.3938	0.2286
0.18	2.2699	0.6304	0.53	1.6517	0.3335	0.88	1.3885	0.2266
0.19	2.2419	0.6162	0.54	1.6411	0.3289	0.89	1.3832	0.2247
0.2	2.2149	0.6026	0.55	1.6308	0.3244	0.9	1.378	0.2229
0.21	2.1887	0.5894	0.56	1.6208	0.32	0.91	1.3729	0.221
0.22	2.1633	0.5766	0.57	1.6109	0.3157	0.92	1.3679	0.2192
0.23	2.1386	0.5644	0.58	1.6013	0.3116	0.93	1.363	0.2175
0.24	2.1148	0.5525	0.59	1.5919	0.3076	0.94	1.3581	0.2158
0.25	2.0917	0.541	0.6	1.5827	0.3037	0.95	1.3533	0.2141
0.26	2.0692	0.5299	0.61	1.5738	0.2999	0.96	1.3486	0.2124
0.27	2.0475	0.5192	0.62	1.565	0.2962	0.97	1.344	0.2108
0.28	2.0263	0.5088	0.63	1.5564	0.2926	0.98	1.3394	0.2093
0.29	2.0058	0.4988	0.64	1.5479	0.2891	0.99	1.3349	0.2077
0.3	1.9859	0.4891	0.65	1.5397	0.2856	1	1.3304	0.2062
0.31	1.9666	0.4798	0.66	1.5316	0.2823	1.01	1.3261	0.2047
0.32	1.9478	0.4707	0.67	1.5237	0.2791	1.02	1.3217	0.2033
0.33	1.9296	0.4619	0.68	1.516	0.2759	1.03	1.3175	0.2018
0.34	1.9119	0.4534	0.69	1.5084	0.2728	1.04	1.3133	0.2004

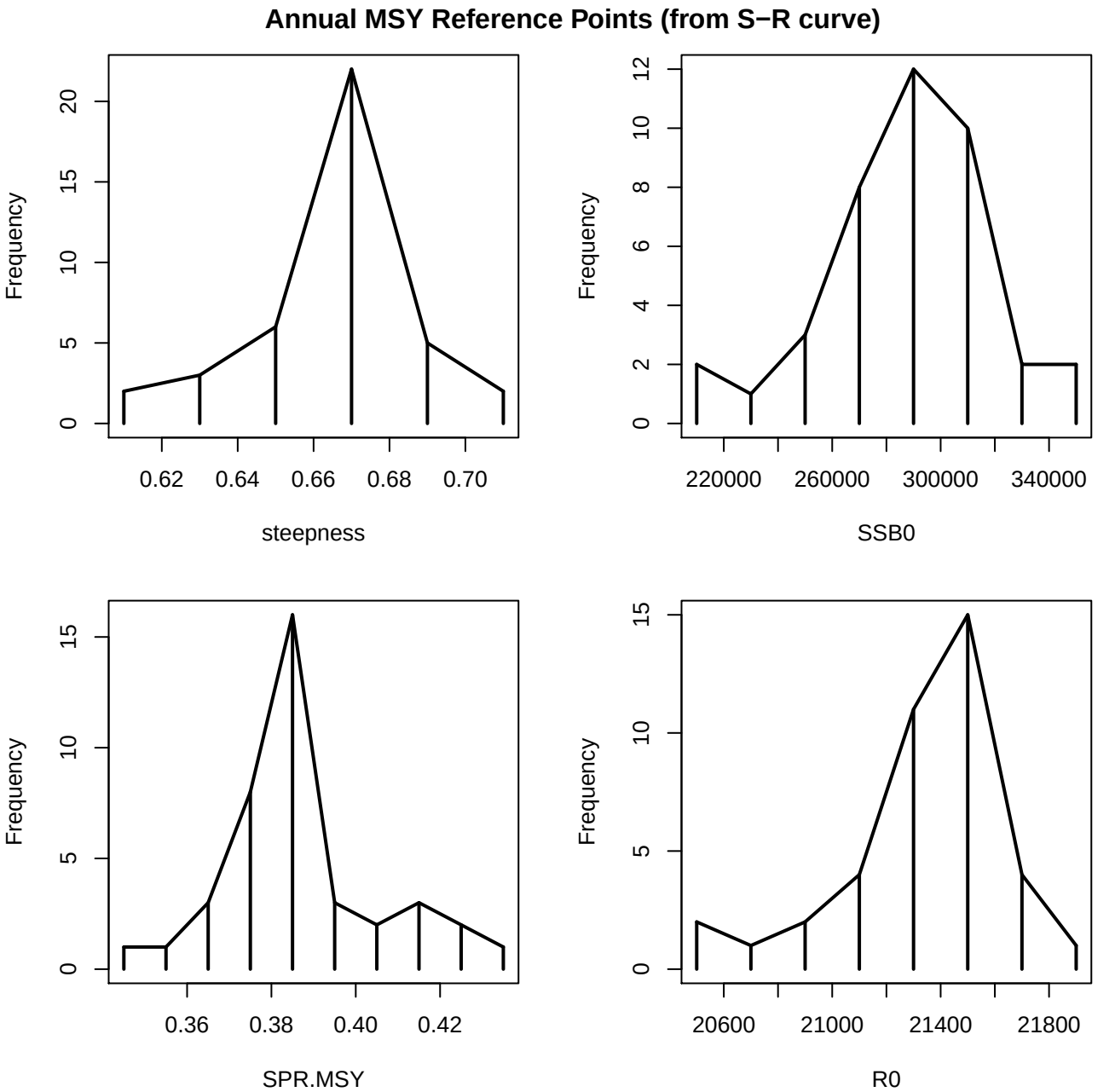

Annual F(%SPR) Reference Points
F20%
F30%
F40%
F50%
Full F (%SPR)
0.0
0.5
1.0
1.5
1970
1980
1990
2000
2010
Years

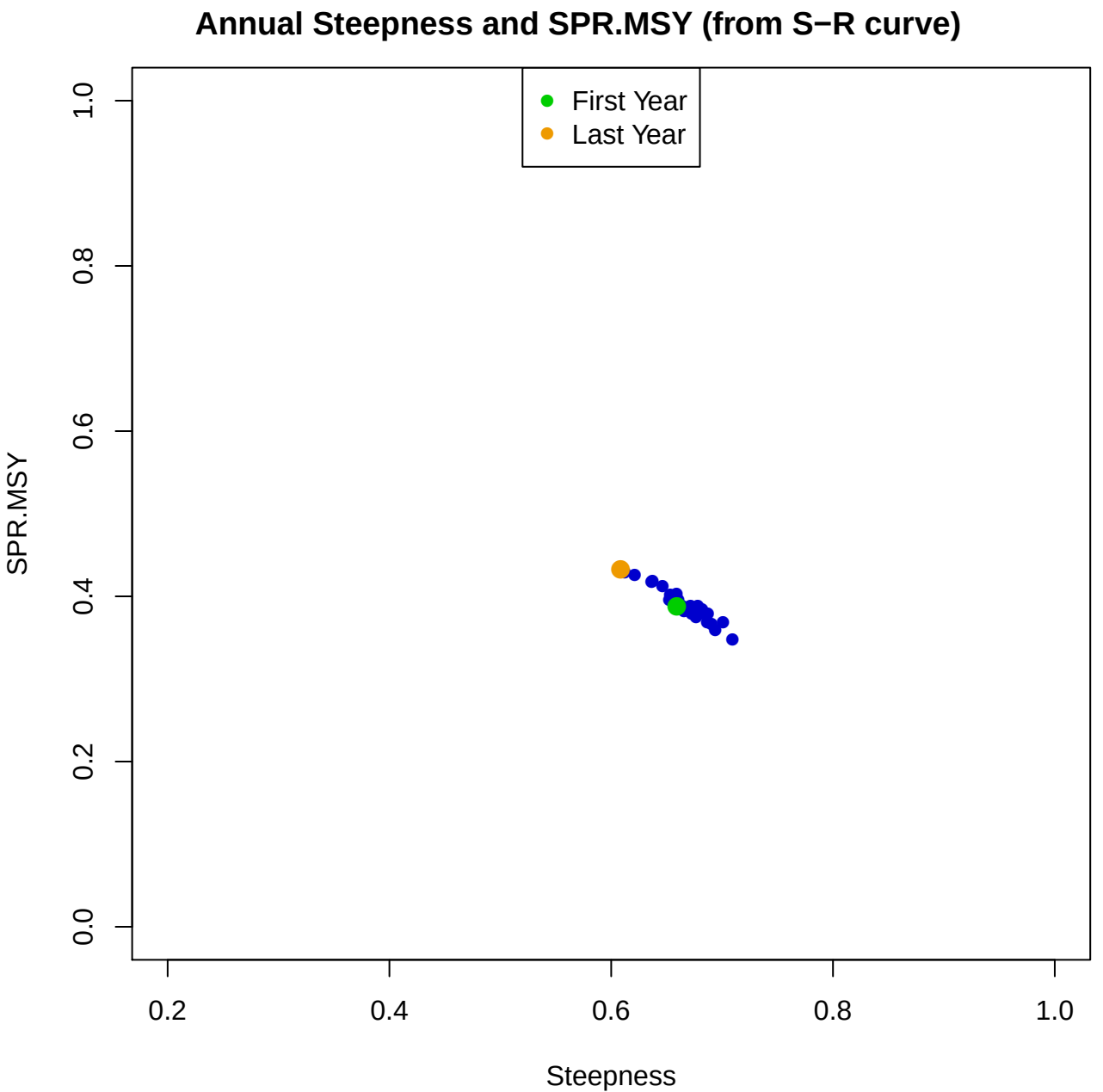

Annual YPR(%SPR) Reference Points
YPR20%
YPR30%
YPR40%
YPR50%
YPR (%SPR)
0.0
0.5
1.0
1.5
1970
1980
1990
2000
2010
Years

