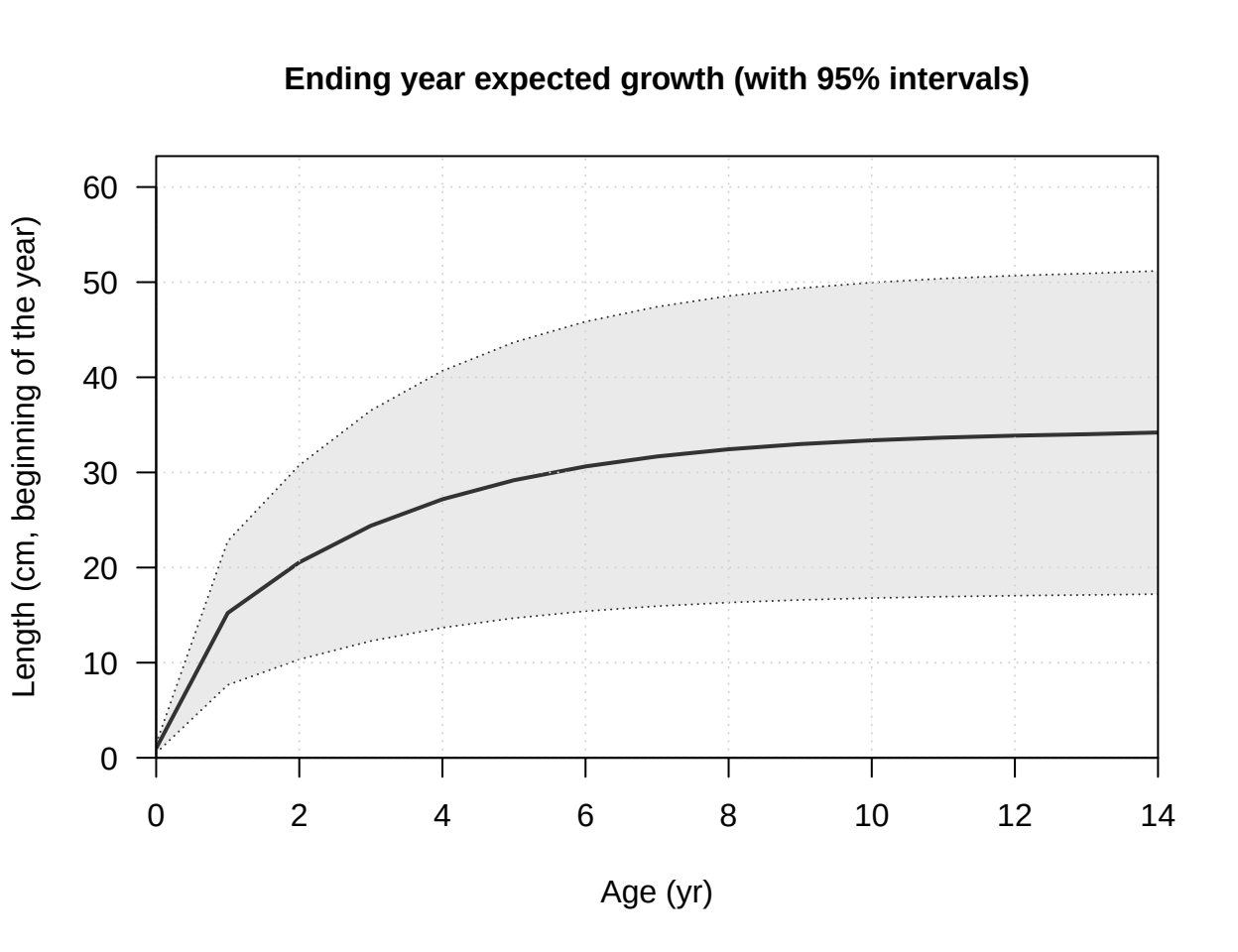
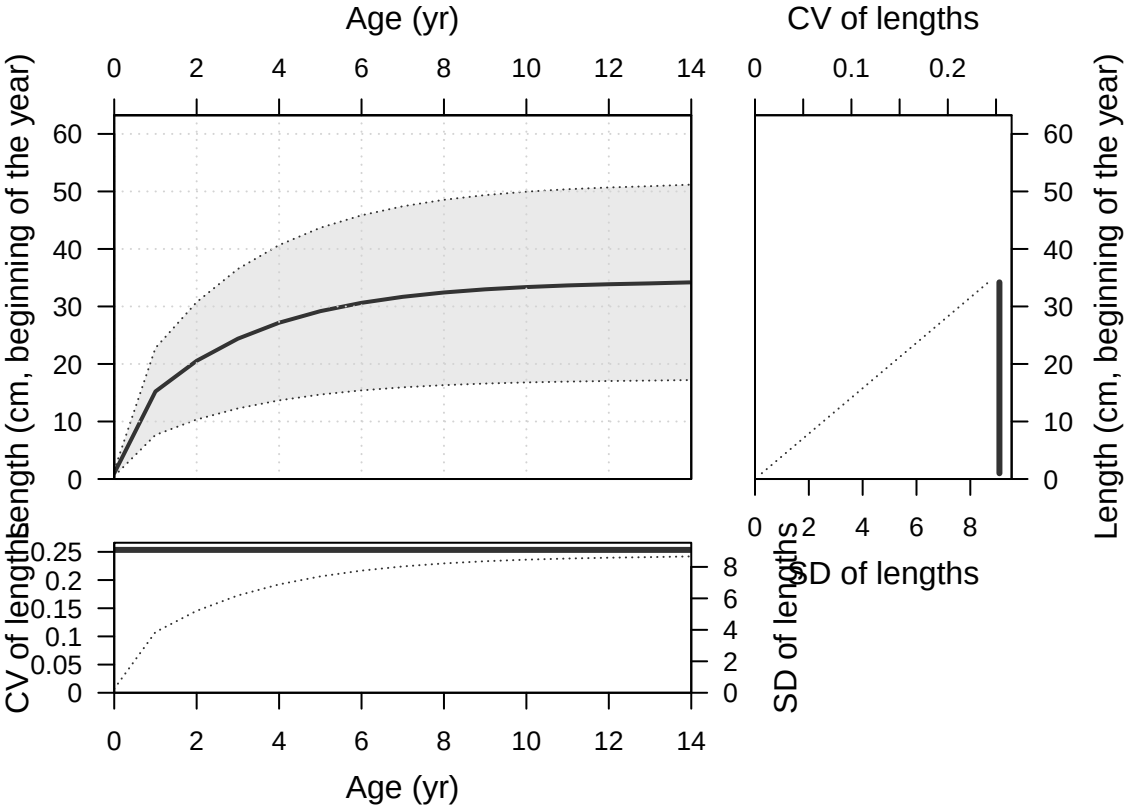
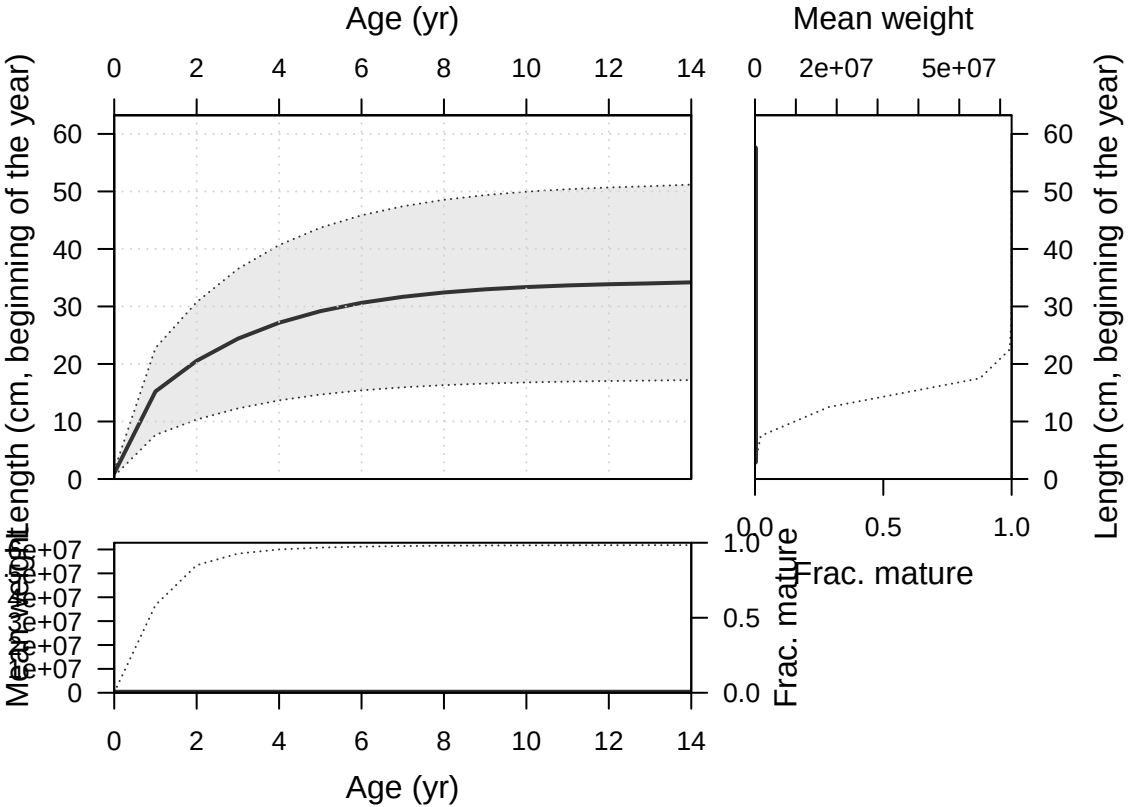
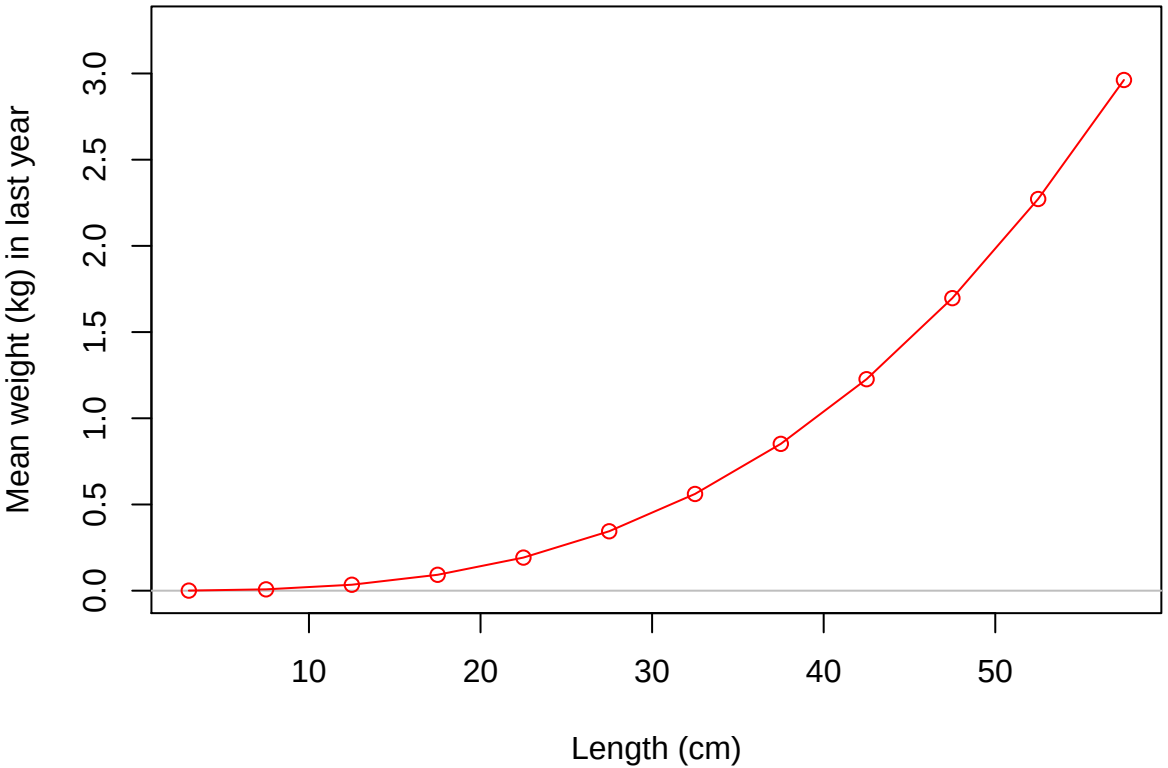
Plots created using the 'r4ss' package in R
Stock Synthesis version: SS−V3.24Y

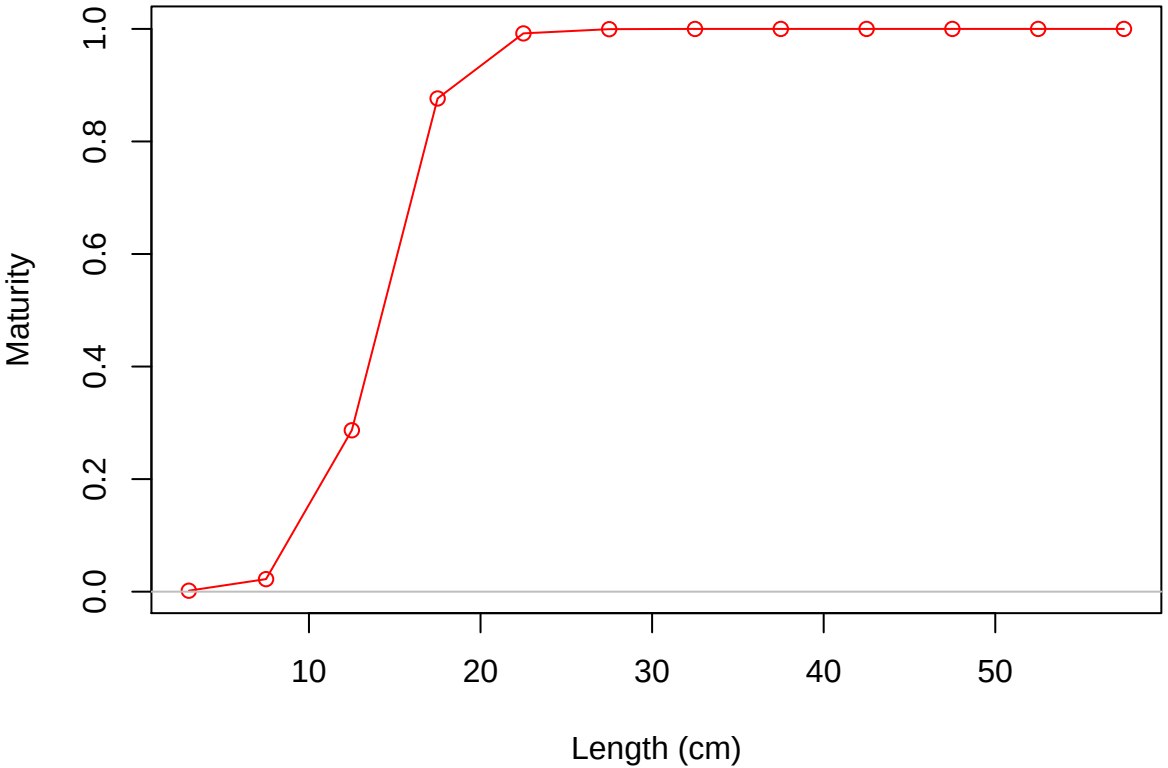
Data_File: vermilion.dat
Control_File: vermilion.ctl

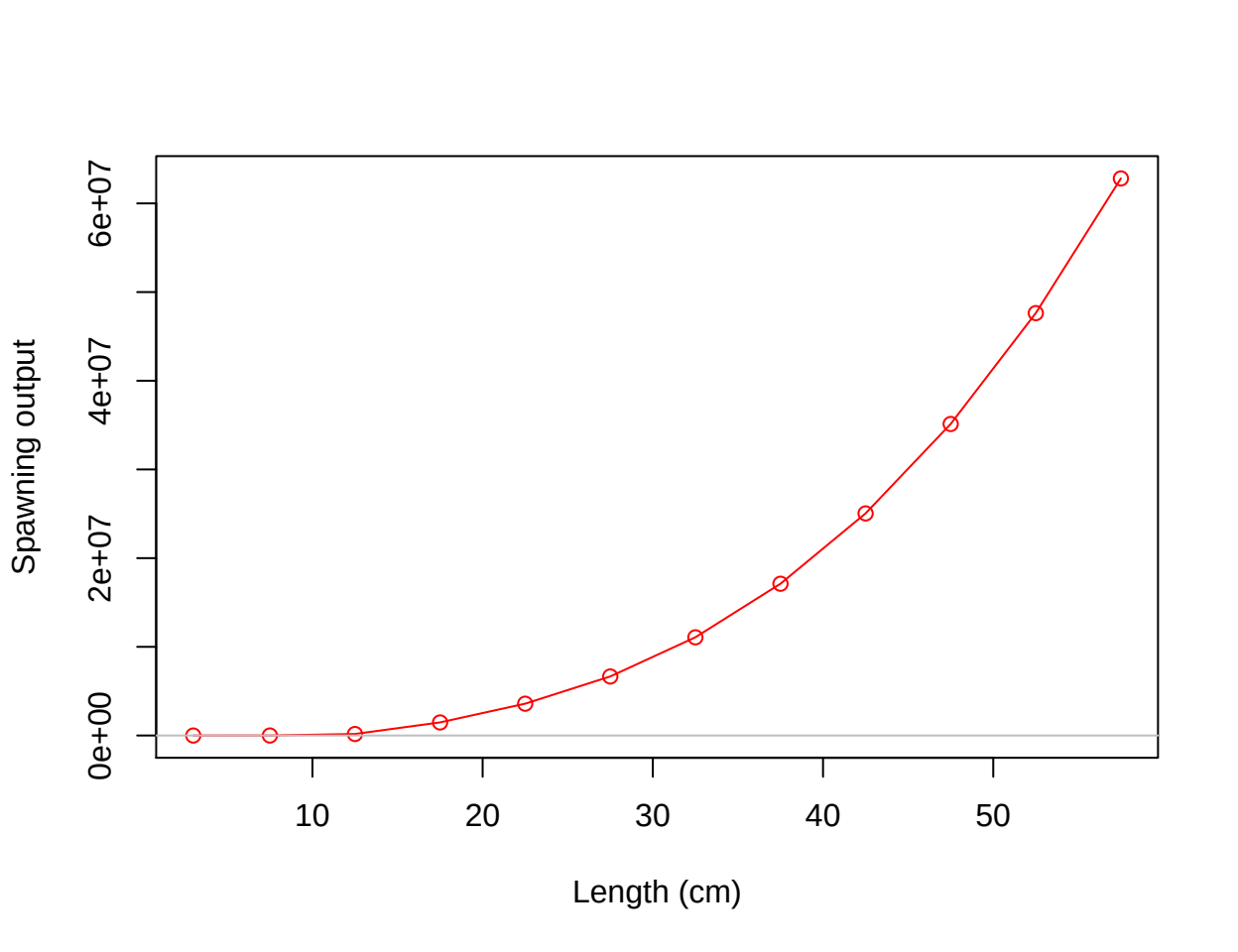

Ending year expected growth (with 95% intervals)
Length (cm, beginning of the year)
0
10
20
30
40
50
60
0
2
4
6
8
10
12
14
Age (yr)

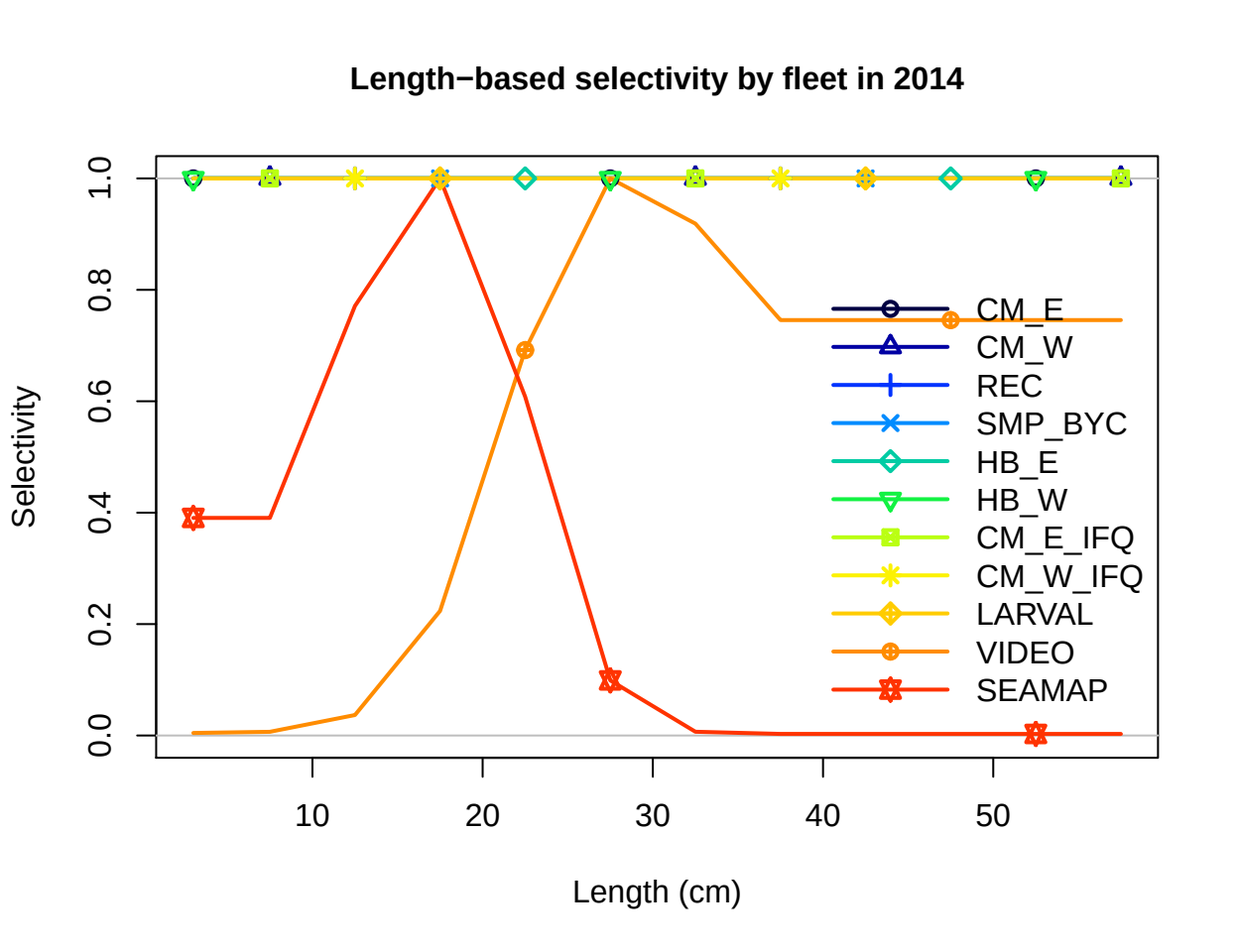

Age (yr)
CV of lengths
Length (cm, beginning of the year)
CV of lengths
SD of lengths
Age (yr)
SD of lengths

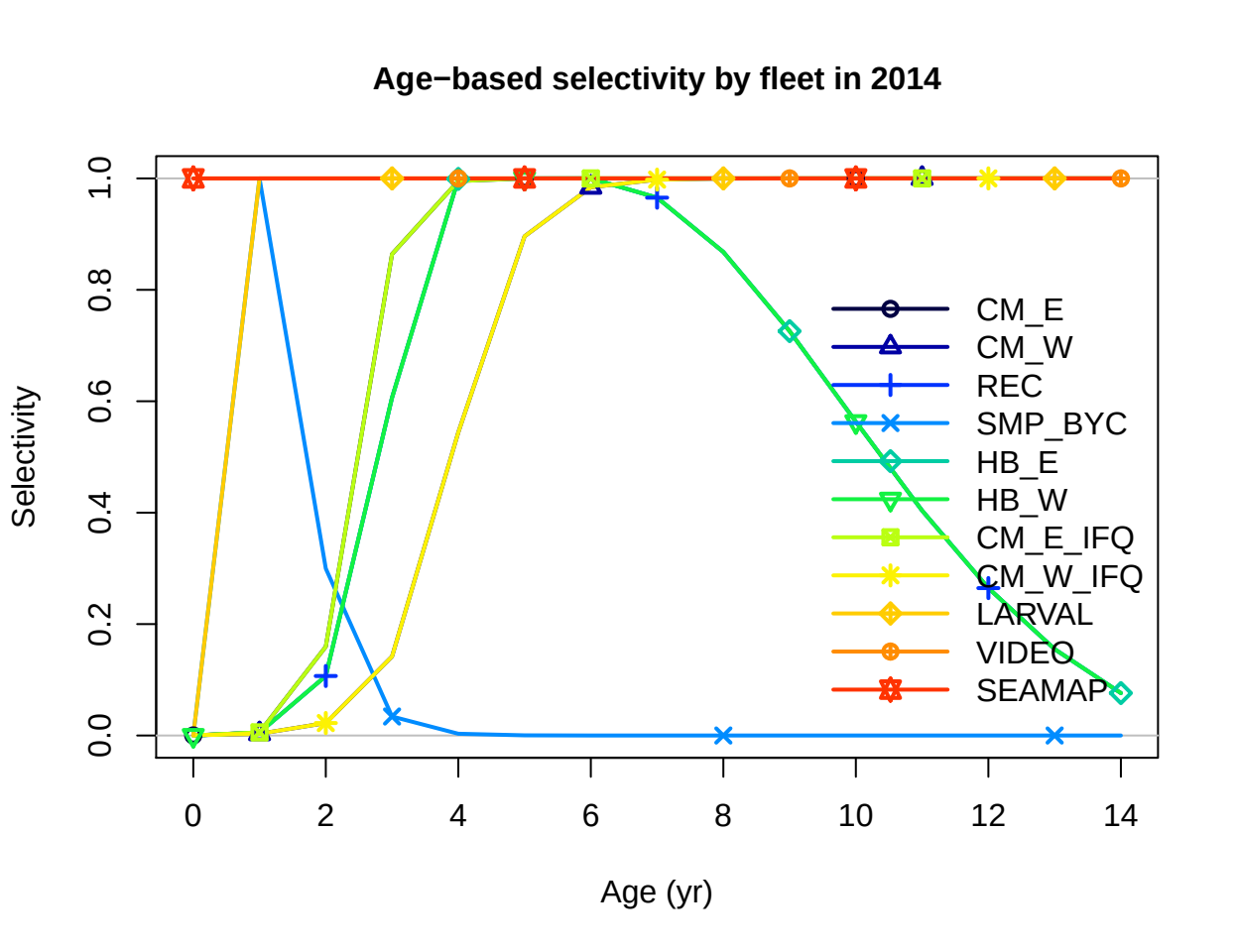

Age (yr)
0
2
4
6
8
10
12
14
Length (cm, beginning of the year)
0
10
20
30
40
50
60
Mean weight
0
2e+07
5e+07
Frac. mature
0.0
0.5
1.0

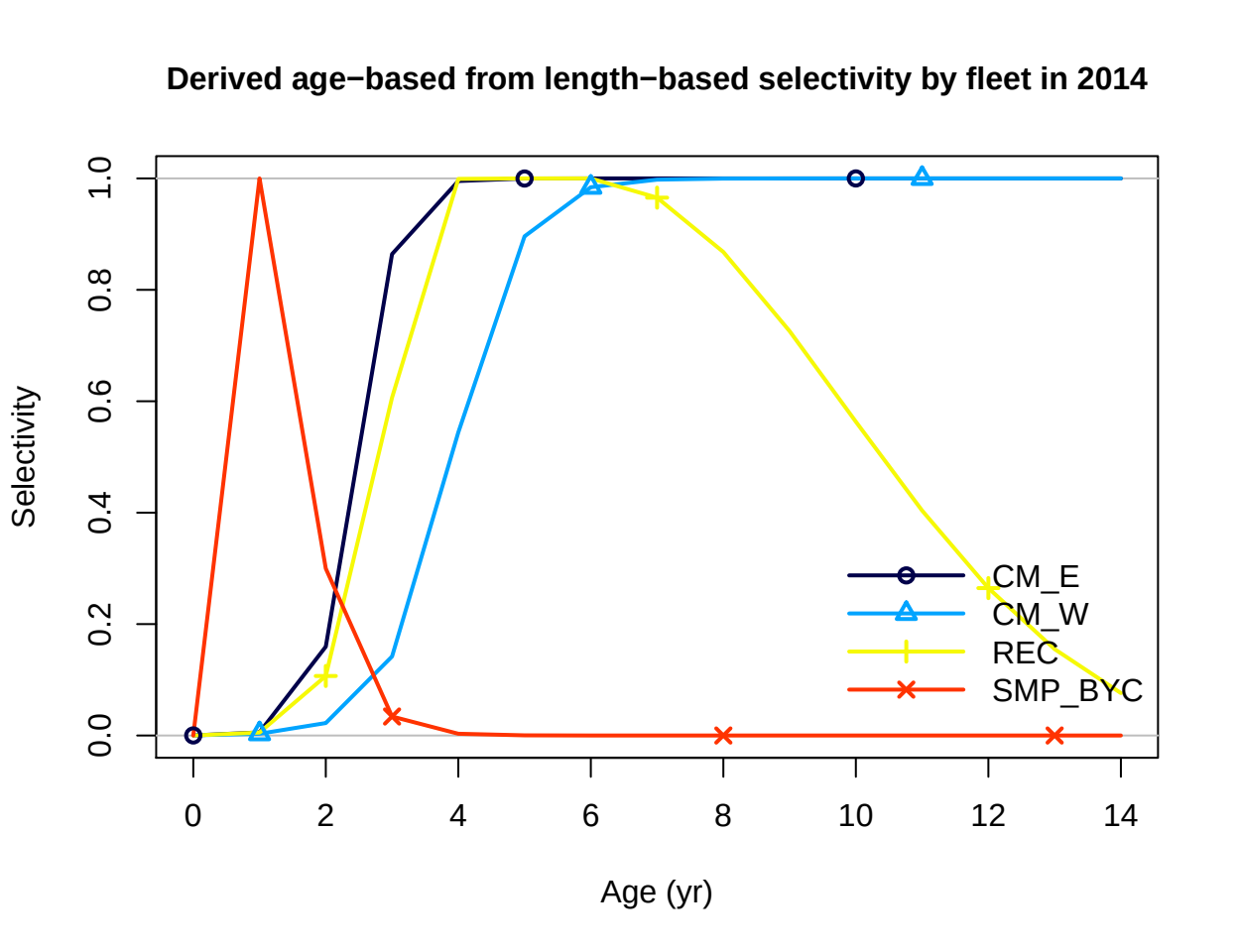

Mean weight (kg) in last year
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
20
30
40
50
Length (cm)

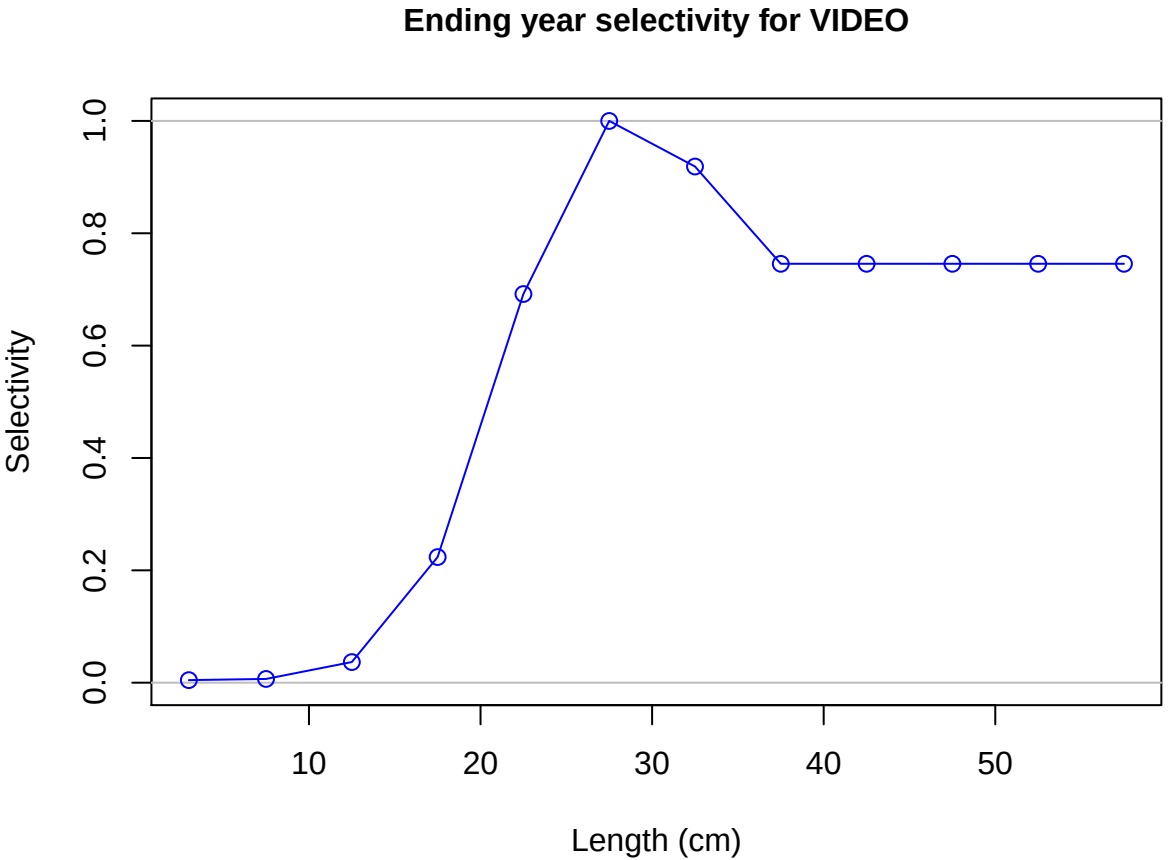

Maturity
0.0
0.2
0.4
0.6
0.8
1.0
10
20
30
40
50
Length (cm)

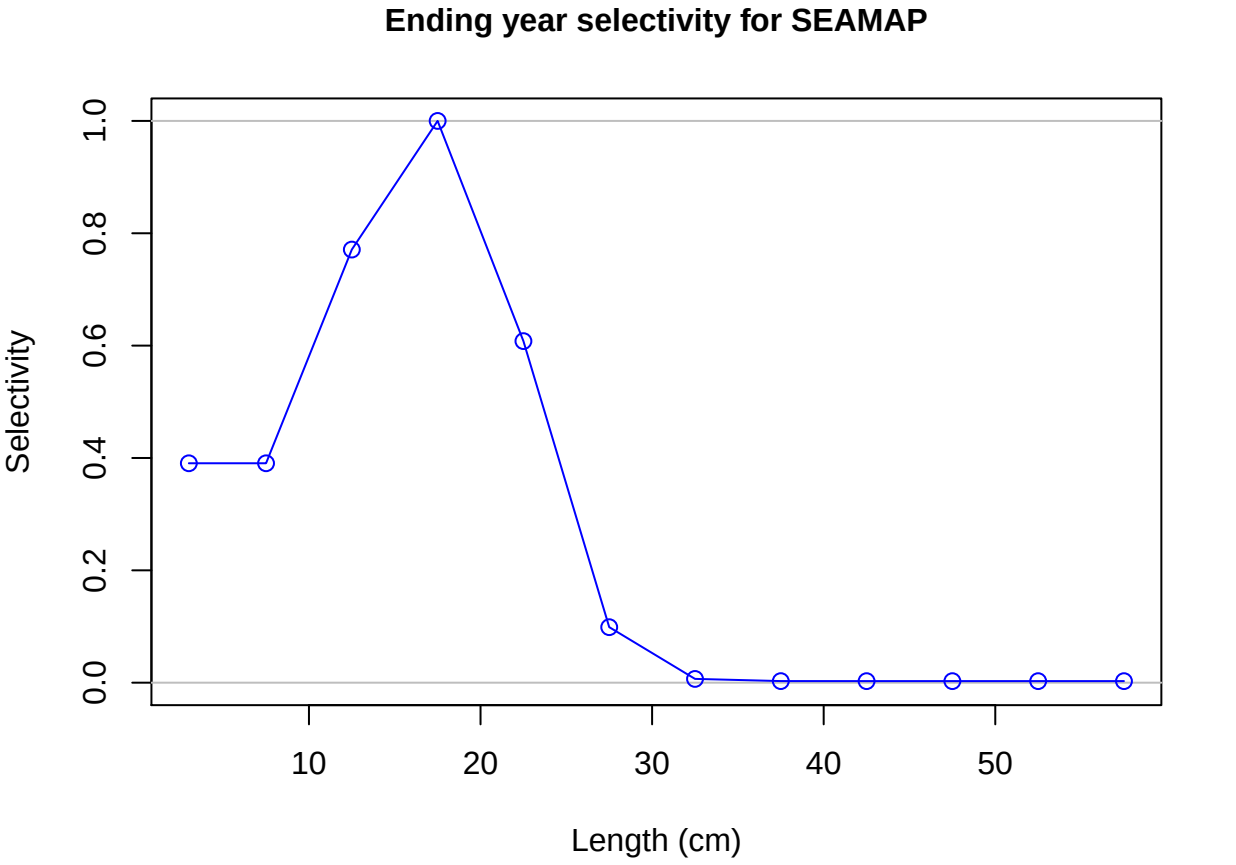

Spawning output
0e+00
2e+07
4e+07
6e+07
10
20
30
40
50
Length (cm)

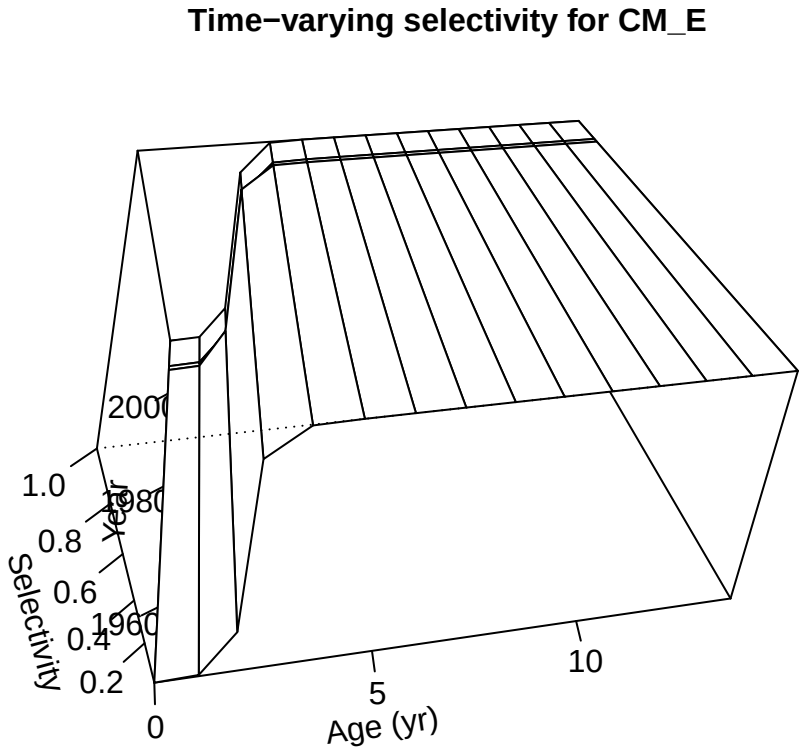

Length−based selectivity by fleet in 2014
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
10
20
30
40
50
Length (cm)
CM_E
CM_W
REC
SMP_BYC
HB_E
HB_W
CM_E_IFQ
CM_W_IFQ
LARVAL
VIDEO
SEAMAP

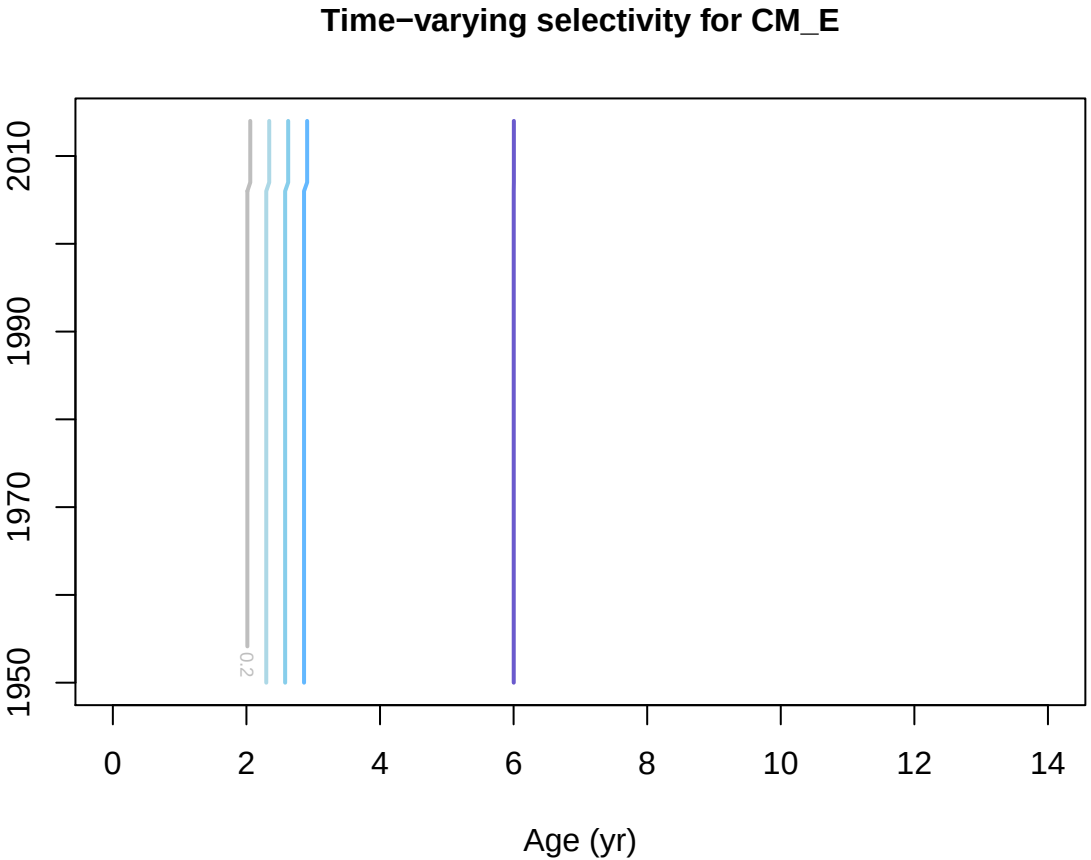

Age−based selectivity by fleet in 2014
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)
CM_E
CM_W
REC
SMP_BYC
HB_E
HB_W
CM_E_IFQ
CM_W_IFQ
LARVAL
VIDEO
SEAMAP

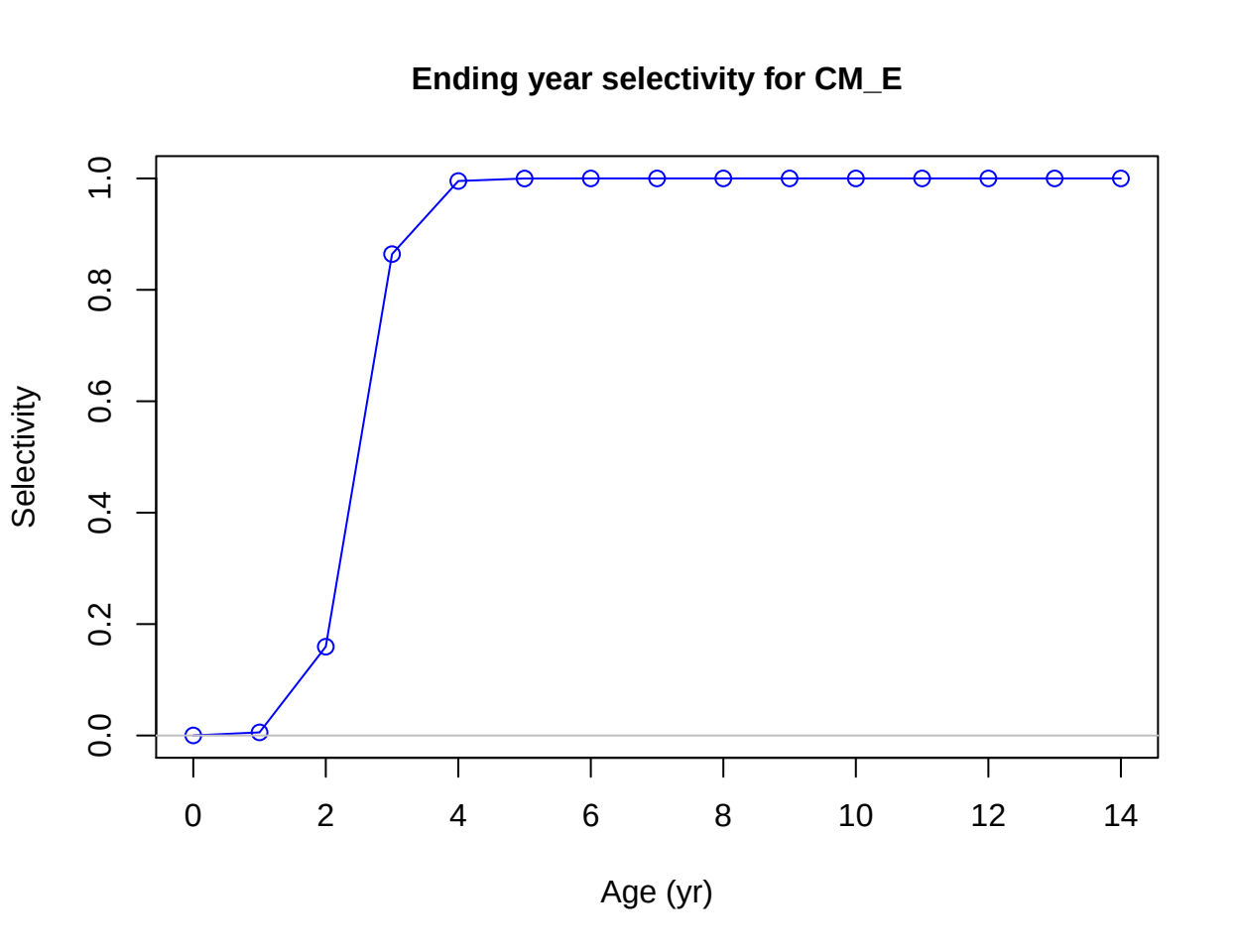

Derived age−based from length−based selectivity by fleet in 2014
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)
CM_E
CM_W
REC
SMP_BYC