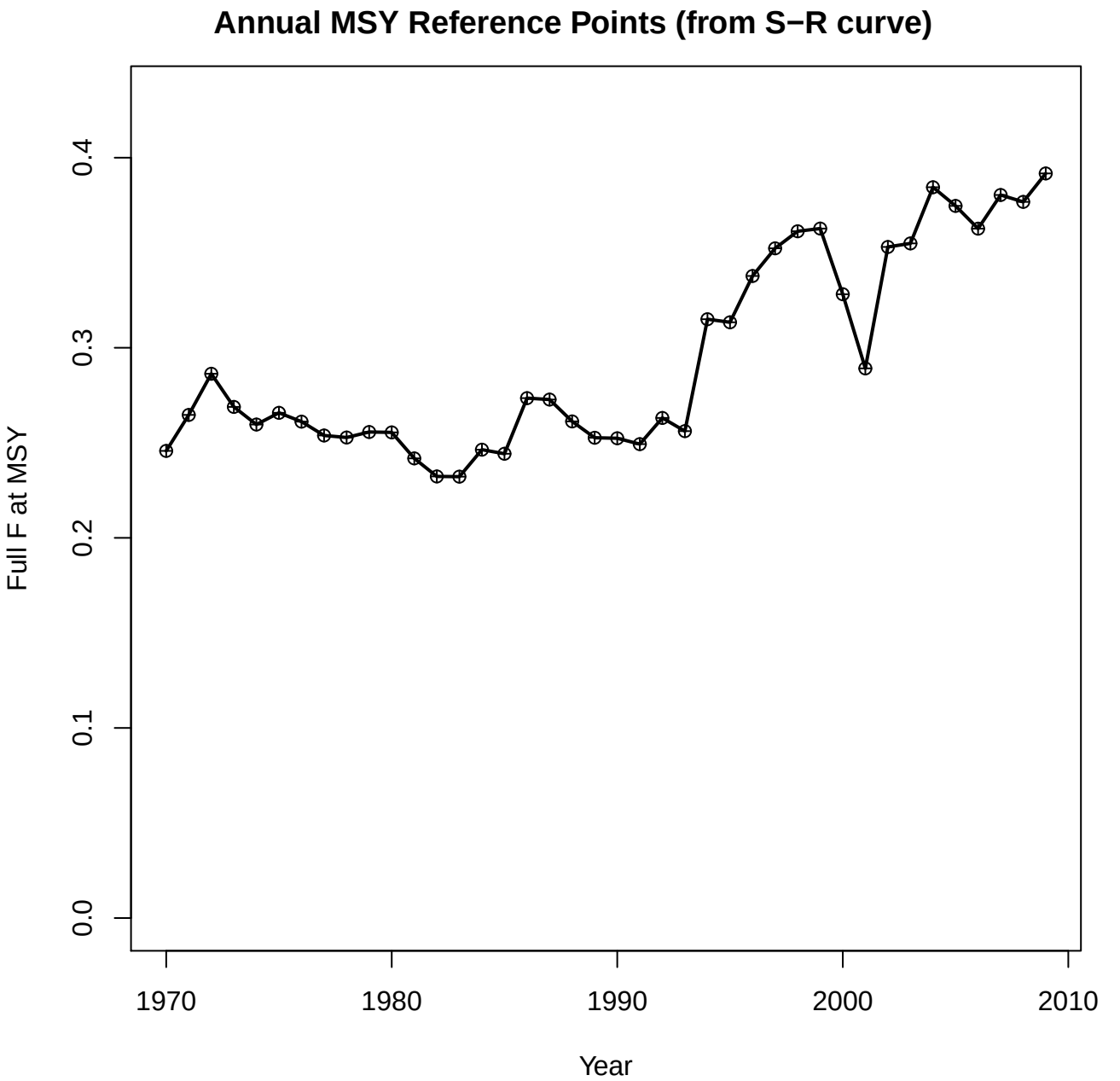

Annual F (%SPR) Reference Points
Frequency
0
5
10
15
20
0.6
0.8
1.0
1.2
Full F20%
Frequency
0
5
10
15
20
0.3
0.4
0.5
0.6
Full F30%
Frequency
0
5
10
15
20
0.25
0.30
0.35
0.40
Full F40%
Frequency
0
5
10
15
0.18
0.22
0.26
0.30
Full F50%

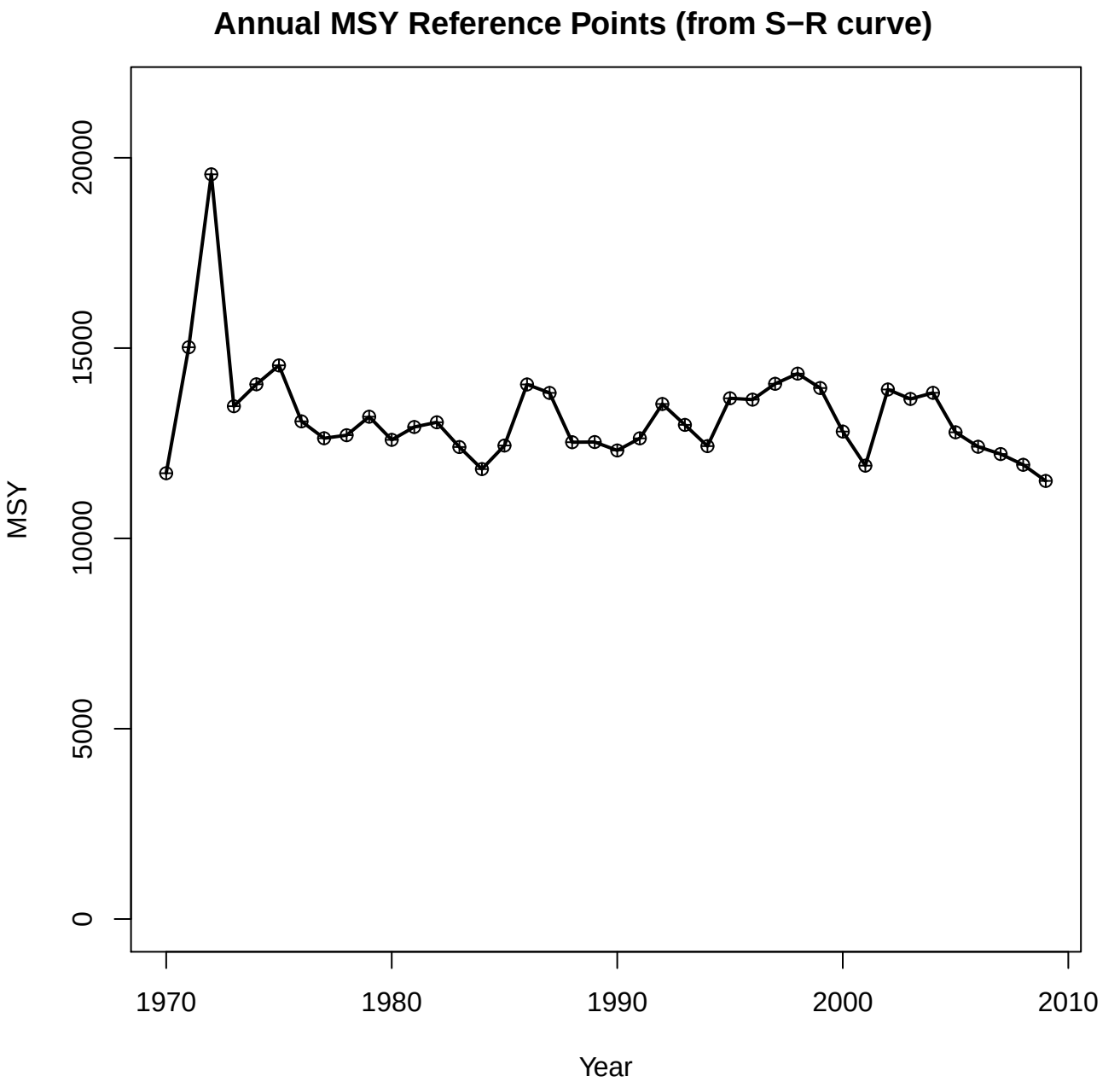

Annual YPR (%SPR) Reference Points
Frequency
0
2
4
6
8
10
12
14
0.9
1.0
1.1
1.2
1.3
YPR (F20%)
Frequency
0
2
4
6
8
10
12
0.8
0.9
1.0
1.1
1.2
YPR (F30%)
Frequency
0
5
10
15
0.75
0.85
0.95
1.05
YPR (F40%)
Frequency
0
2
4
6
8
10
12
14
0.65
0.70
0.75
0.80
0.85
0.90
YPR (F50%)

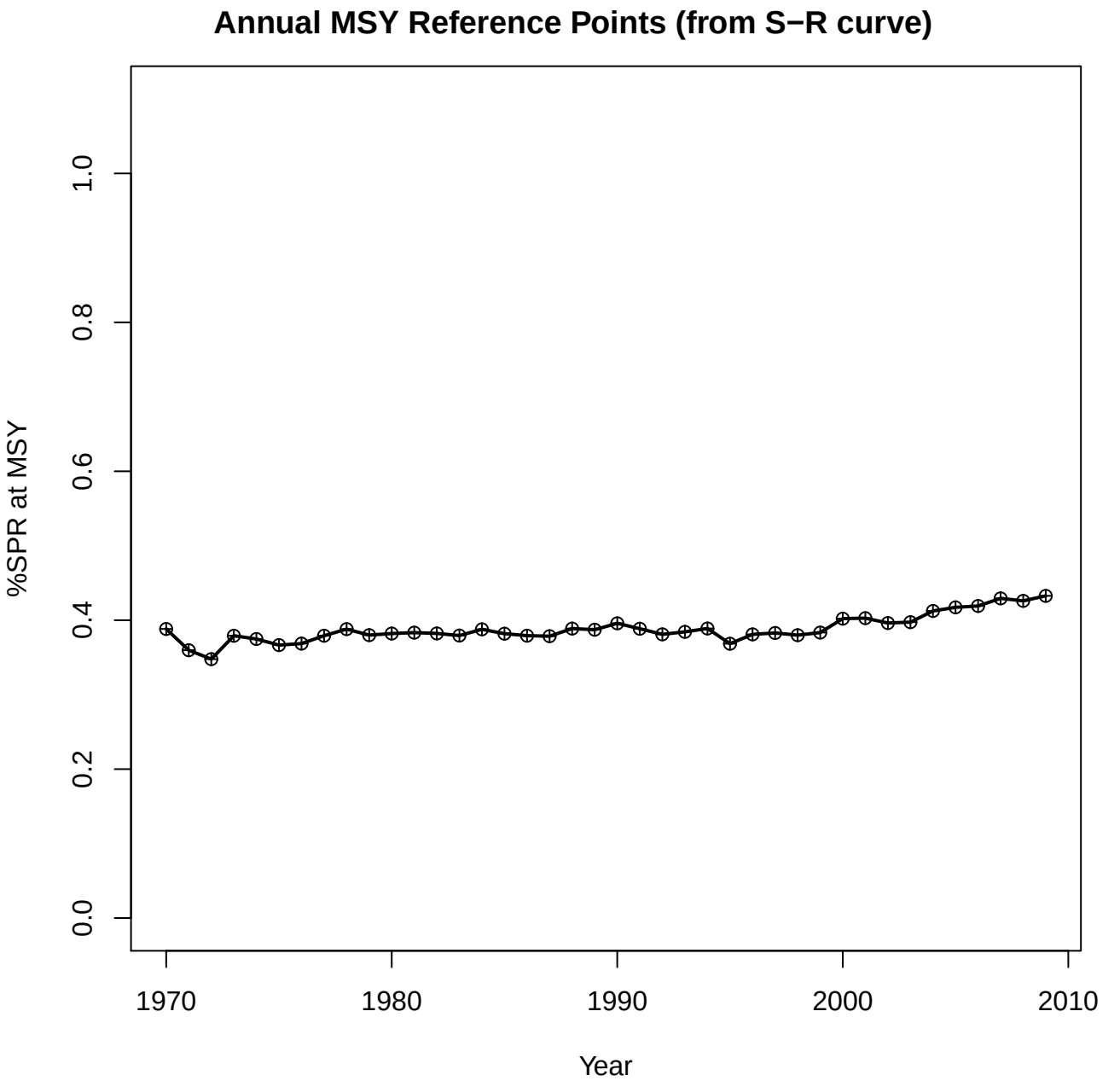

Annual MSY Reference Points (from S−R curve)
Frequency
0
2
4
6
8
10
12
0.25
0.30
0.35
Full F
Frequency
0
2
4
6
8
10
12
70000
80000
90000
SSB.MSY
Frequency
0
5
10
15
12000
14000
16000
18000
MSY
Frequency
0
5
10
15
40000
45000
50000
55000
R.MSY

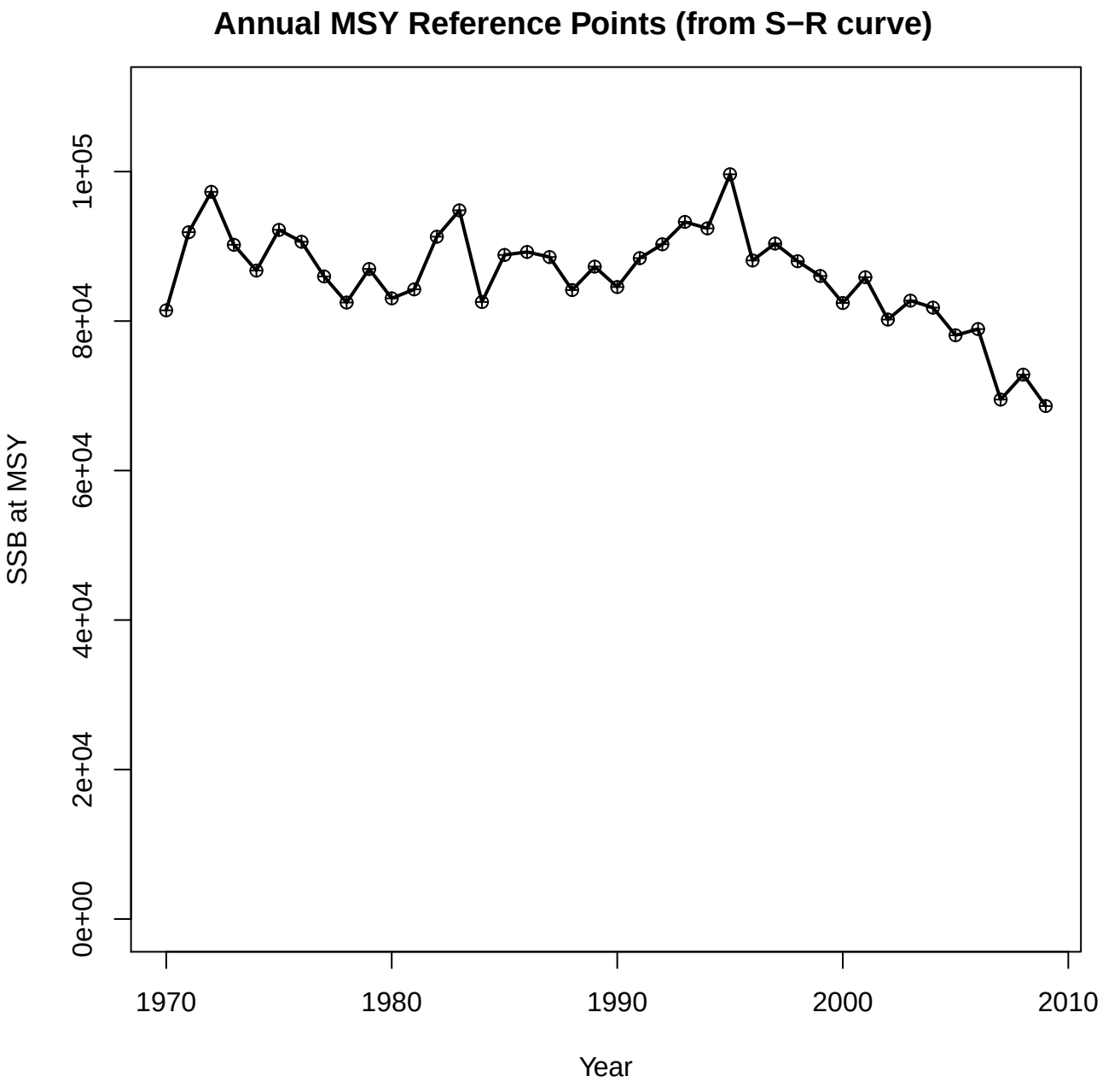

Annual MSY Reference Points (from S−R curve)
Frequency
0
5
10
15
20
0.62
0.64
0.66
0.68
0.70
steepness
Frequency
0
2
4
6
8
10
12
220000
260000
300000
340000
SSB0
Frequency
0
5
10
15
0.36
0.38
0.40
0.42
SPR.MSY
Frequency
0
5
10
15
20600
21000
21400
21800
R0

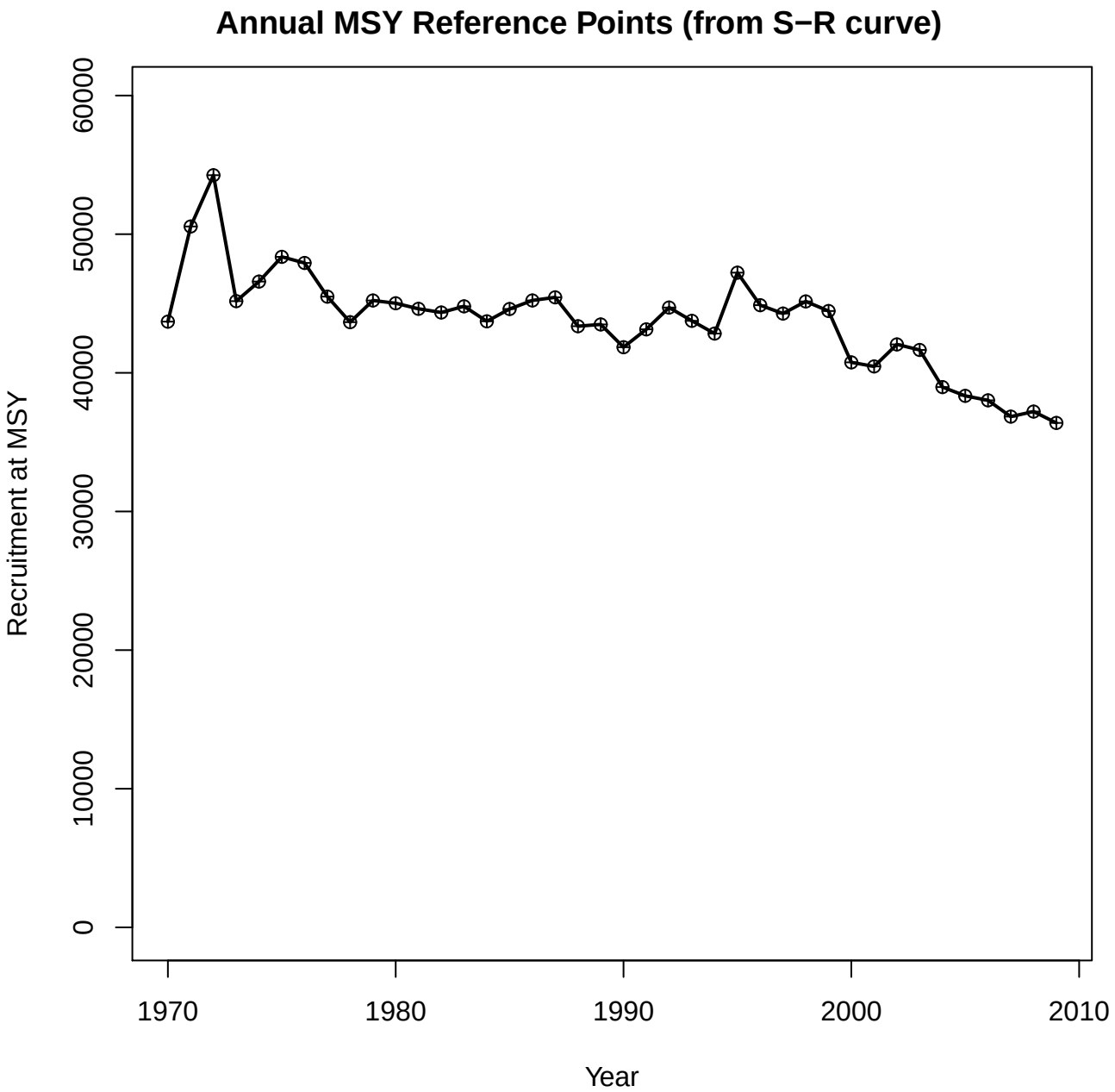

Annual Steepness and SPR.MSY (from S−R curve)
First Year
Last Year
SPR.MSY
0.0
0.2
0.4
0.6
0.8
1.0
0.2
0.4
0.6
0.8
1.0
Steepness