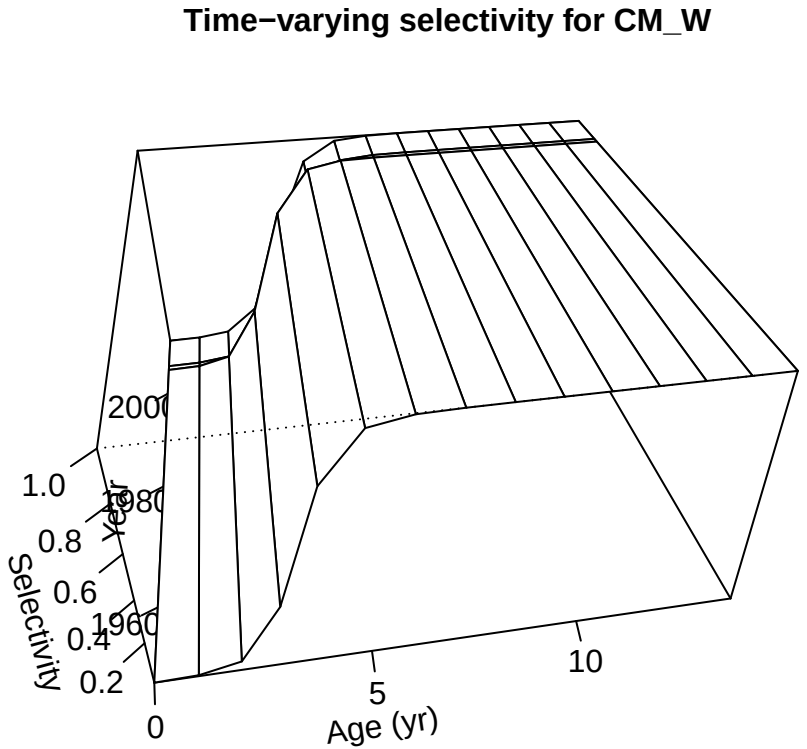

Ending year selectivity for VIDEO
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
10
20
30
40
50
Length (cm)

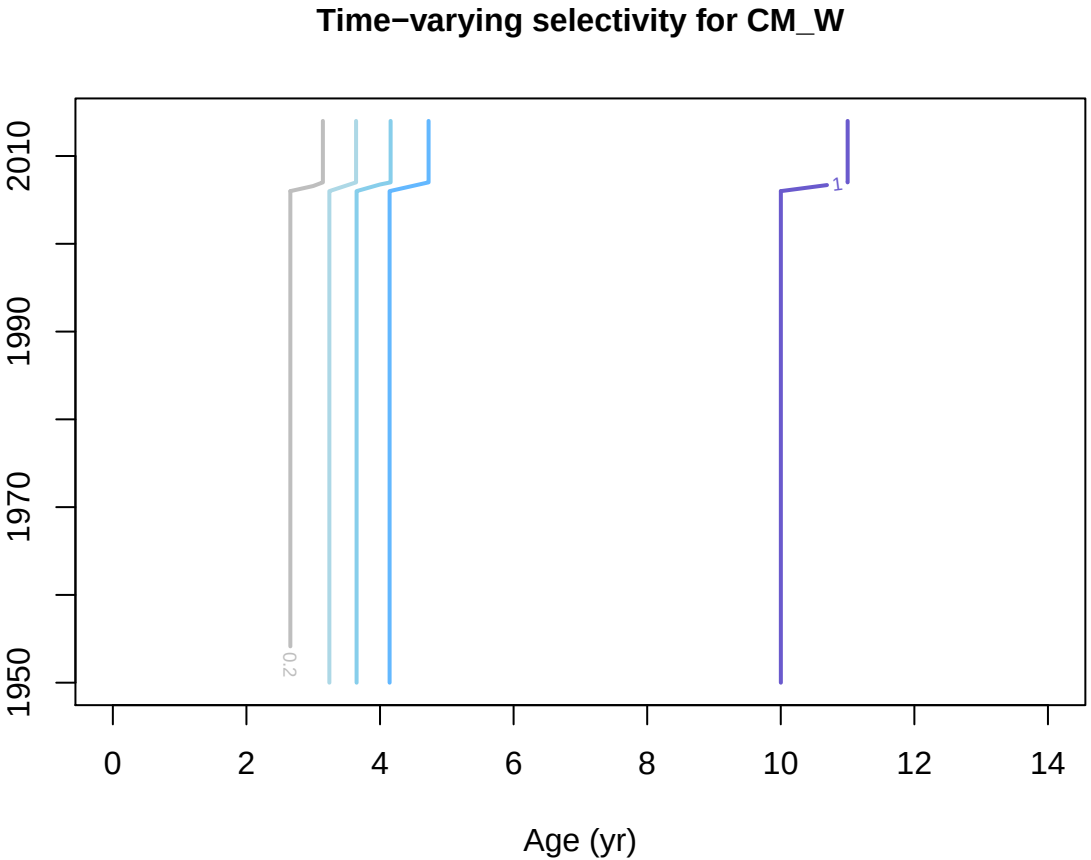

Ending year selectivity for SEAMAP
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
10
20
30
40
50
Length (cm)

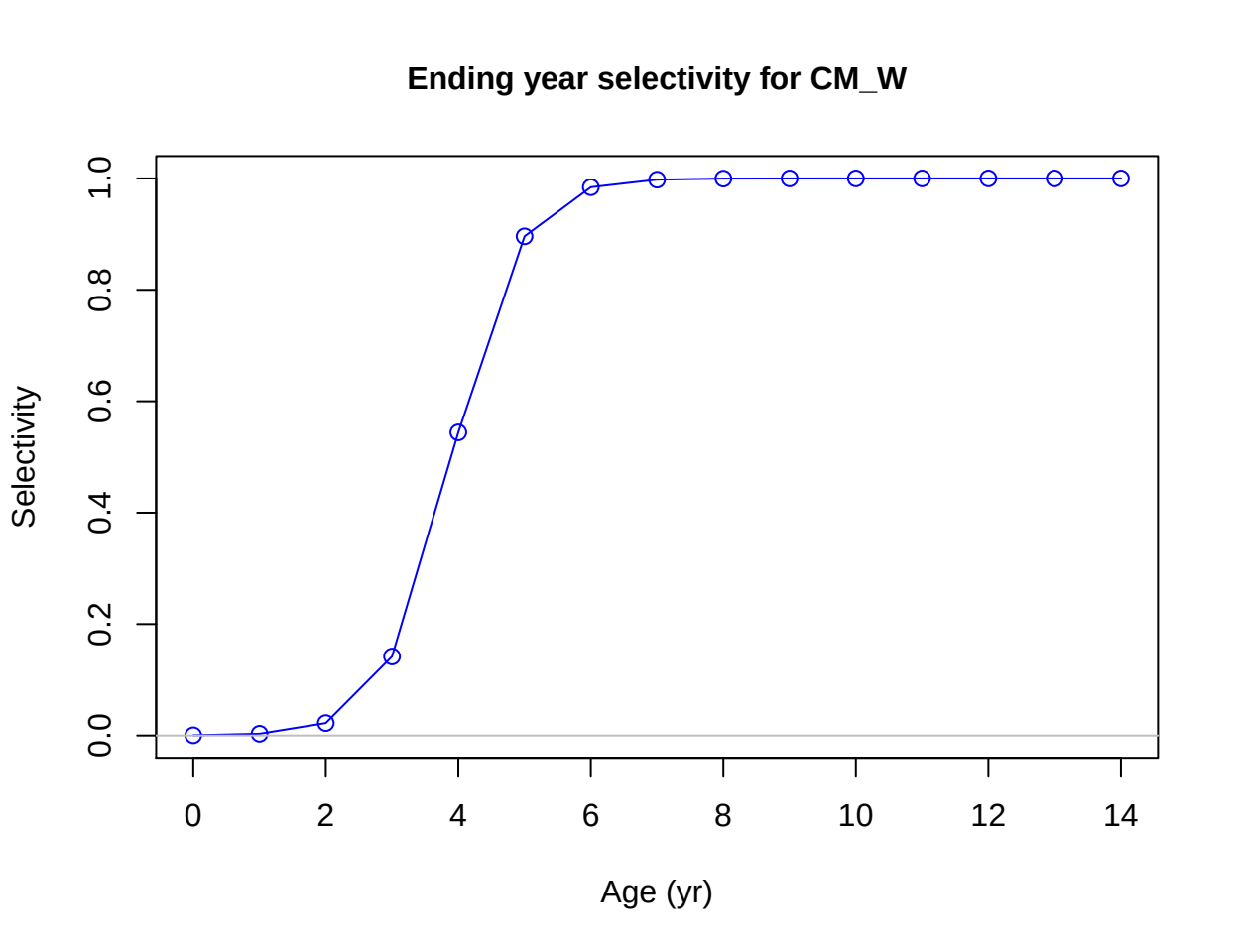

Time−varying selectivity for CM_E
Selectivity
1.0
0.8
0.6
0.4
0.2
Year
2000
1980
1960
0
5
10
Age (yr)

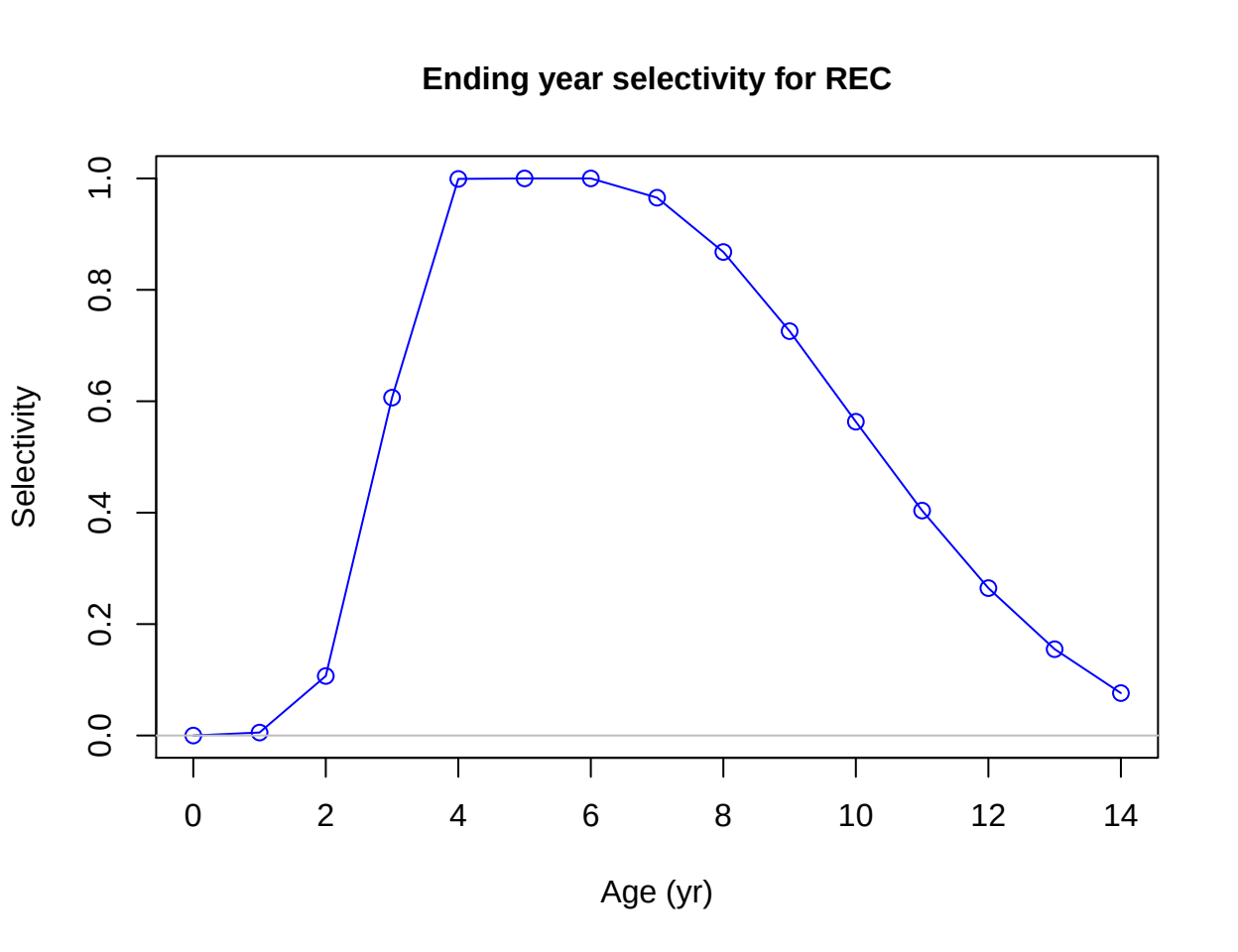

Time−varying selectivity for CM_E
2010
1990
1970
1950
0.2
0
2
4
6
8
10
12
14
Age (yr)

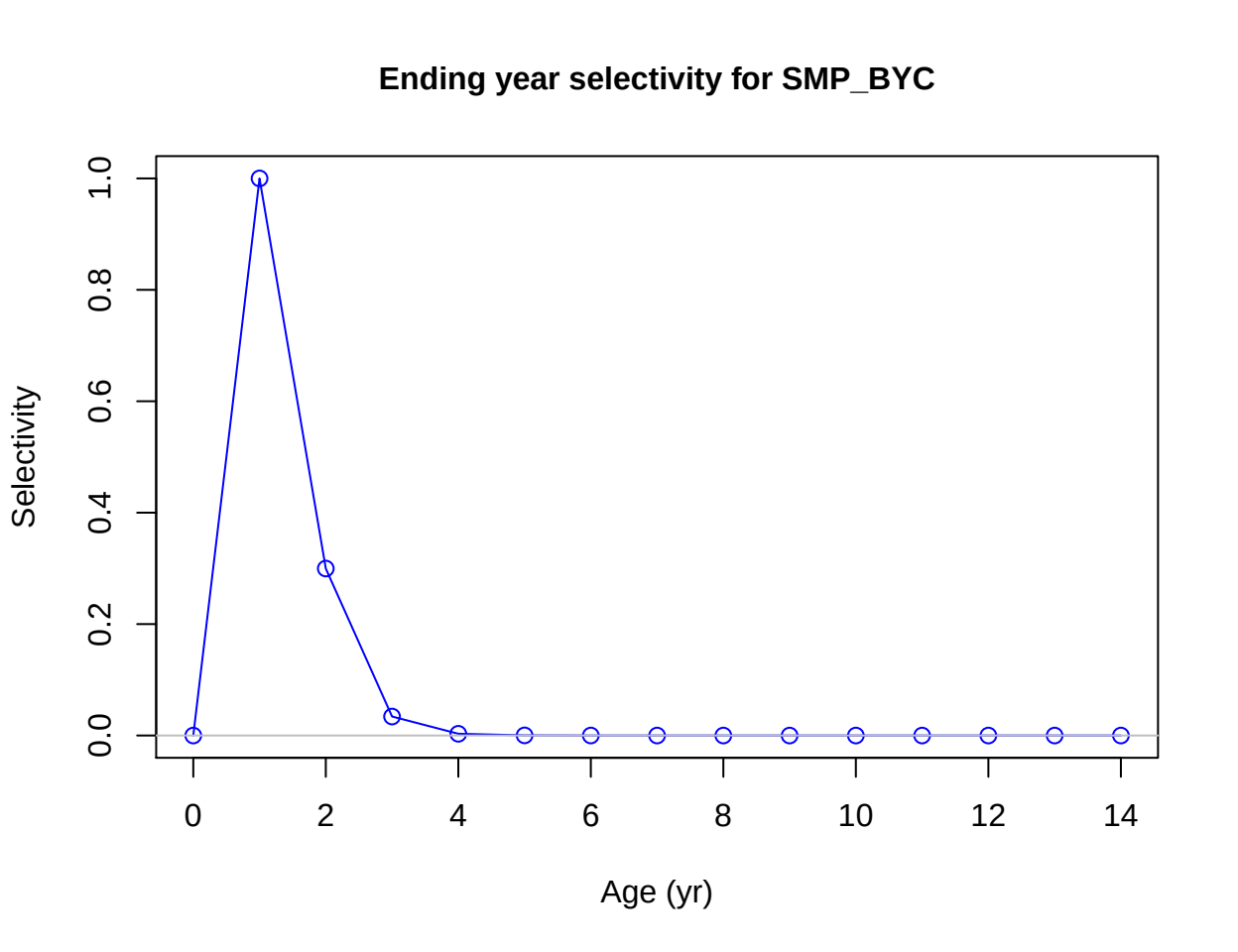

Ending year selectivity for CM_E
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)

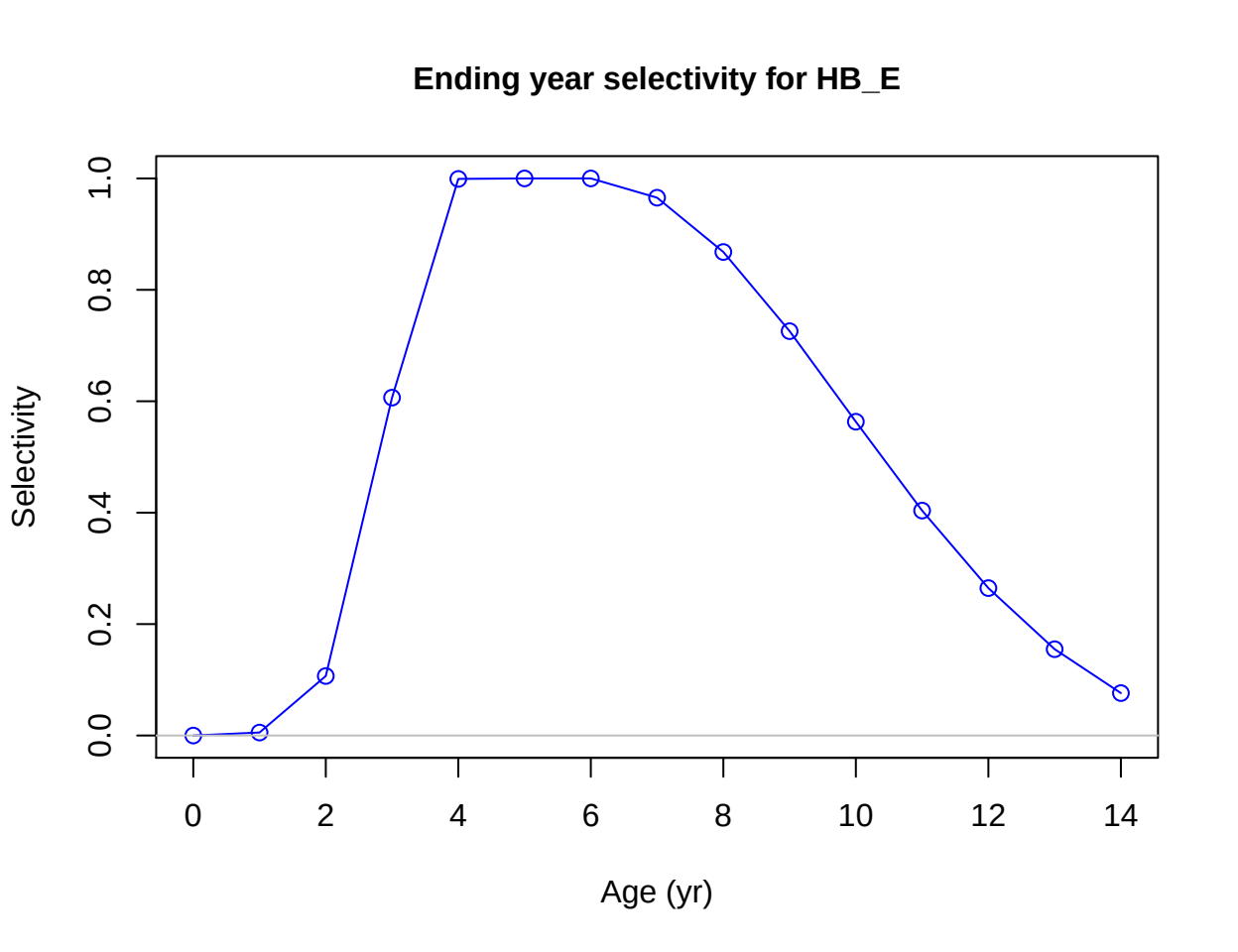

Time−varying selectivity for CM_W
2000
1980
1960
Year
1.0
0.8
0.6
0.4
0.2
Selectivity
0
5
10
Age (yr)

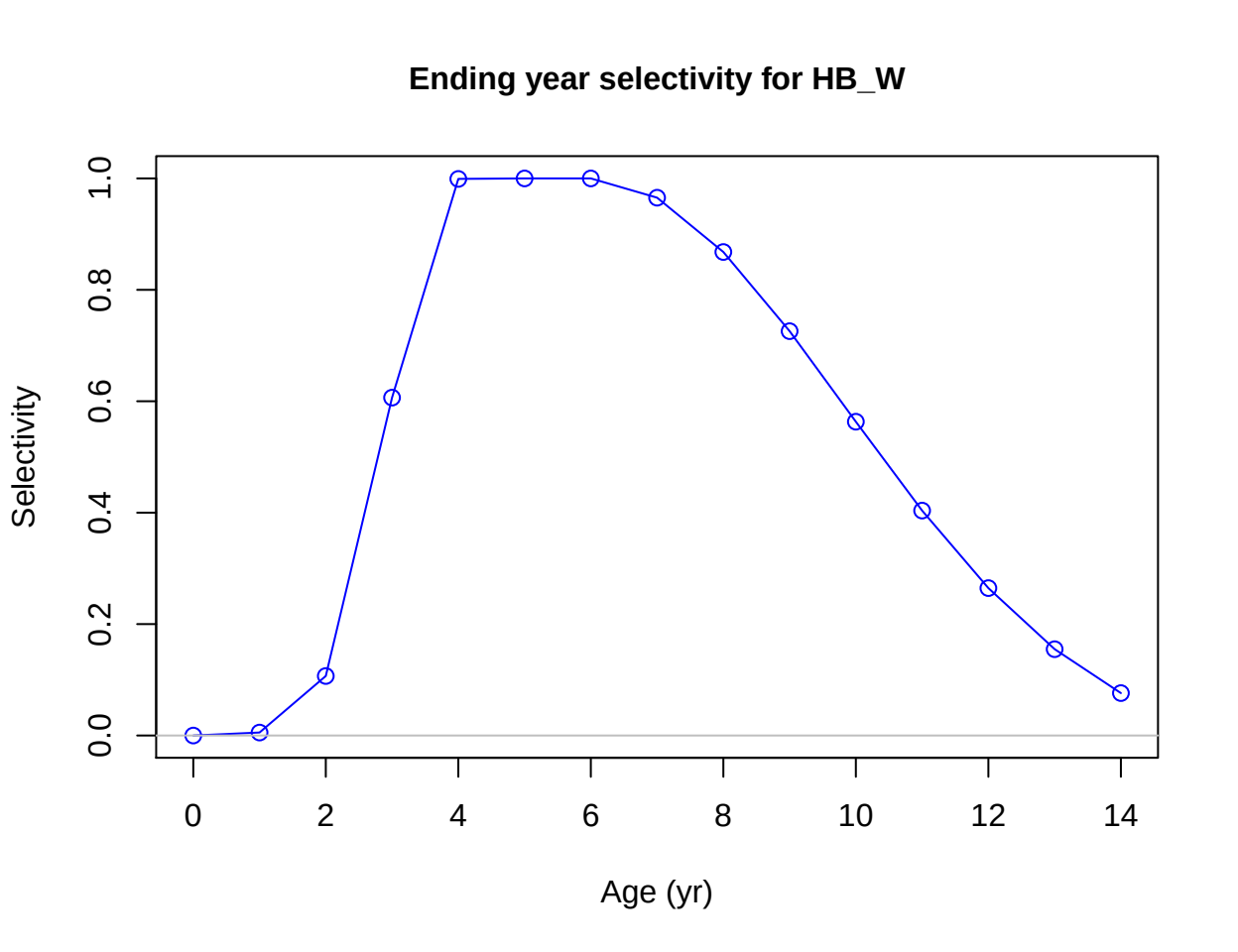

Time−varying selectivity for CM_W
2010
1990
1970
1950
0.2
1
0
2
4
6
8
10
12
14
Age (yr)

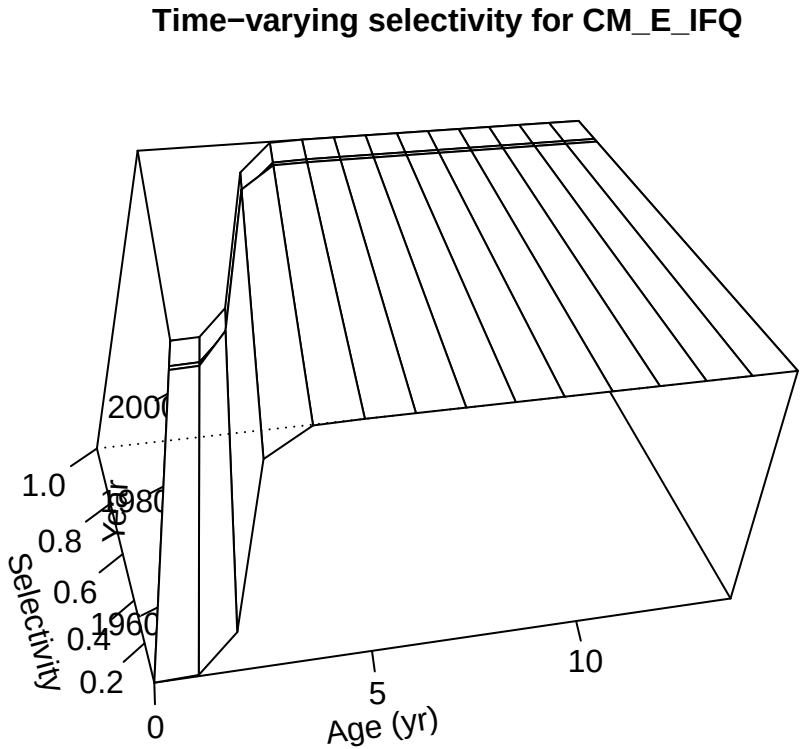

Ending year selectivity for CM_W
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)

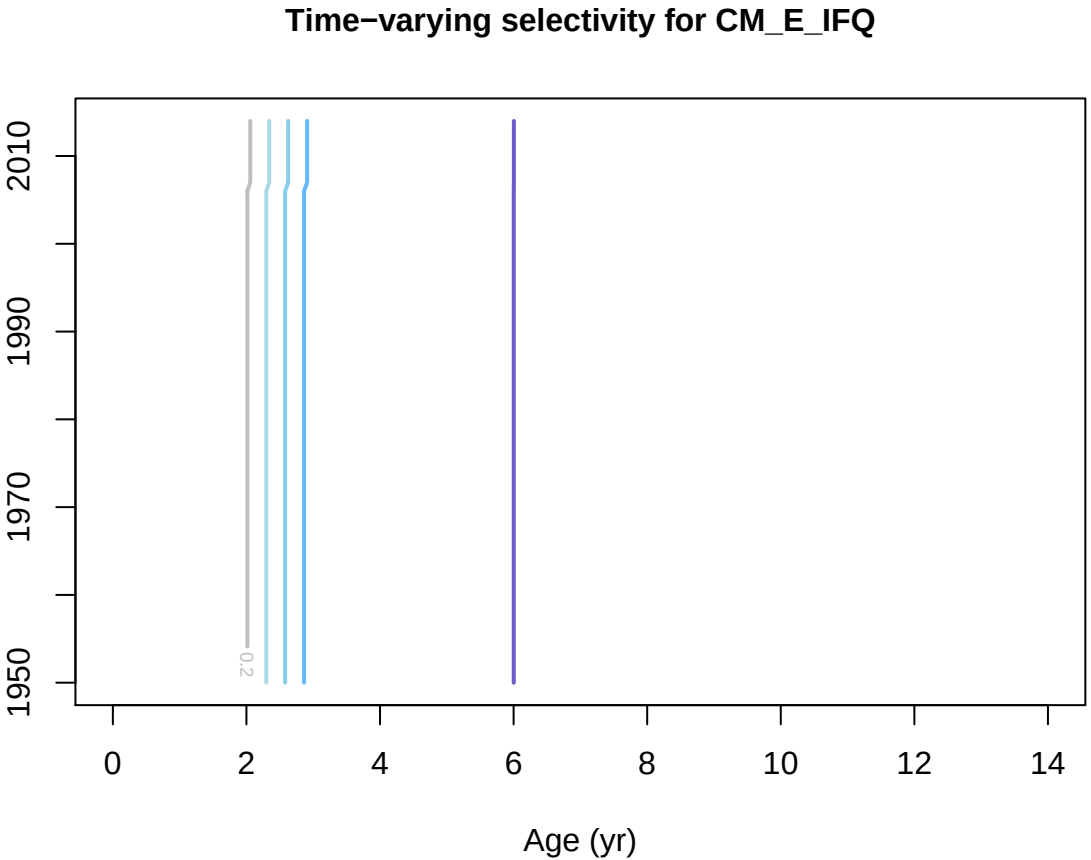

Ending year selectivity for REC
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)

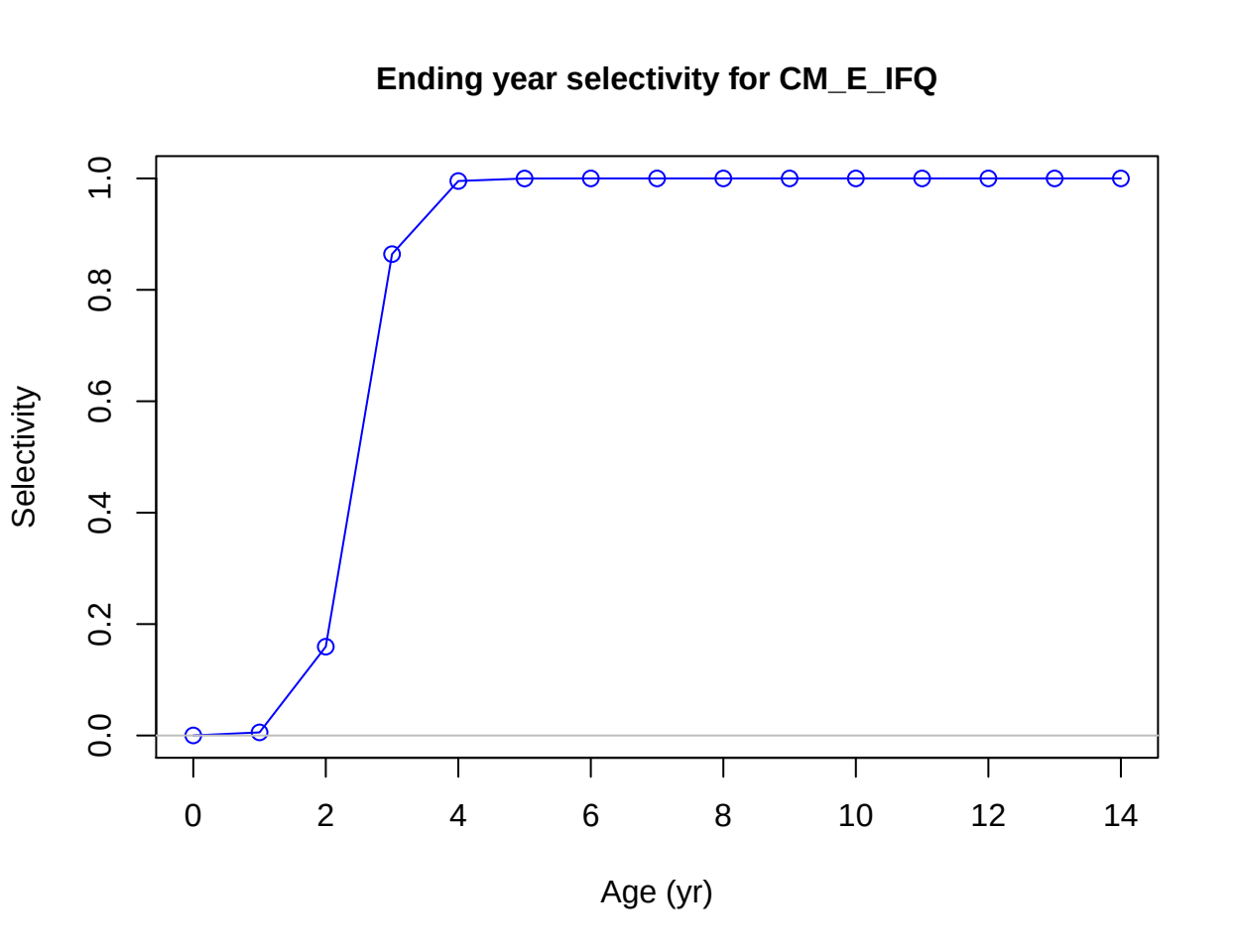

Ending year selectivity for SMP_BYC
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)

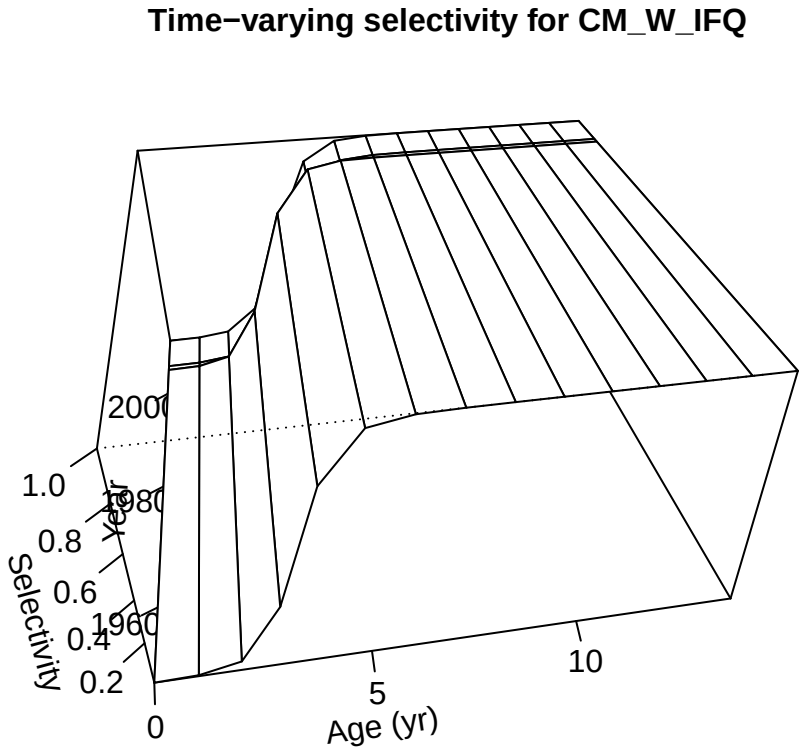

Ending year selectivity for HB_E
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)

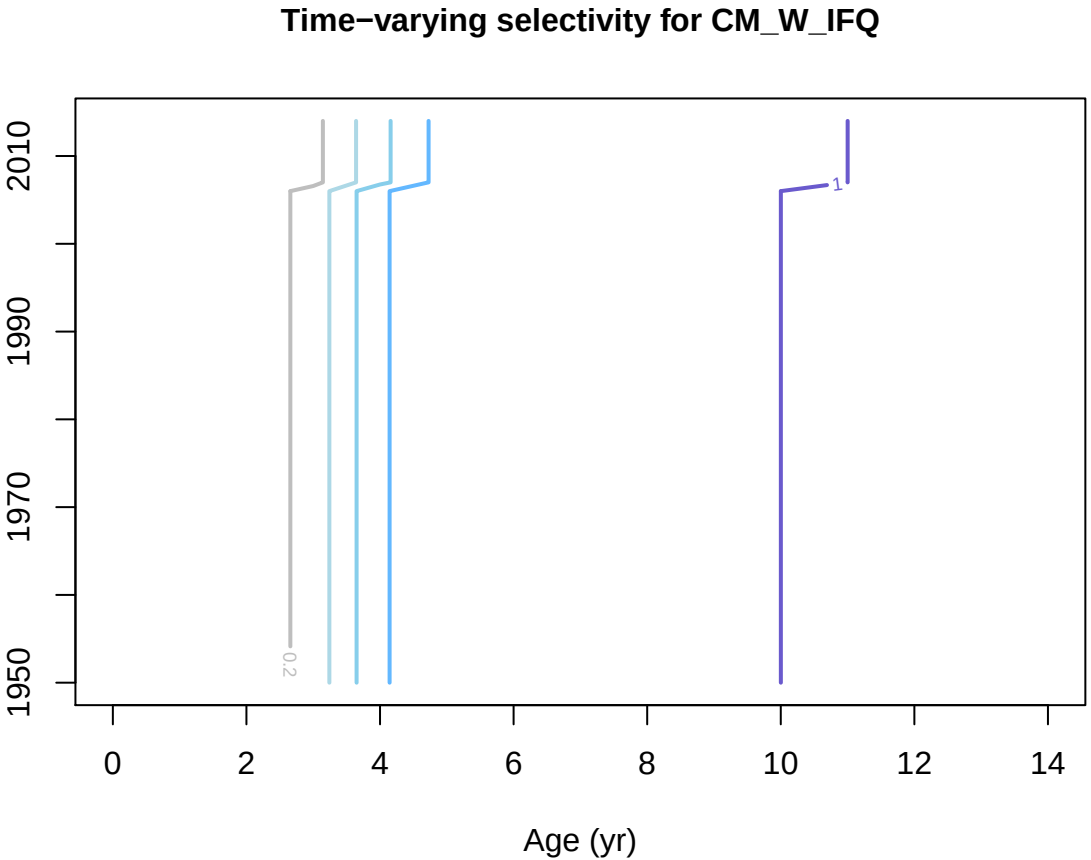

Ending year selectivity for HB_W
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)

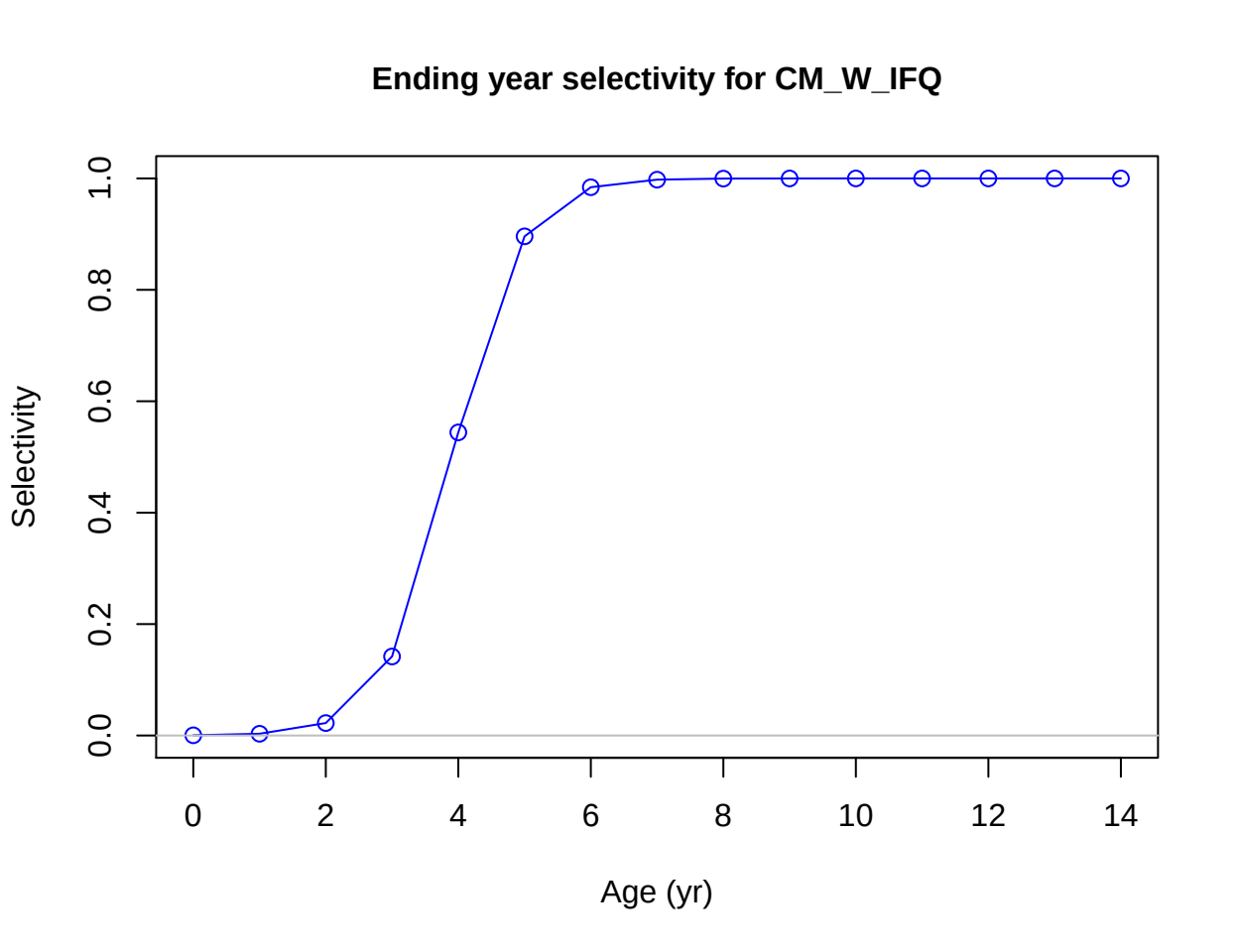

Time−varying selectivity for CM_E_IFQ
Selectivity
1.0
0.8
0.6
0.4
0.2
Year
2000
1980
1960
0
5
10
Age (yr)

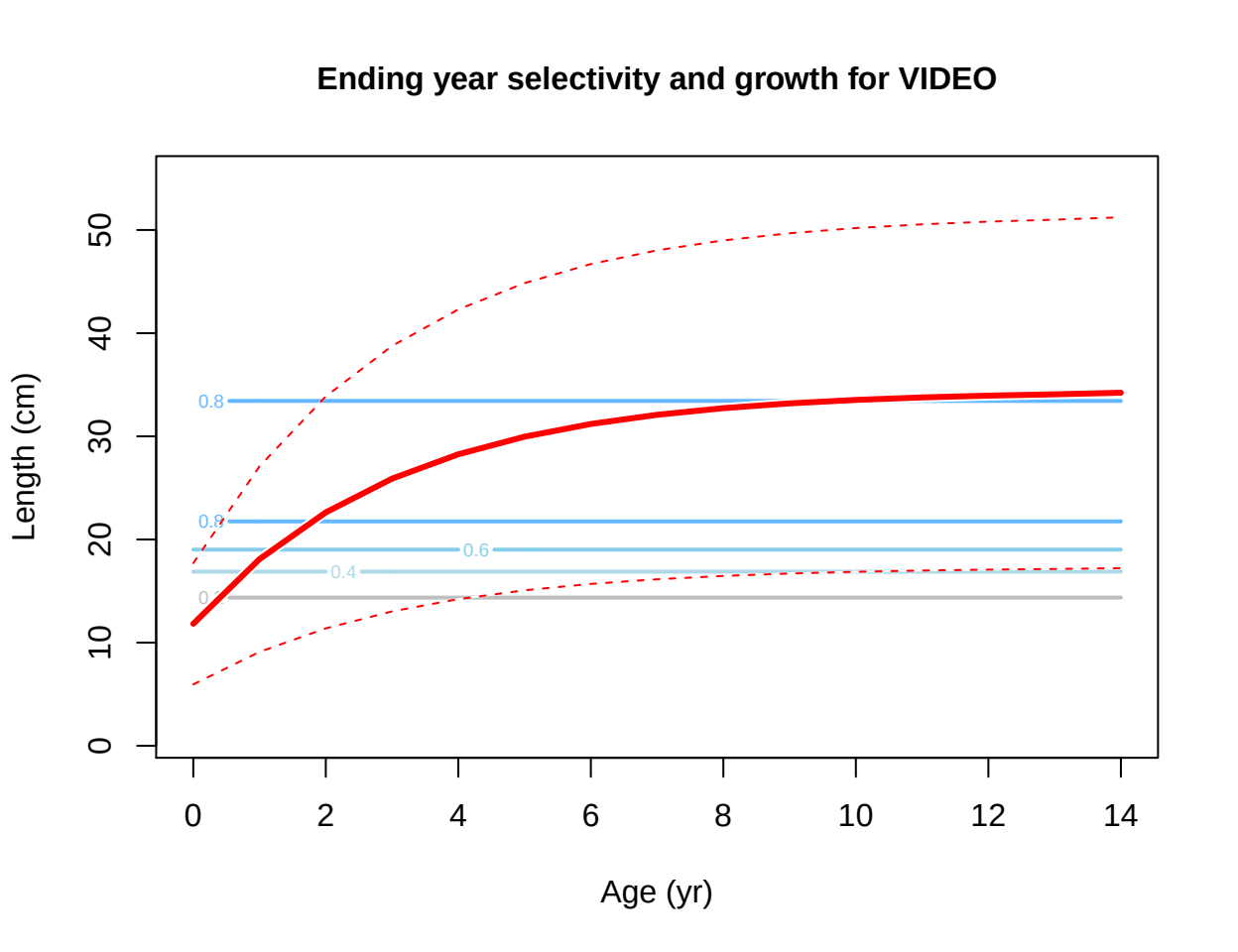

Time−varying selectivity for CM_E_IFQ
2010
1990
1970
1950
0.2
0
2
4
6
8
10
12
14
Age (yr)

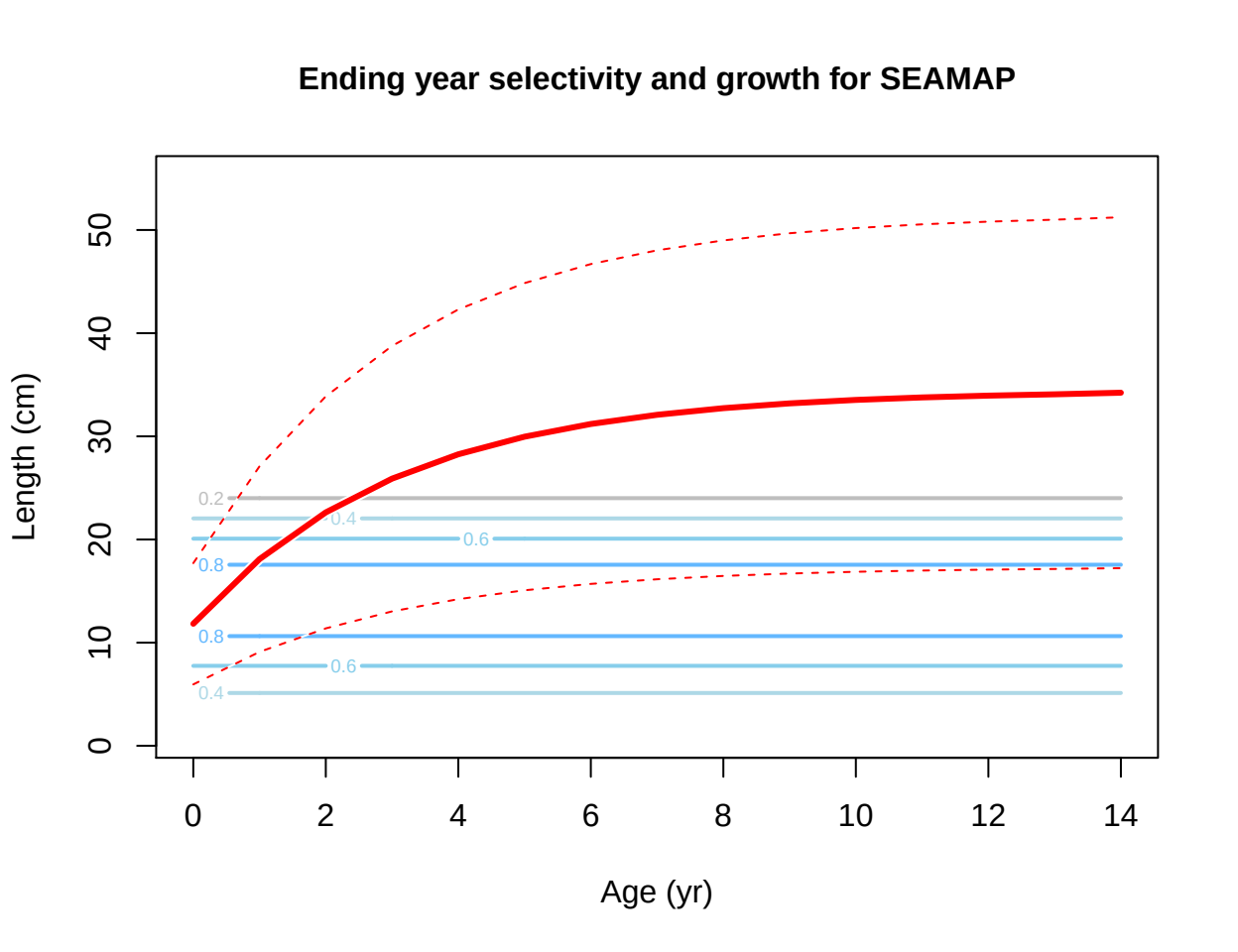

Ending year selectivity for CM_E_IFQ
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)