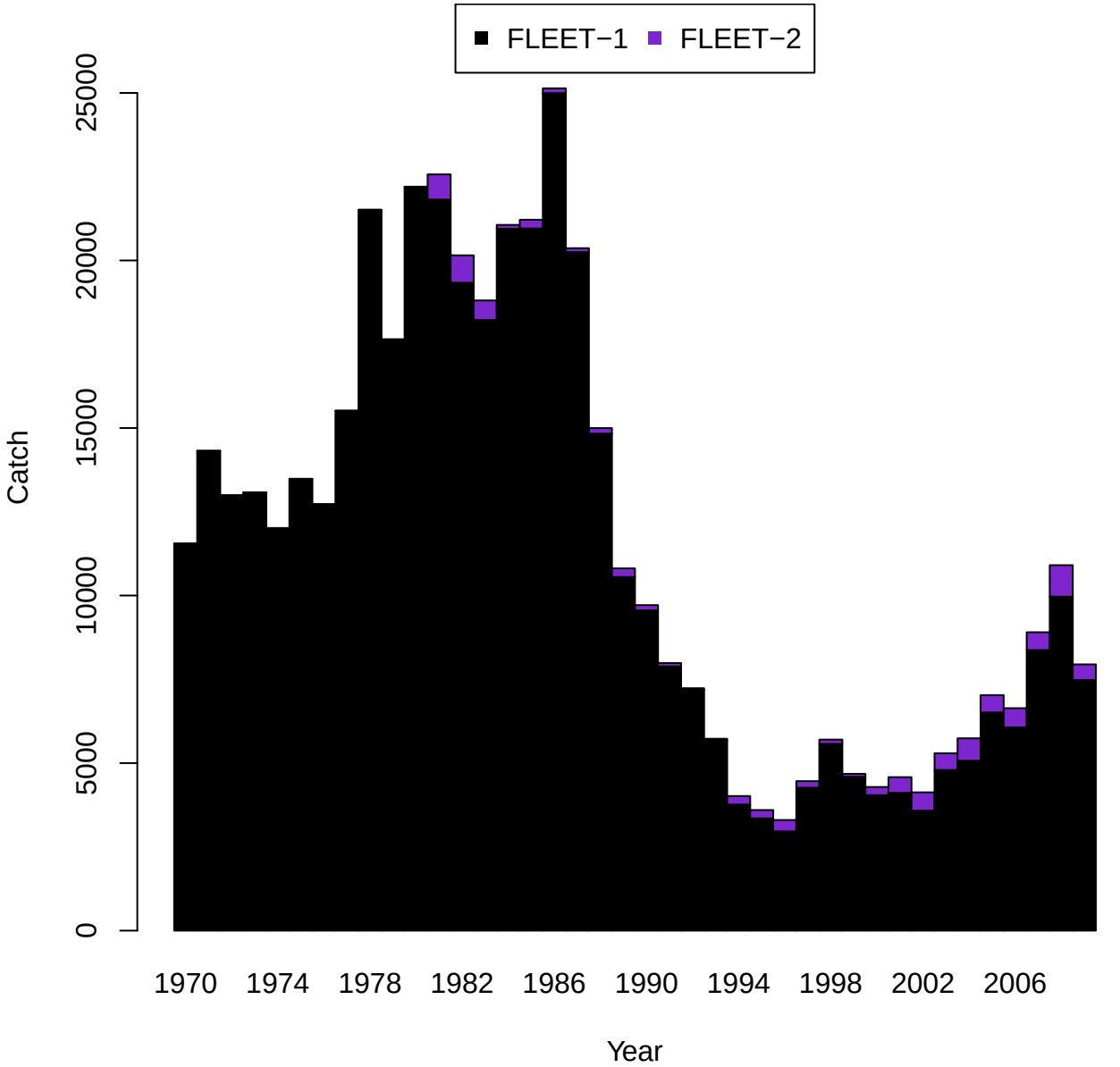

Annual MSY Reference Points (from S−R curve)
Full F at MSY
0.0
0.1
0.2
0.3
0.4
1970
1980
1990
2000
2010
Year

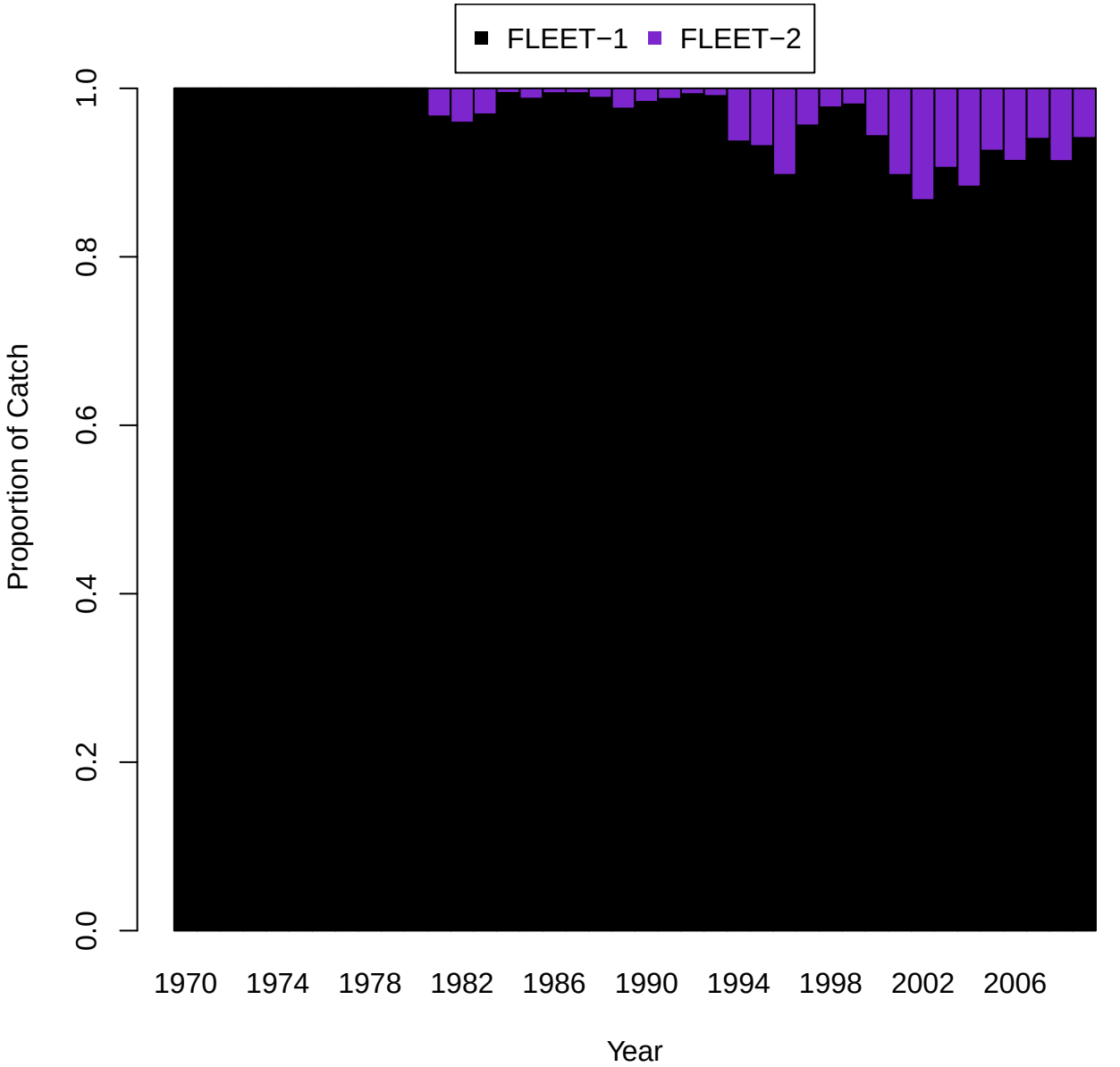

Annual MSY Reference Points (from S−R curve)
MSY
0
5000
10000
15000
20000
1970
1980
1990
2000
2010
Year

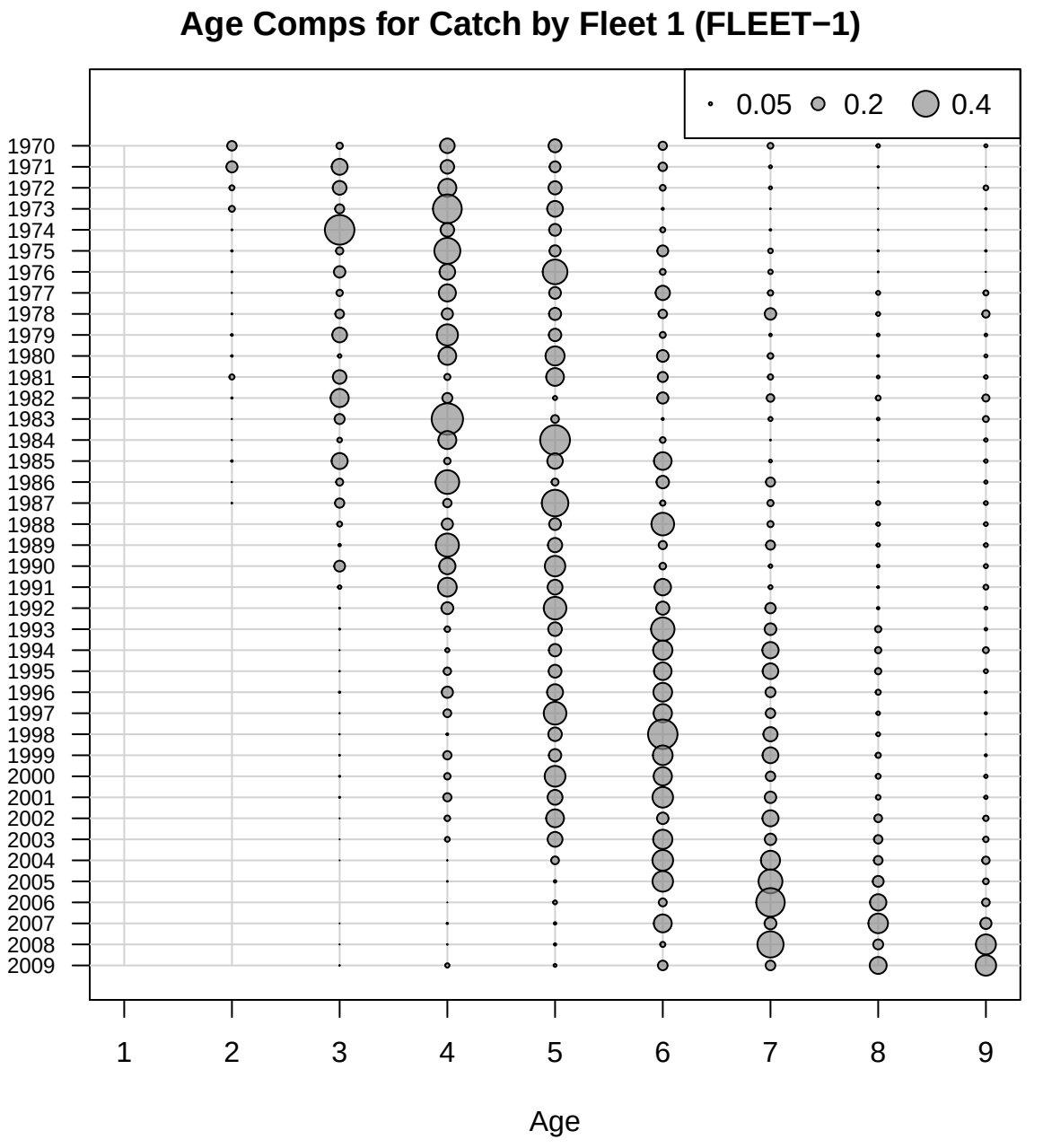

Annual MSY Reference Points (from S−R curve)
%SPR at MSY
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
Year


Annual MSY Reference Points (from S−R curve)
SSB at MSY
0e+00
2e+04
4e+04
6e+04
8e+04
1e+05
1970
1980
1990
2000
2010
Year


Annual MSY Reference Points (from S−R curve)
Recruitment at MSY
0
10000
20000
30000
40000
50000
60000
1970
1980
1990
2000
2010
Year


FLEET−1
FLEET−2
Catch
0
5000
10000
15000
20000
25000
1970
1974
1978
1982
1986
1990
1994
1998
2002
2006
Year


FLEET−1
FLEET−2
Proportion of Catch
0.0
0.2
0.4
0.6
0.8
1.0
1970
1974
1978
1982
1986
1990
1994
1998
2002
2006
Year


Age Comps for Catch by Fleet 1 (FLEET−1)
0.05
0.2
0.4
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
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1997
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2001
2002
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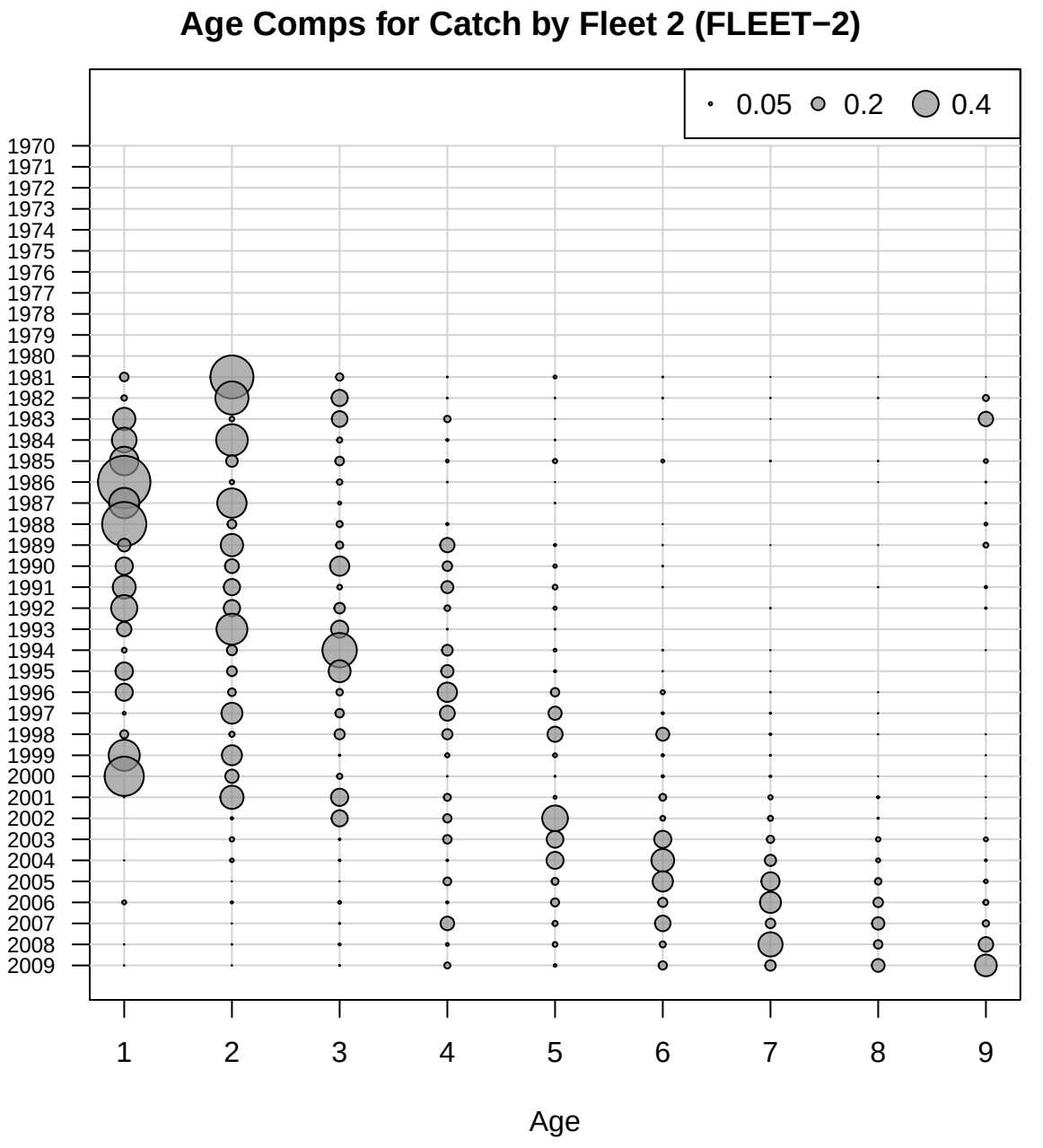
2004
2005
2006
2007
2008
2009
1
2
3
4
5
6
7
8
9
Age


Age Comps for Catch by Fleet 2 (FLEET−2)
0.05
0.2
0.4
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
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2004
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2006
2007
2008
2009
1
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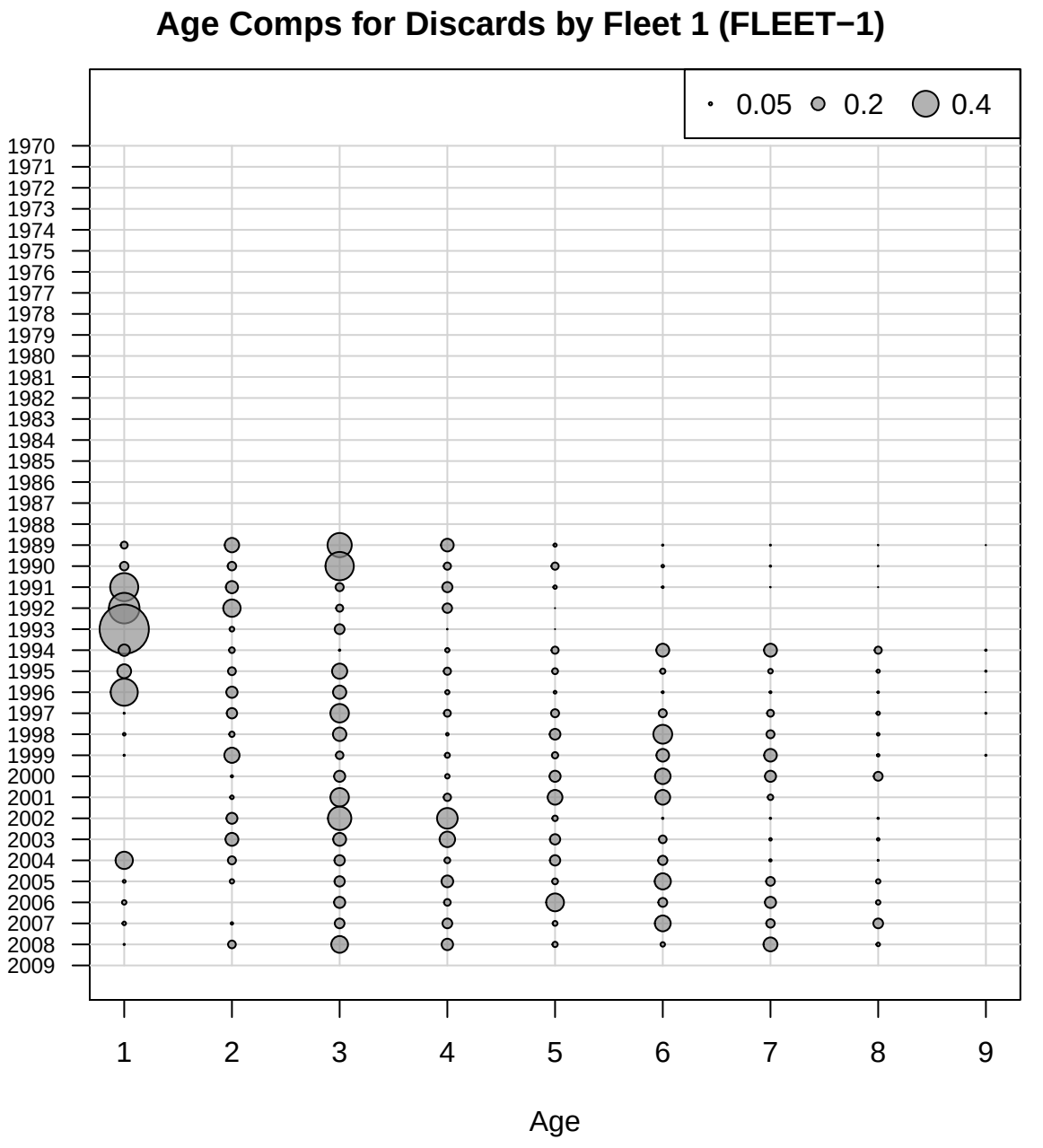
3
4
5
6
7
8
9
Age