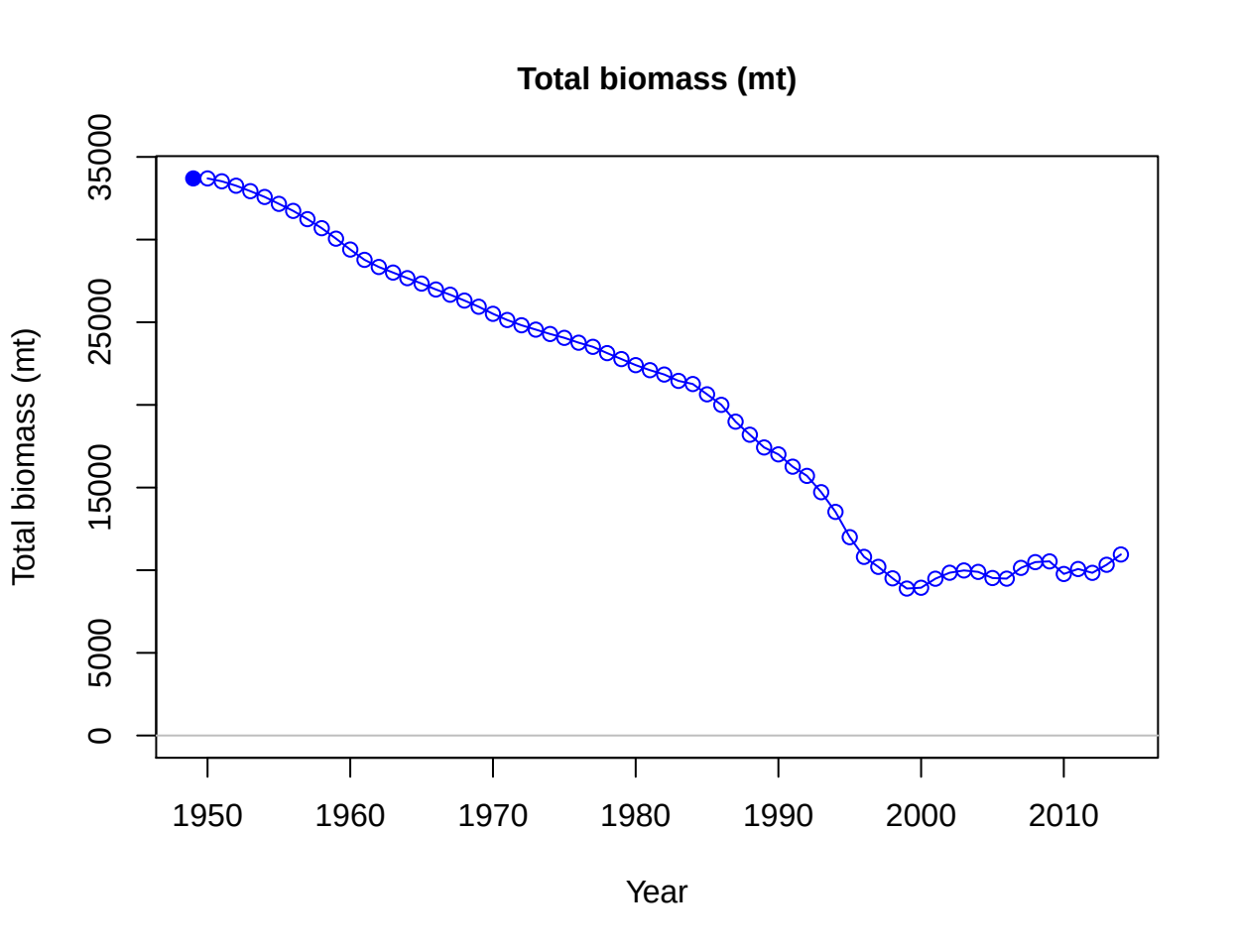

Time−varying selectivity for CM_W_IFQ
Selectivity
1.0
0.8
0.6
0.4
0.2
Year
2000
1980
1960
0
5
10
Age (yr)

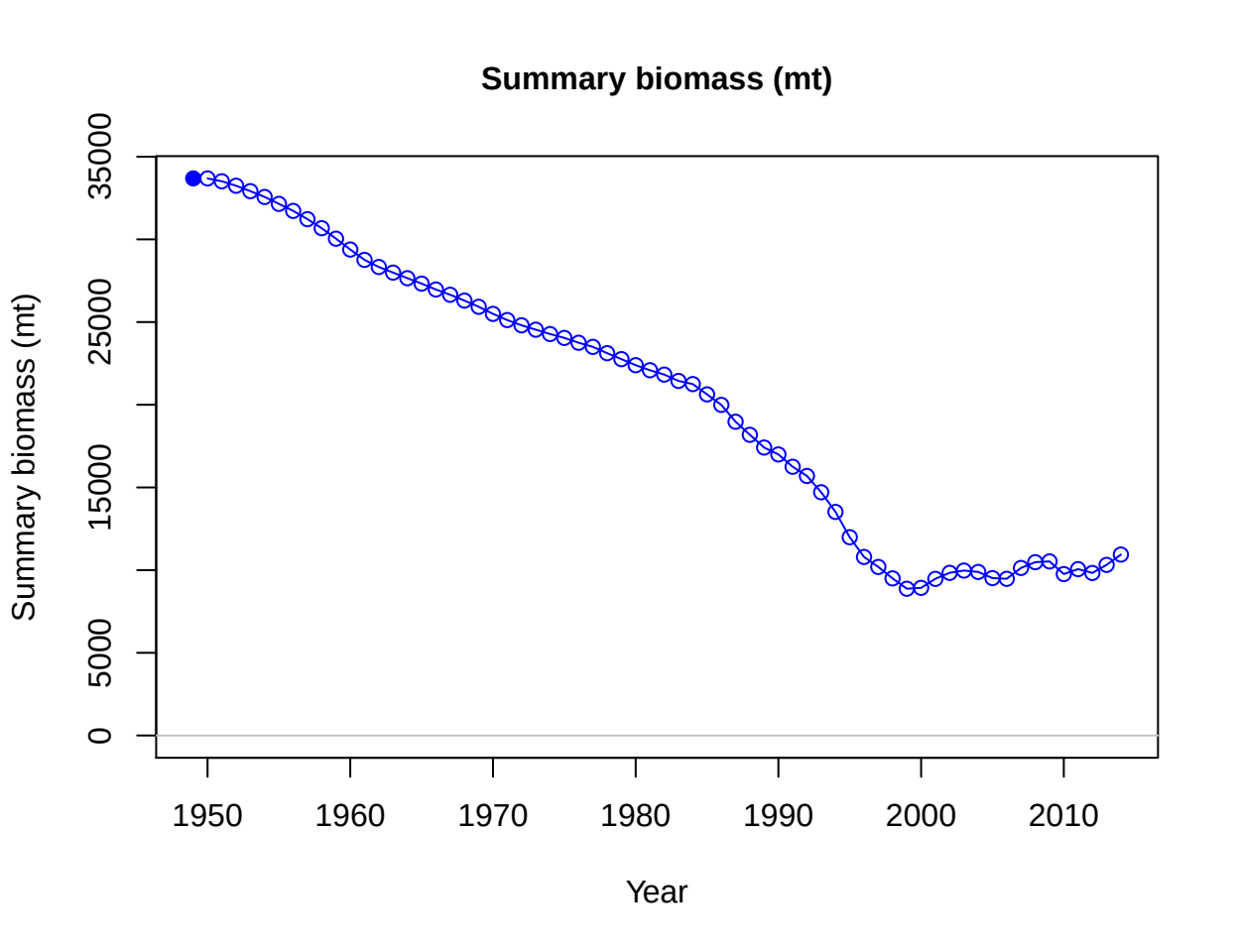

Time−varying selectivity for CM_W_IFQ
2010
1990
1970
1950
0.2
1
0
2
4
6
8
10
12
14
Age (yr)

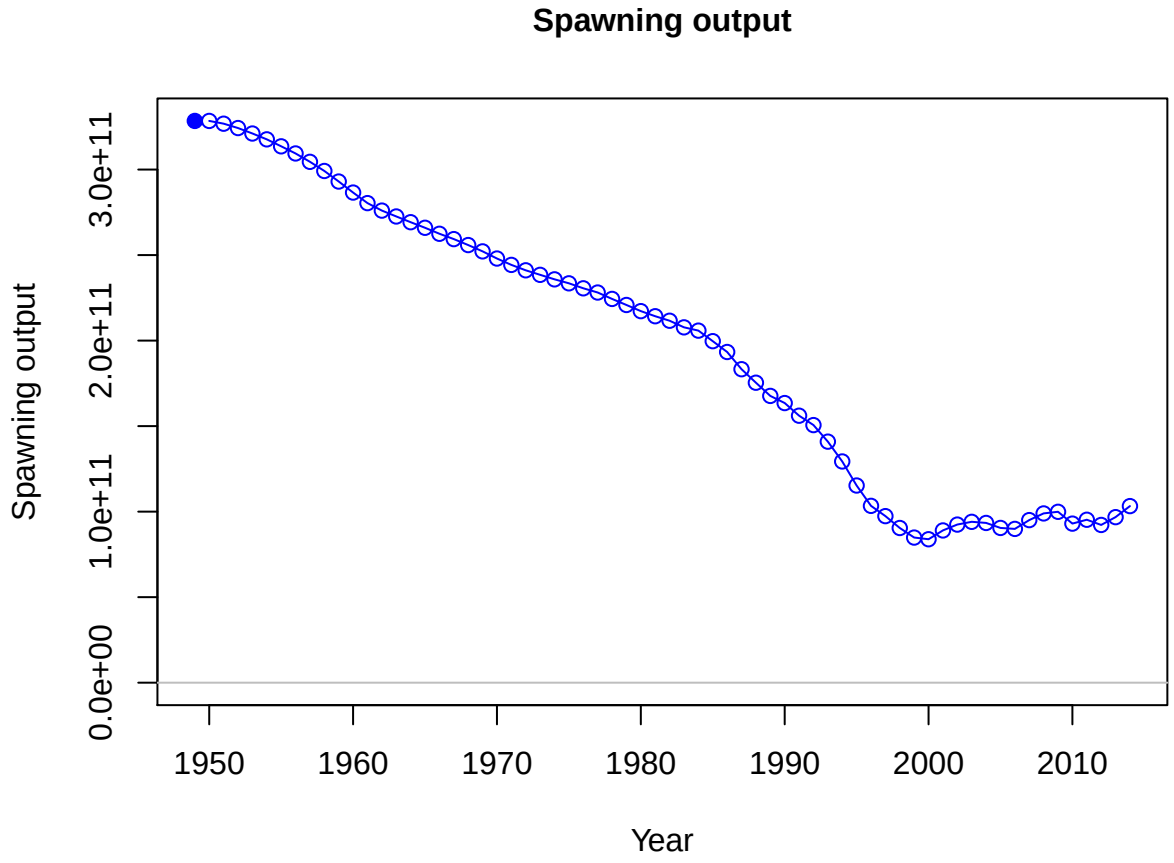

Ending year selectivity for CM_W_IFQ
Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Age (yr)

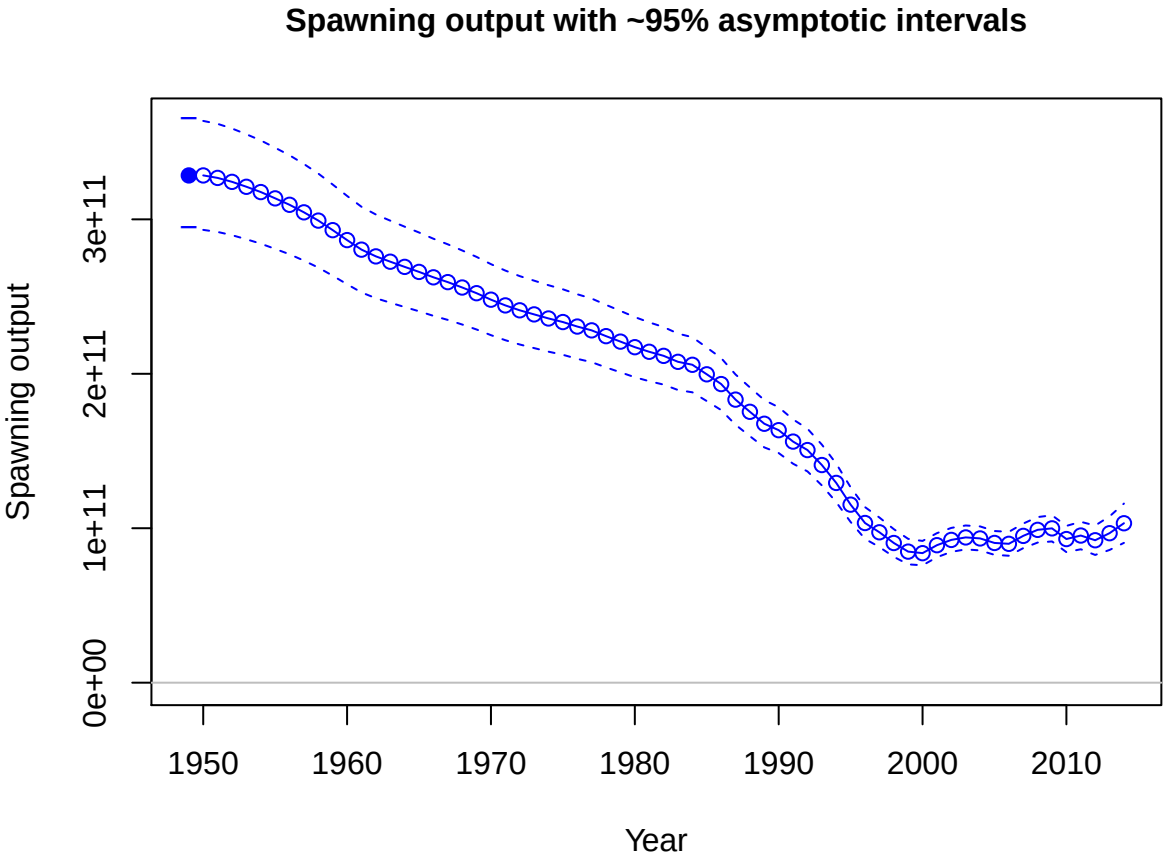

Ending year selectivity and growth for VIDEO
Length (cm)
0
10
20
30
40
50
0.8
0.6
0.4
0
2
4
6
8
10
12
14
Age (yr)

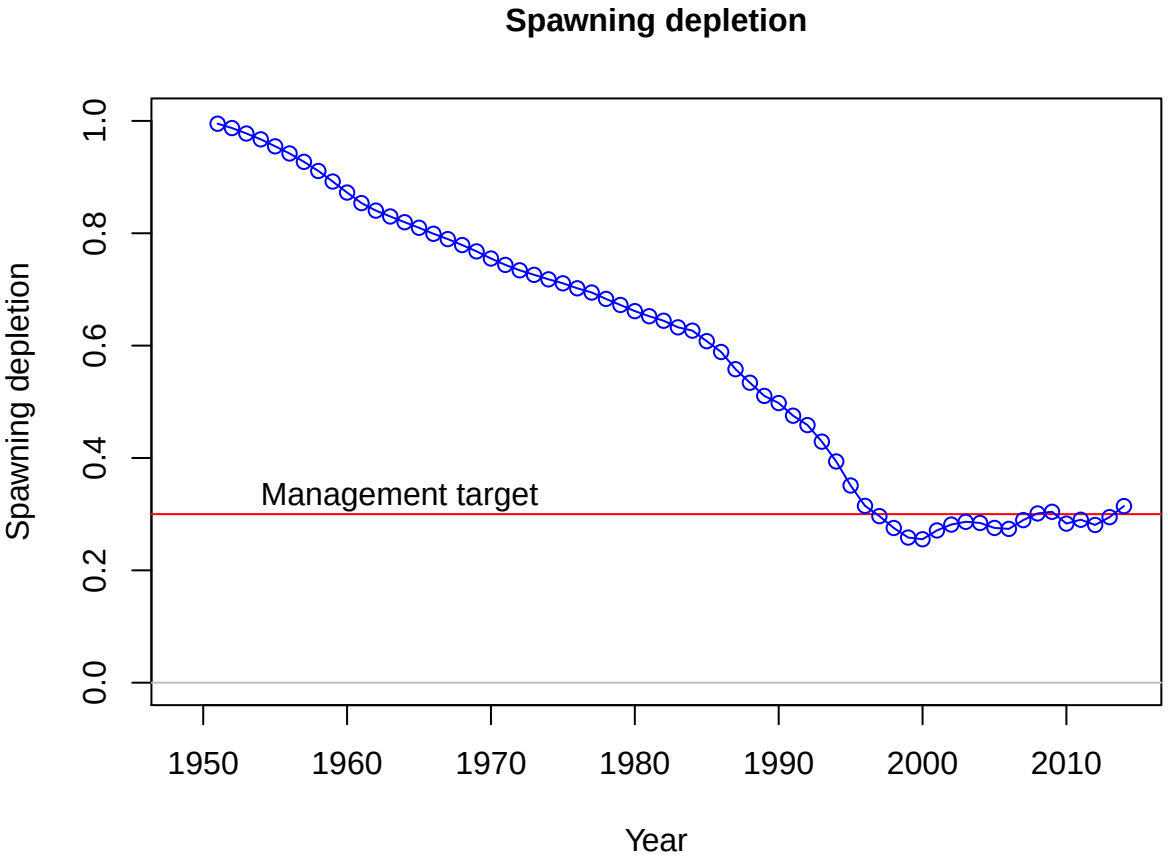

Ending year selectivity and growth for SEAMAP
Length (cm)
0
10
20
30
40
50
0
2
4
6
8
10
12
14
Age (yr)
0.2
0.4
0.6
0.8
0.8
0.6
0.4

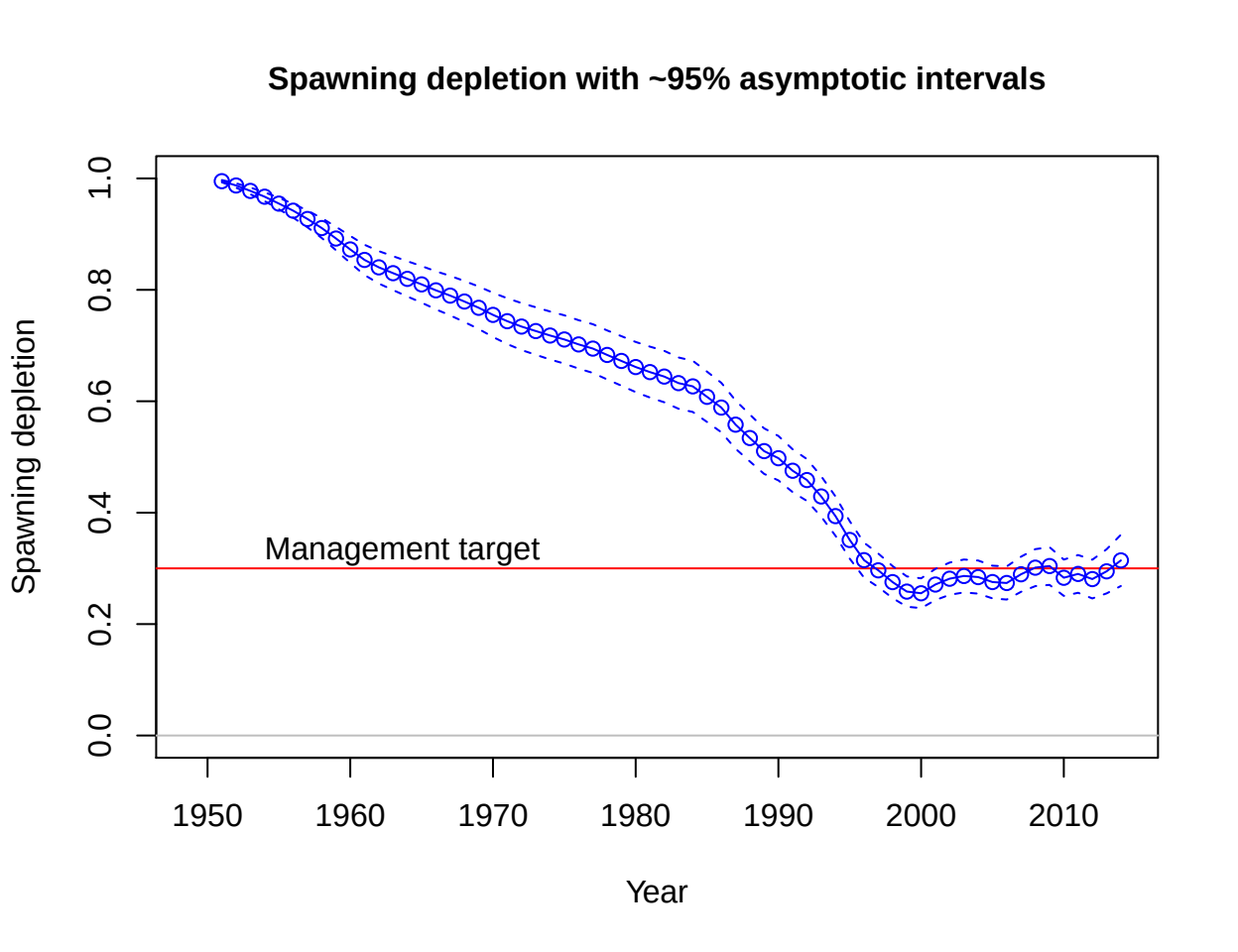

Total biomass (mt)
Total biomass (mt)
0
5000
15000
25000
35000
1950
1960
1970
1980
1990
2000
2010
Year

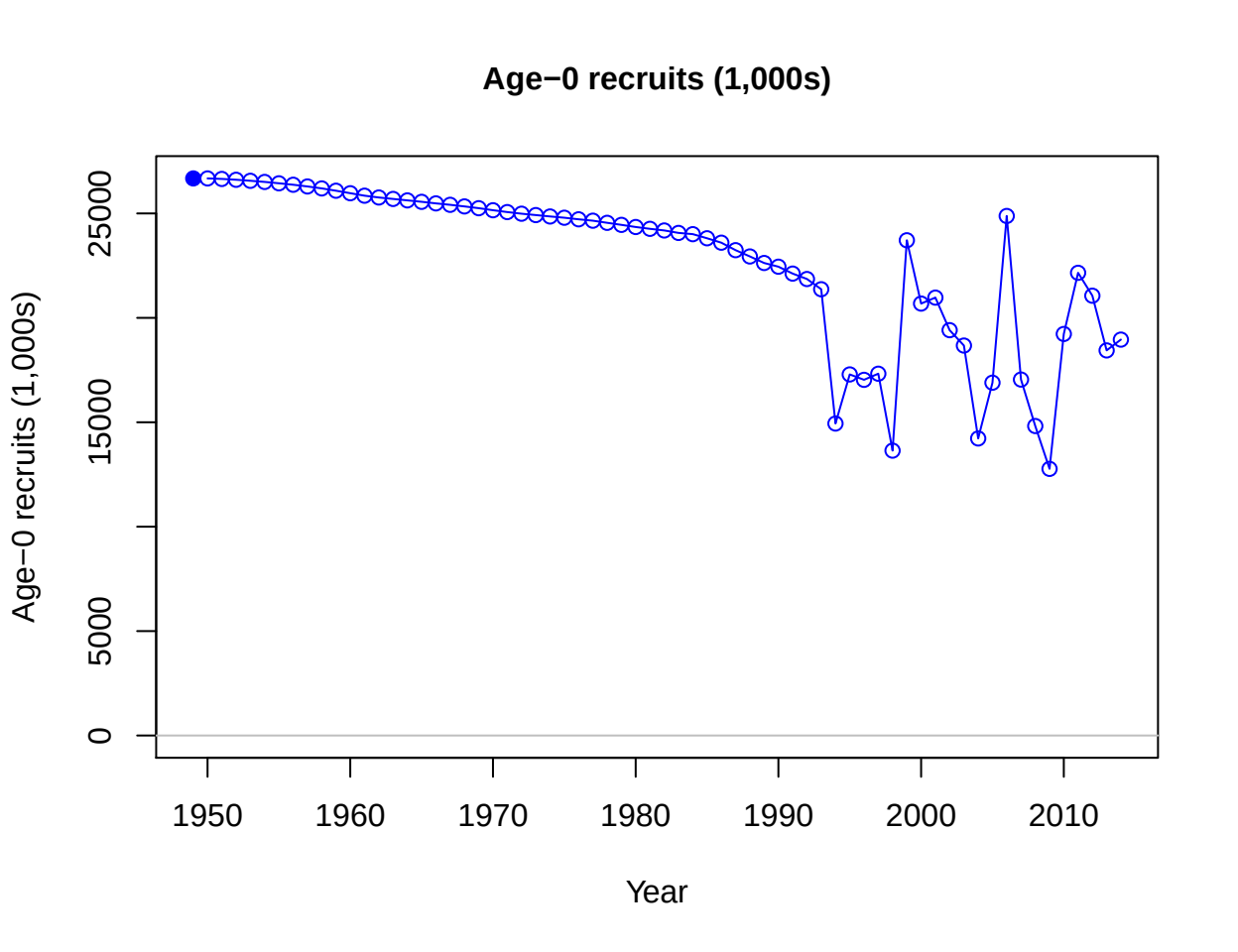

Summary biomass (mt)
Summary biomass (mt)
0
5000
15000
25000
35000
1950
1960
1970
1980
1990
2000
2010
Year

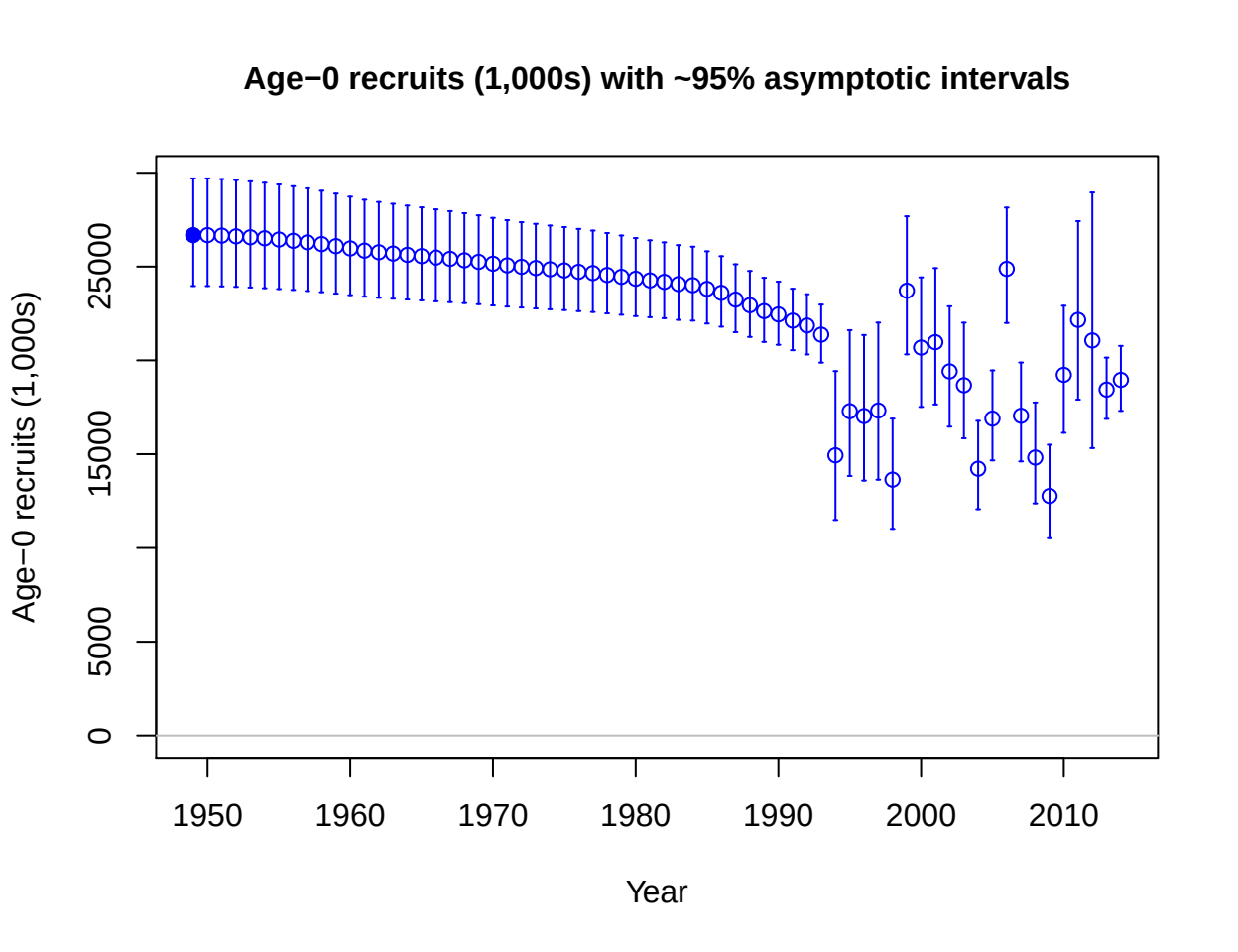

Spawning output
Spawning output
0.0e+00
1.0e+11
2.0e+11
3.0e+11
1950
1960
1970
1980
1990
2000
2010
Year

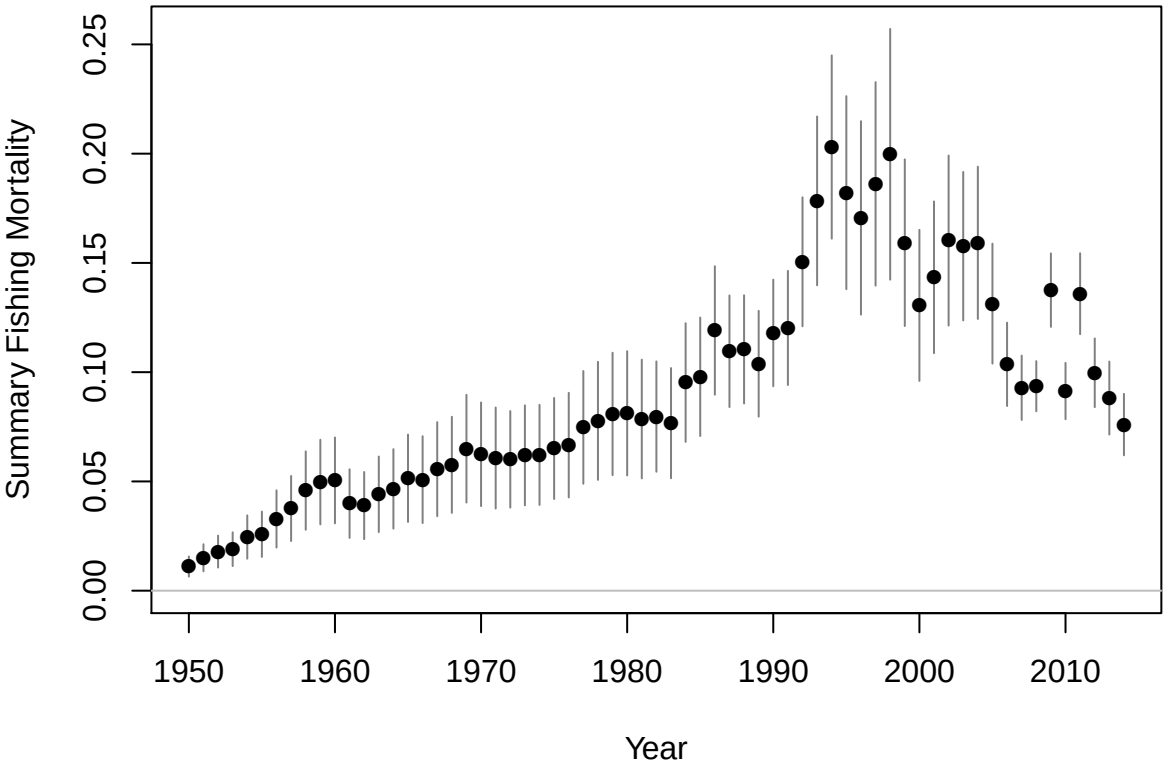

Spawning output with ~95% asymptotic intervals
Spawning output
0e+00
1e+11
2e+11
3e+11
1950
1960
1970
1980
1990
2000
2010
Year

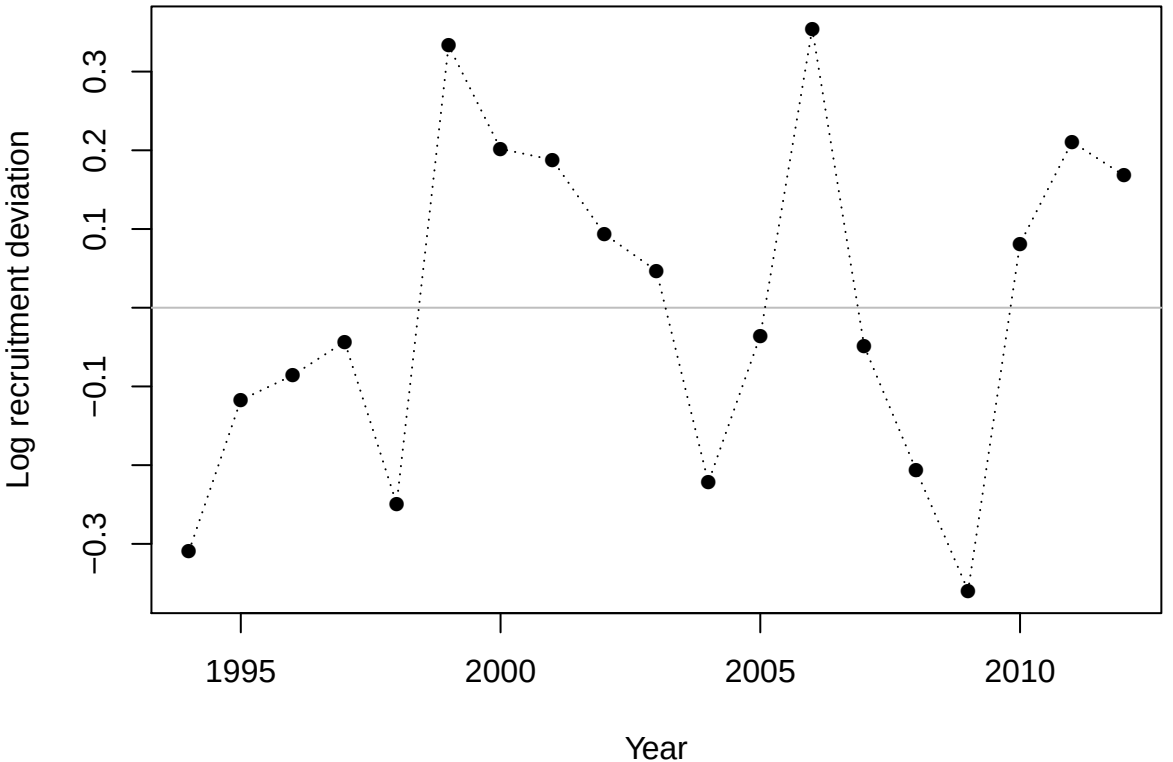

Spawning depletion
Spawning depletion
1.0
0.8
0.6
0.4
0.2
0.0
Management target
1950
1960
1970
1980
1990
2000
2010
Year

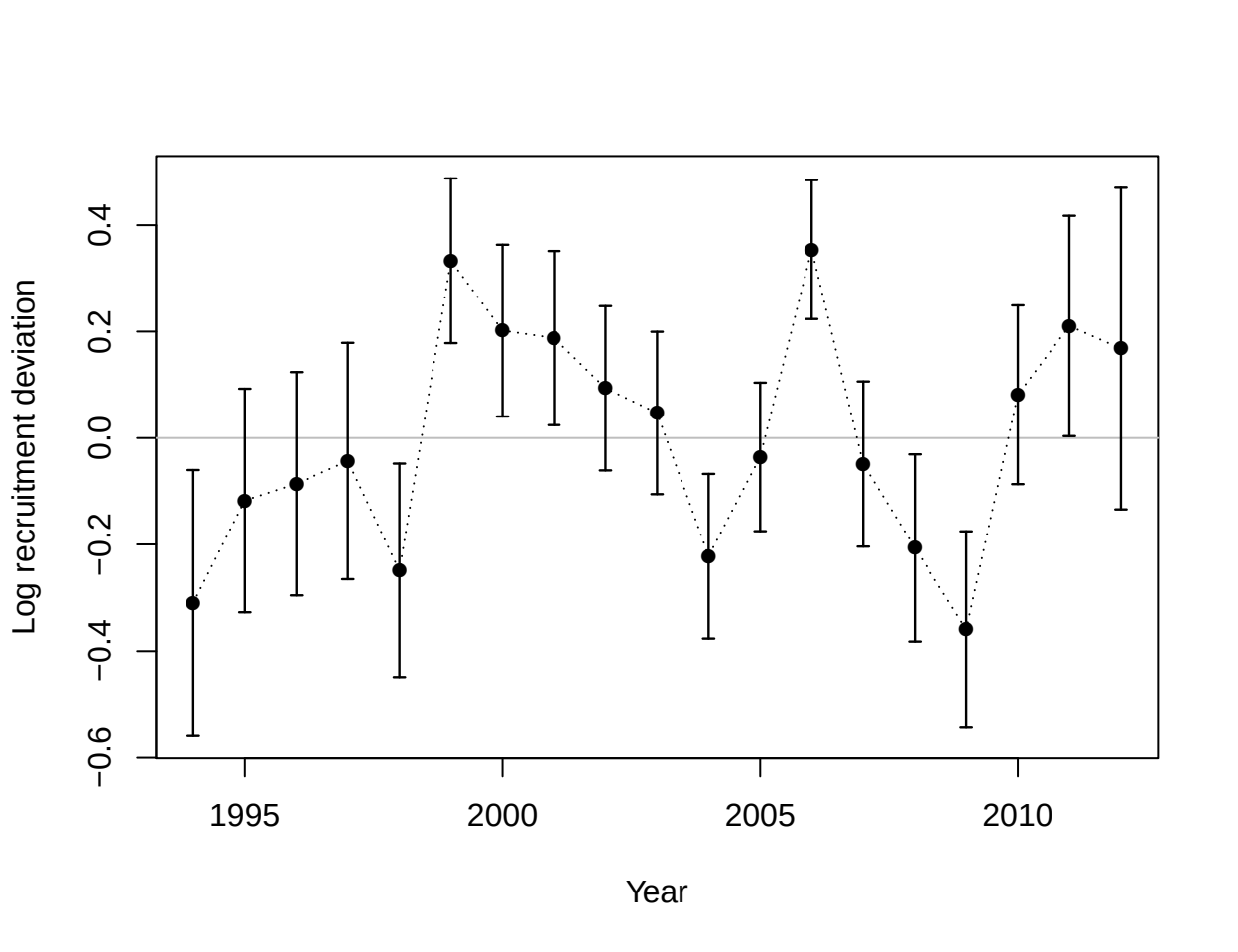

Spawning depletion with ~95% asymptotic intervals
Spawning depletion
0.0
0.2
0.4
0.6
0.8
1.0
Management target
1950
1960
1970
1980
1990
2000
2010
Year

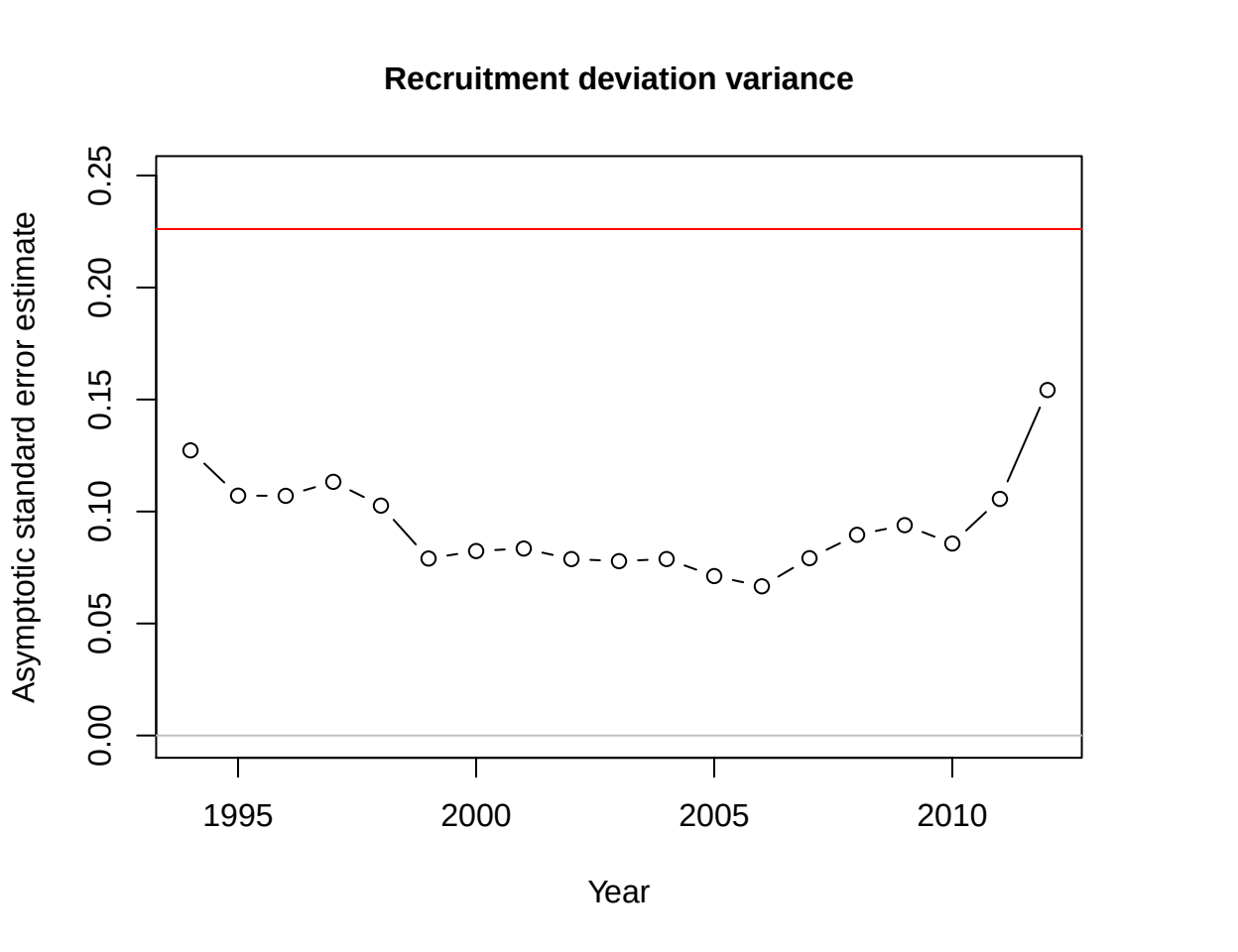

Age−0 recruits (1,000s)
Age−0 recruits (1,000s)
0
5000
15000
25000
1950
1960
1970
1980
1990
2000
2010
Year

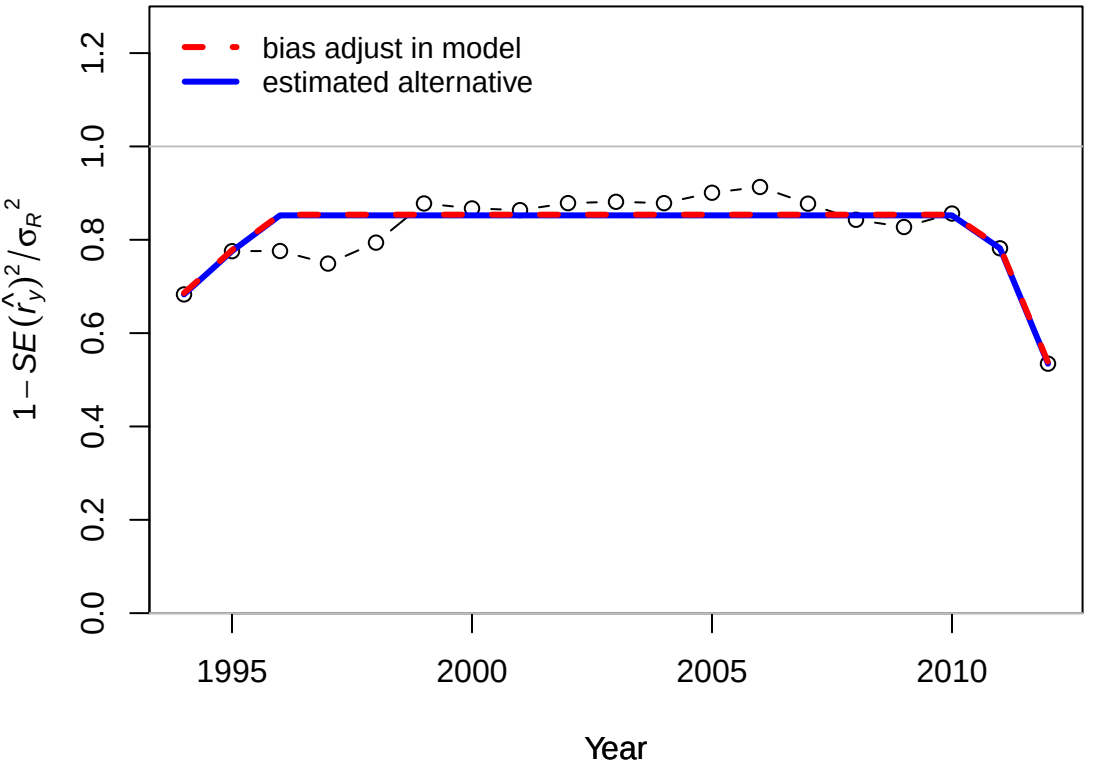

Age−0 recruits (1,000s) with ~95% asymptotic intervals
Age−0 recruits (1,000s)
0
5000
15000
25000
1950
1960
1970
1980
1990
2000
2010
Year