Age Comps for Discards by Fleet 1 (FLEET−1)
0.05
0.2
0.4
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
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2002
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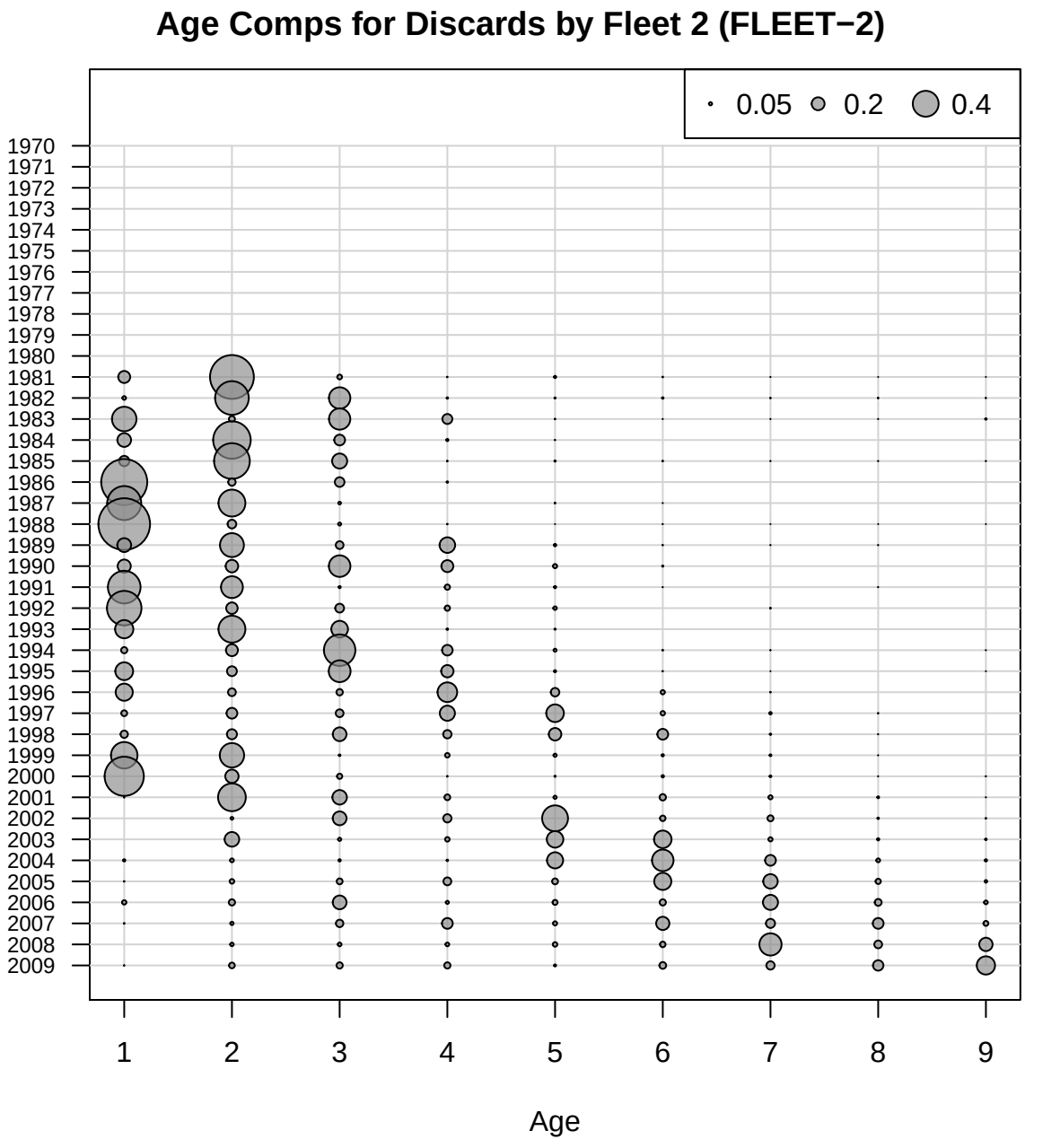
2004
2005
2006
2007
2008
2009
1
2
3
4
5
6
7
8
9
Age


Age Comps for Discards by Fleet 2 (FLEET−2)
0.05
0.2
0.4
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
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2004
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2006
2007
2008
2009
1
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4
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6
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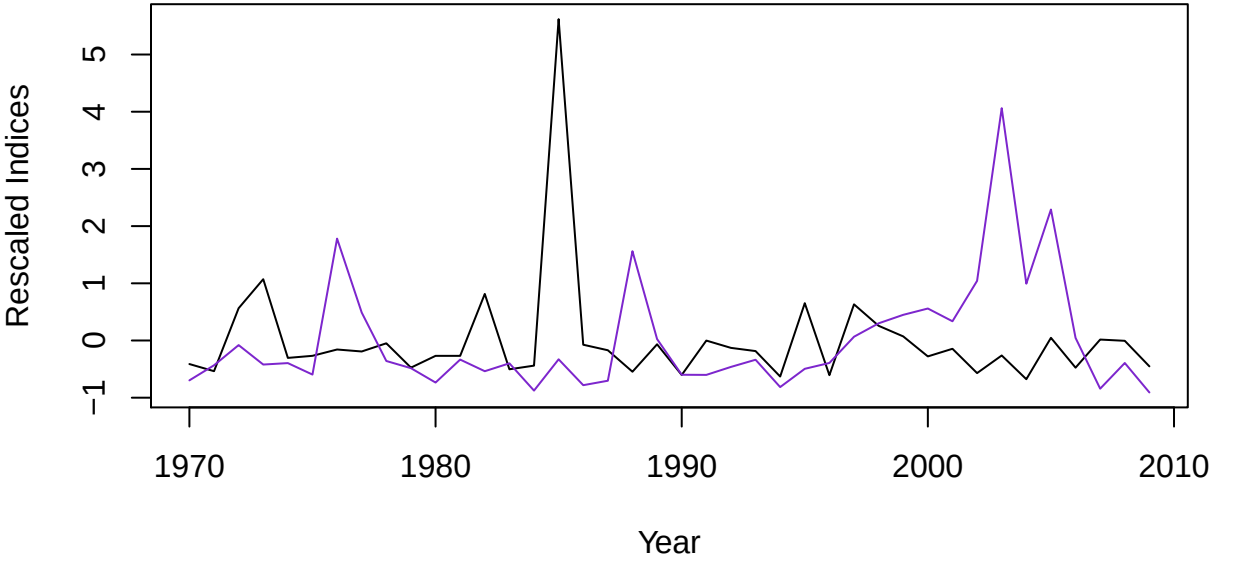
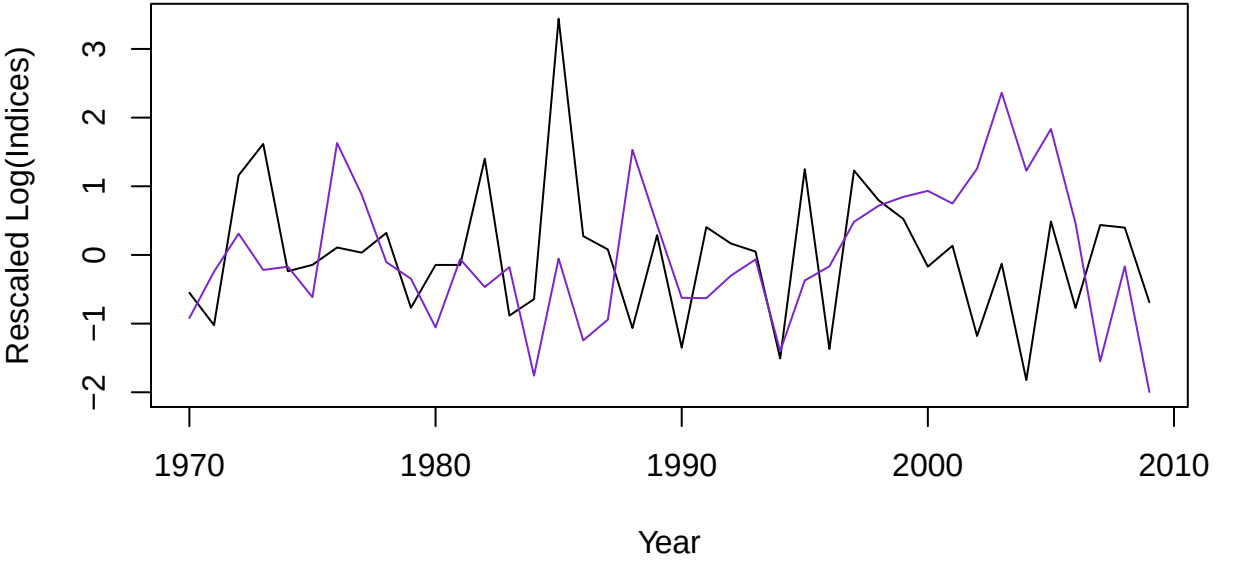
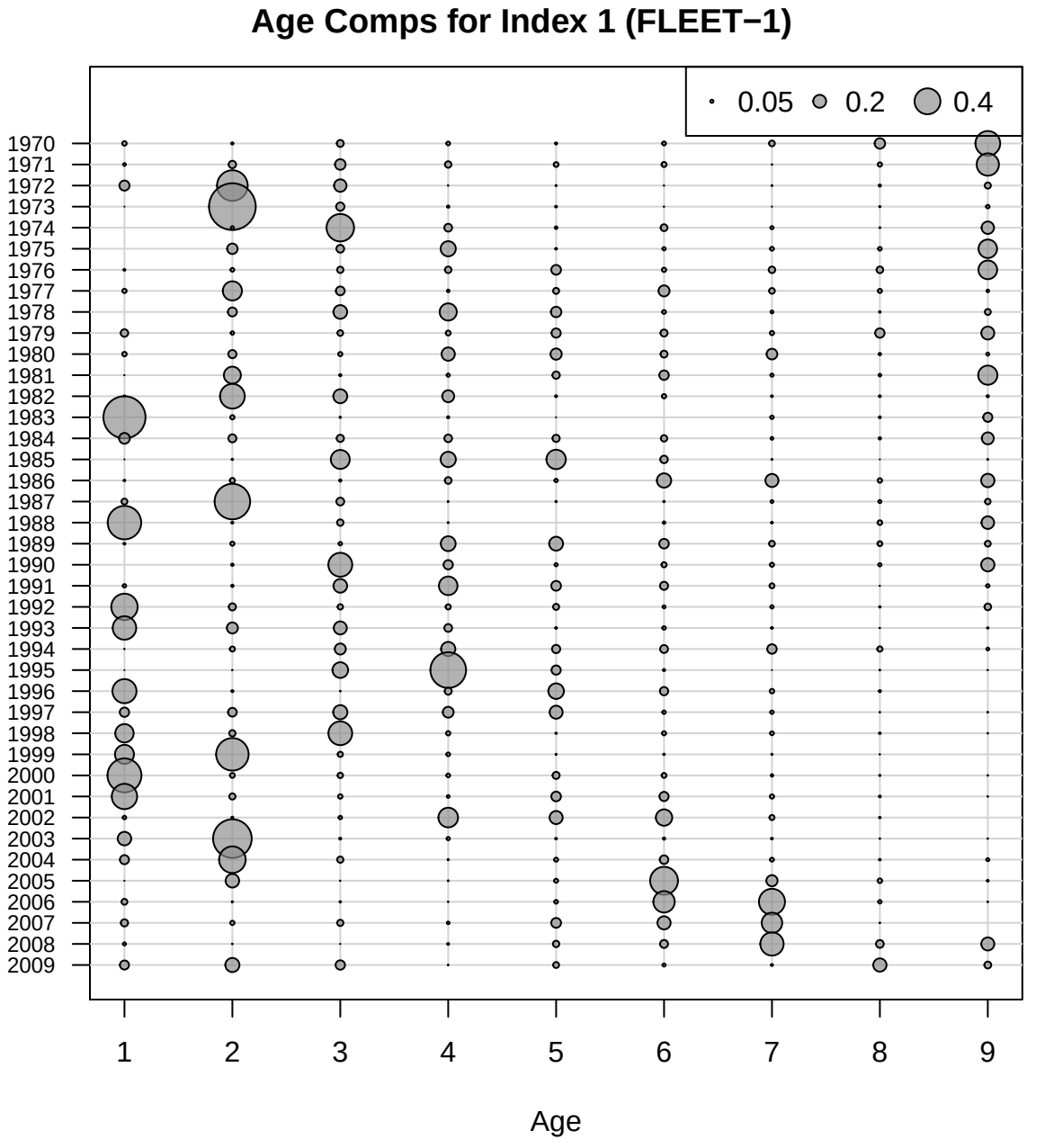
8
9
Age