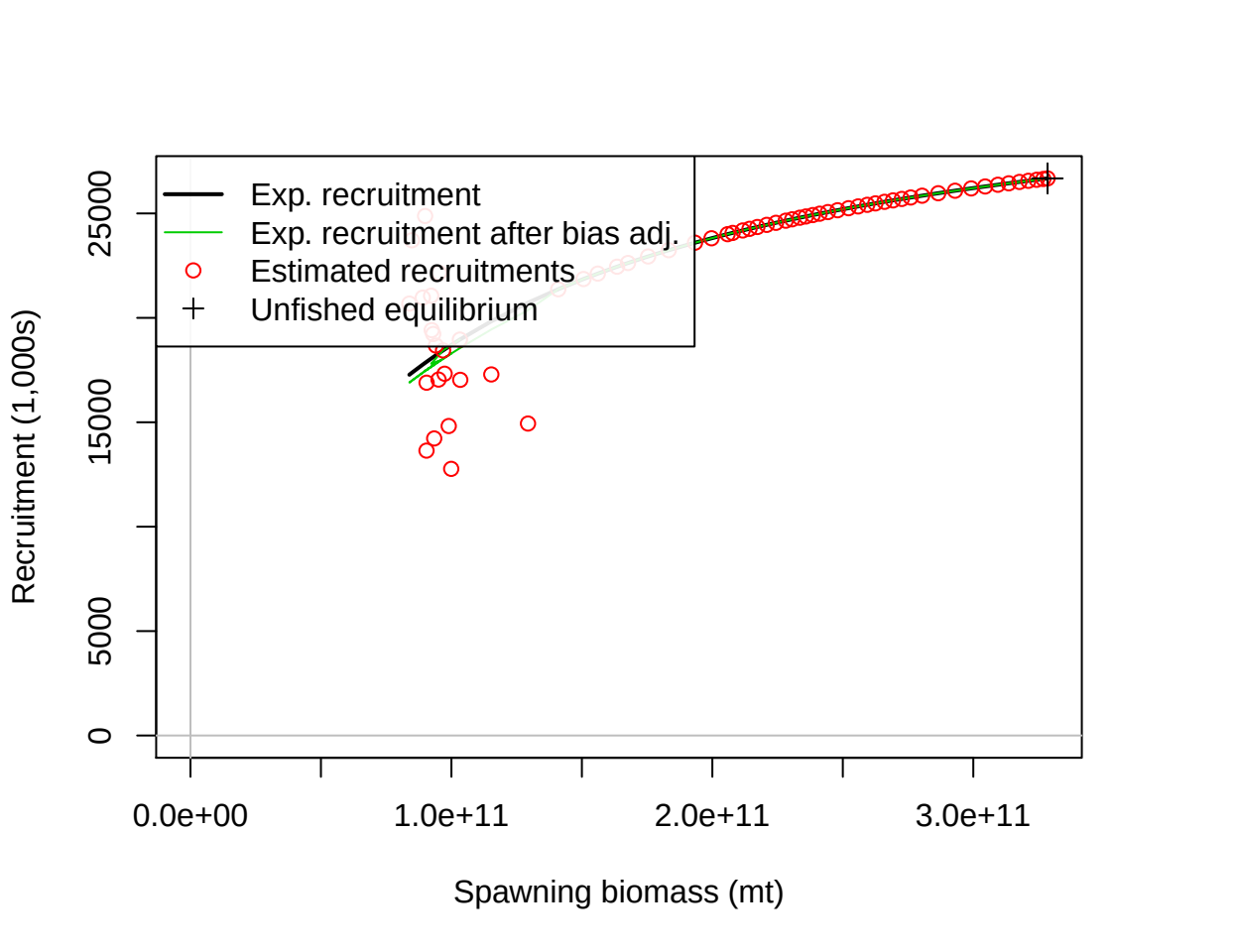

Summary Fishing Mortality
0.00
0.05
0.10
0.15
0.20
0.25
1950
1960
1970
1980
1990
2000
2010
Year

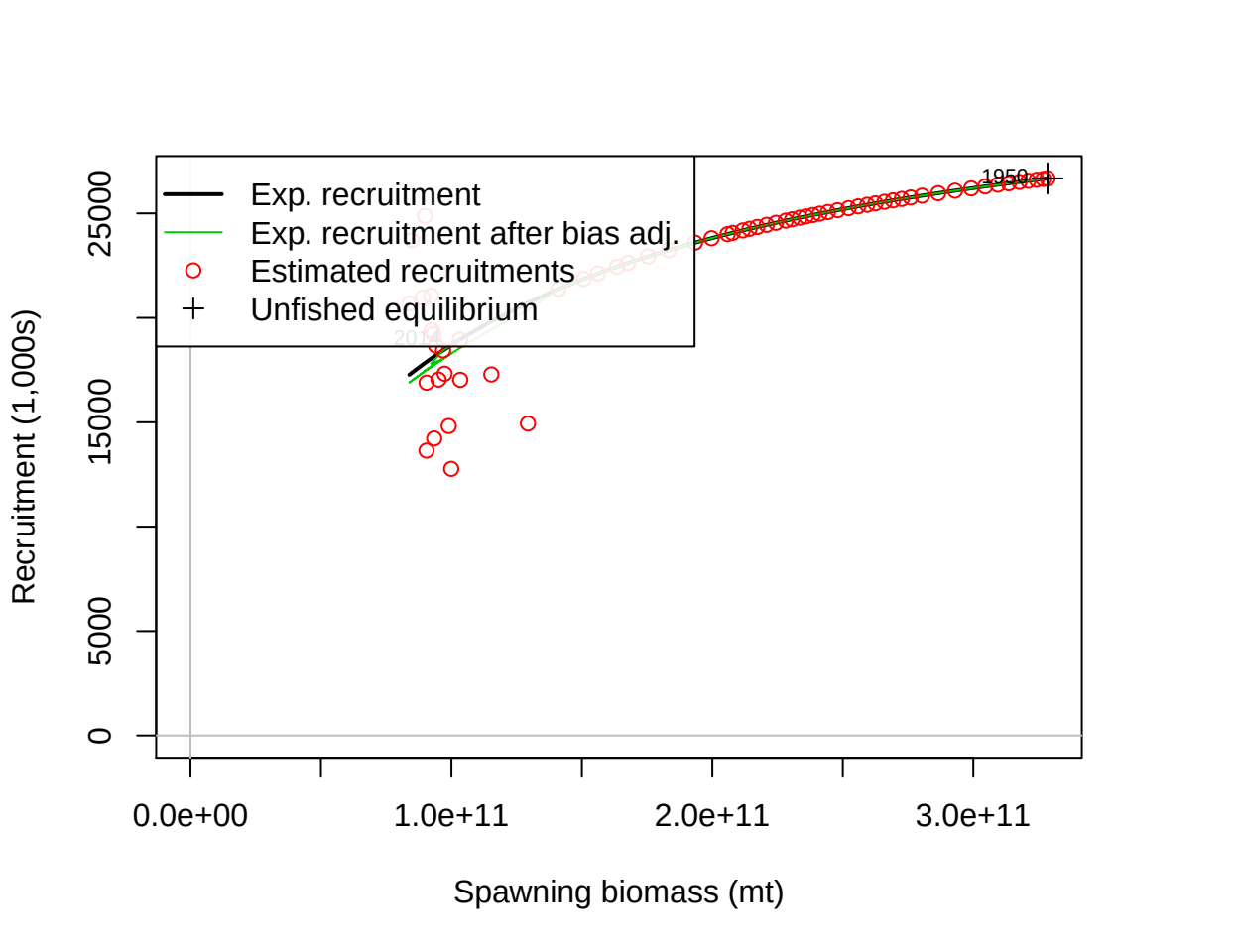

Log recruitment deviation
0.3
0.2
0.1
−0.1
−0.3
1995
2000
2005
2010
Year

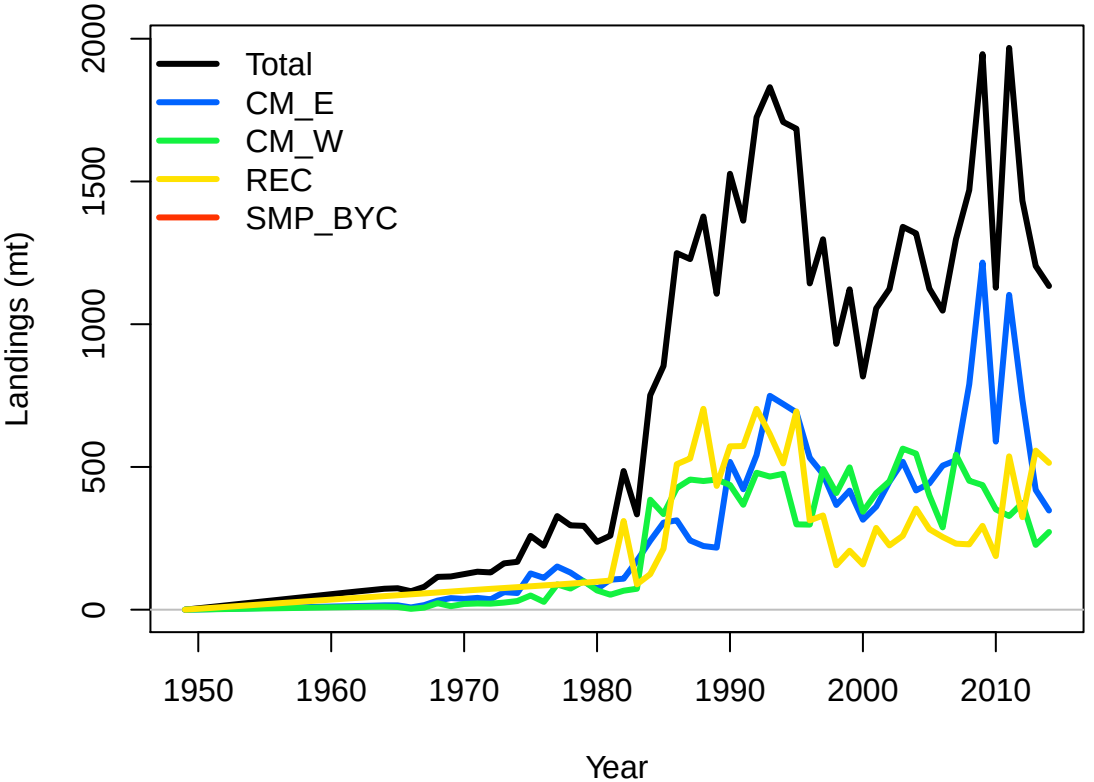

Log recruitment deviation
−0.6
−0.4
−0.2
0.0
0.2
0.4
1995
2000
2005
2010
Year

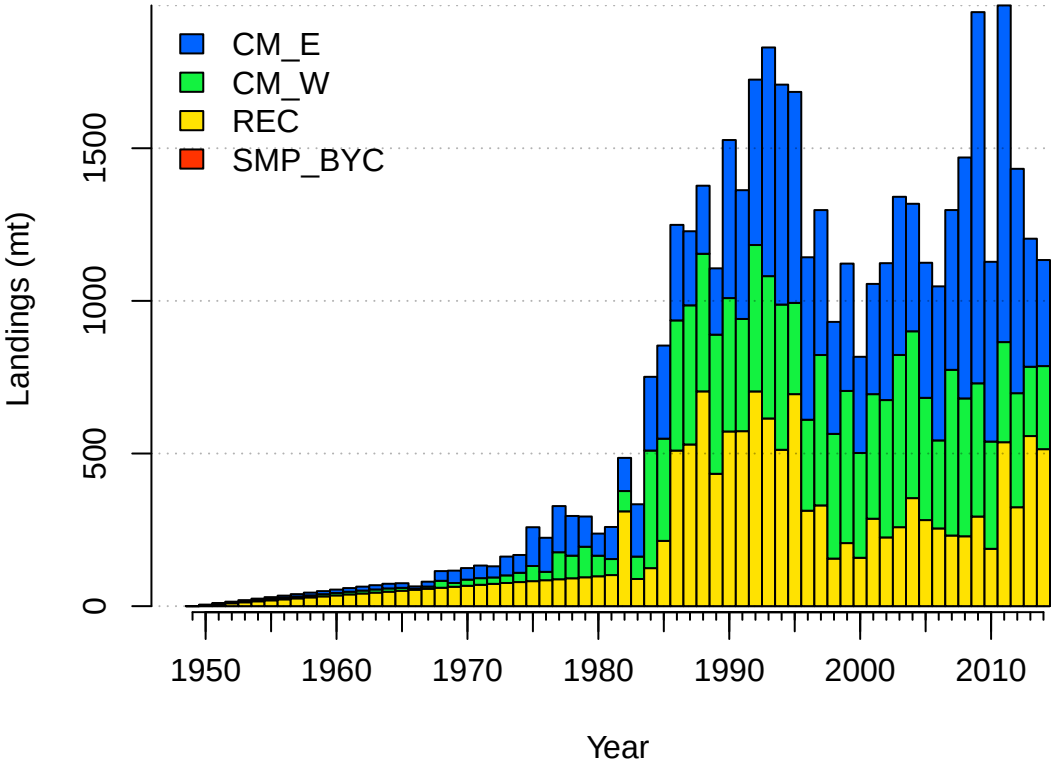

Recruitment deviation variance
Asymptotic standard error estimate
0.00
0.05
0.10
0.15
0.20
0.25
1995
2000
2005
2010
Year

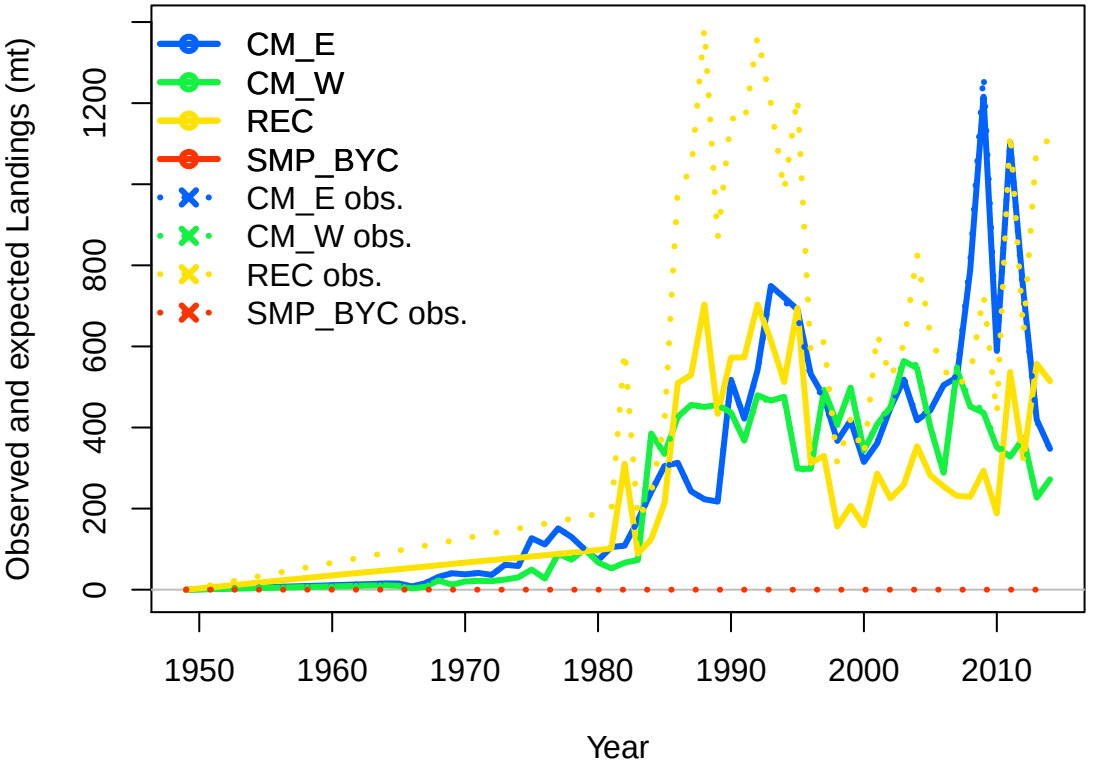

bias adjust in model
estimated alternative
$1 - SE(\hat{r}_y)^2/\sigma_R^2$
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1995
2000
2005
2010
Year

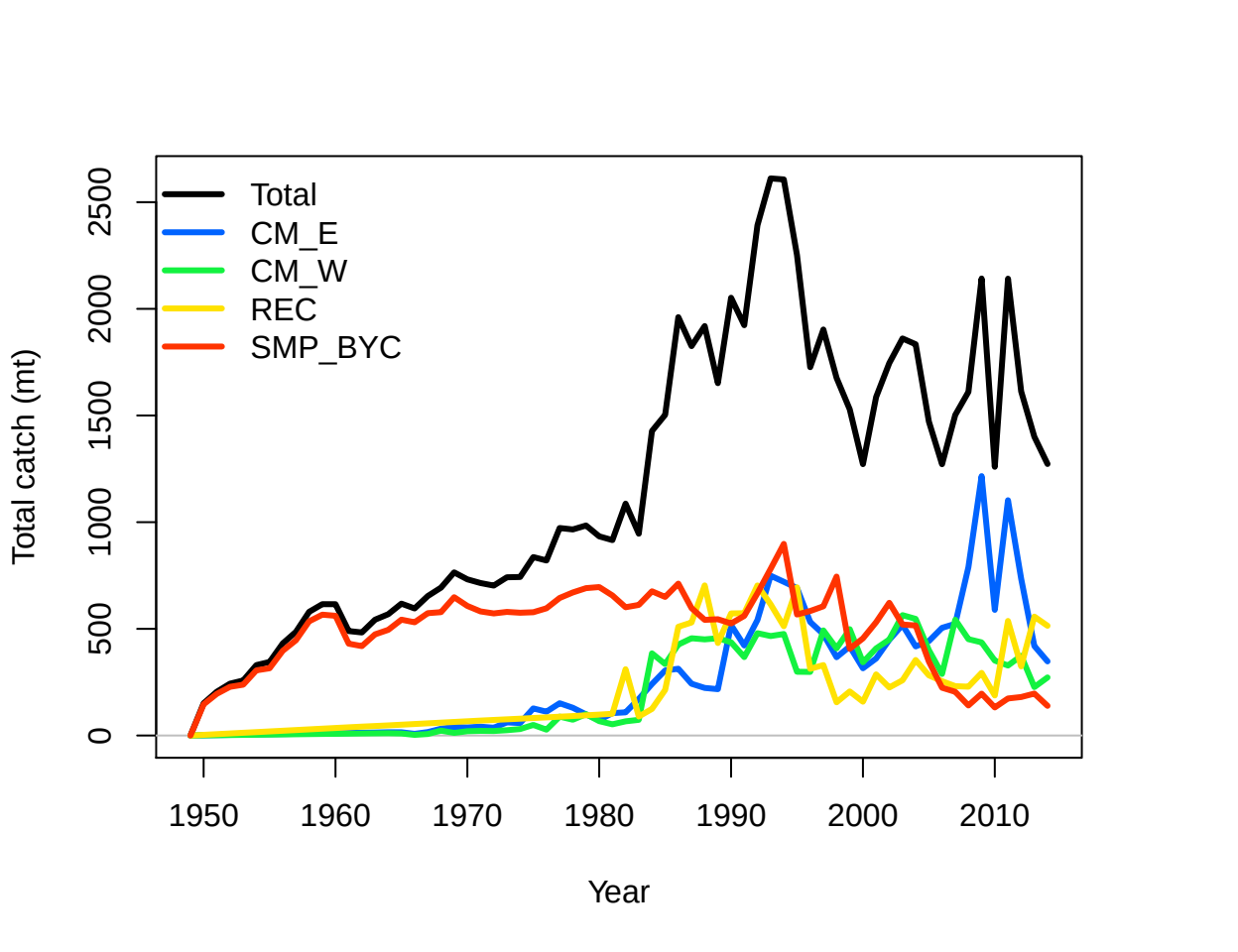

Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium
Recruitment (1,000s)
0
5000
15000
25000
0.0e+00
1.0e+11
2.0e+11
3.0e+11
Spawning biomass (mt)

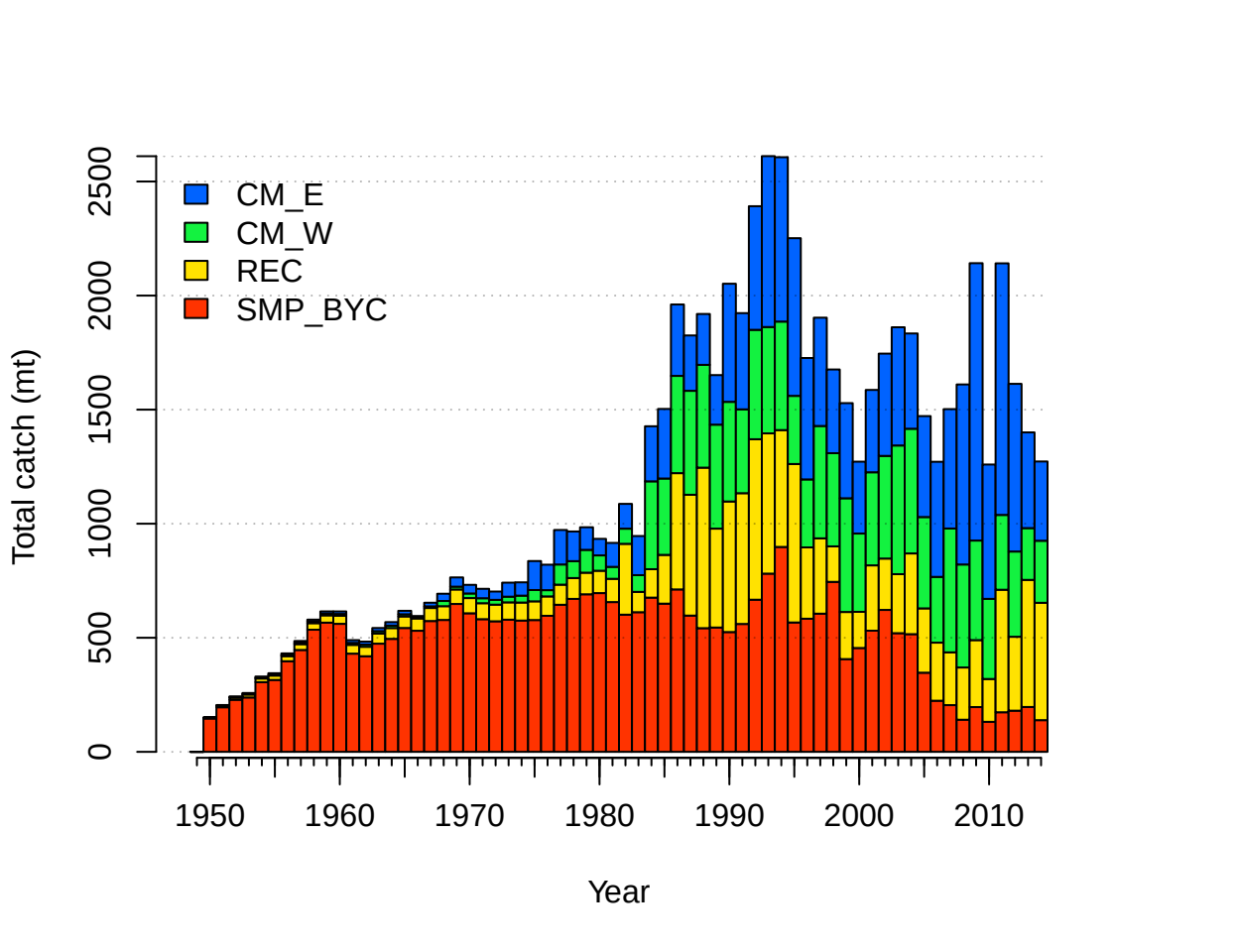

Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium
1950
2018
Recruitment (1,000s)
0
5000
15000
25000
0.0e+00
1.0e+11
2.0e+11
3.0e+11
Spawning biomass (mt)

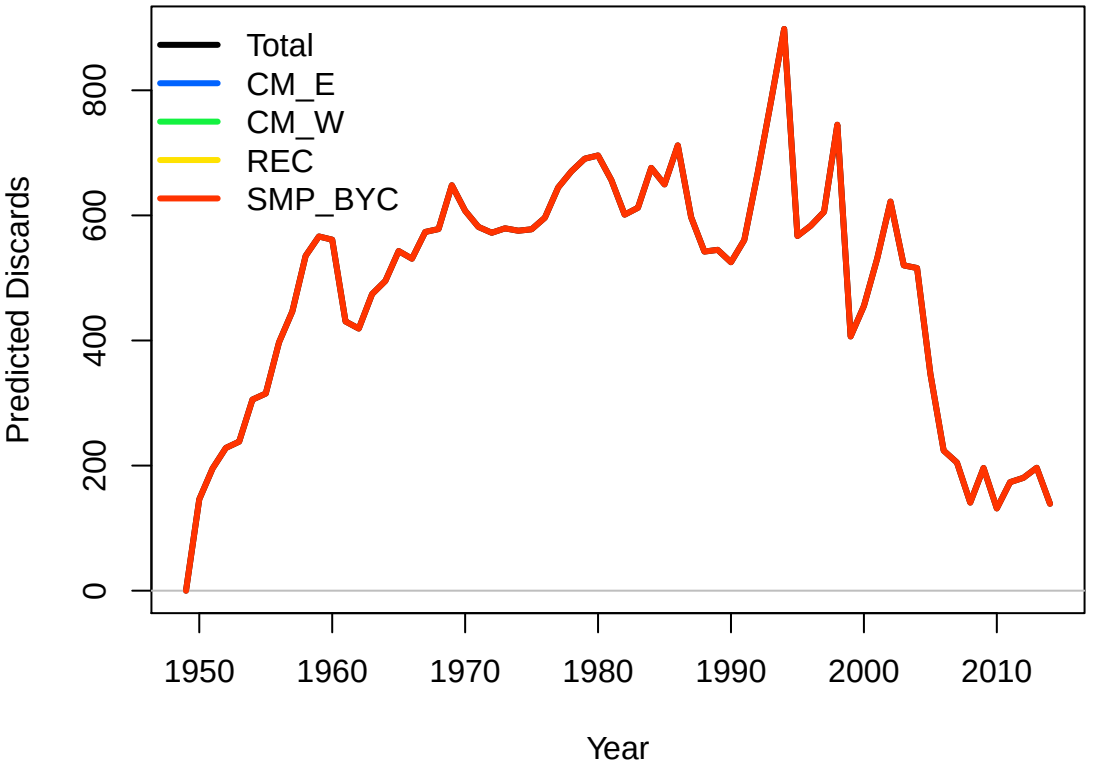

Total
CM_E
CM_W
REC
SMP_BYC
Landings (mt)
0
500
1000
1500
2000
1950
1960
1970
1980
1990
2000
2010
Year

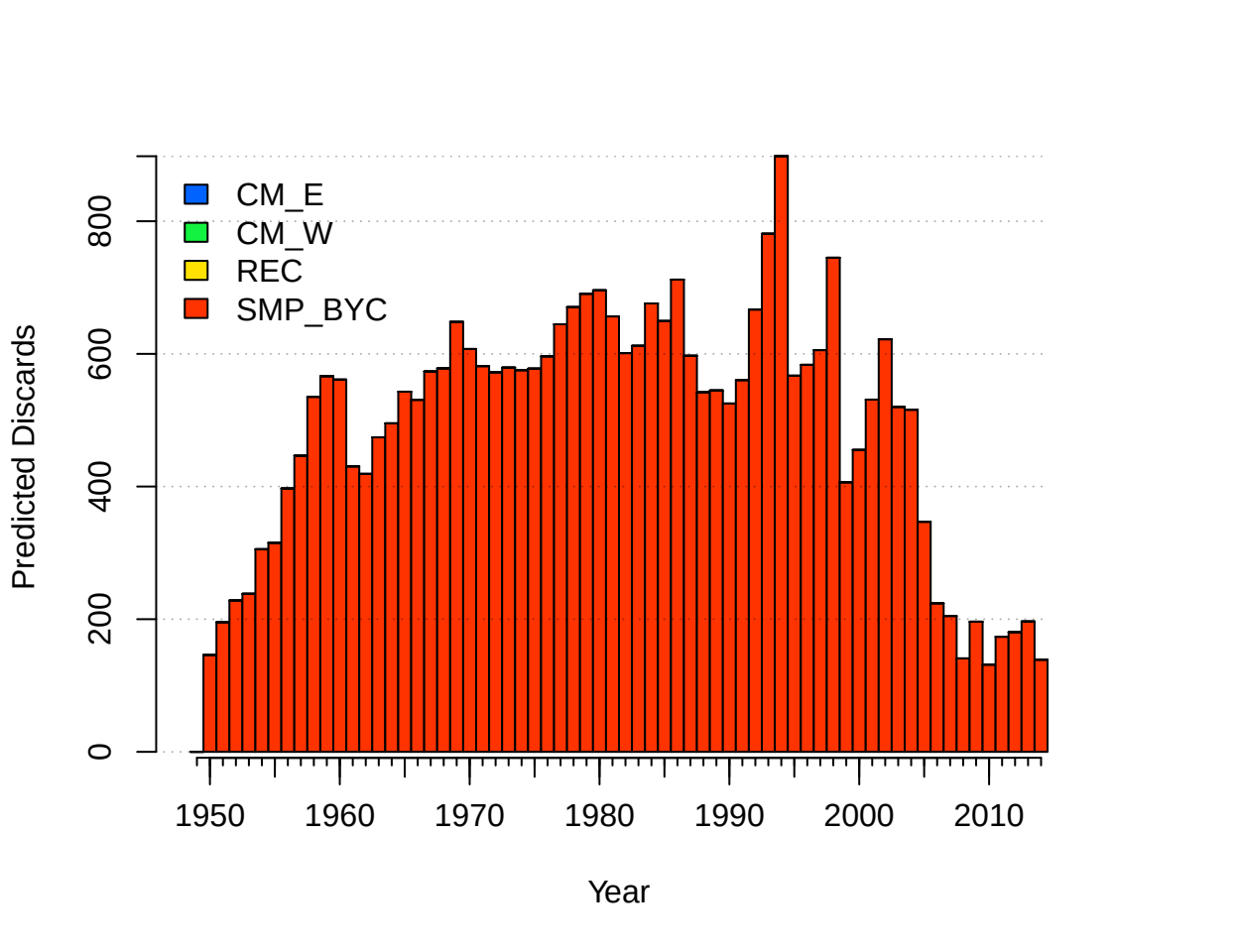

CM_E
CM_W
REC
SMP_BYC
Landings (mt)
0
500
1000
1500
1950
1960
1970
1980
1990
2000
2010
Year

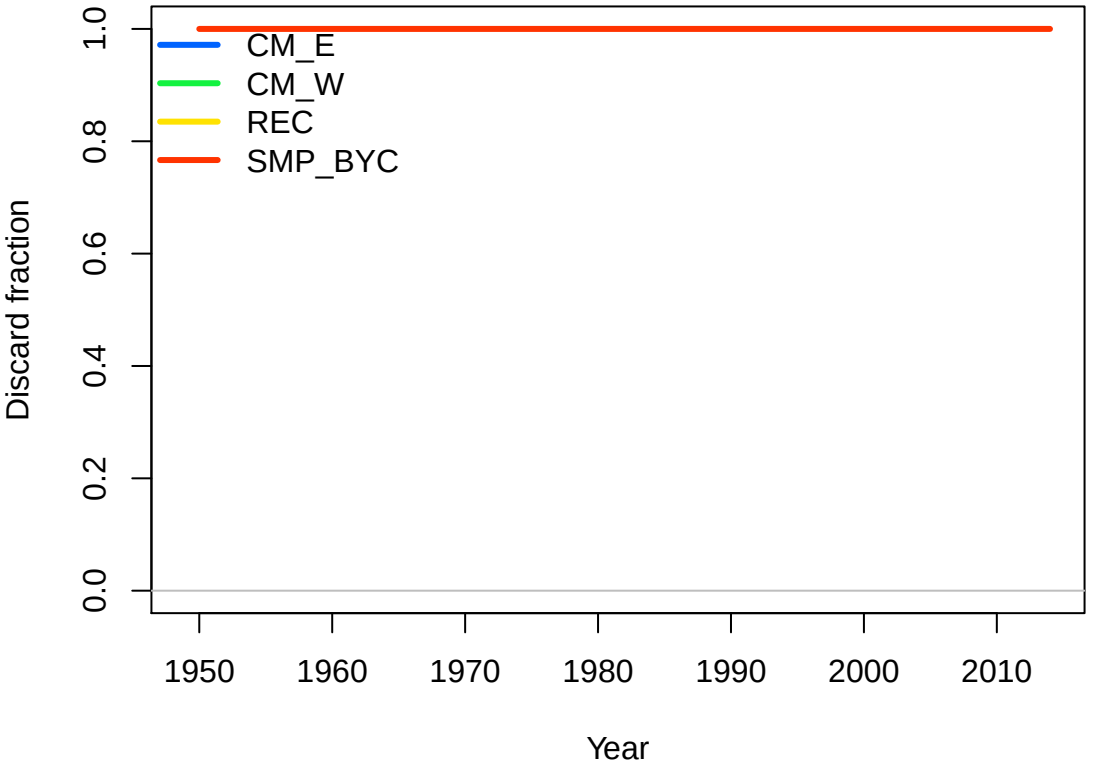

CM_E
CM_W
REC
SMP_BYC
CM_E obs.
CM_W obs.
REC obs.
SMP_BYC obs.
Observed and expected Landings (mt)
0
200
400
600
800
1200
1950
1960
1970
1980
1990
2000
2010
Year

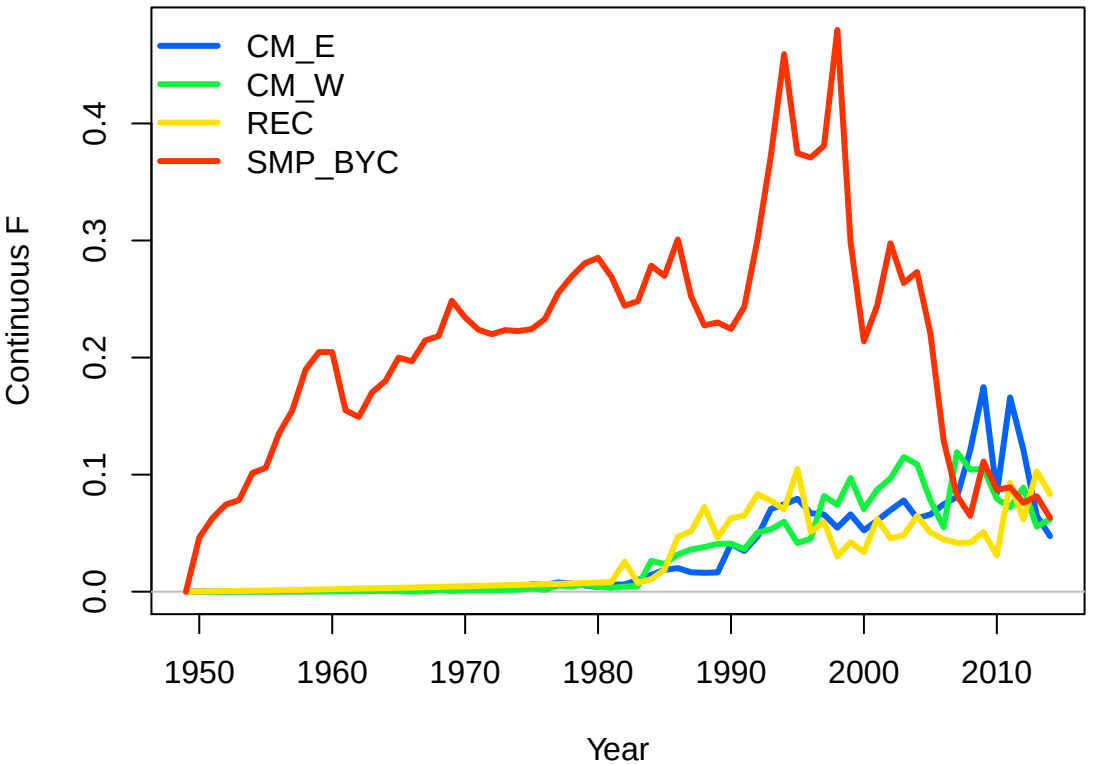

Total
CM_E
CM_W
REC
SMP_BYC
Total catch (mt)
0
500
1000
1500
2000
2500
1950
1960
1970
1980
1990
2000
2010
Year

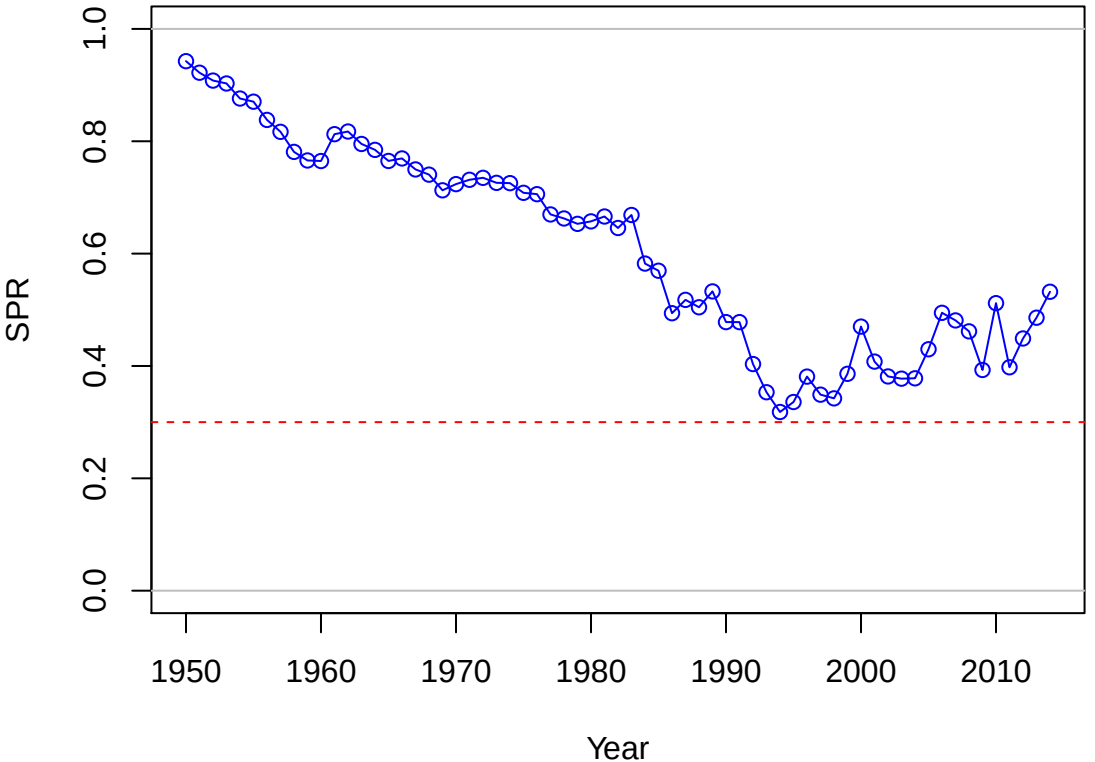

CM_E
CM_W
REC
SMP_BYC
Total catch (mt)
0
500
1000
1500
2000
2500
1950
1960
1970
1980
1990
2000
2010
Year

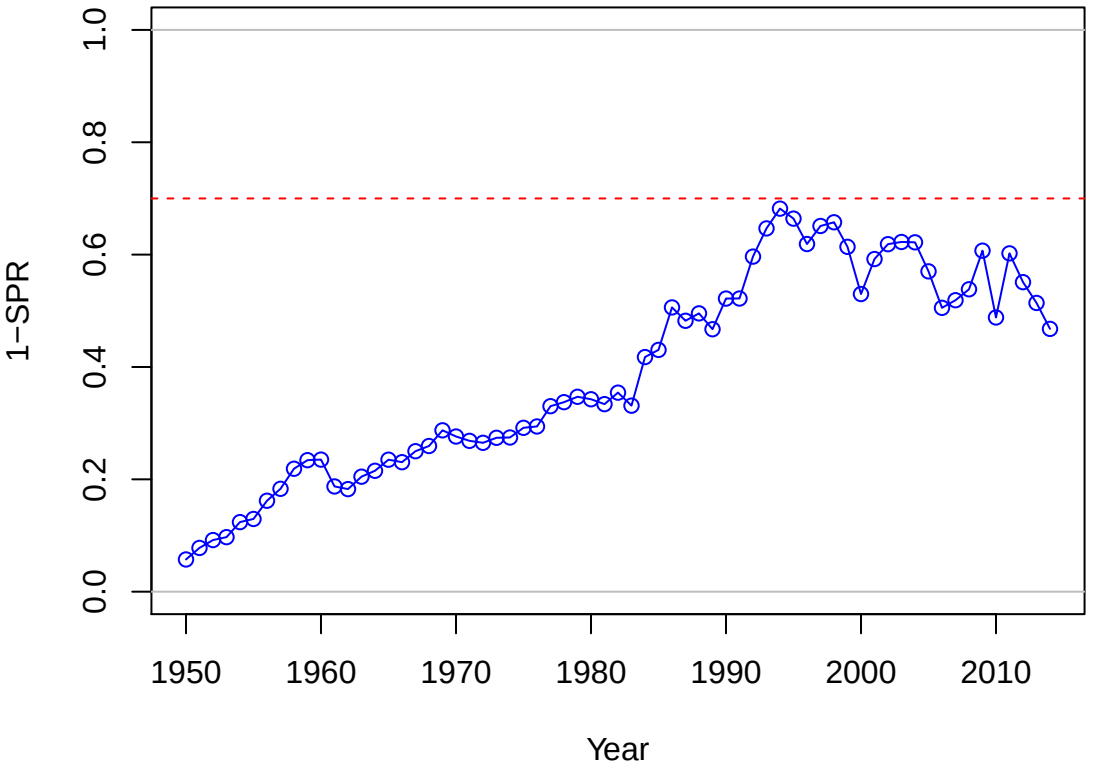

Total
CM_E
CM_W
REC
SMP_BYC
Predicted Discards
0
200
400
600
800
1950
1960
1970
1980
1990
2000
2010
Year

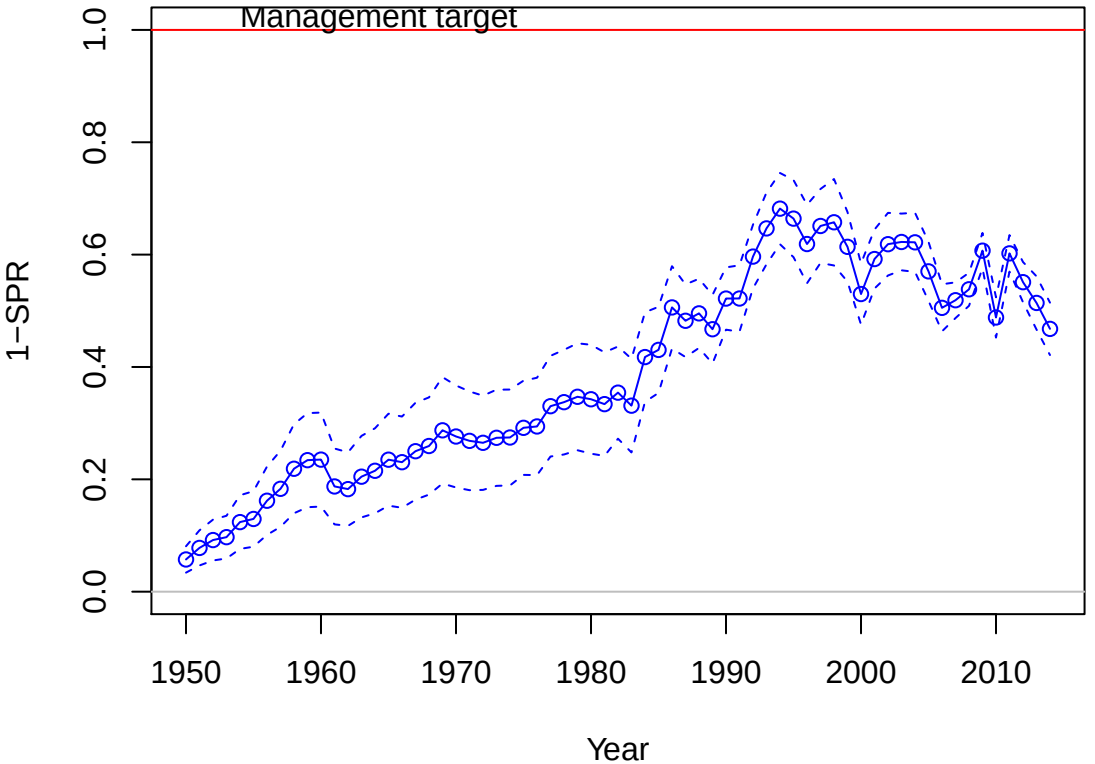

CM_E
CM_W
REC
SMP_BYC
Predicted Discards
0
200
400
600
800
1950
1960
1970
1980
1990
2000
2010
Year

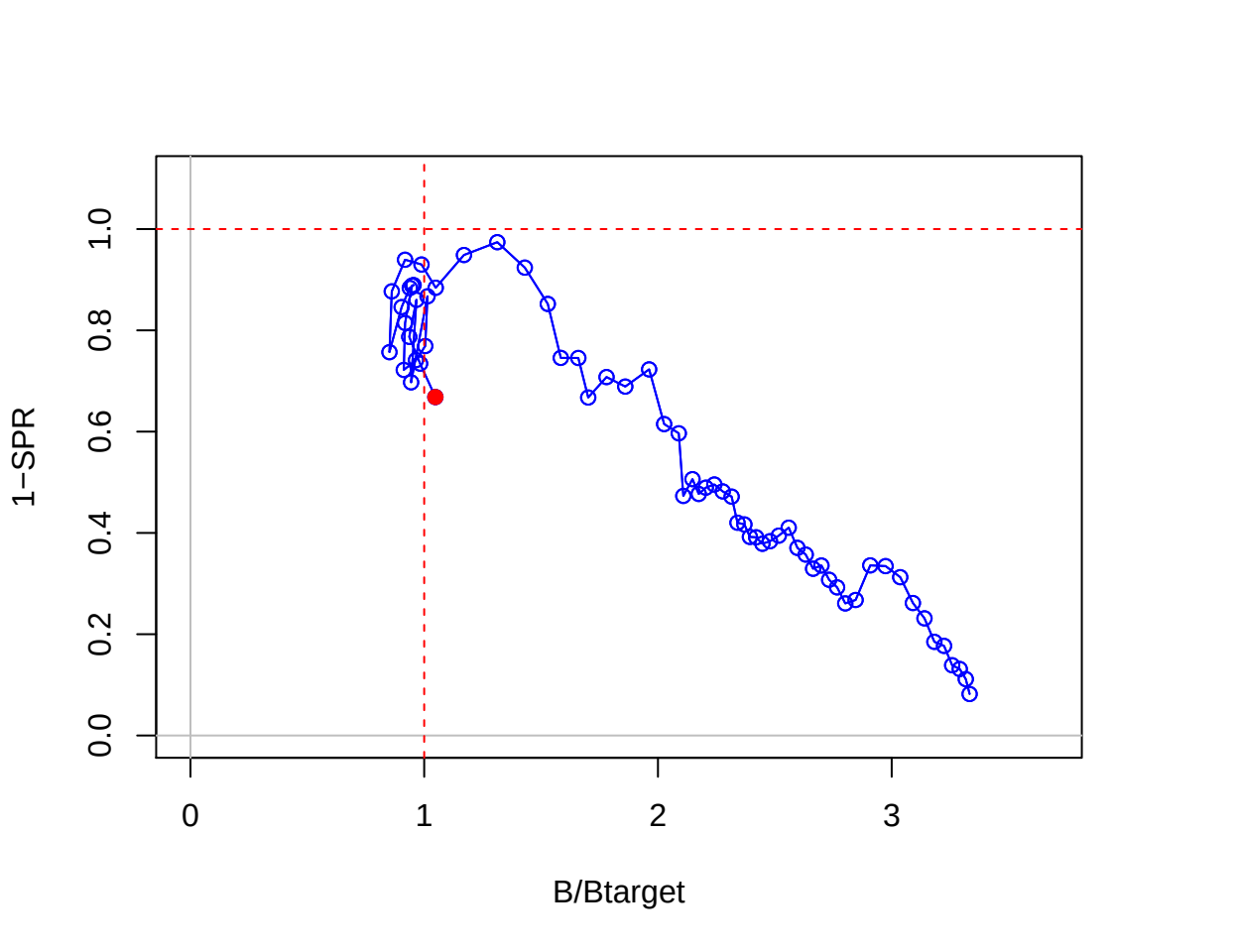

CM_E
CM_W
REC
SMP_BYC
Discard fraction
0.0
0.2
0.4
0.6
0.8
1.0
1950
1960
1970
1980
1990
2000
2010
Year

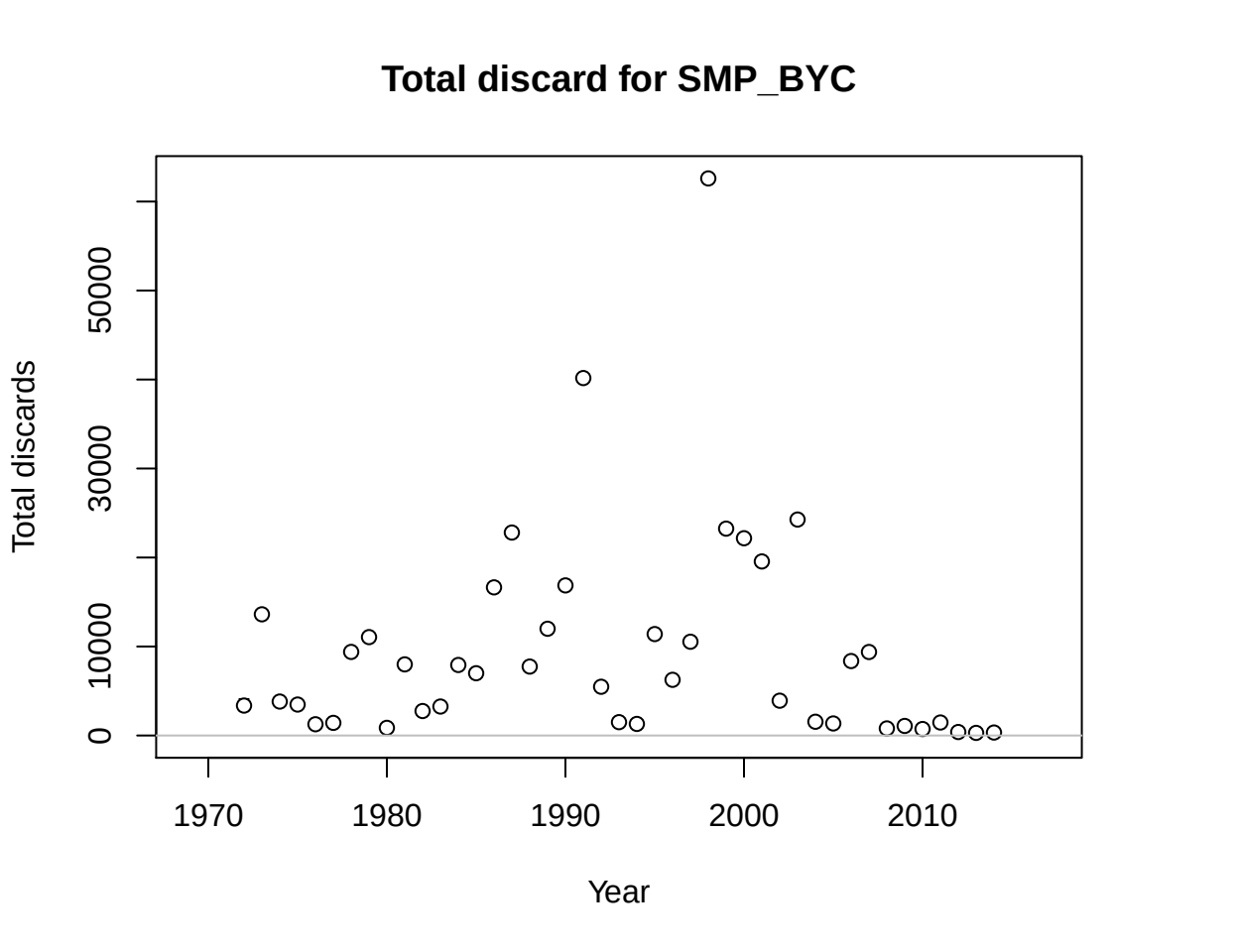

CM_E
CM_W
REC
SMP_BYC
Continuous F
0.0
0.1
0.2
0.3
0.4
1950
1960
1970
1980
1990
2000
2010
Year

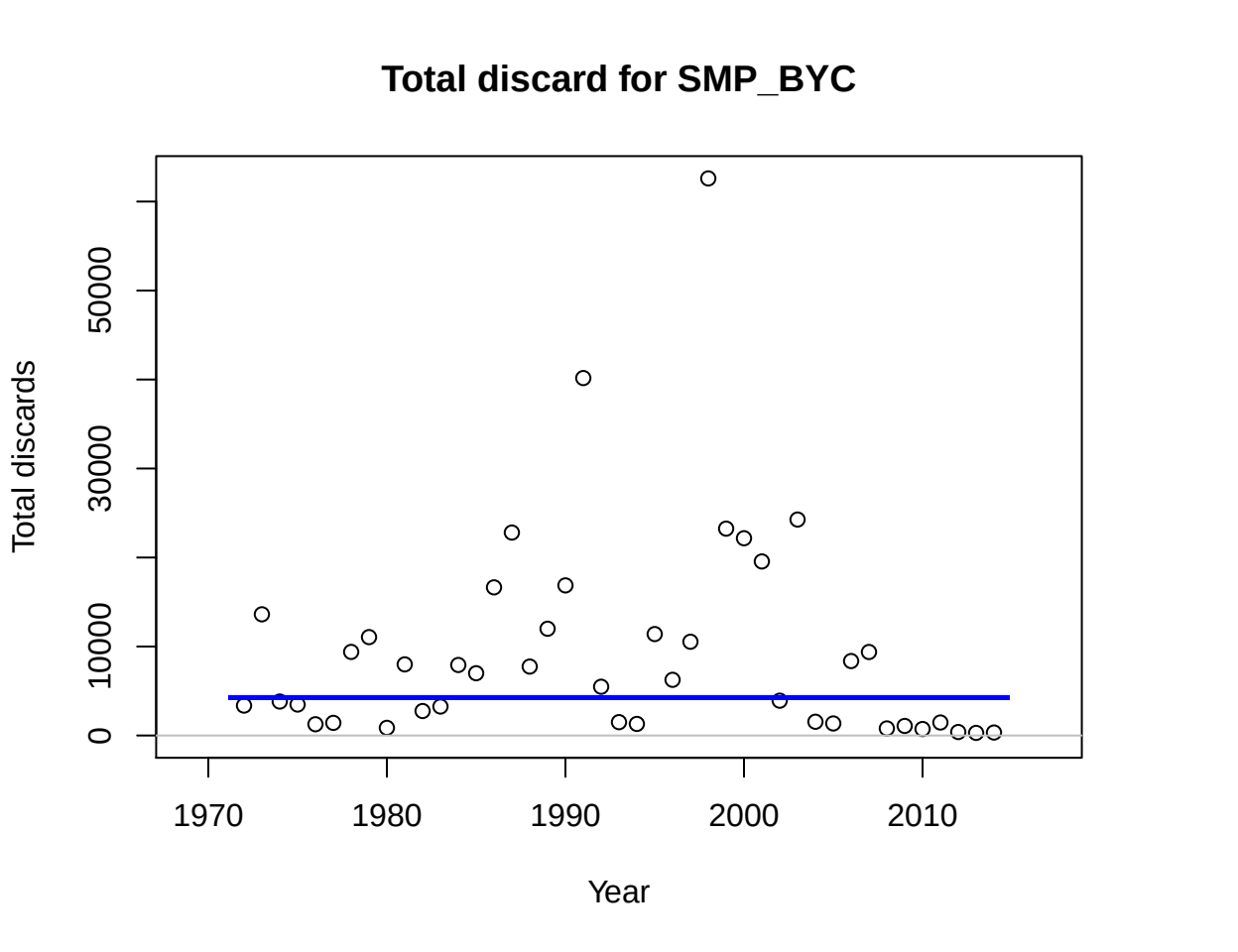

SPR
1.0
0.8
0.6
0.4
0.2
0.0
1950
1960
1970
1980
1990
2000
2010
Year

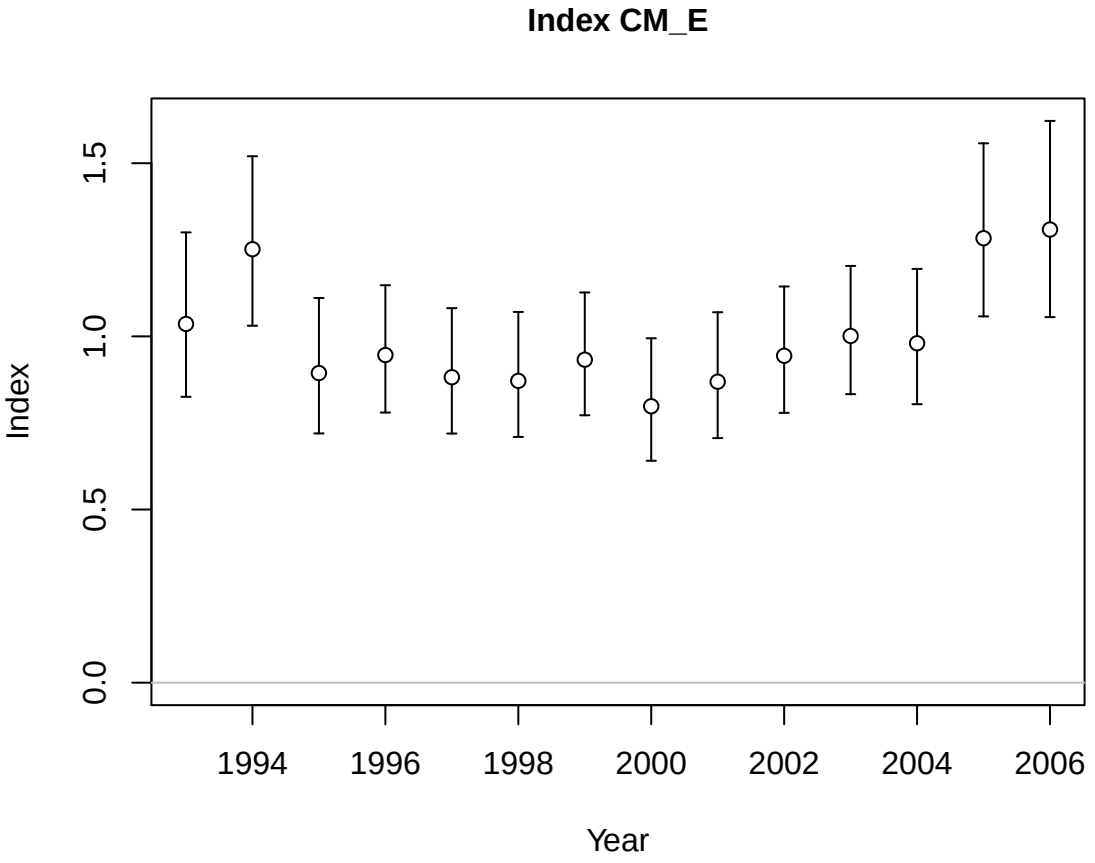

1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1950
1960
1970
1980
1990
2000
2010
Year

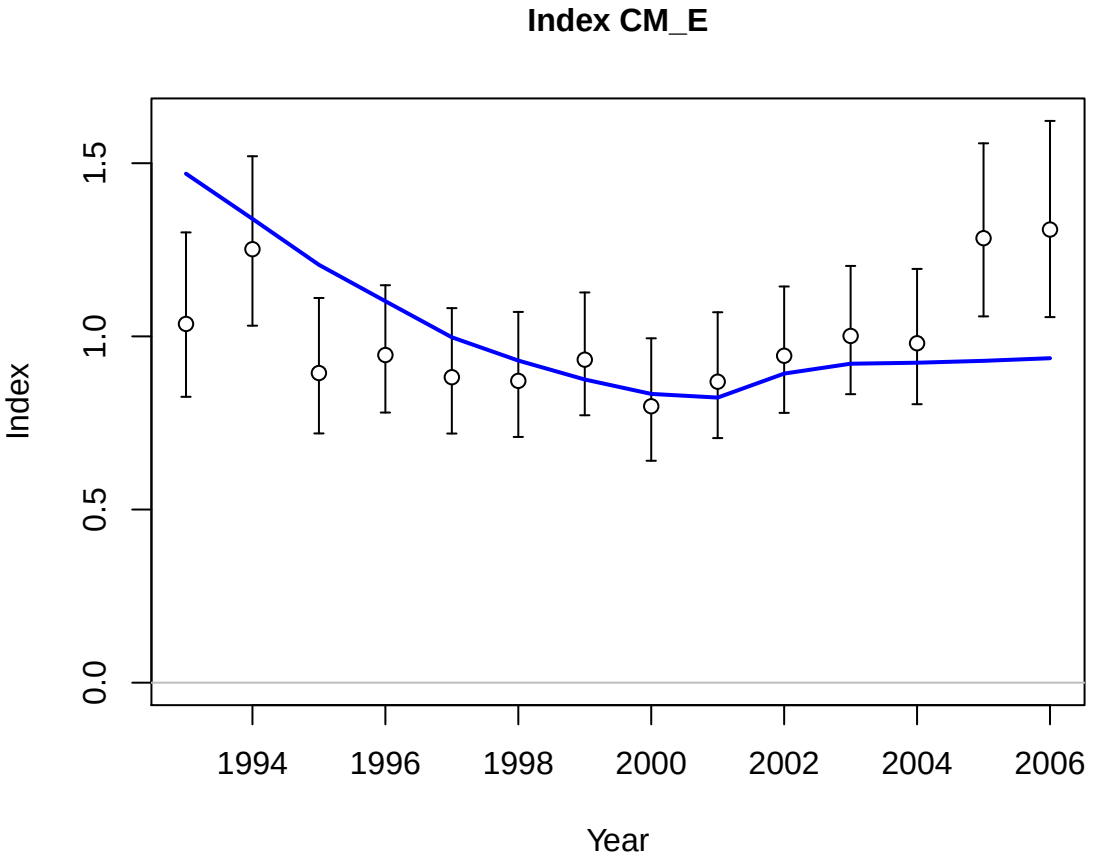

Management target
1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1950
1960
1970
1980
1990
2000
2010
Year

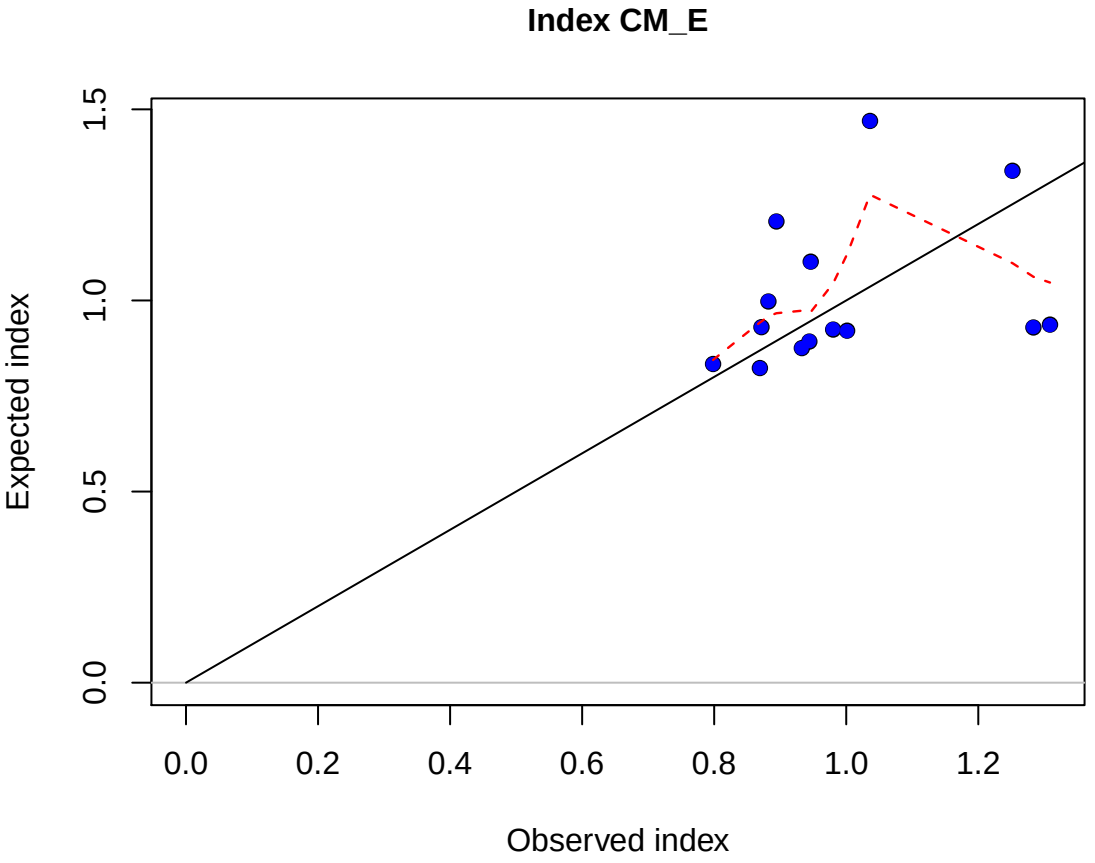

1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
B/Btarget

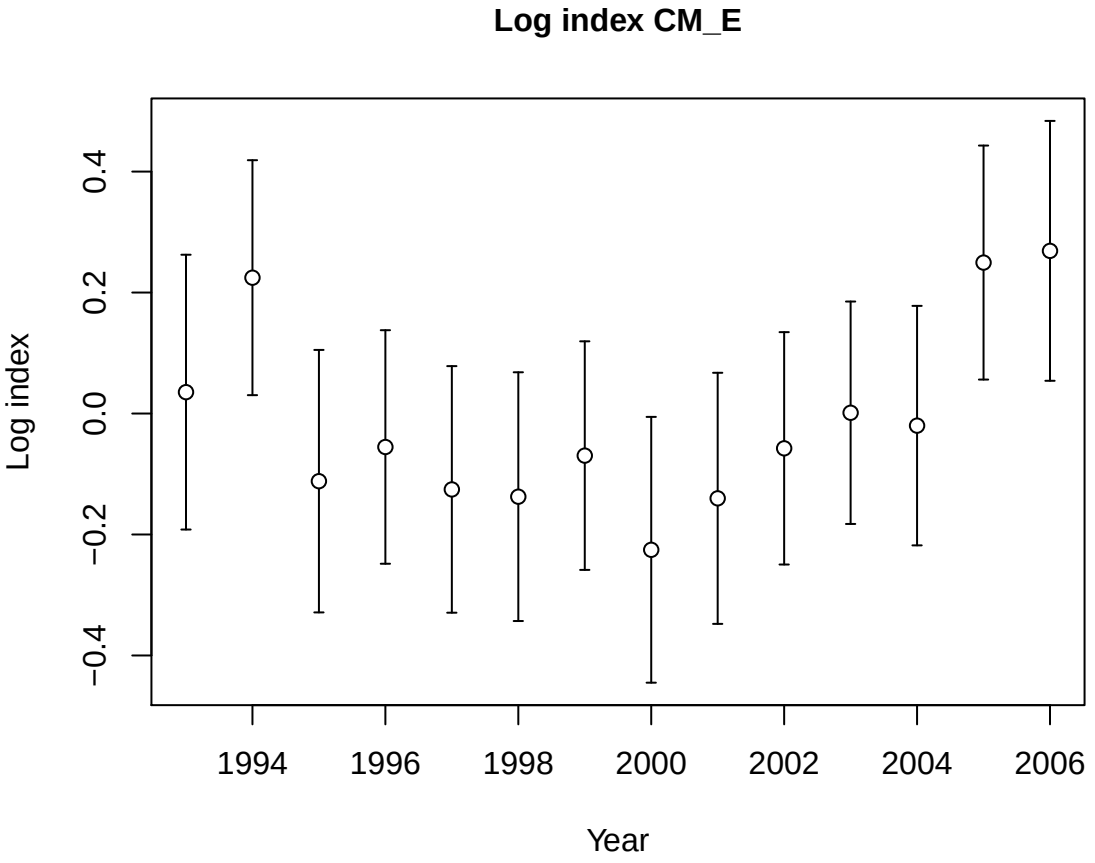

Total discard for SMP_BYC
Total discards
0
10000
30000
50000
1970
1980
1990
2000
2010
Year

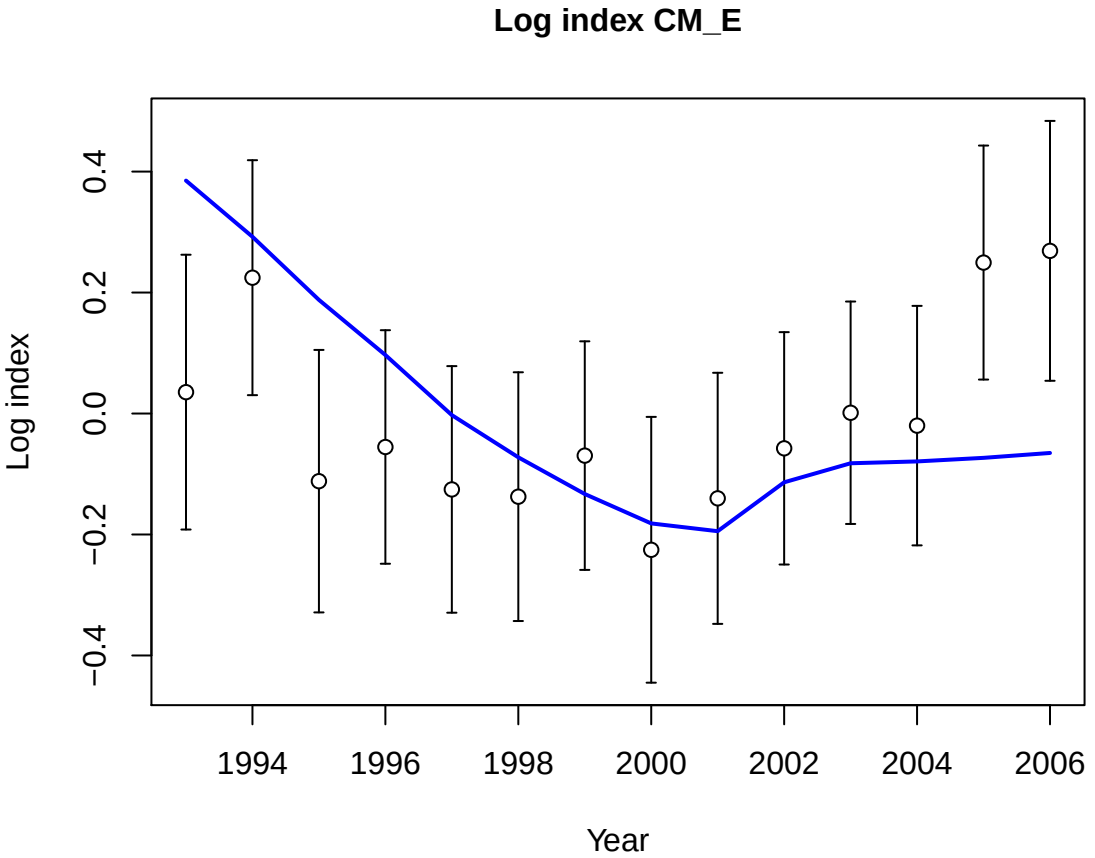

Total discard for SMP_BYC
Total discards
0
10000
30000
50000
1970
1980
1990
2000
2010
Year

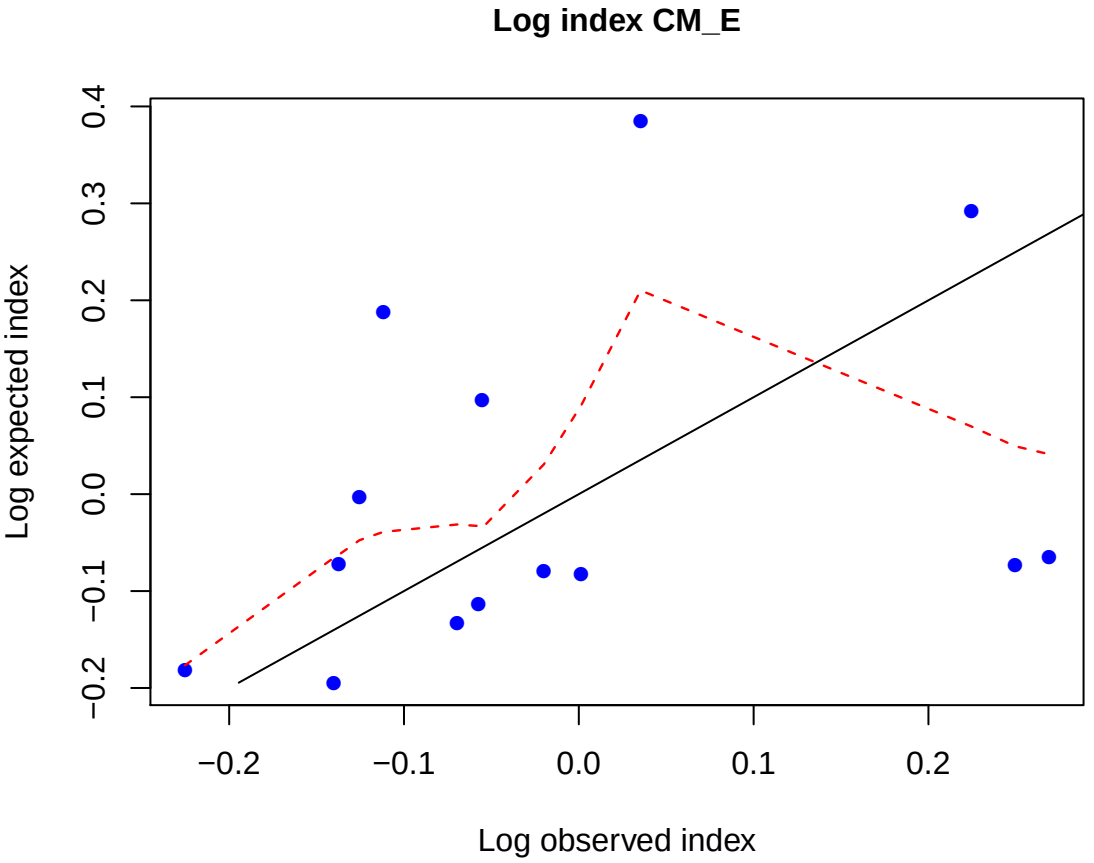

Index CM_E
Index
0.0
0.5
1.0
1.5
1994
1996
1998
2000
2002
2004
2006
Year

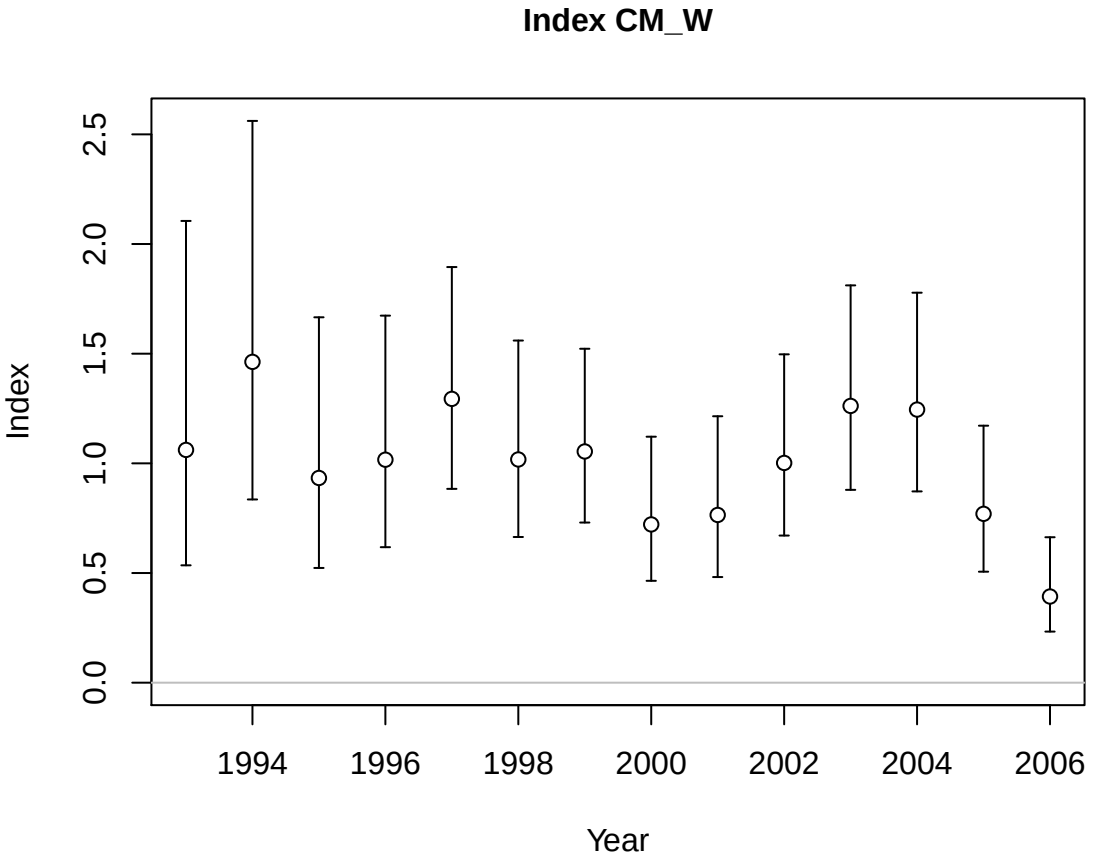

Index CM_E
Index
0.0
0.5
1.0
1.5
1994
1996
1998
2000
2002
2004
2006
Year

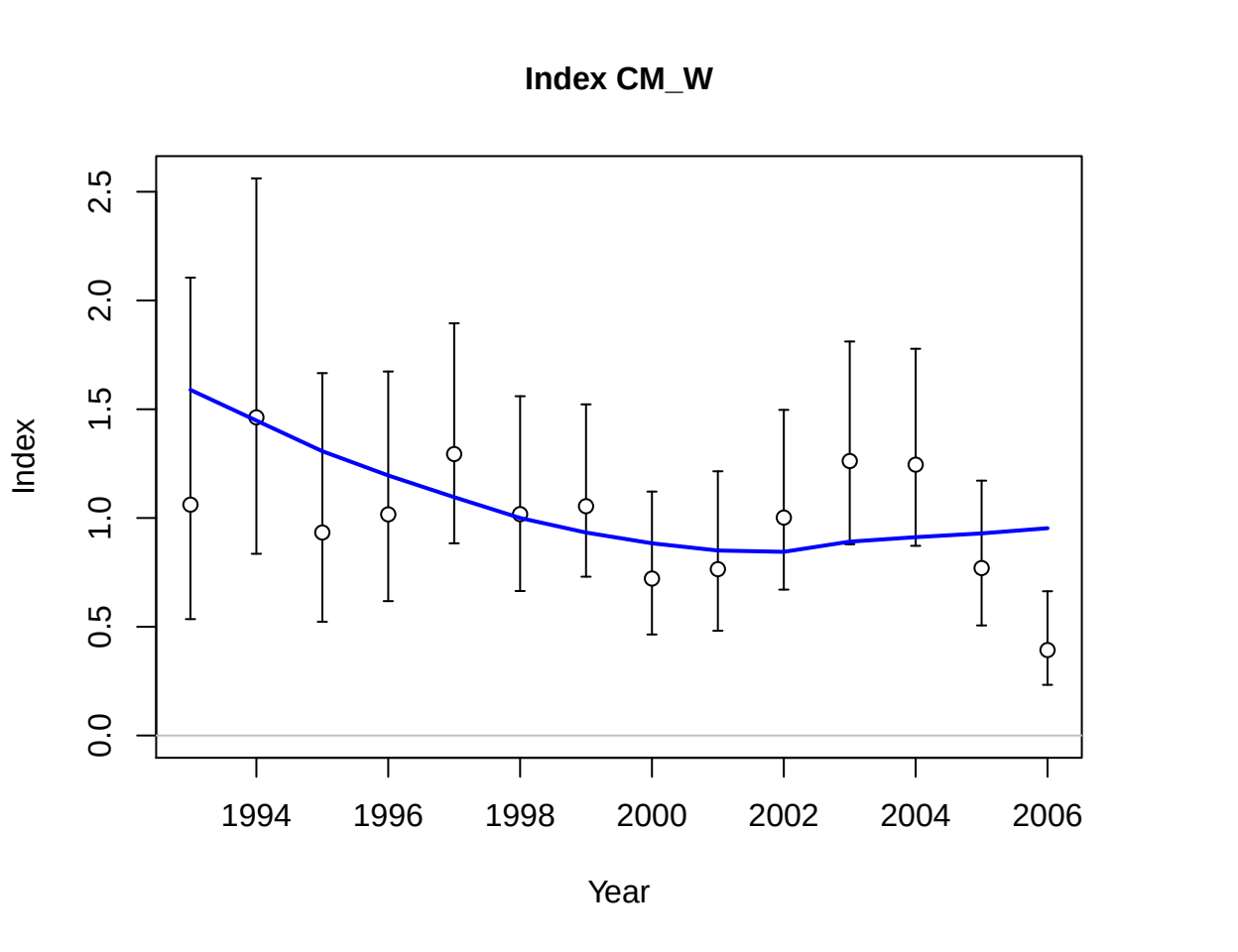

Index CM_E
Expected index
0.0
0.5
1.0
1.5
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Observed index

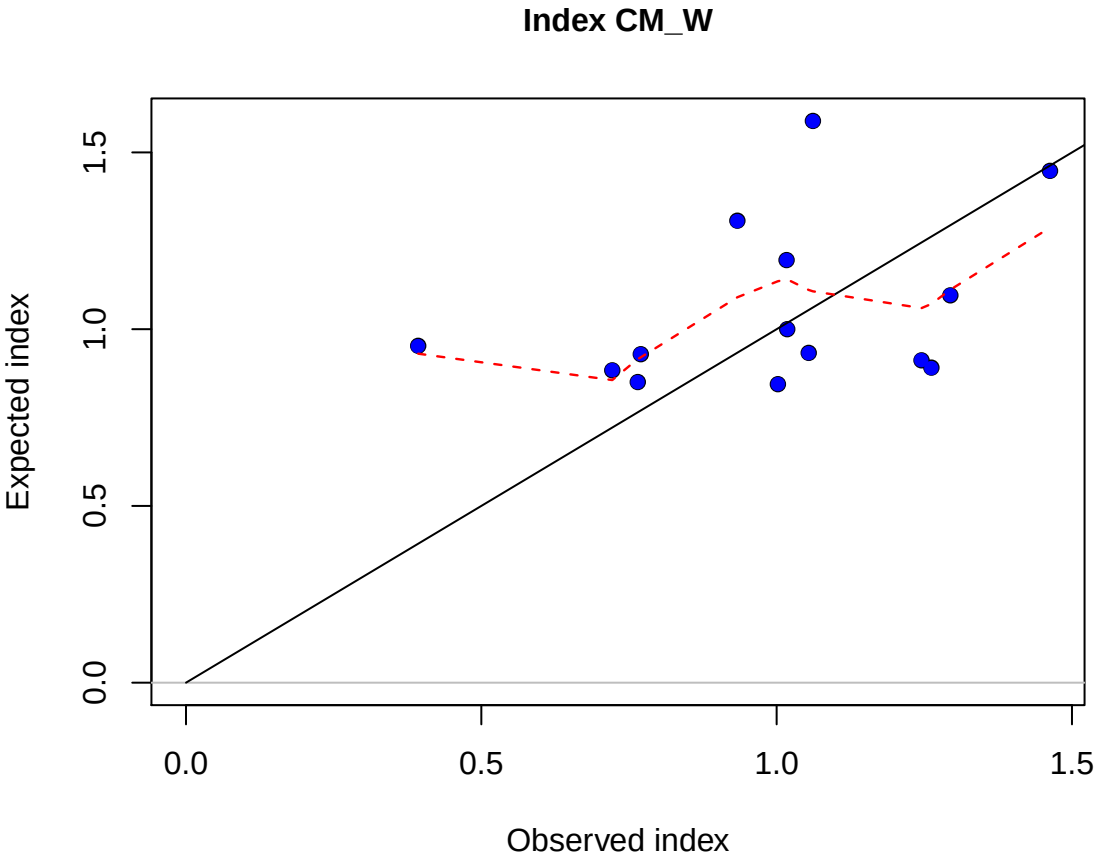

Log index CM_E
Log index
0.4
0.2
0.0
−0.2
−0.4
1994
1996
1998
2000
2002
2004
2006
Year

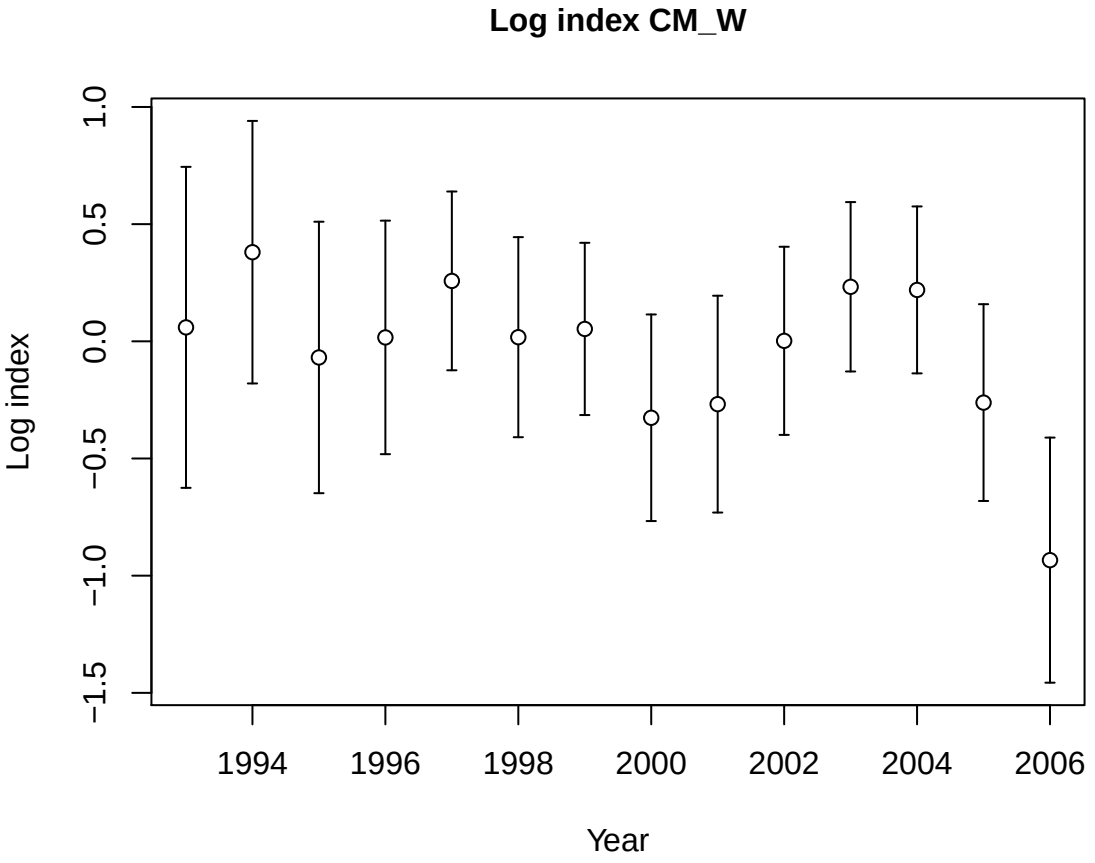

Log index CM_E
Log index
0.4
0.2
0.0
−0.2
−0.4
1994
1996
1998
2000
2002
2004
2006
Year

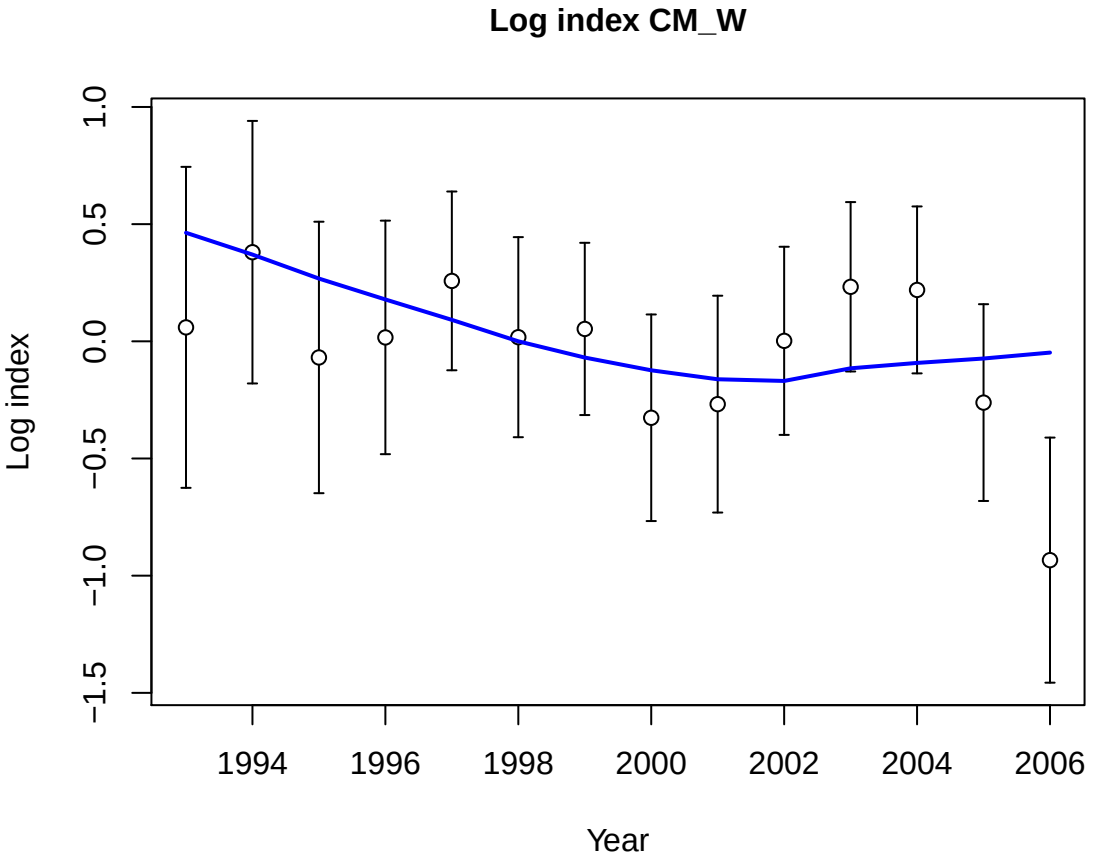

Log index CM_E
Log expected index
Log observed index
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.2
−0.1
0.0
0.1
0.2