Rescaled Indices
−1
0
1
2
3
4
5
1970
1980
1990
2000
2010
Year


Rescaled Log(Indices)
−2
−1
0
1
2
3
1970
1980
1990
2000
2010
Year


Age Comps for Index 1 (FLEET−1)
0.05
0.2
0.4
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
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2007
2008
2009
1
2
3
4
5
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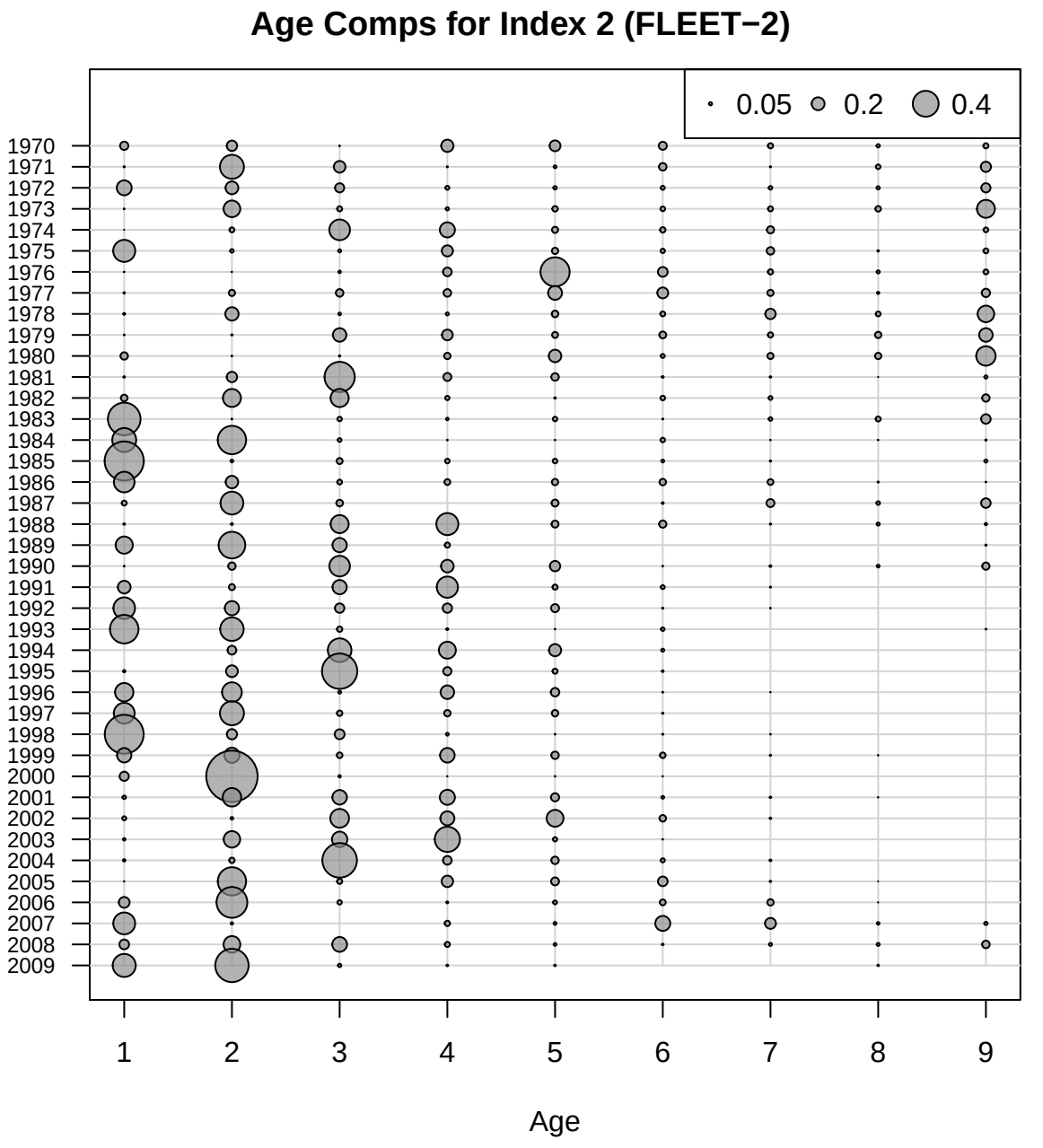
7
8
9
Age