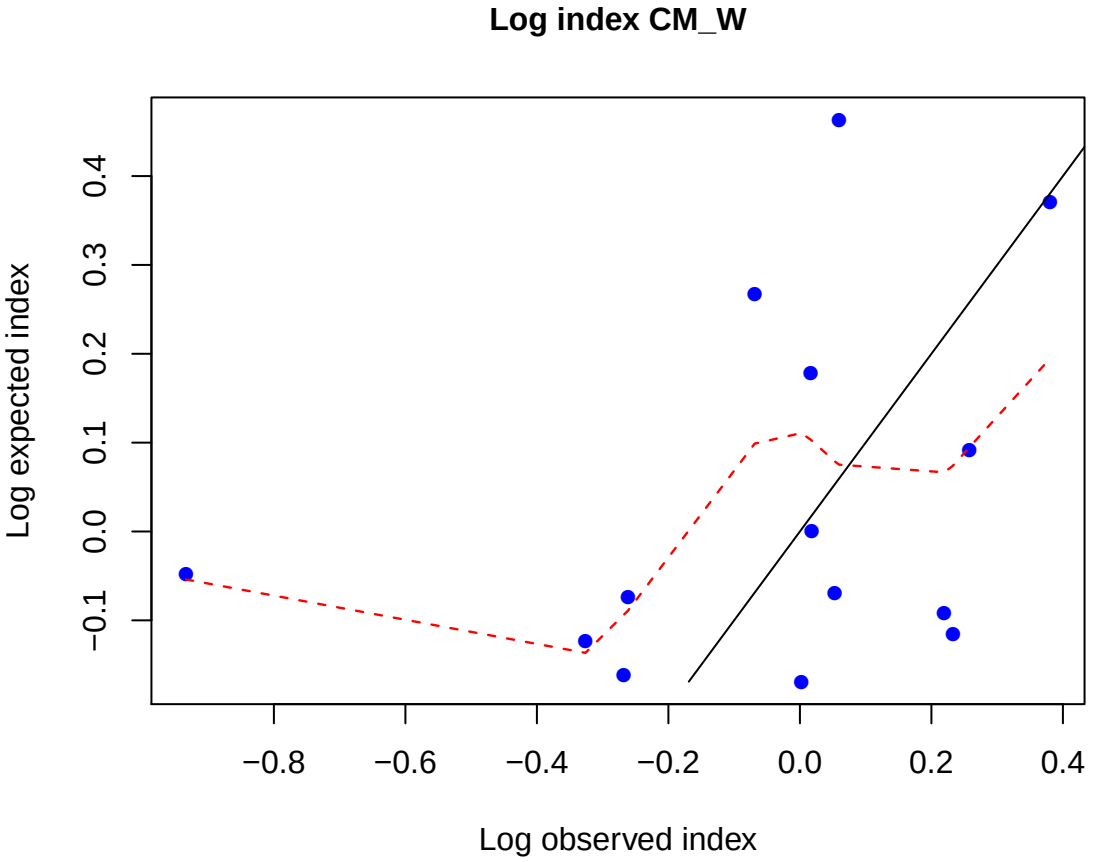

Index CM_W
Index
0.0
0.5
1.0
1.5
2.0
2.5
1994
1996
1998
2000
2002
2004
2006
Year

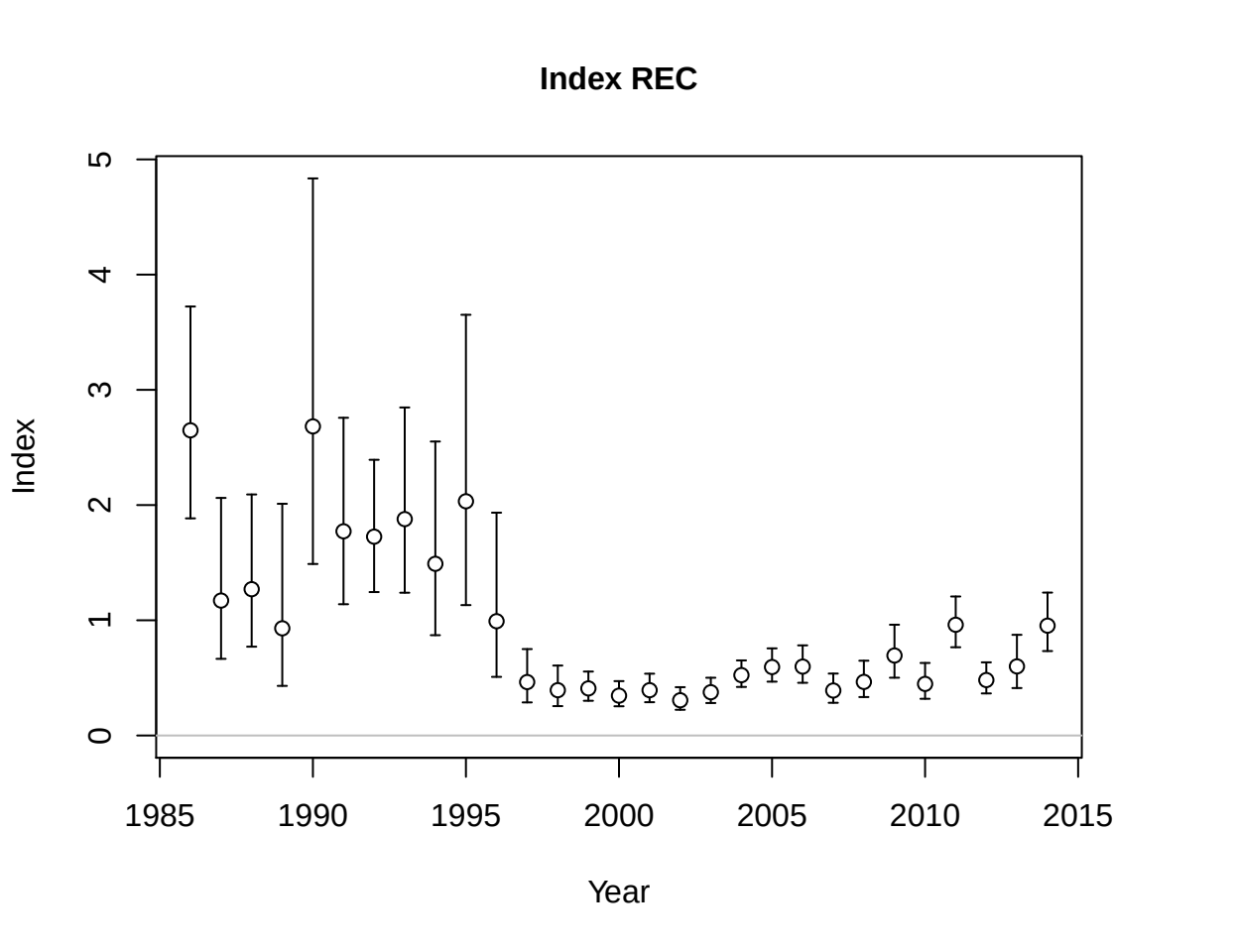

Index CM_W
Index
0.0
0.5
1.0
1.5
2.0
2.5
1994
1996
1998
2000
2002
2004
2006
Year

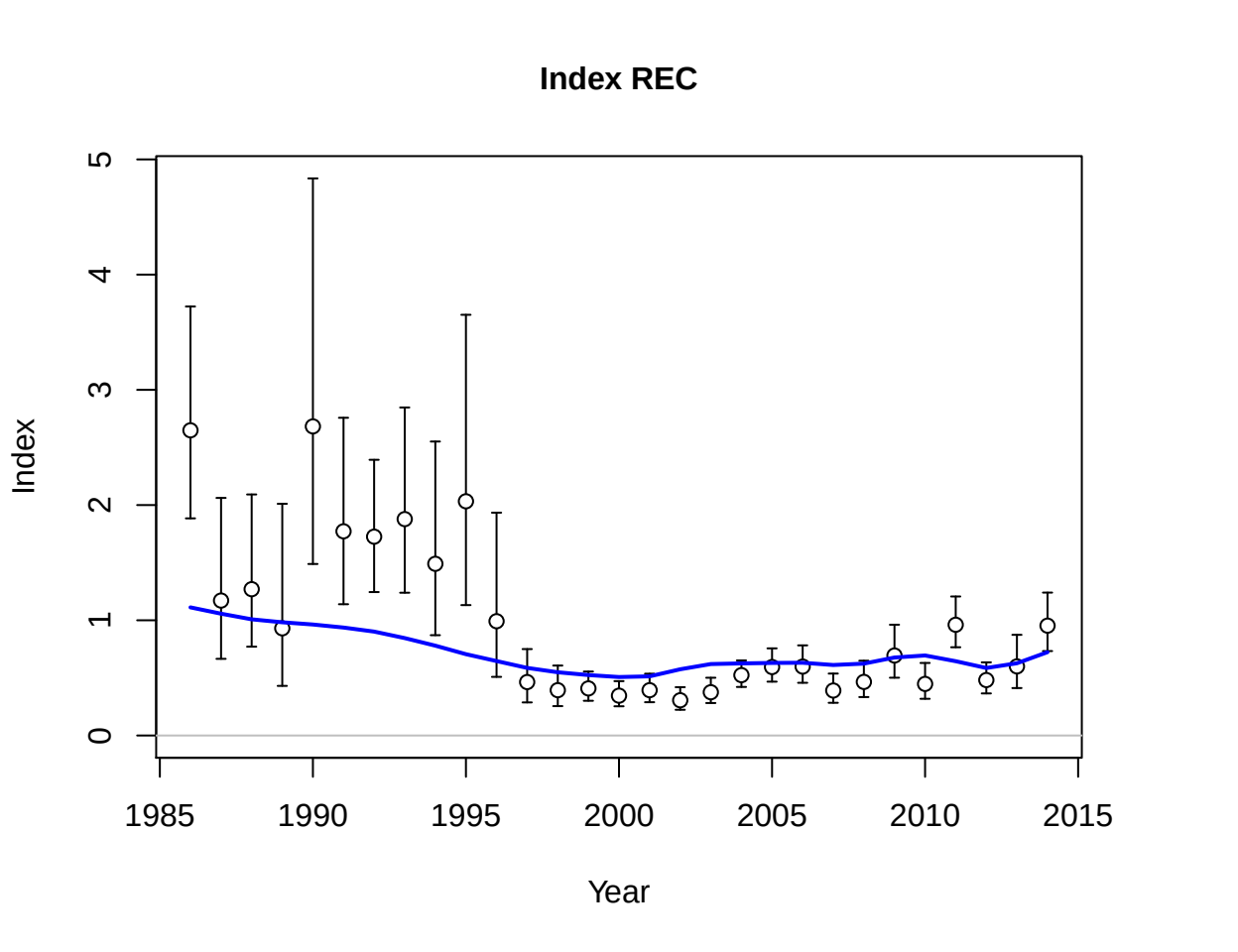

Index CM_W
Expected index
0.0
0.5
1.0
1.5
0.0
0.5
1.0
1.5
Observed index

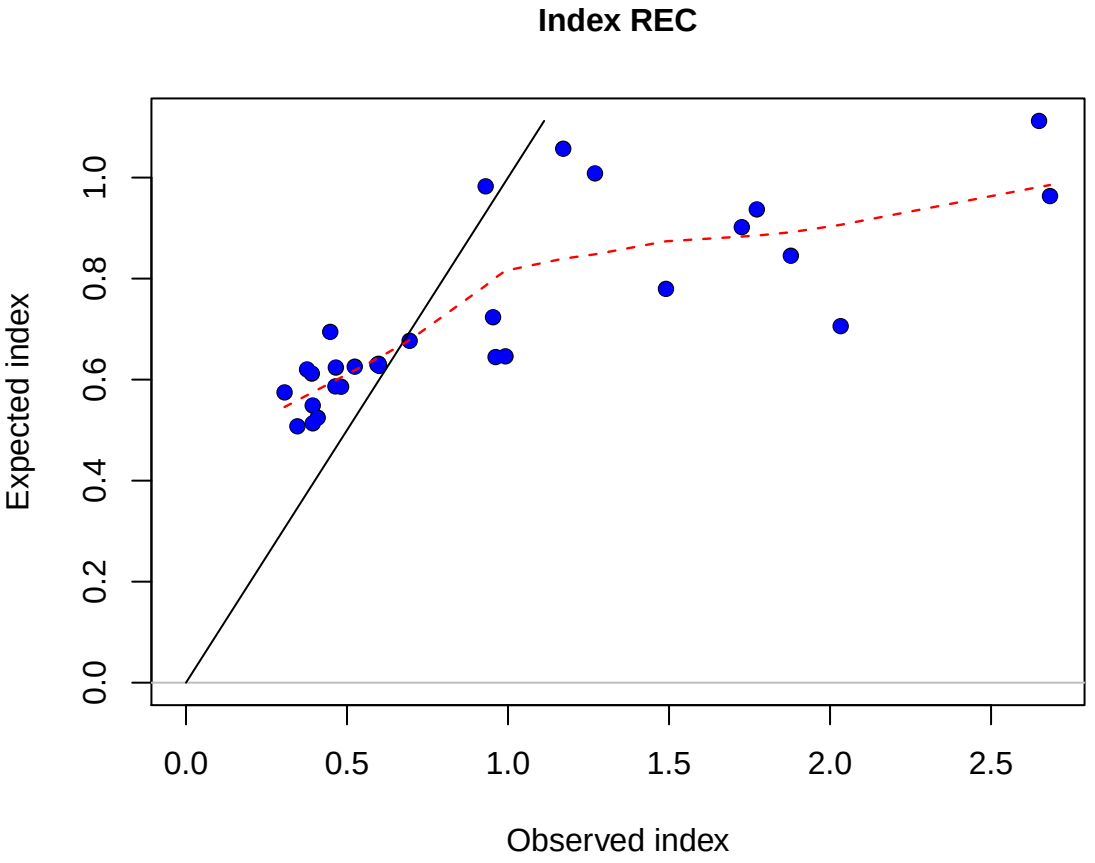

Log index CM_W
Log index
1.0
0.5
0.0
−0.5
−1.0
−1.5
1994
1996
1998
2000
2002
2004
2006
Year

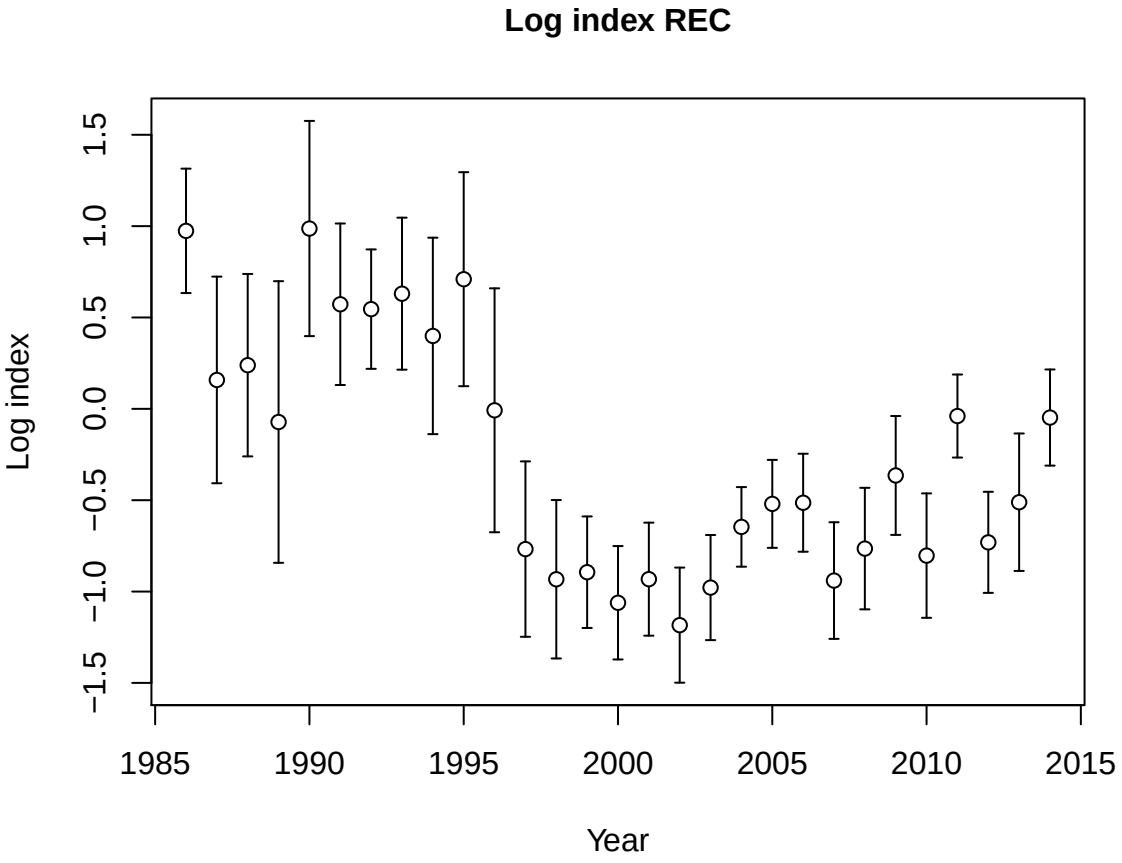

Log index CM_W
Log index
1.0
0.5
0.0
−0.5
−1.0
−1.5
1994
1996
1998
2000
2002
2004
2006
Year

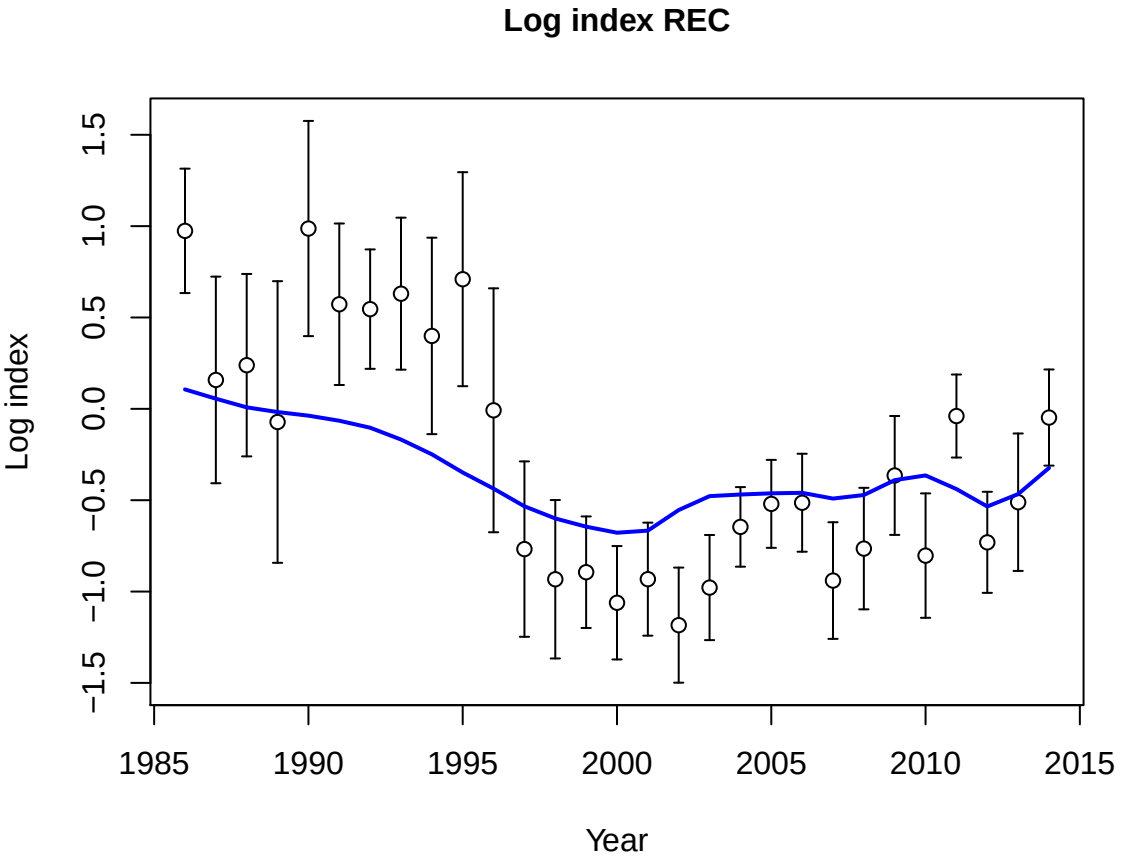

Log index CM_W
Log expected index
−0.1
0.0
0.1
0.2
0.3
0.4
−0.8
−0.6
−0.4
−0.2
0.0
0.2
0.4
Log observed index

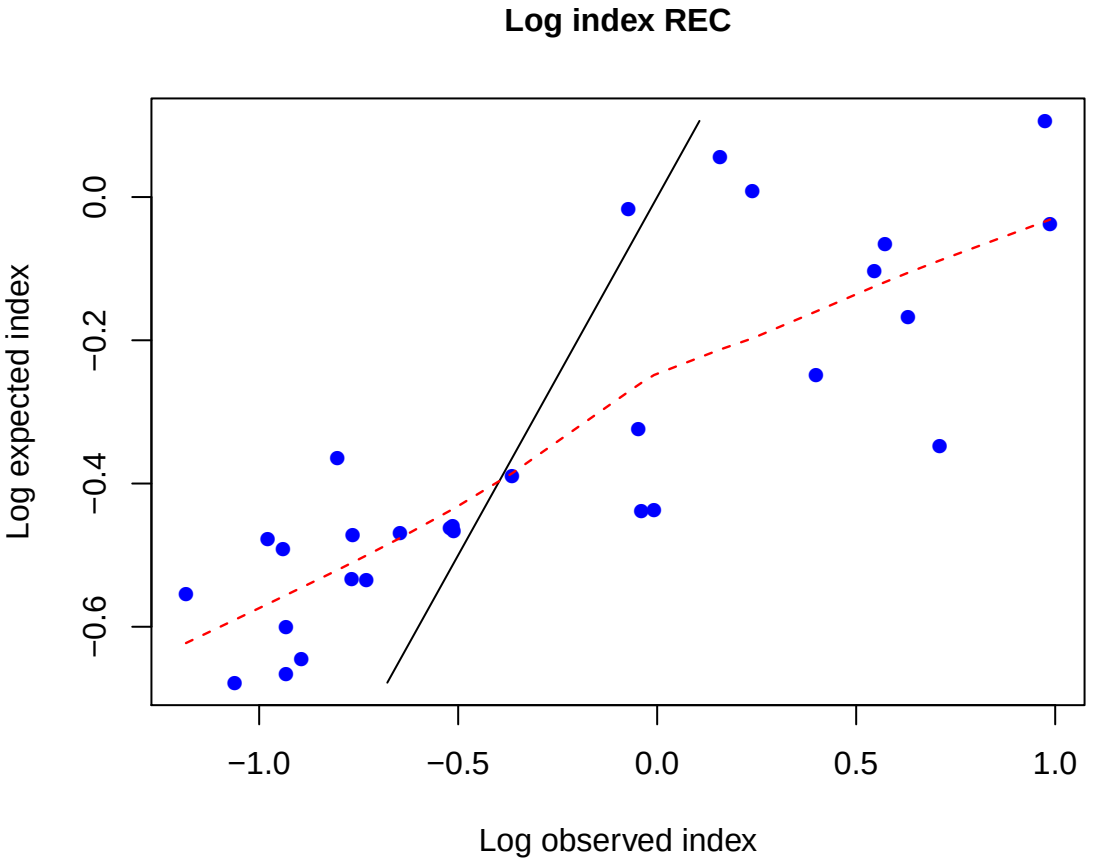

Index REC
Index
0
1
2
3
4
5
1985
1990
1995
2000
2005
2010
2015
Year

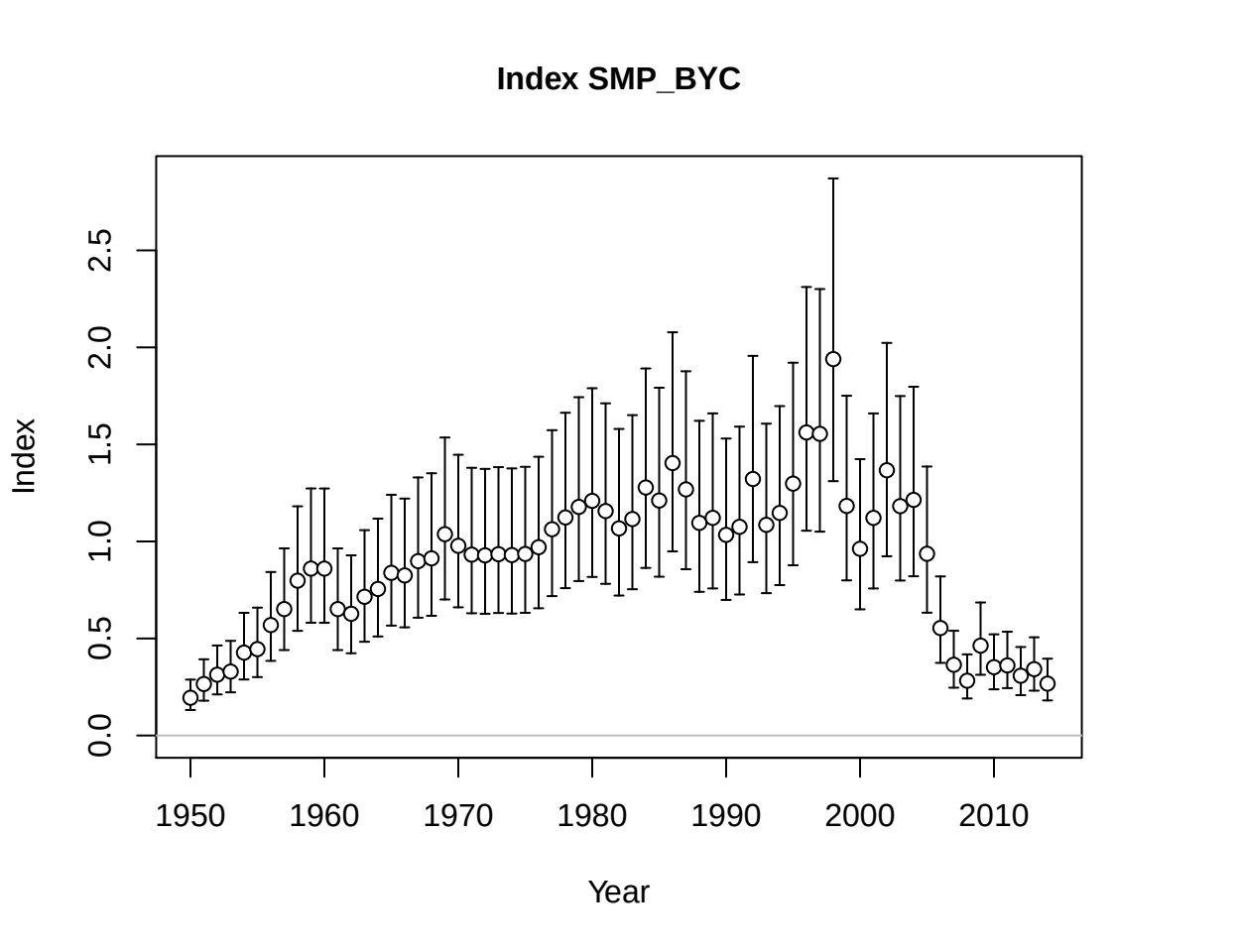

Index REC
Index
0
1
2
3
4
5
1985
1990
1995
2000
2005
2010
2015
Year


Index REC
Expected index
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
Observed index


Log index REC
Log index
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
1985
1990
1995
2000
2005
2010
2015
Year


Log index REC
Log index
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
1985
1990
1995
2000
2005
2010
2015
Year


Log index REC
Log expected index
0.0
−0.2
−0.4
−0.6
−1.0
−0.5
0.0
0.5
1.0
Log observed index


Index SMP_BYC
Index
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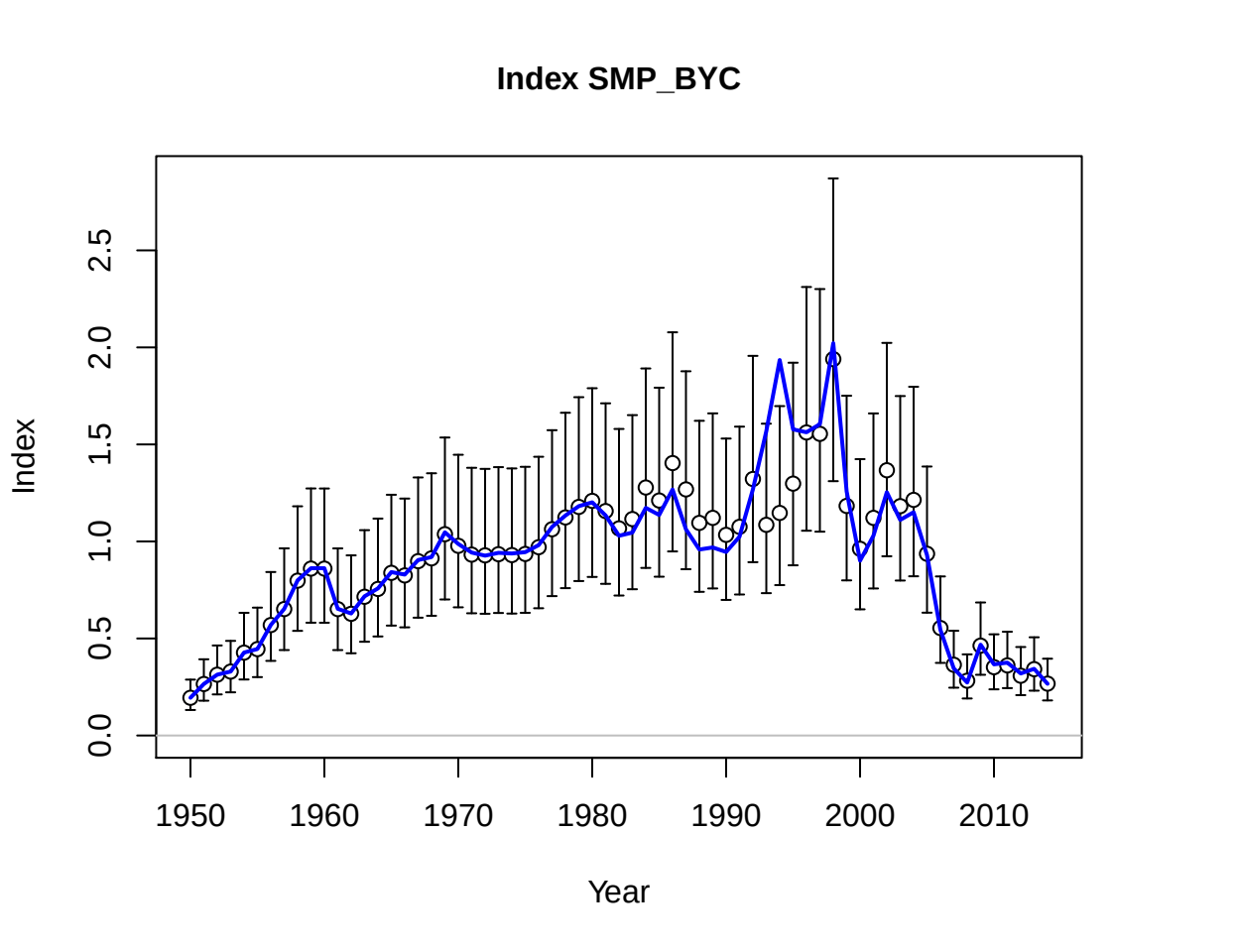
0.5
1.0
1.5
2.0
2.5
1950
1960
1970
1980
1990
2000
2010
Year


Index SMP_BYC
Index
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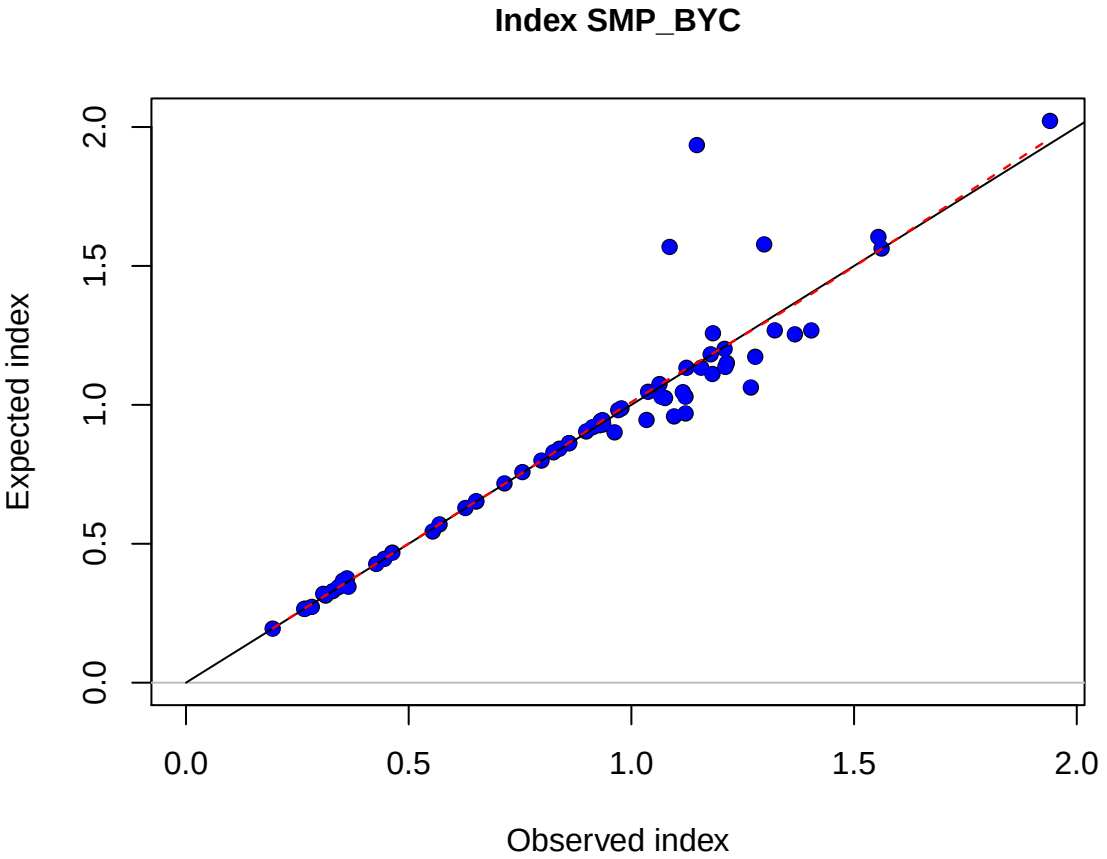
2.5
1950
1960
1970
1980
1990
2000
2010
Year


Index SMP_BYC
Expected index
Observed index
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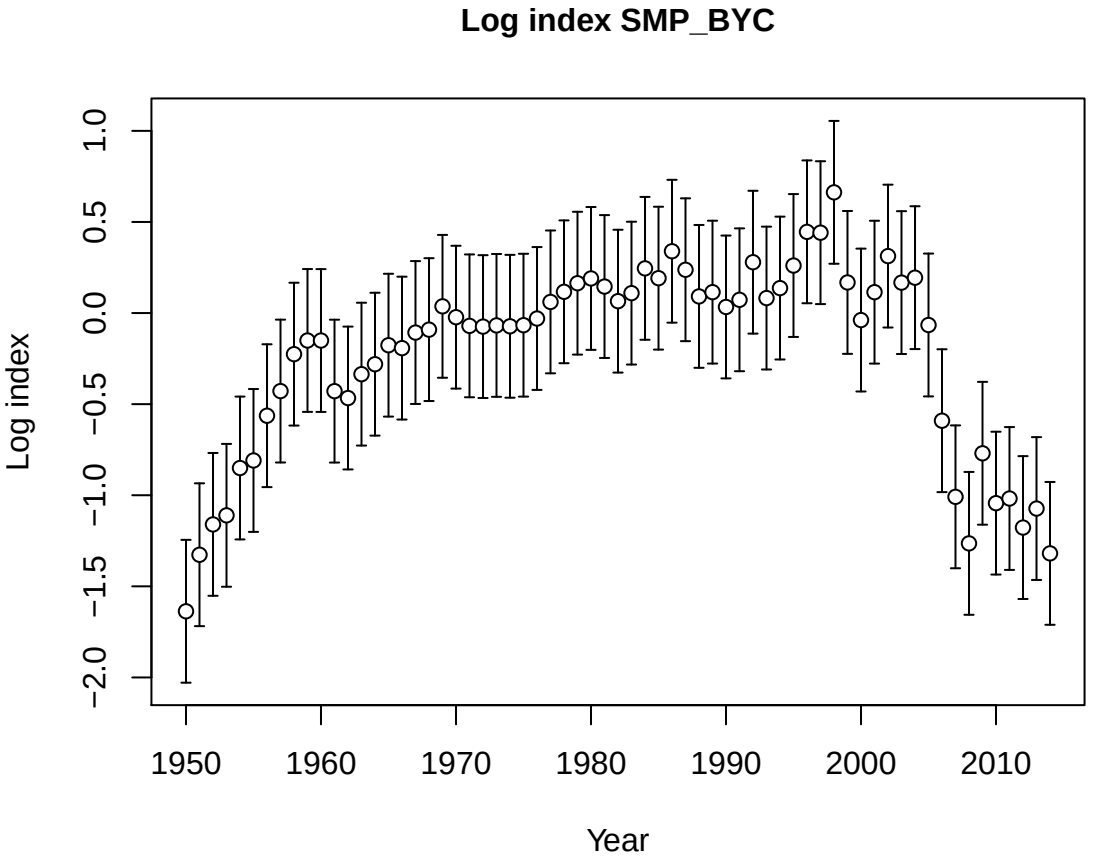
0.5
1.0
1.5
2.0


Log index SMP_BYC
Log index
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0.5
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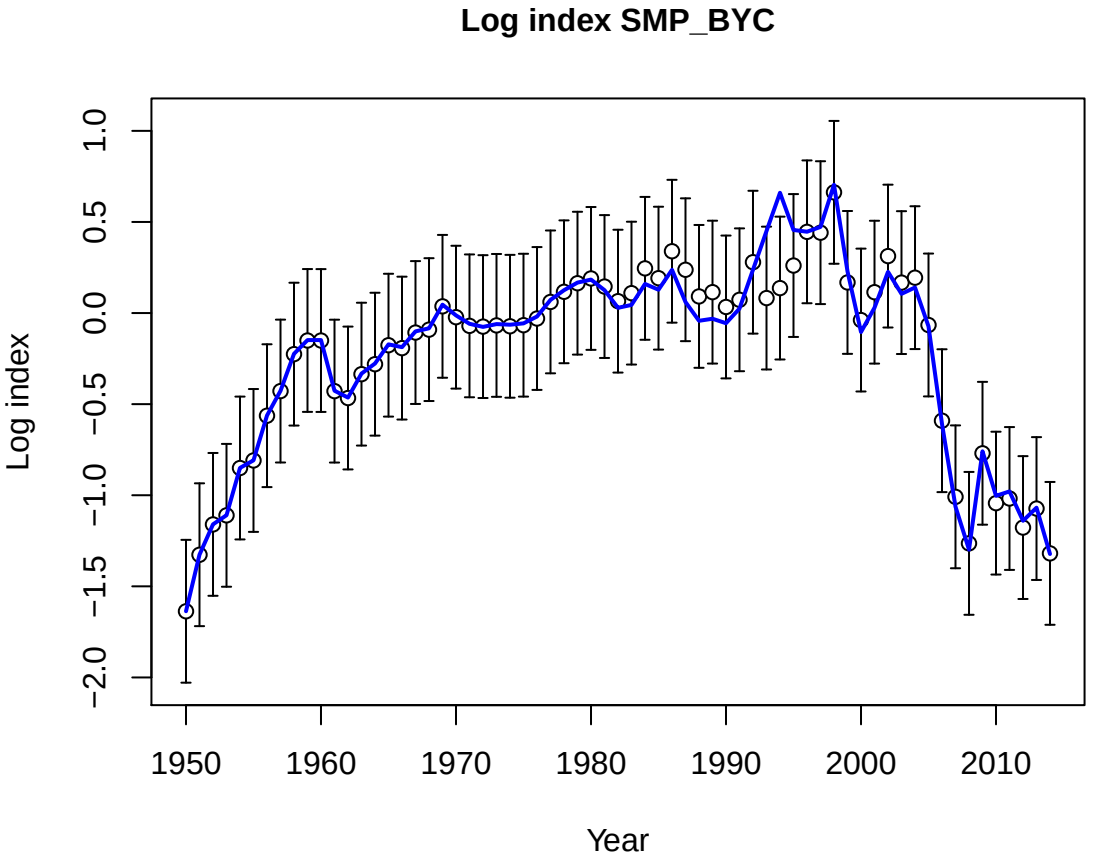
−1.0
−1.5
−2.0
1950
1960
1970
1980
1990
2000
2010
Year


Log index SMP_BYC
Log index
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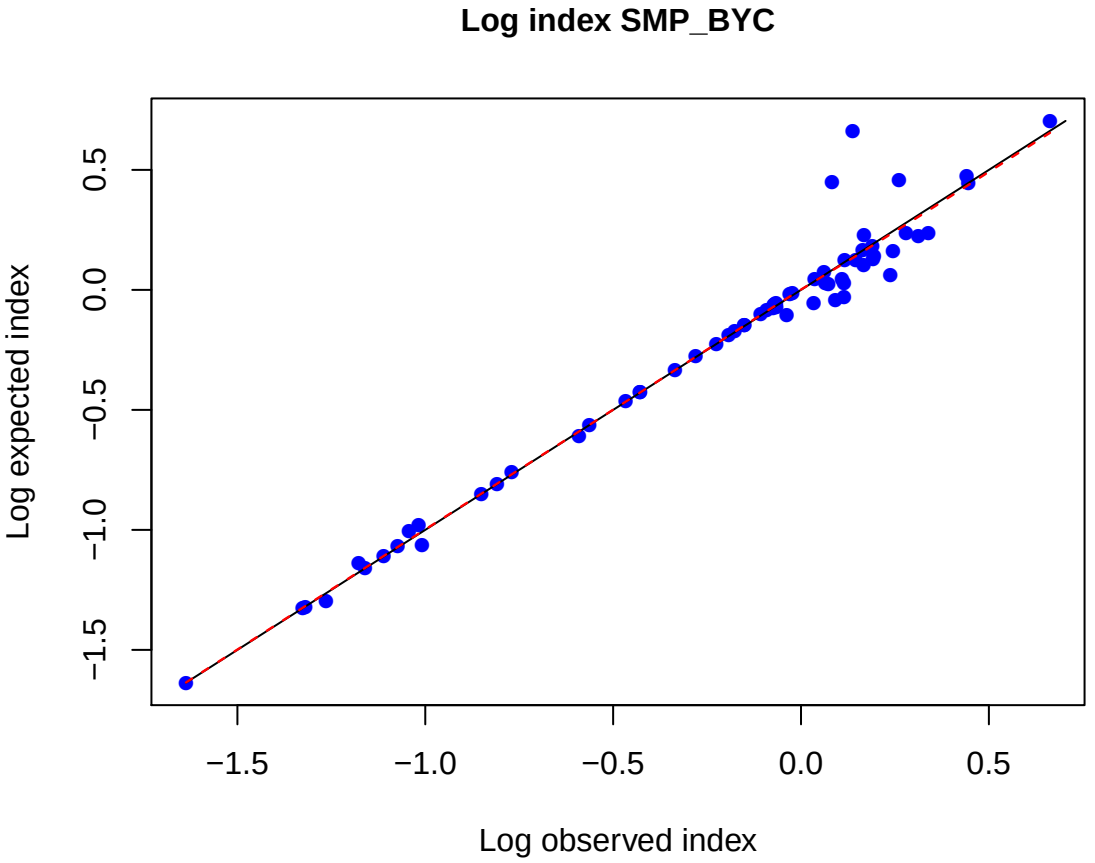
−1.0
−1.5
−2.0
1950
1960
1970
1980
1990
2000
2010
Year


Log index SMP_BYC
Log expected index
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0.0
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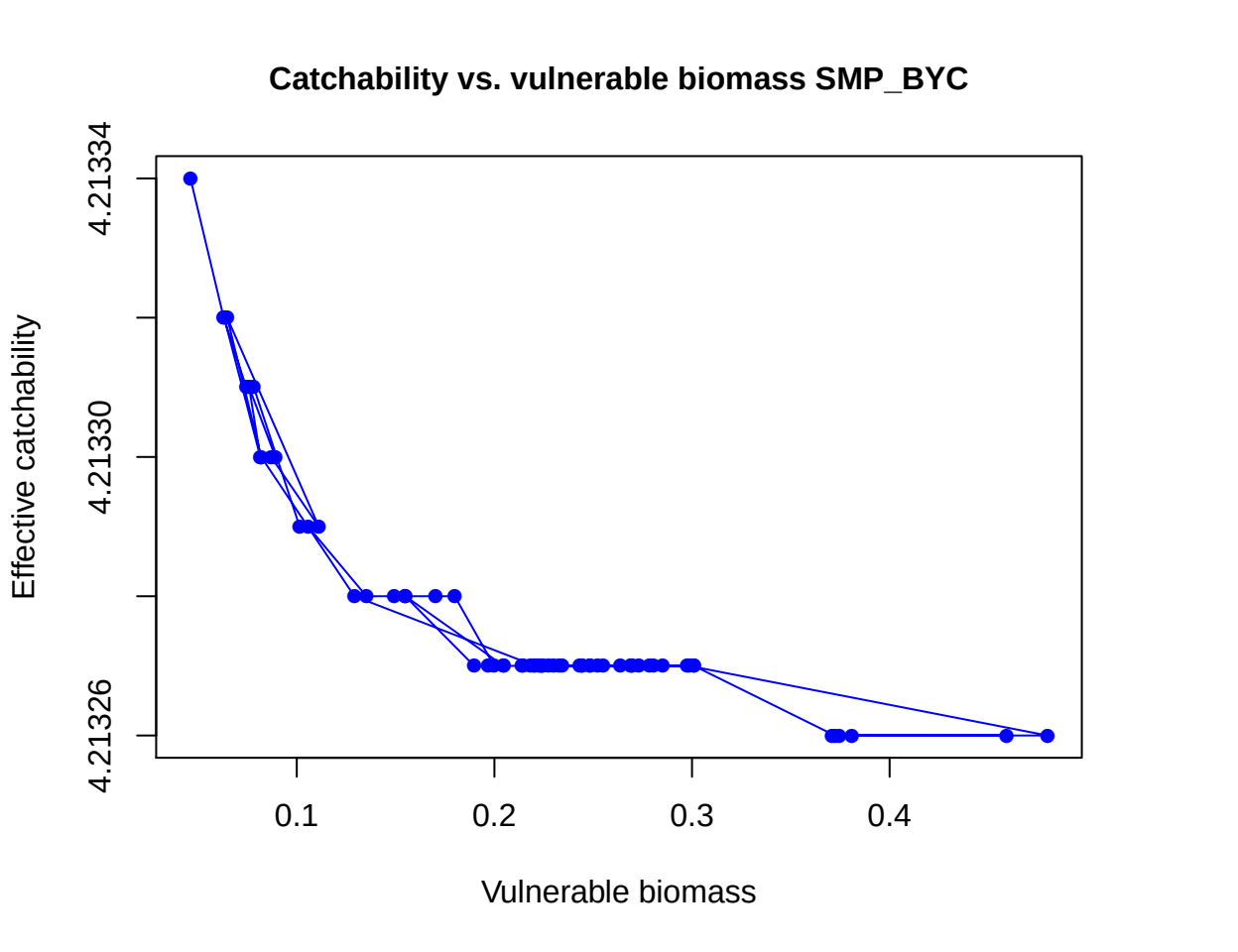
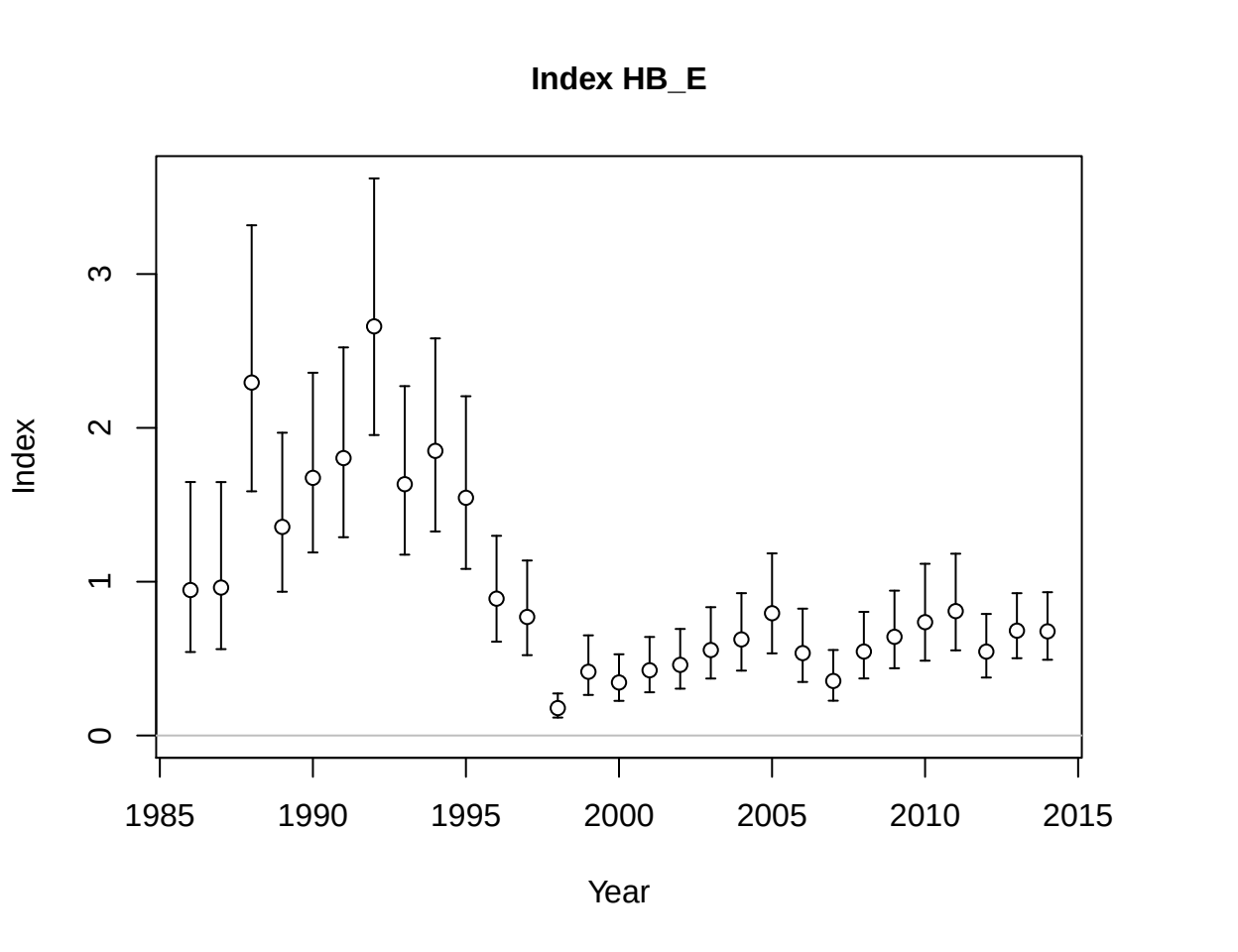
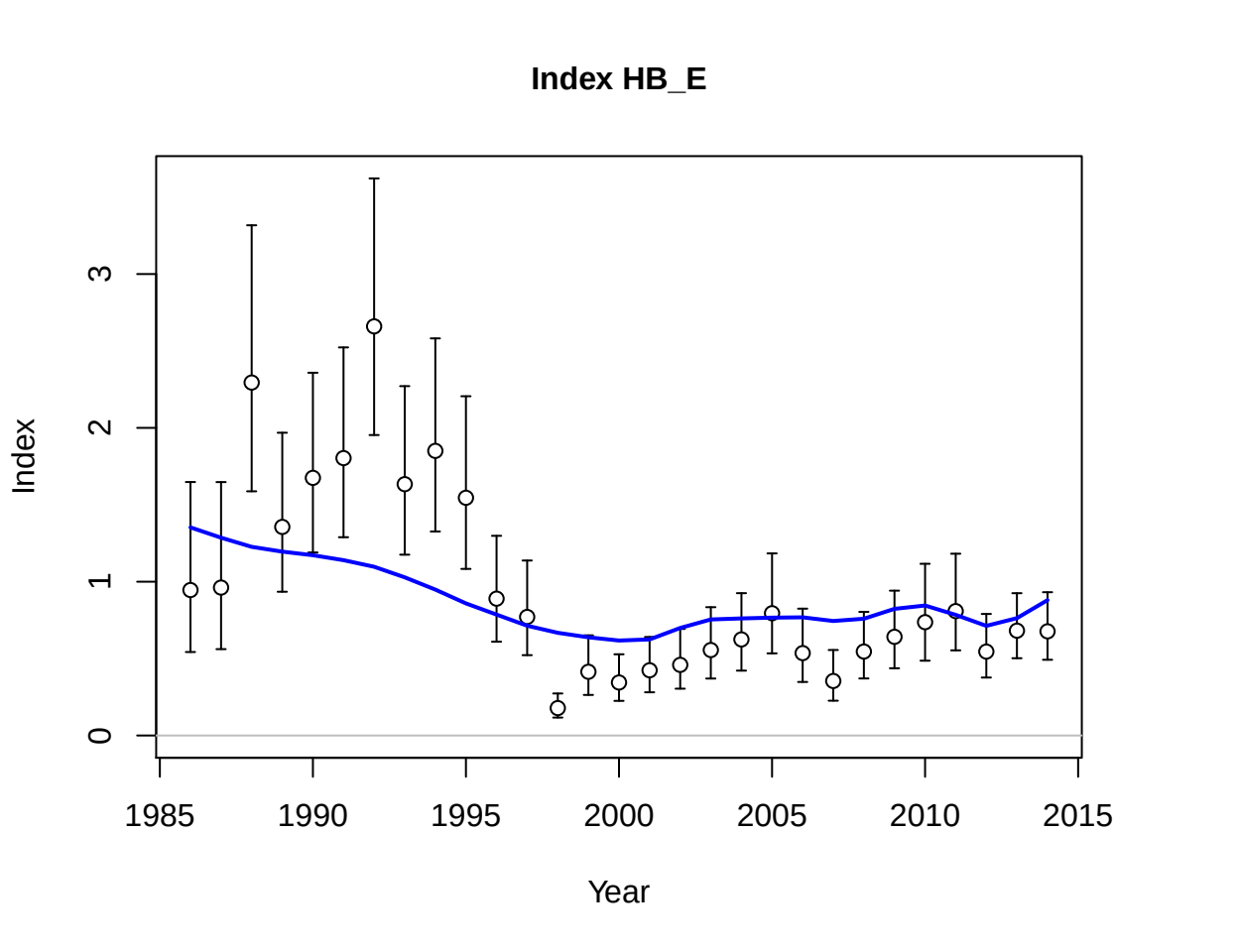
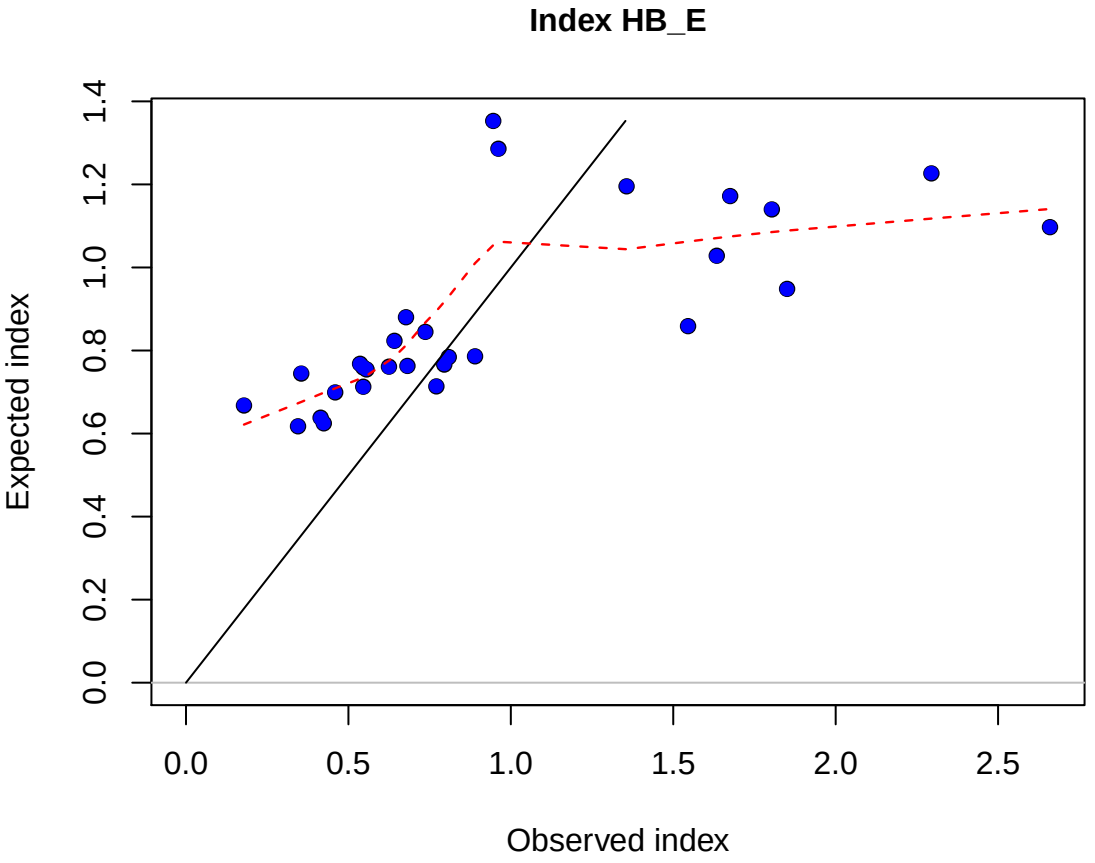
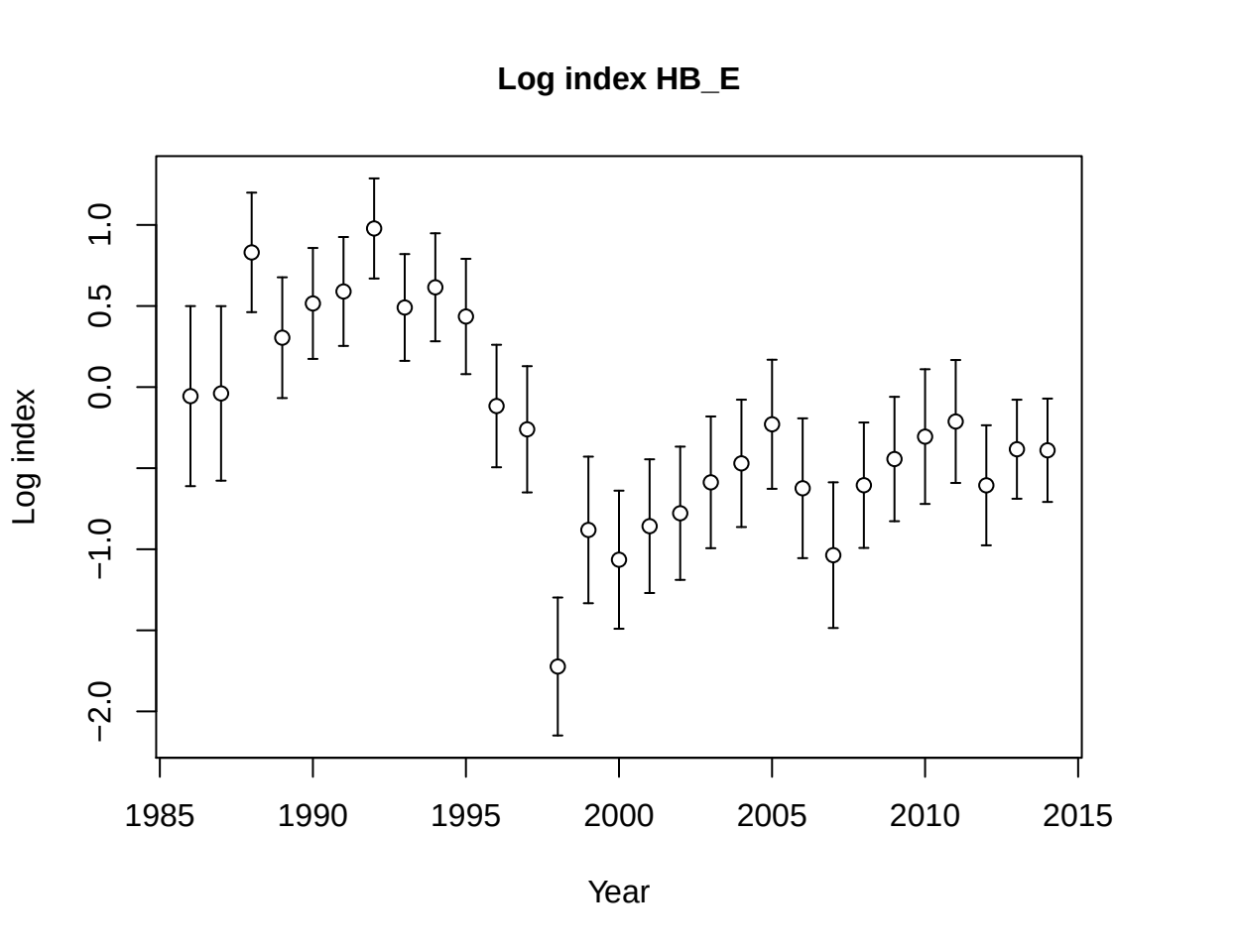
−1.0
−1.5
−1.5
−1.0
−0.5
0.0
0.5
Log observed index


Catchability vs. vulnerable biomass SMP_BYC
Effective catchability
4.21334
4.21330
4.21326
0.1
0.2
0.3
0.4
Vulnerable biomass


Index HB_E
Index
0
1
2
3
1985
1990
1995
2000
2005
2010
2015
Year


Index HB_E
Index
0
1
2
3
1985
1990
1995
2000
2005
2010
2015
Year


Index HB_E
Expected index
Observed index
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
0.0
0.5
1.0
1.5
2.0
2.5


Log index HB_E
Log index
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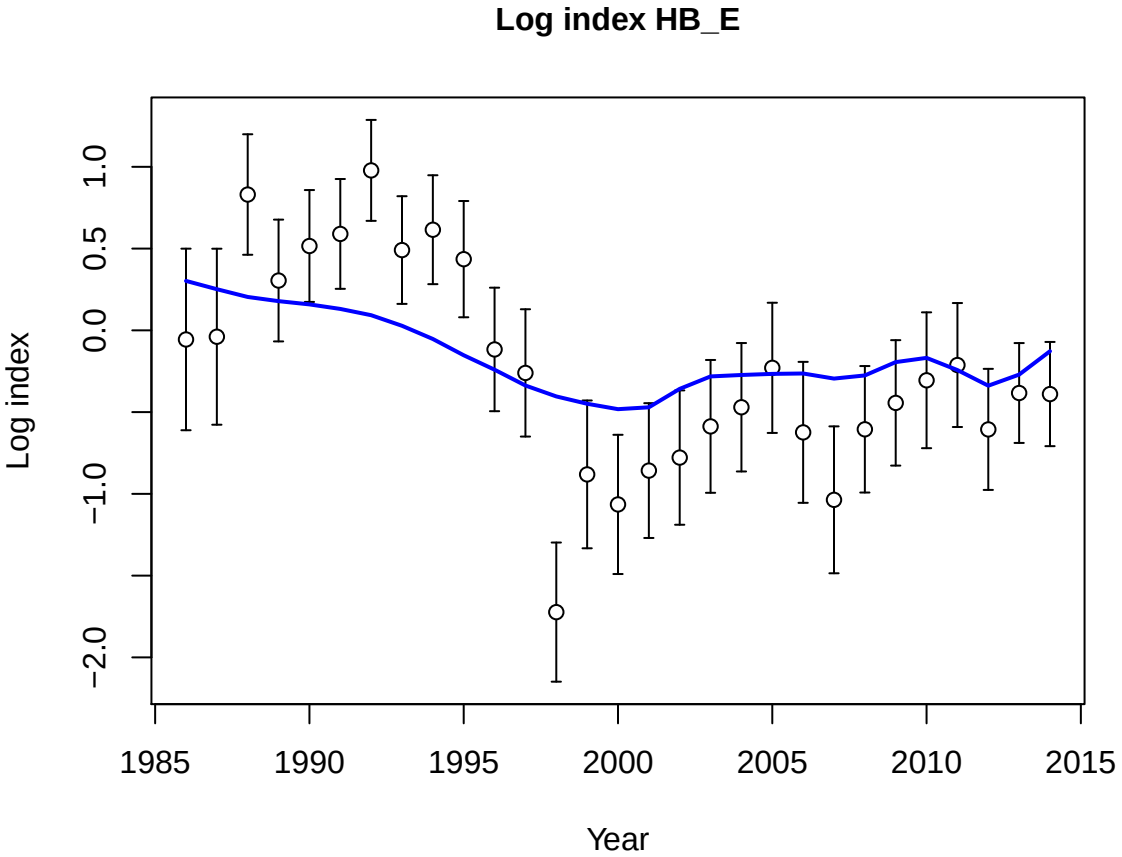
0.5
0.0
−1.0
−2.0
1985
1990
1995
2000
2005
2010
2015
Year


Log index HB_E
Log index
1.0
0.5
0.0
−1.0
−2.0
1985
1990
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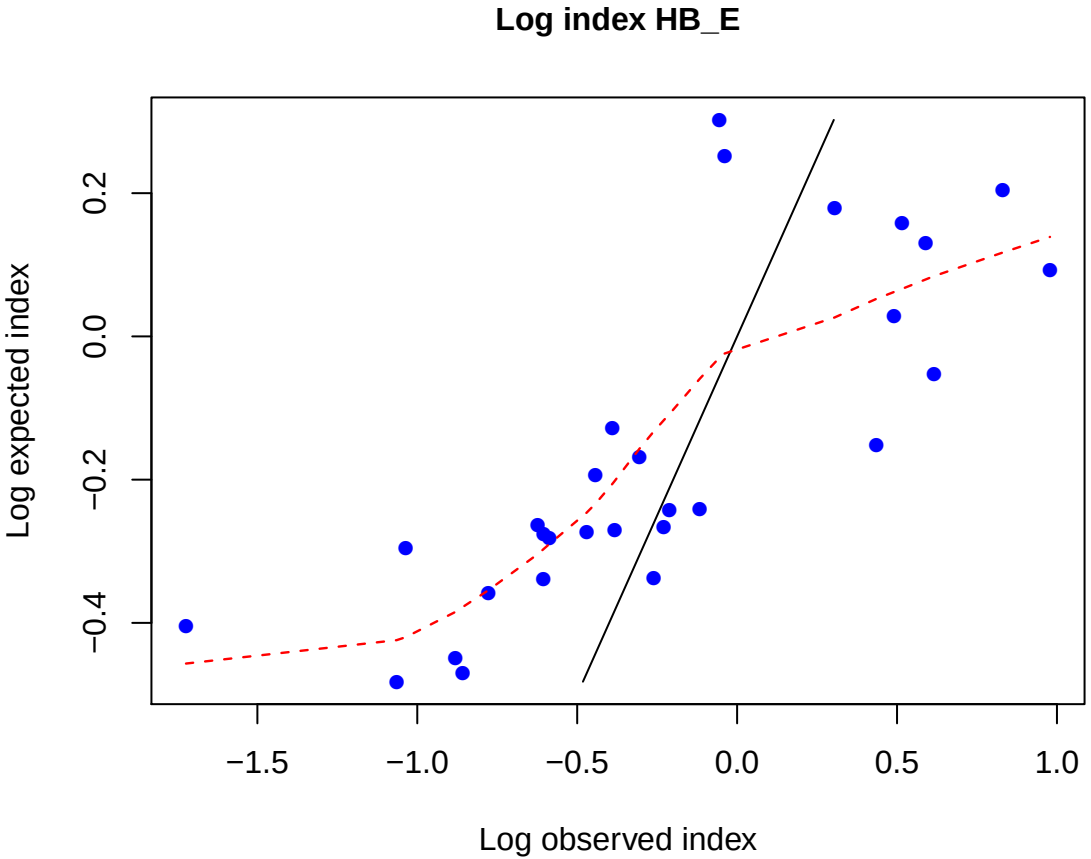
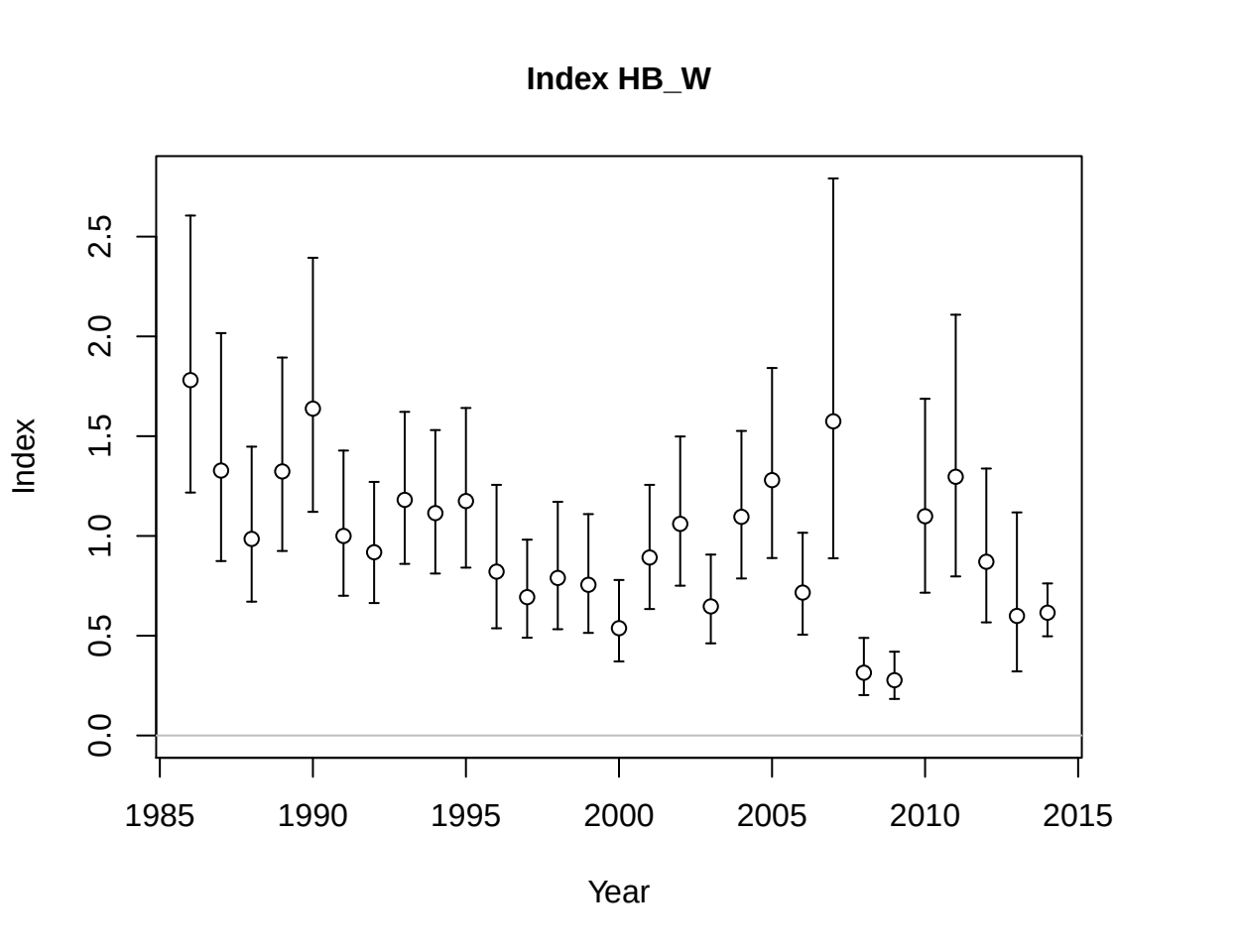
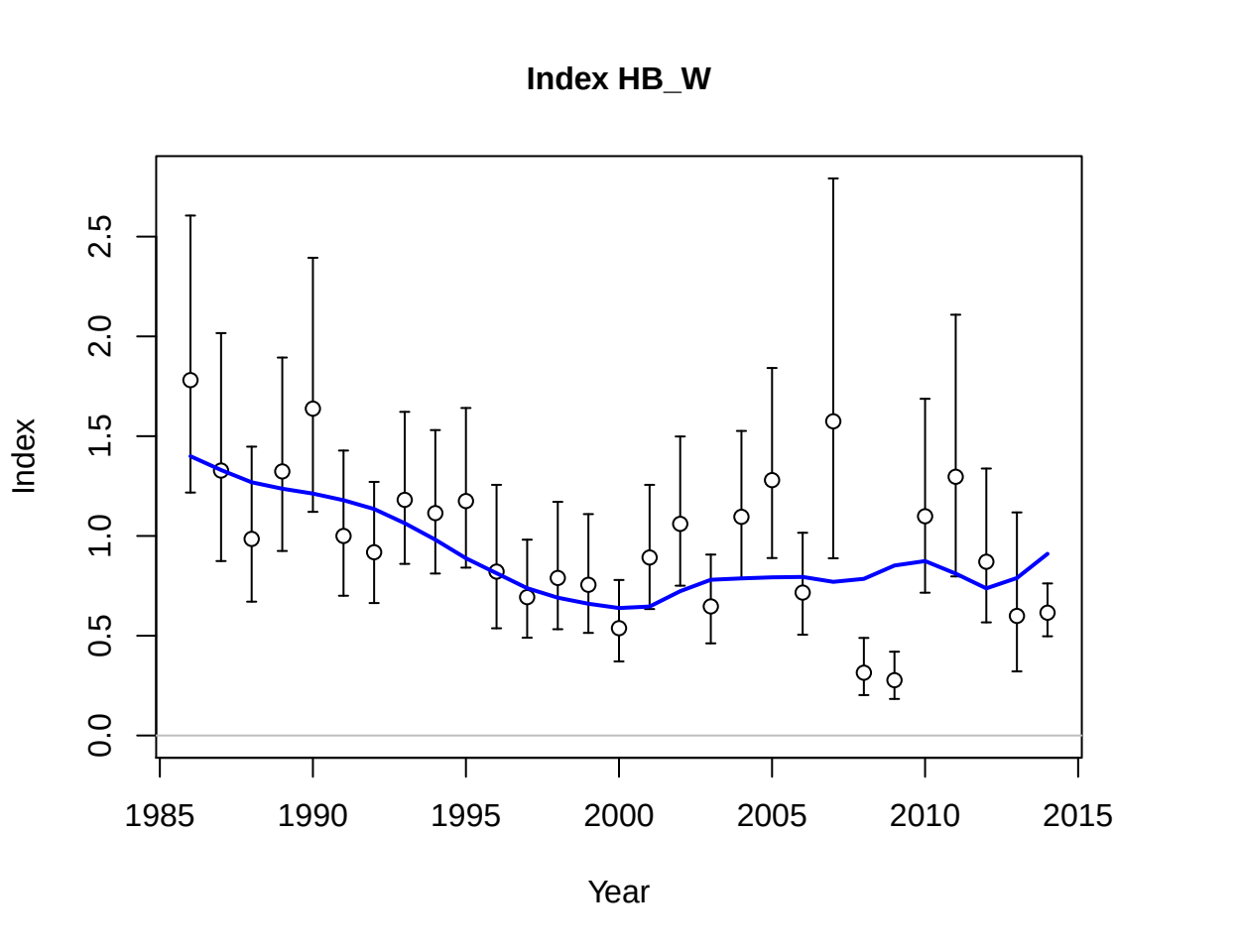
2000
2005
2010
2015
Year


Log index HB_E
Log expected index
0.2
0.0
−0.2
−0.4
−1.5
−1.0
−0.5
0.0
0.5
1.0
Log observed index


Index HB_W
Index
0.0
0.5
1.0
1.5
2.0
2.5
1985
1990
1995
2000
2005
2010
2015
Year


Index HB_W
Index
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0.5
1.0
1.5
2.0
2.5
1985
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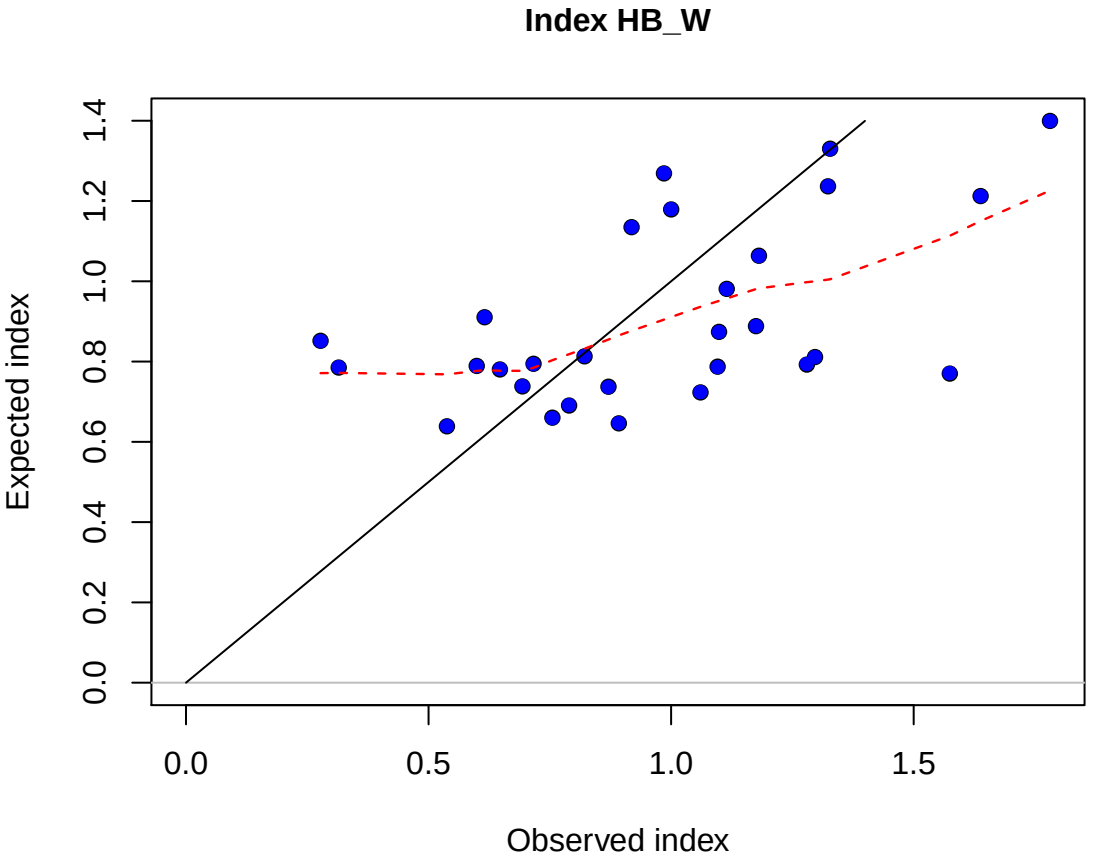
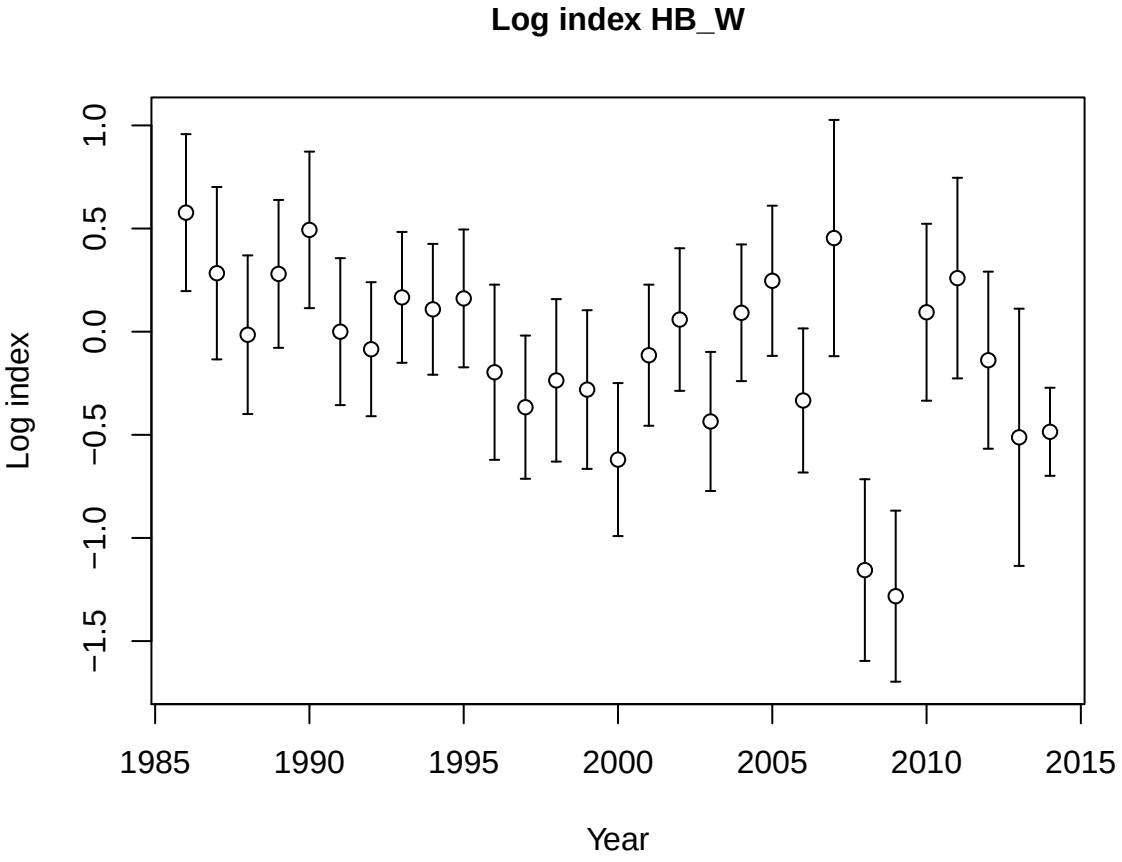
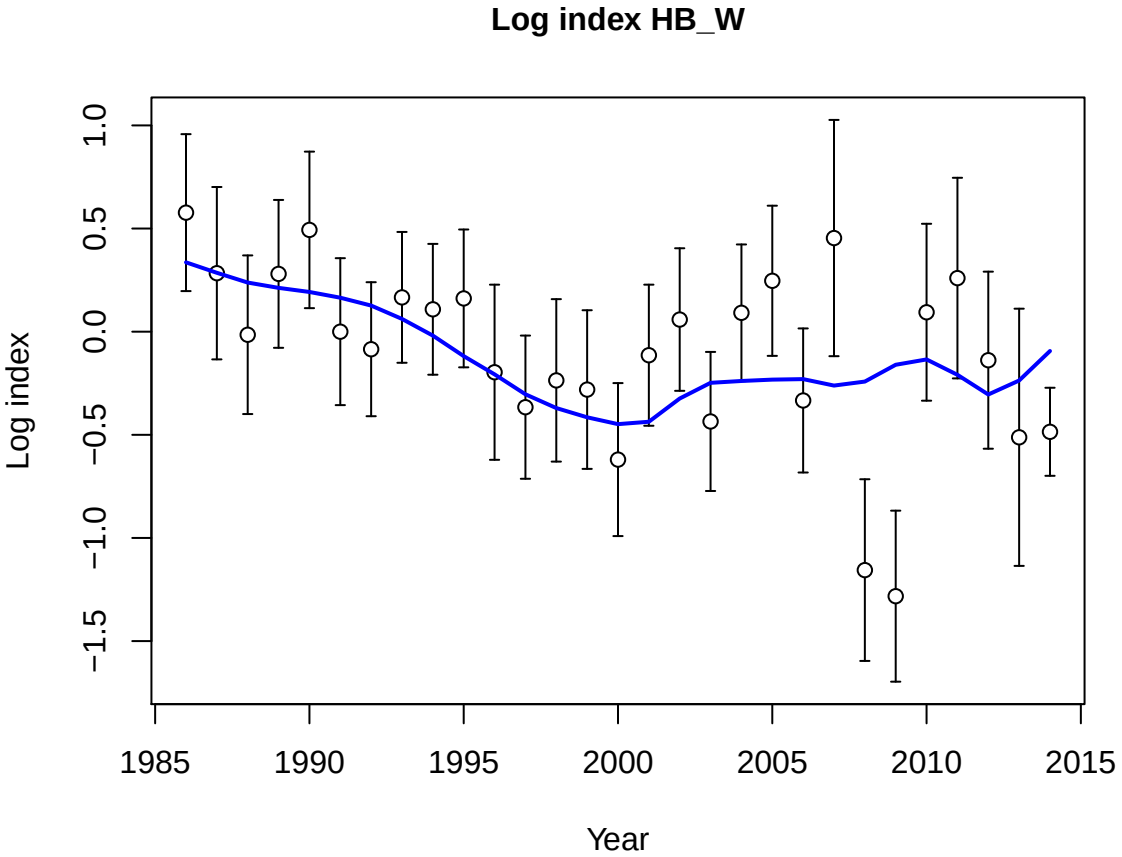
1995
2000
2005
2010
2015
Year


Index HB_W
Expected index
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
0.0
0.5
1.0
1.5
Observed index


Log index HB_W
Log index
1.0
0.5
0.0
−0.5
−1.0
−1.5
1985
1990
1995
2000
2005
2010
2015
Year


Log index HB_W
Log index
1.0
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0.0
−0.5
−1.0
−1.5
1985
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1995
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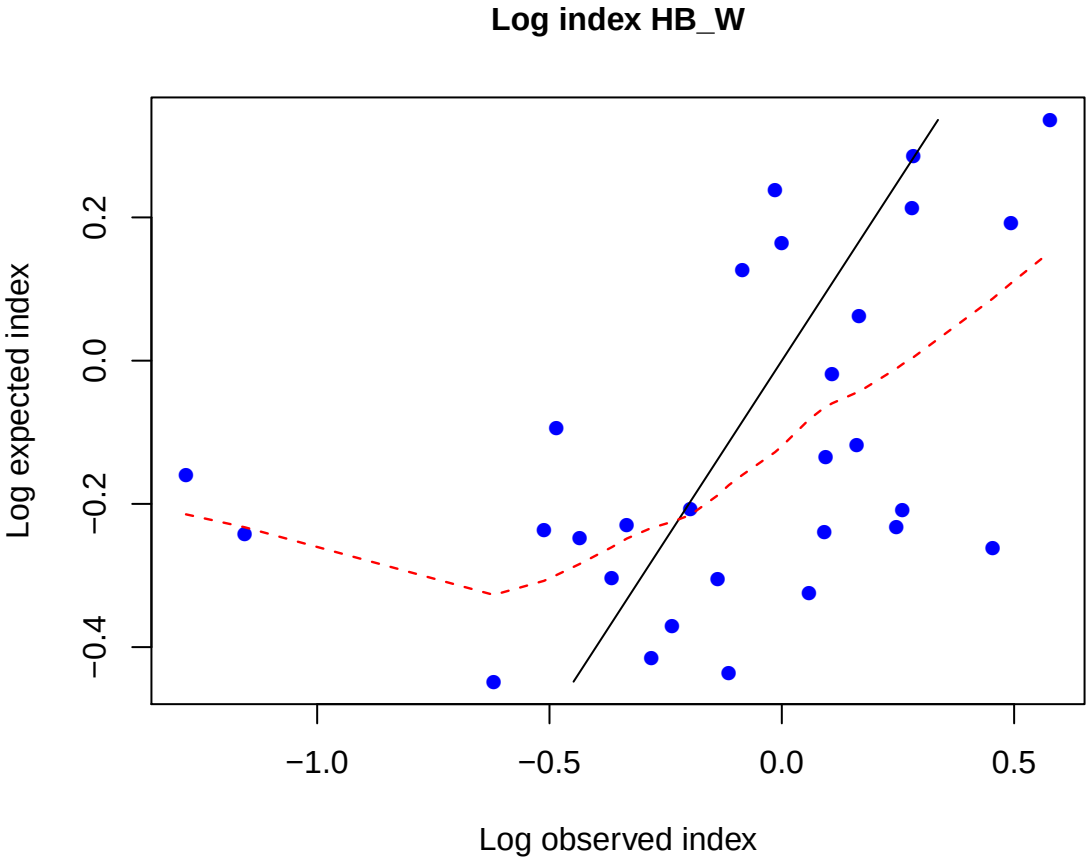
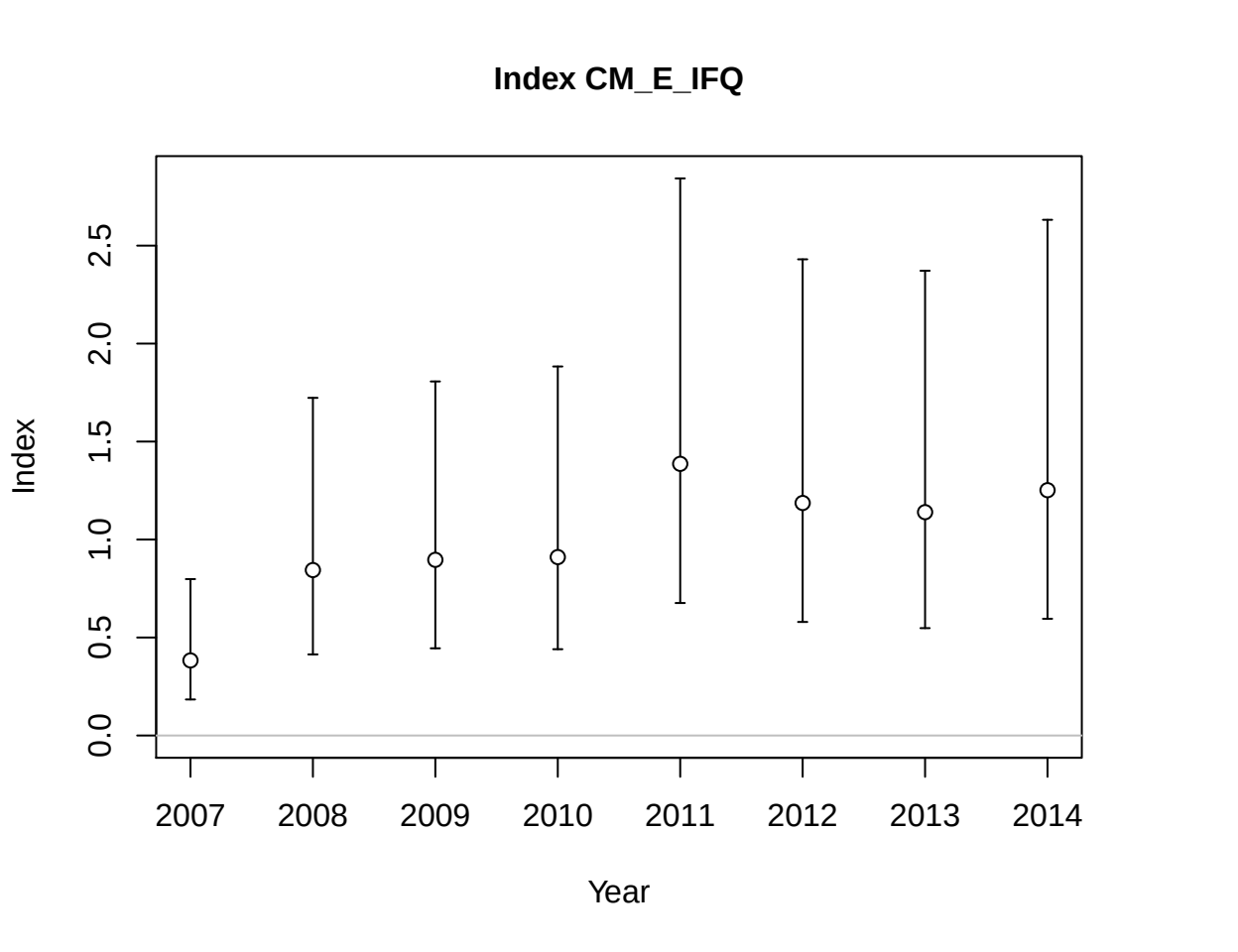
2005
2010
2015
Year


Log index HB_W
Log expected index
0.2
0.0
−0.2
−0.4
−1.0
−0.5
0.0
0.5
Log observed index


Index CM_E_IFQ
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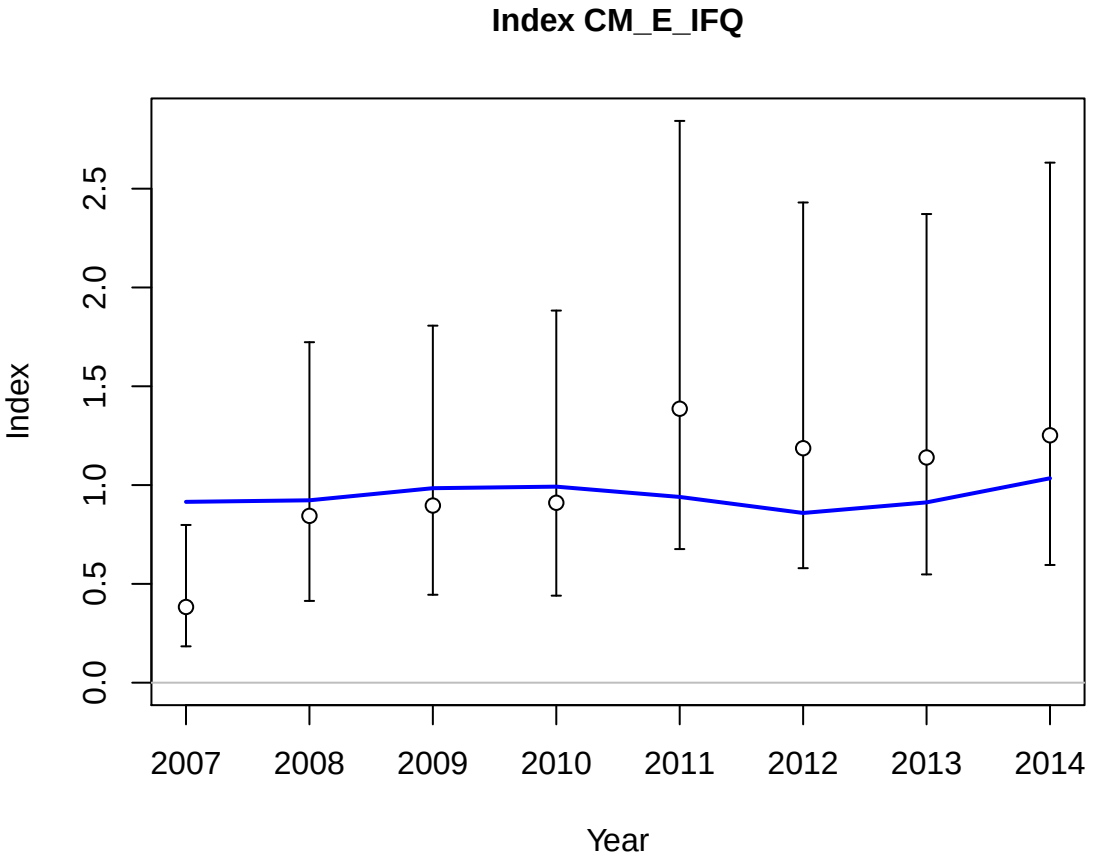
2.0
2.5
2007
2008
2009
2010
2011
2012
2013
2014
Year


Index CM_E_IFQ
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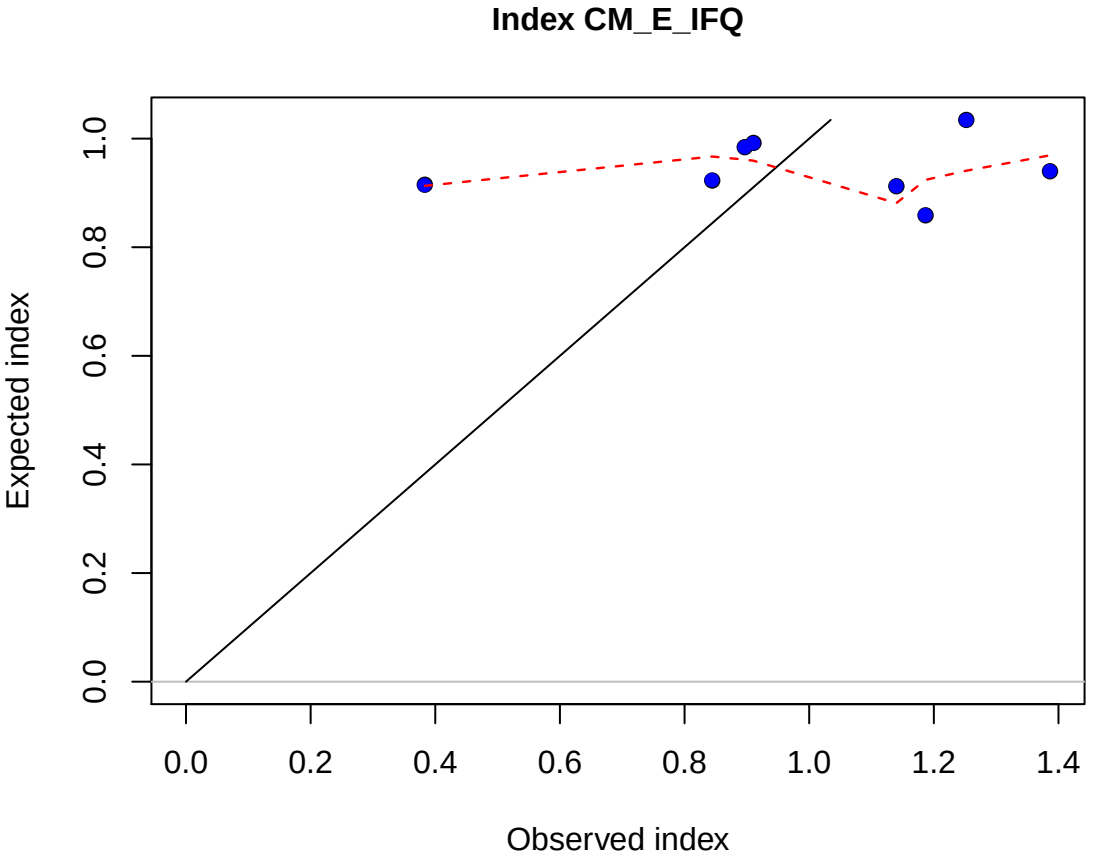
1.0
1.5
2.0
2.5
2007
2008
2009
2010
2011
2012
2013
2014
Year