Age Comps for Index 2 (FLEET−2)
0.05
0.2
0.4
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
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2007
2008
2009
1
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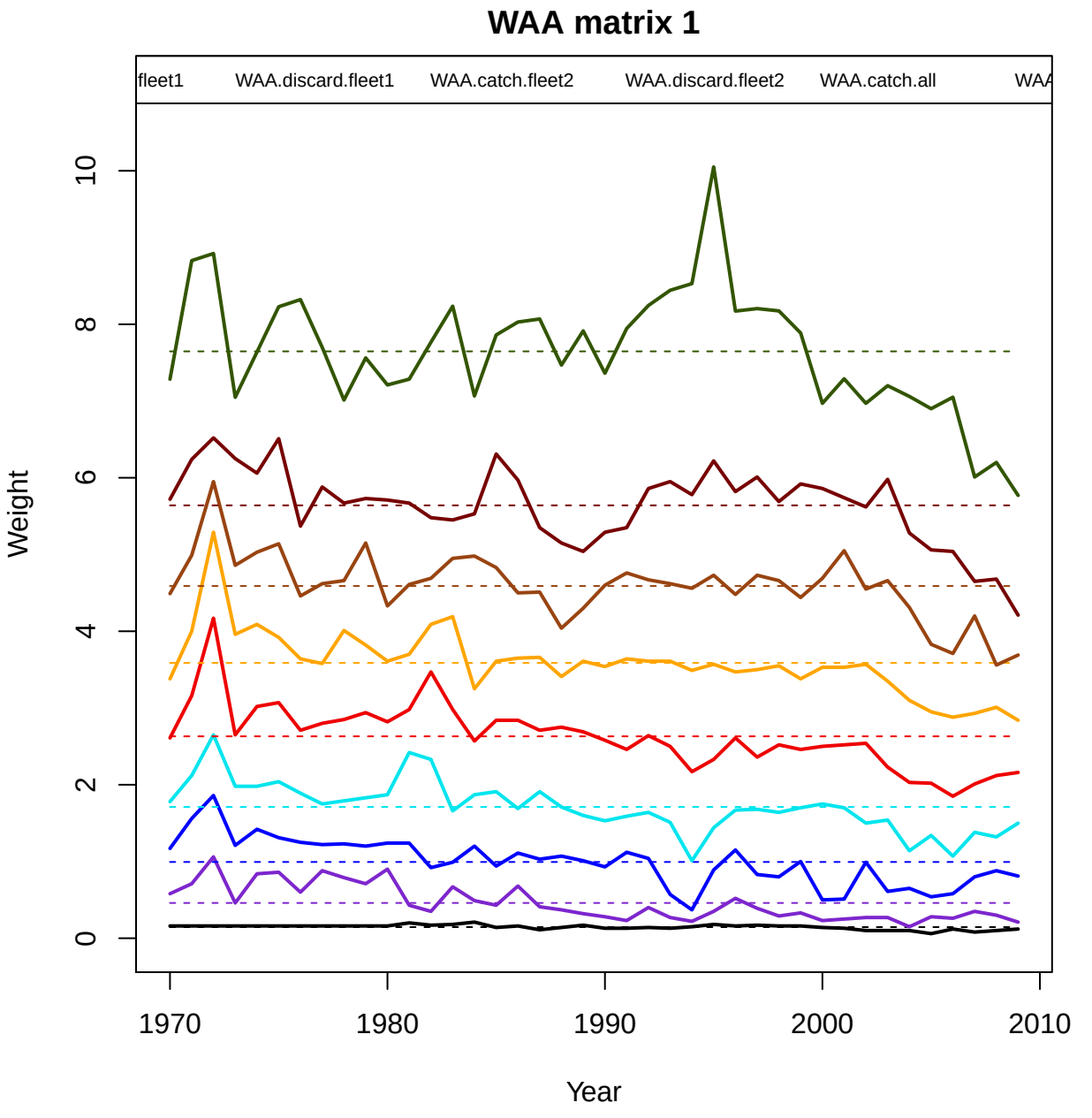
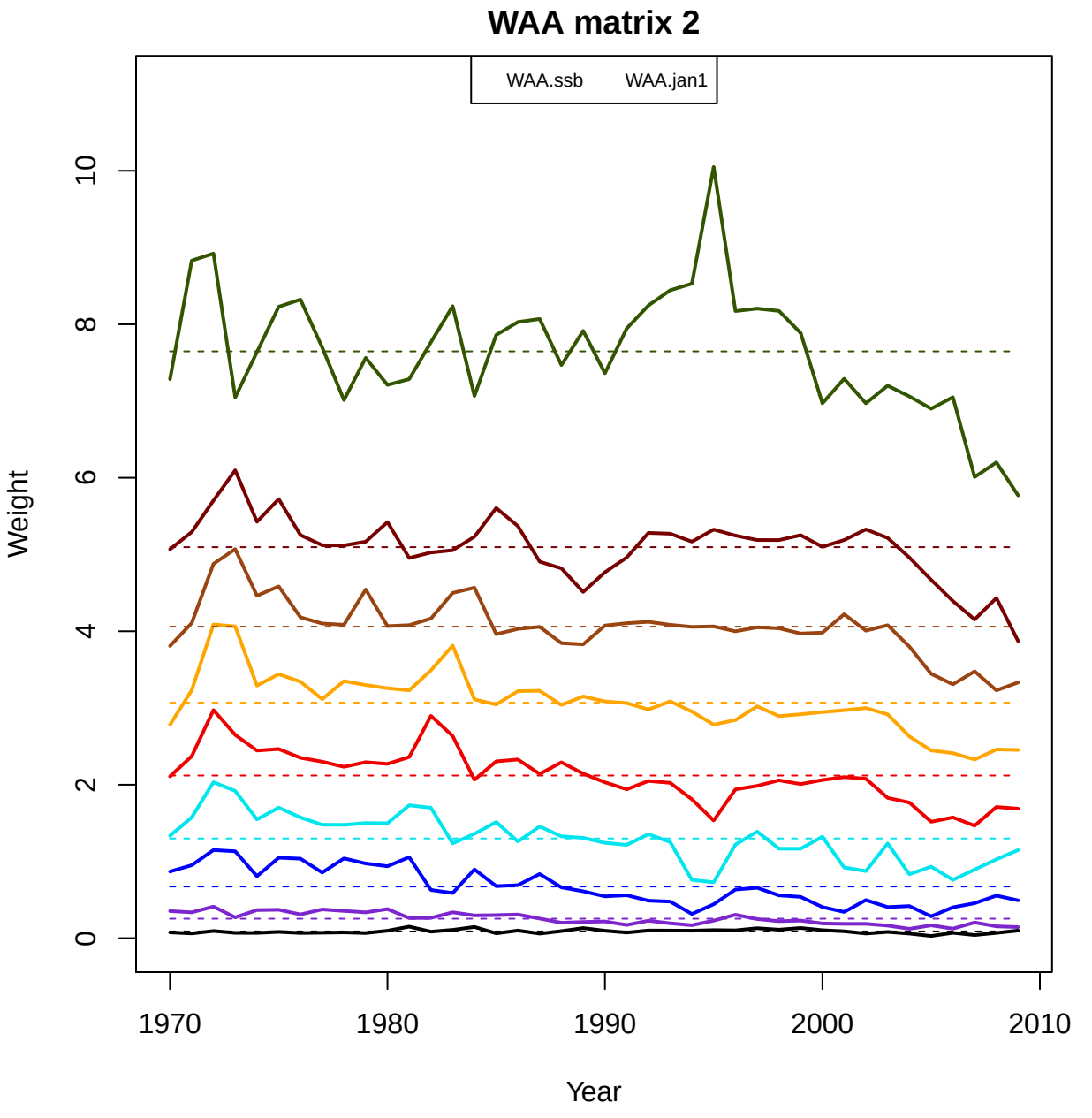
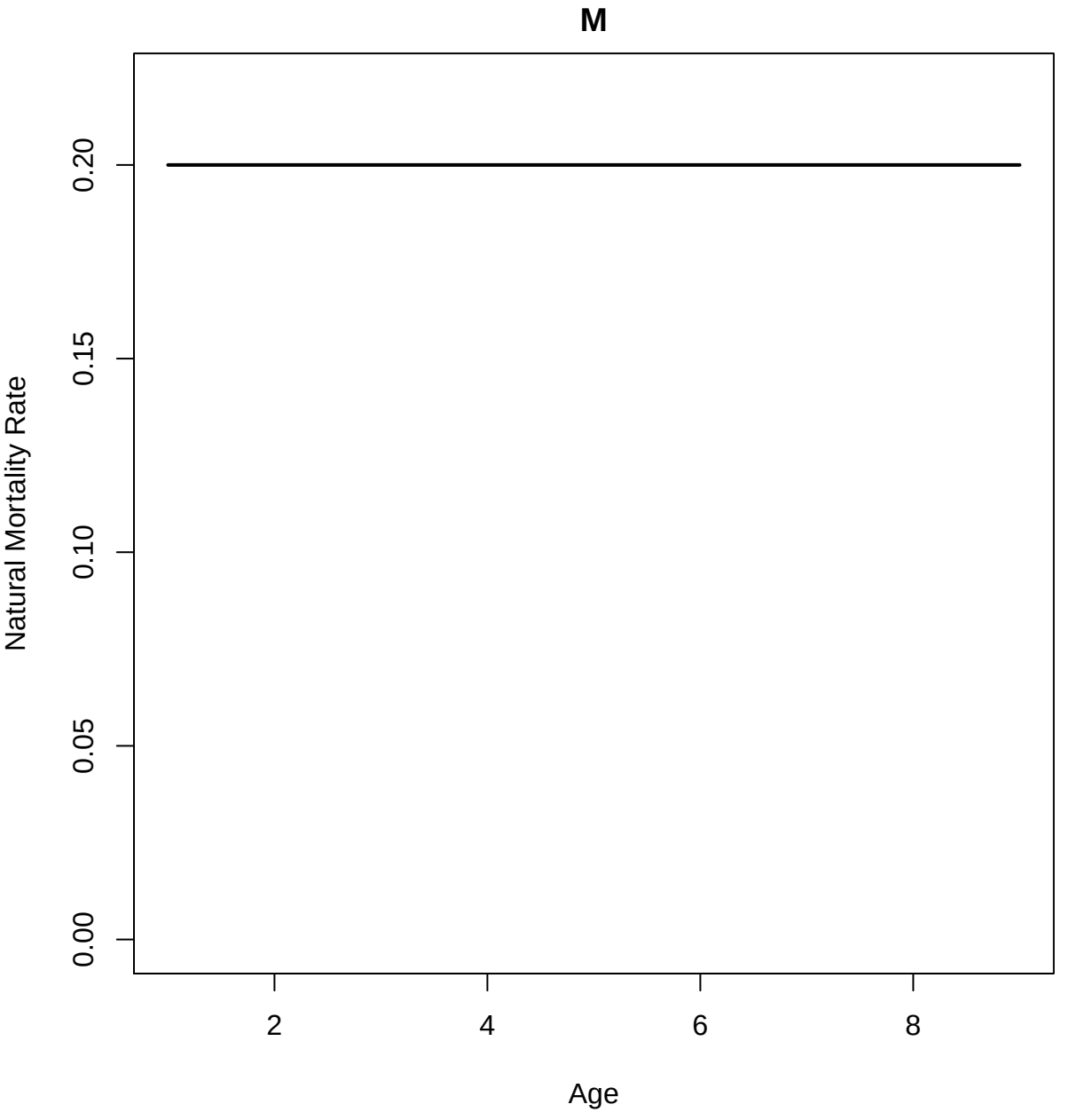
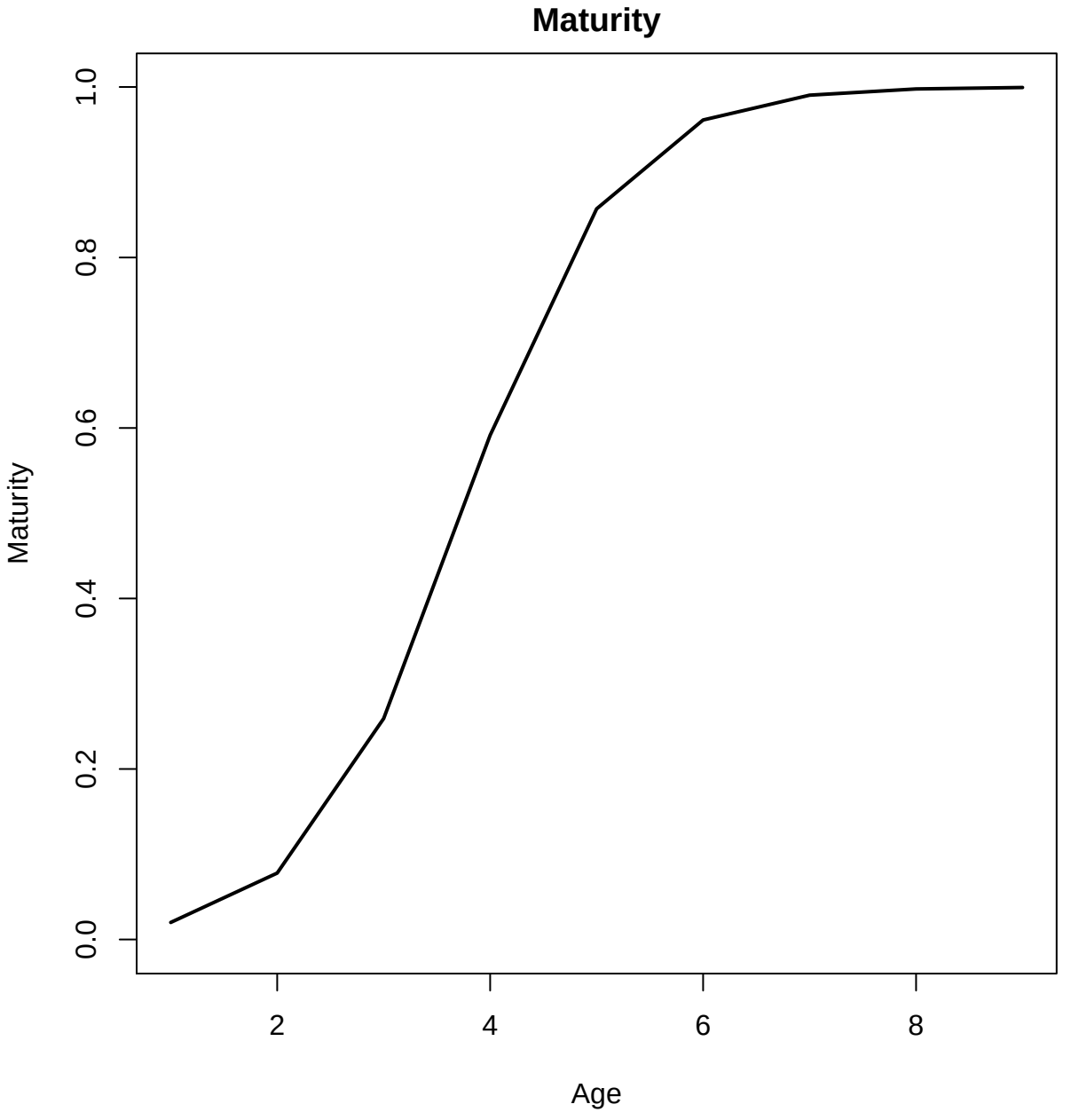
4
5
6
7
8
9
Age


WAA matrix 1
fleet1
WAA.discard.fleet1
WAA.catch.fleet2
WAA.discard.fleet2
WAA.catch.all
WAA
Weight
0
2
4
6
8
10
1970
1980
1990
2000
2010
Year


WAA matrix 2
WAA.ssb
WAA.jan1
Weight
0
2
4
6
8
10
1970
1980
1990
2000
2010
Year


M
Natural Mortality Rate
0.00
0.05
0.10
0.15
0.20
2
4
6
8
Age


Maturity
Maturity
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
Age