Index CM_E_IFQ
Expected index
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0.4
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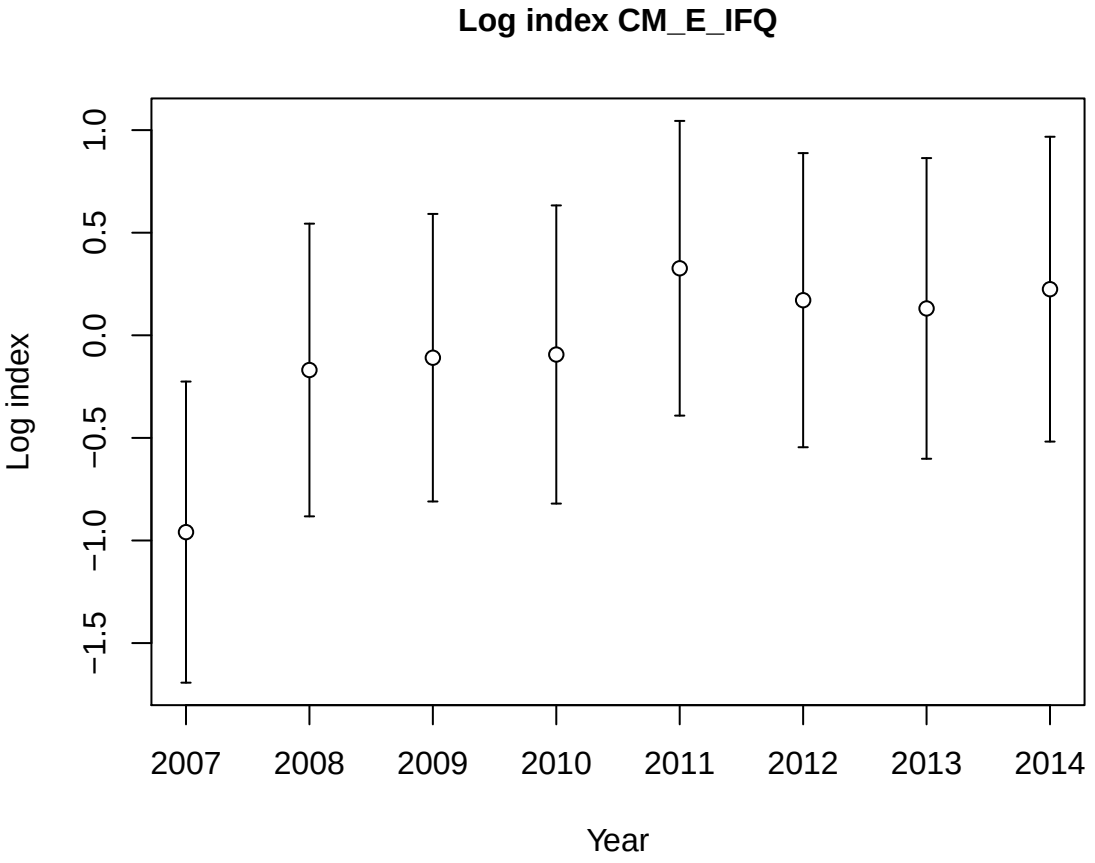
0.8
1.0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Observed index


Log index CM_E_IFQ
Log index
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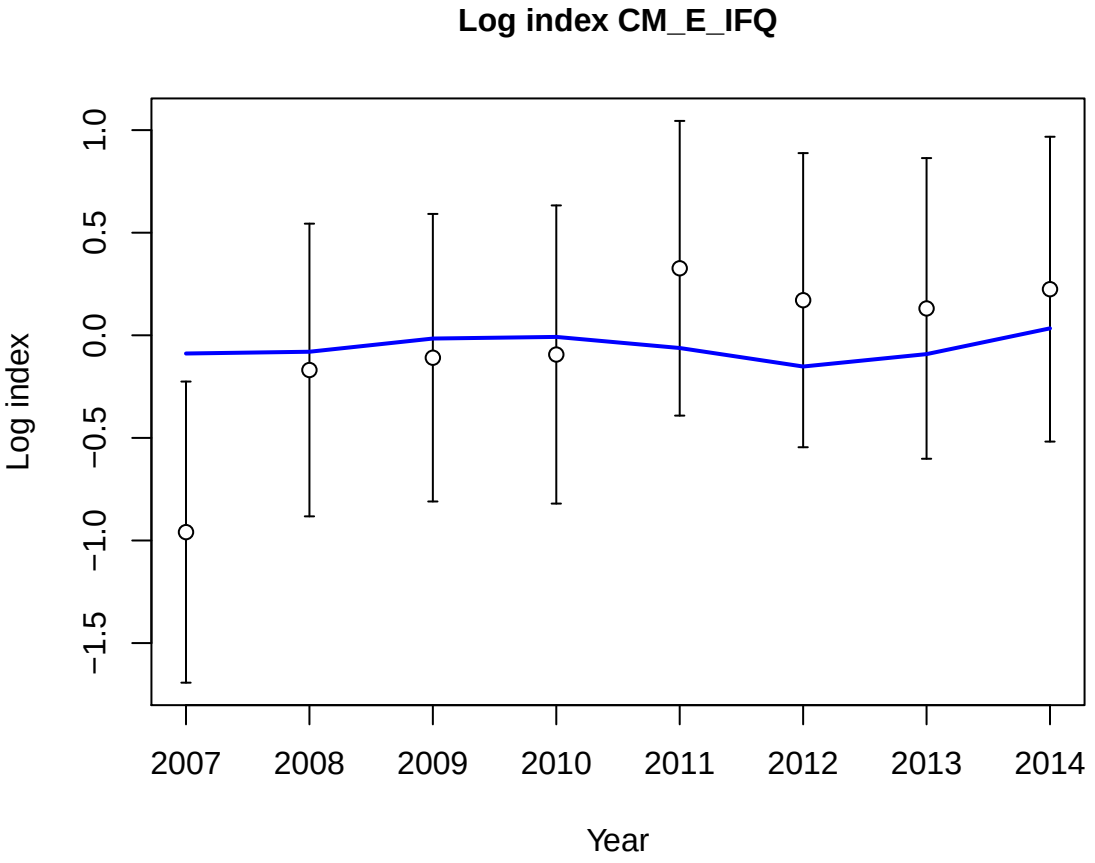
−1.0
−1.5
2007
2008
2009
2010
2011
2012
2013
2014
Year


Log index CM_E_IFQ
Log index
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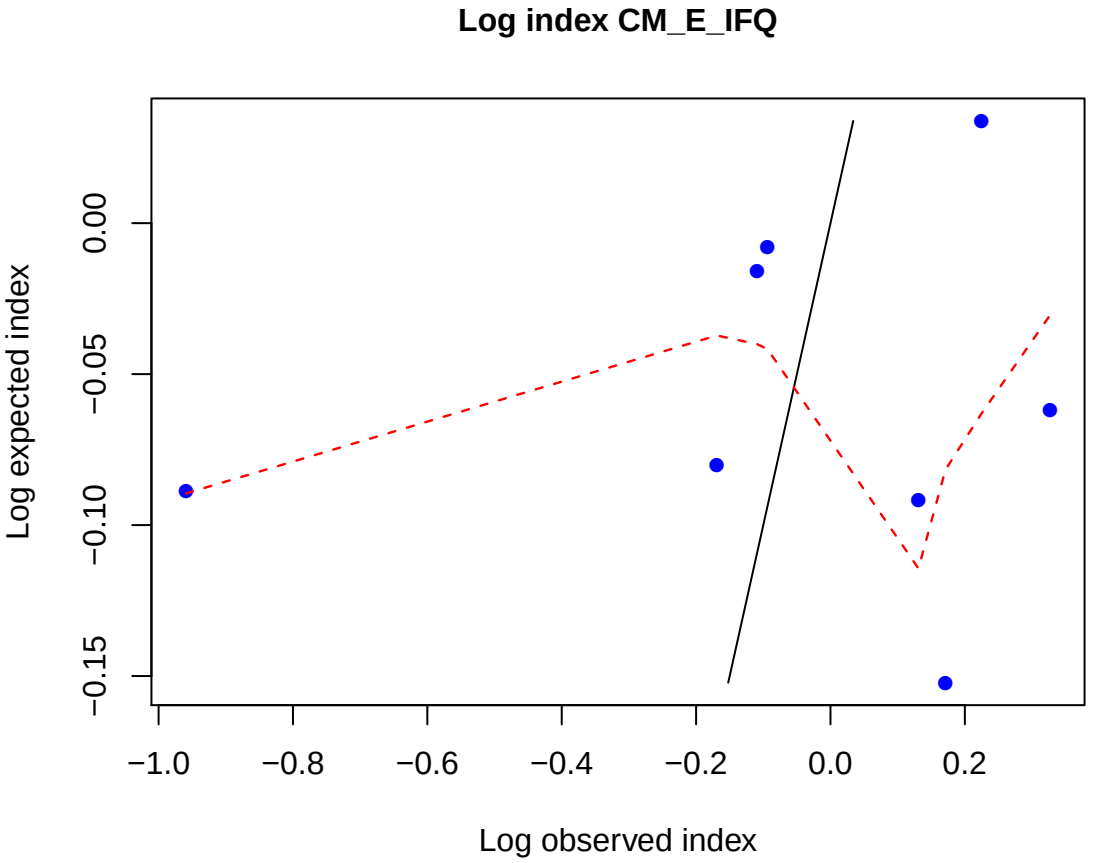
−1.5
2007
2008
2009
2010
2011
2012
2013
2014
Year


Log index CM_E_IFQ
Log expected index
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−1.0
−0.8
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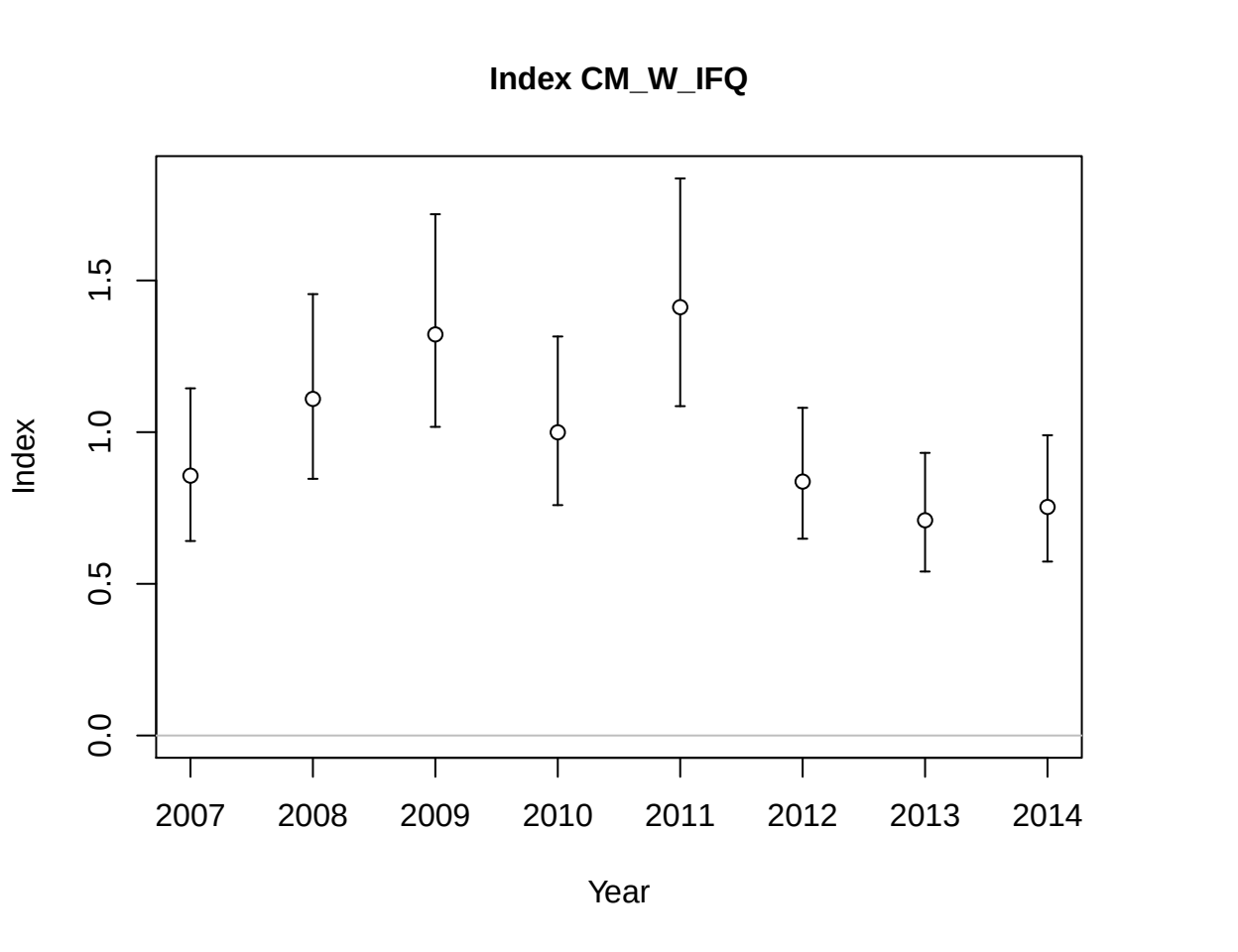
−0.4
−0.2
0.0
0.2
Log observed index


Index CM_W_IFQ
Index
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2007
2008
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2011
2012
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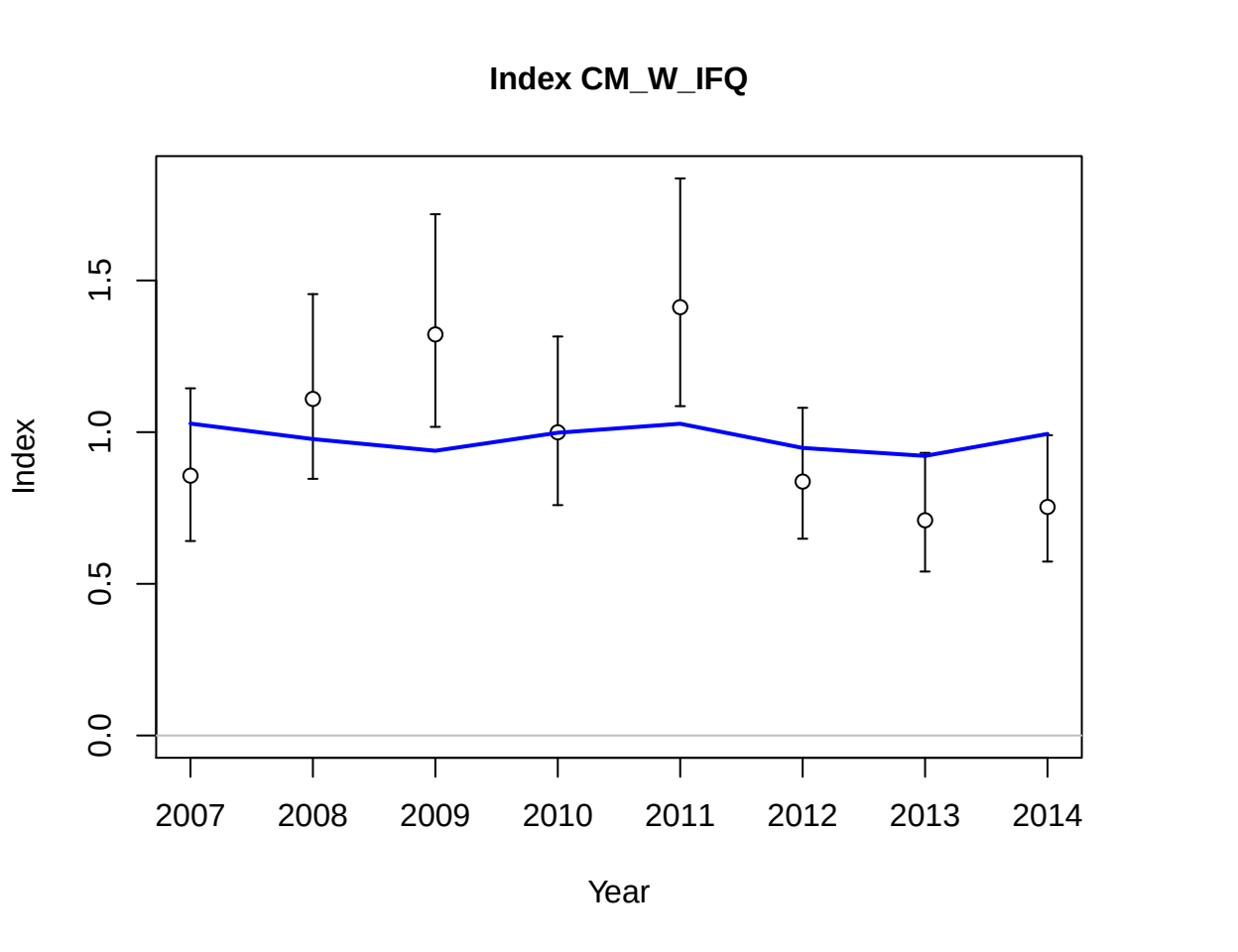
2014
Year


Index CM_W_IFQ
Index
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1.0
1.5
2007
2008
2009
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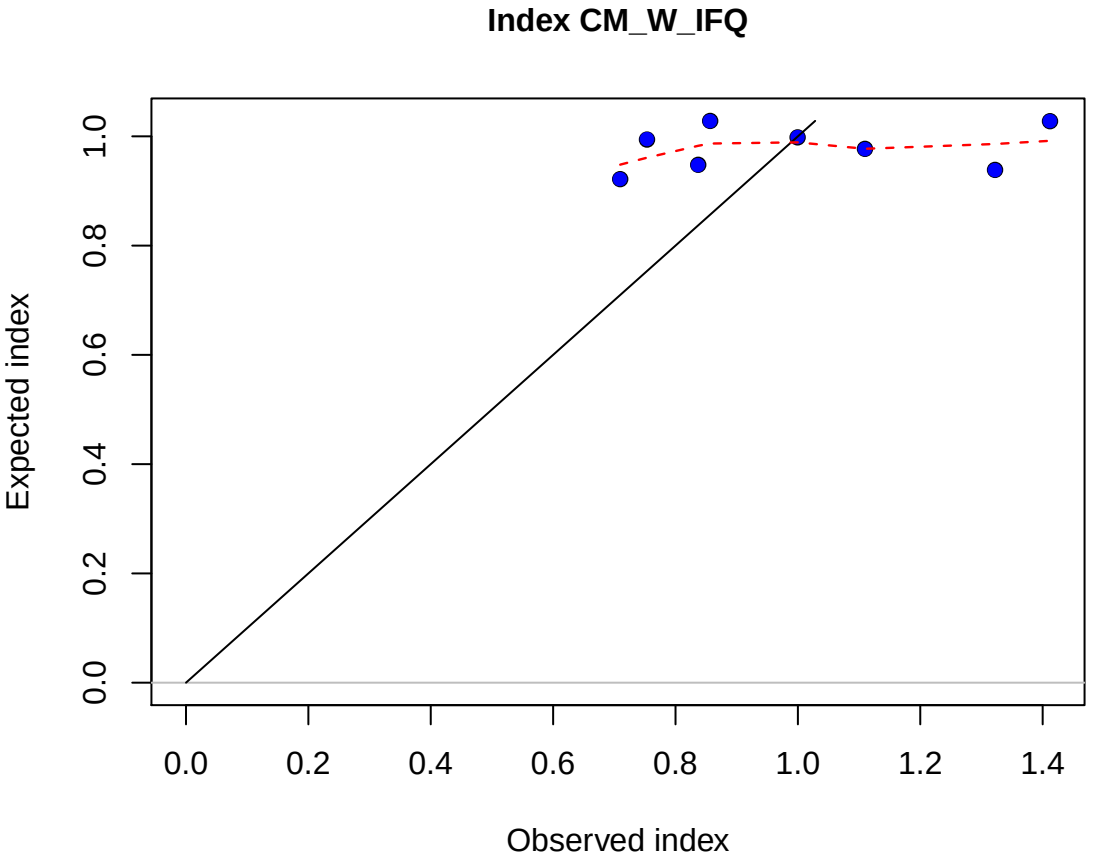
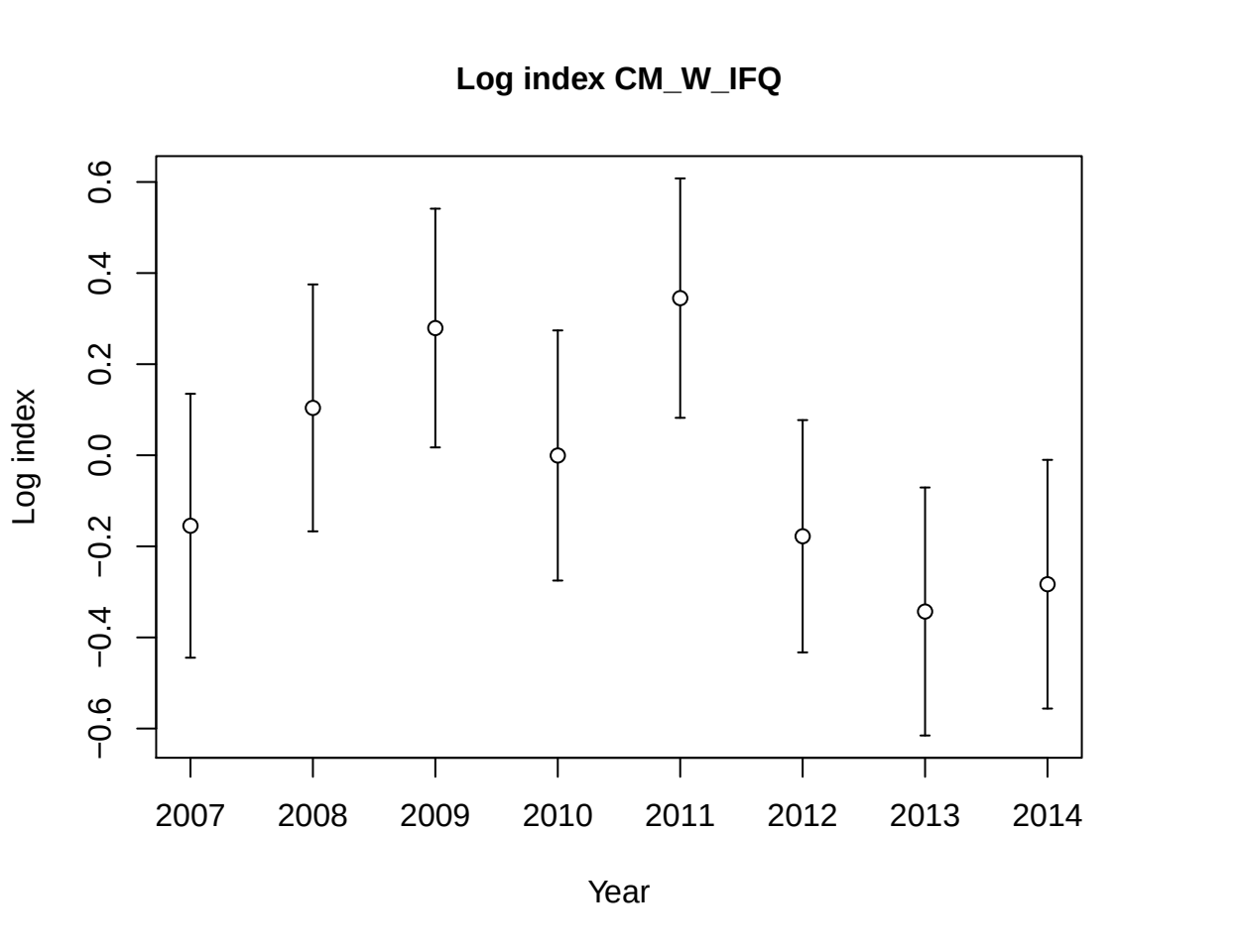
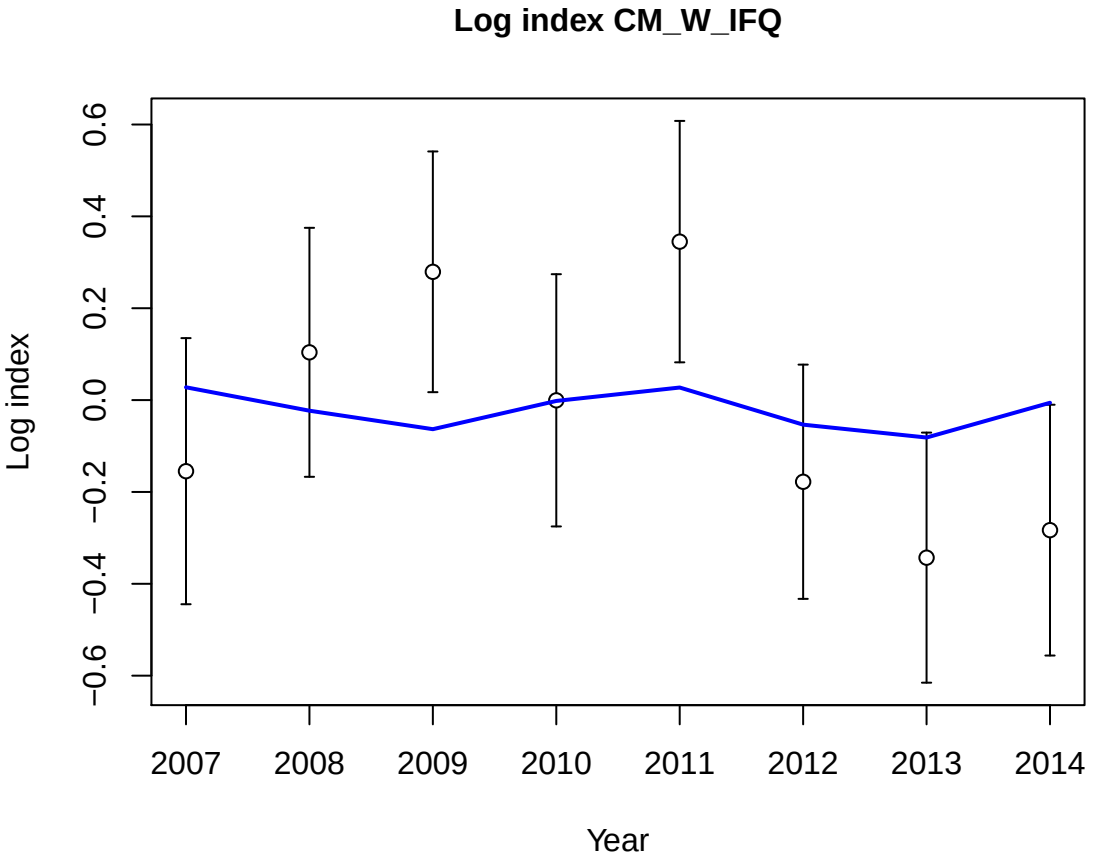
2012
2013
2014
Year


Index CM_W_IFQ
Expected index
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Observed index


Log index CM_W_IFQ
Log index
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
2007
2008
2009
2010
2011
2012
2013
2014
Year


Log index CM_W_IFQ
Log index
0.6
0.4
0.2
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−0.4
−0.6
2007
2008
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2010
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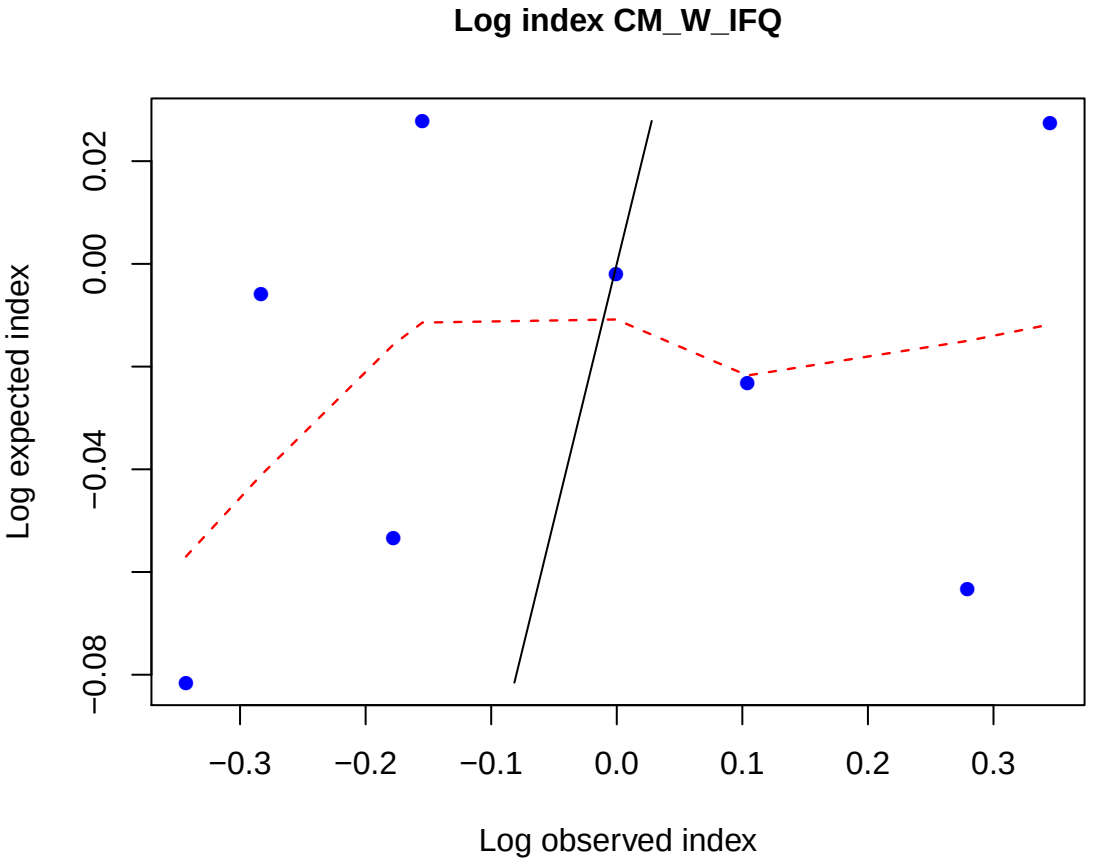
2012
2013
2014
Year


Log index CM_W_IFQ
Log expected index
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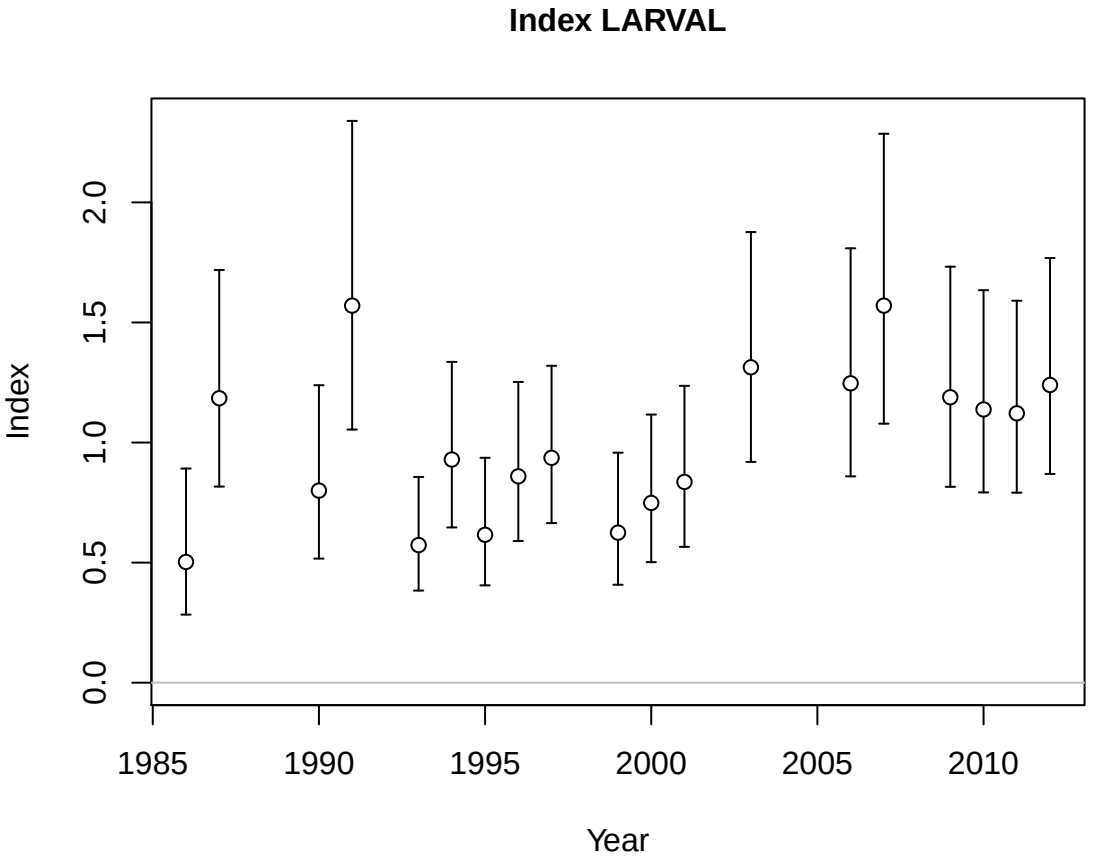
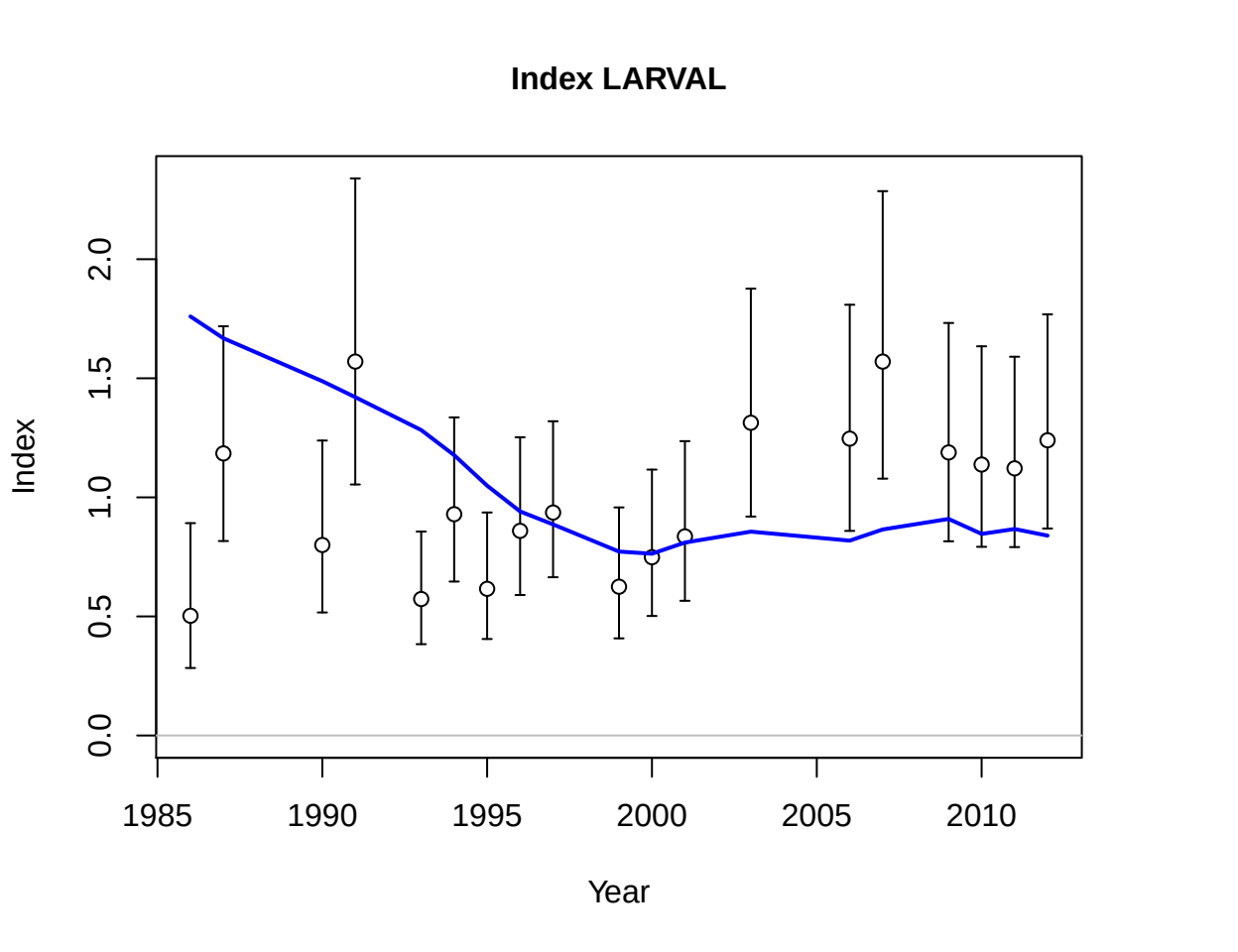
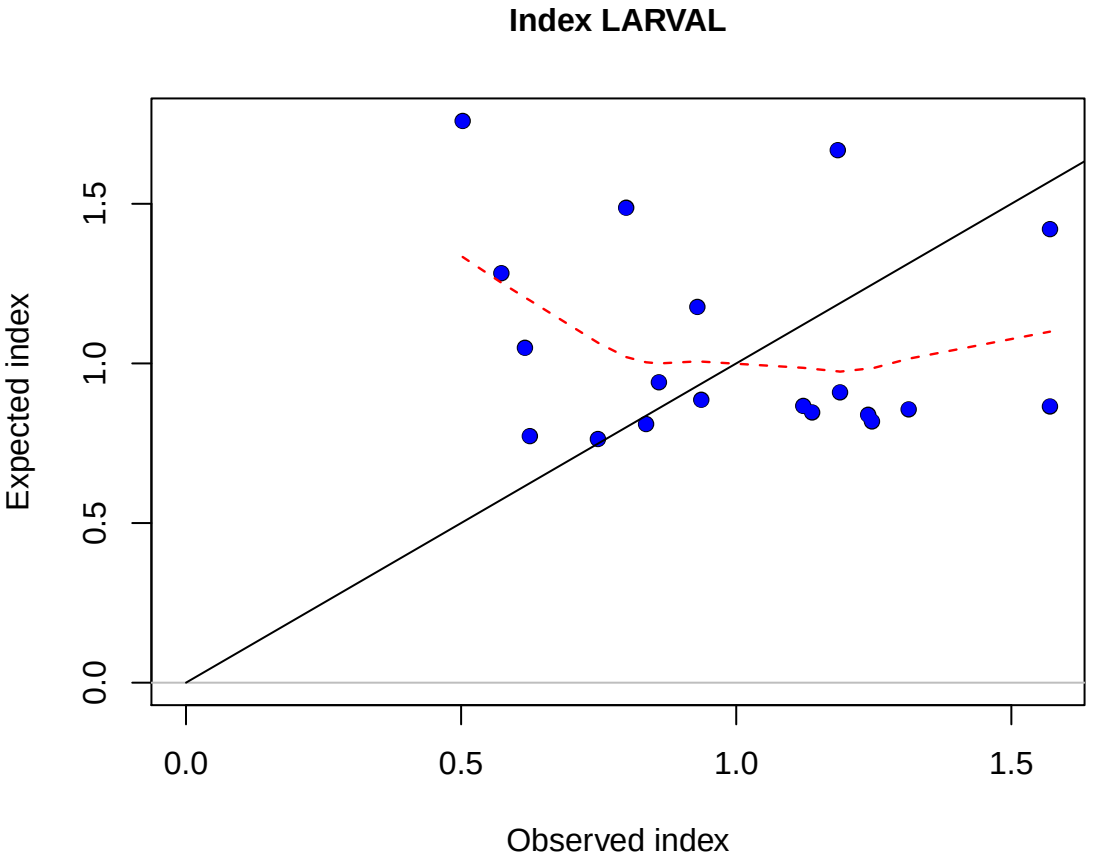
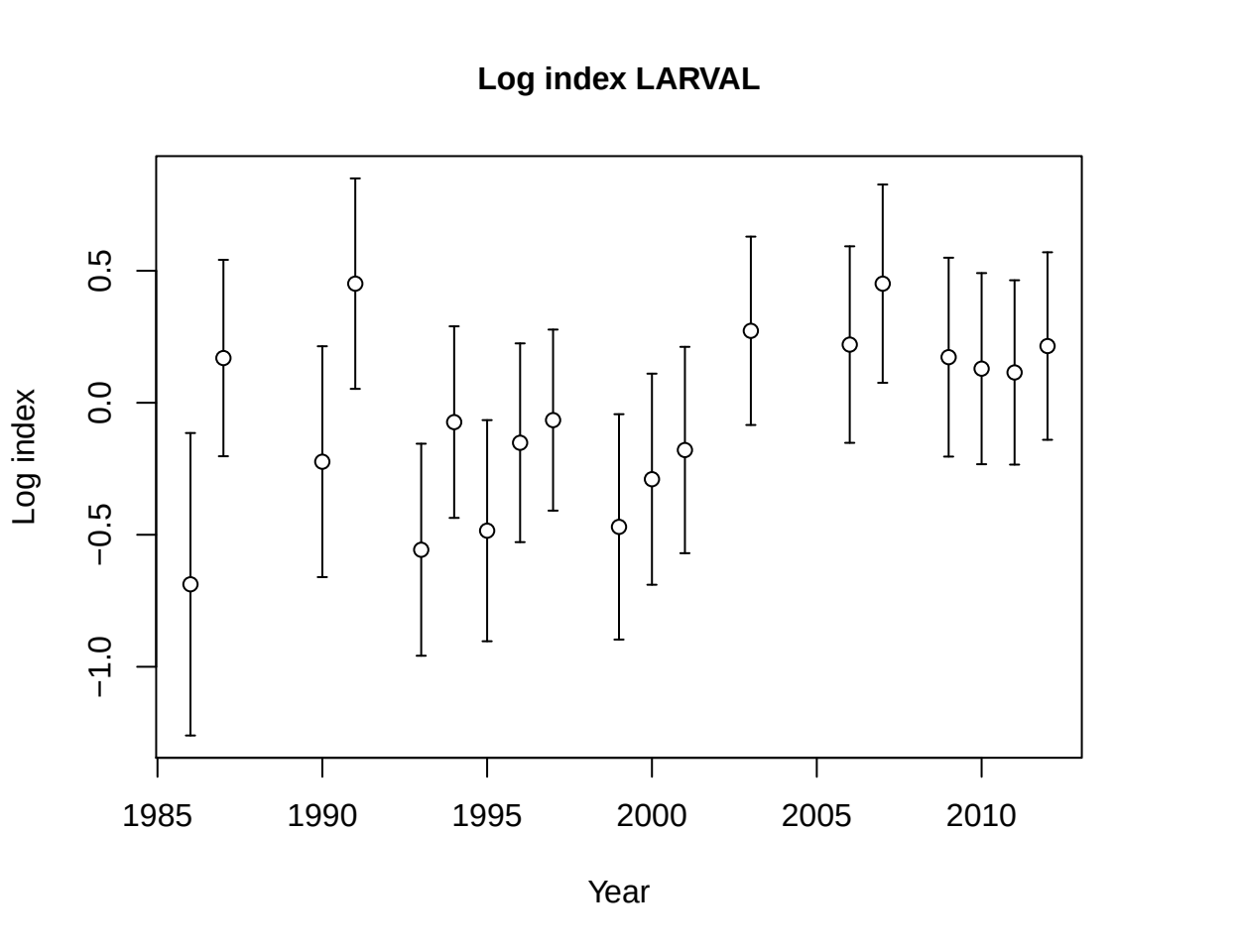
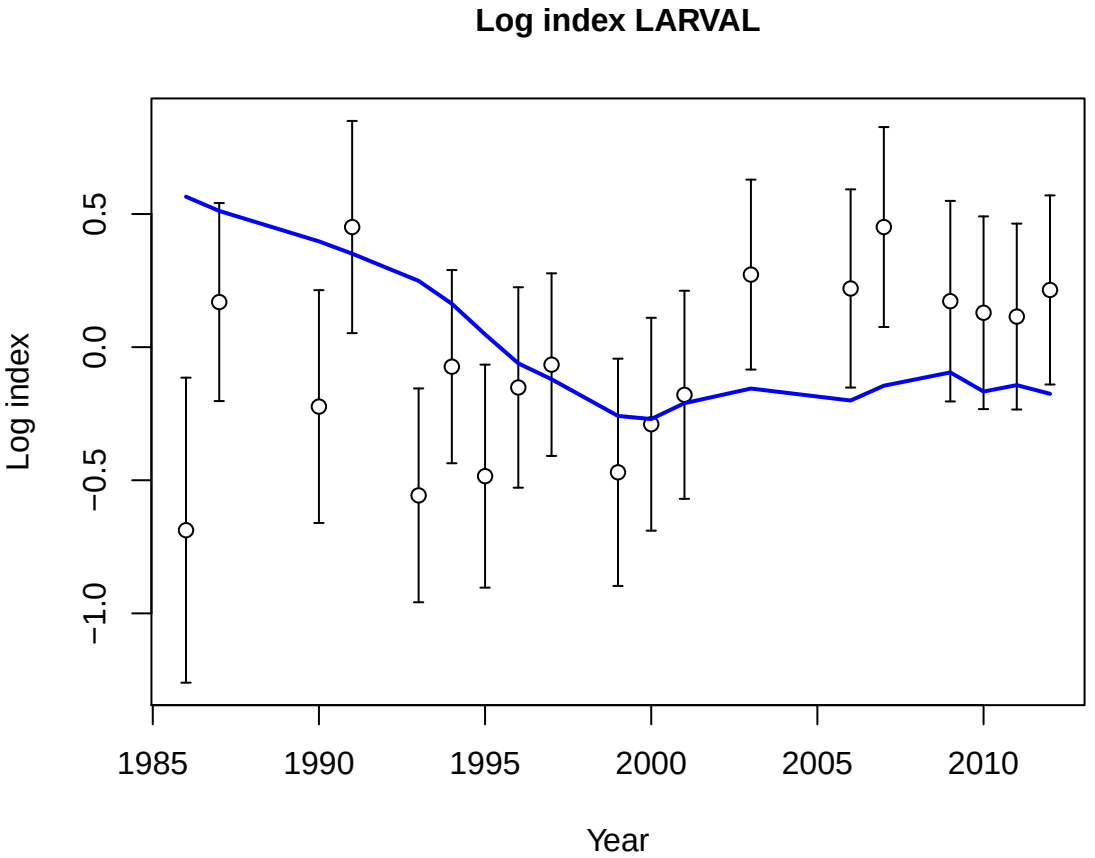
−0.08
−0.3
−0.2
−0.1
0.0
0.1
0.2
0.3
Log observed index


Index LARVAL
Index
0.0
0.5
1.0
1.5
2.0
1985
1990
1995
2000
2005
2010
Year


Index LARVAL
Index
0.0
0.5
1.0
1.5
2.0
1985
1990
1995
2000
2005
2010
Year


Index LARVAL
Expected index
0.0
0.5
1.0
1.5
0.0
0.5
1.0
1.5
Observed index


Log index LARVAL
Log index
0.5
0.0
−0.5
−1.0
1985
1990
1995
2000
2005
2010
Year


Log index LARVAL
Log index
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0.0
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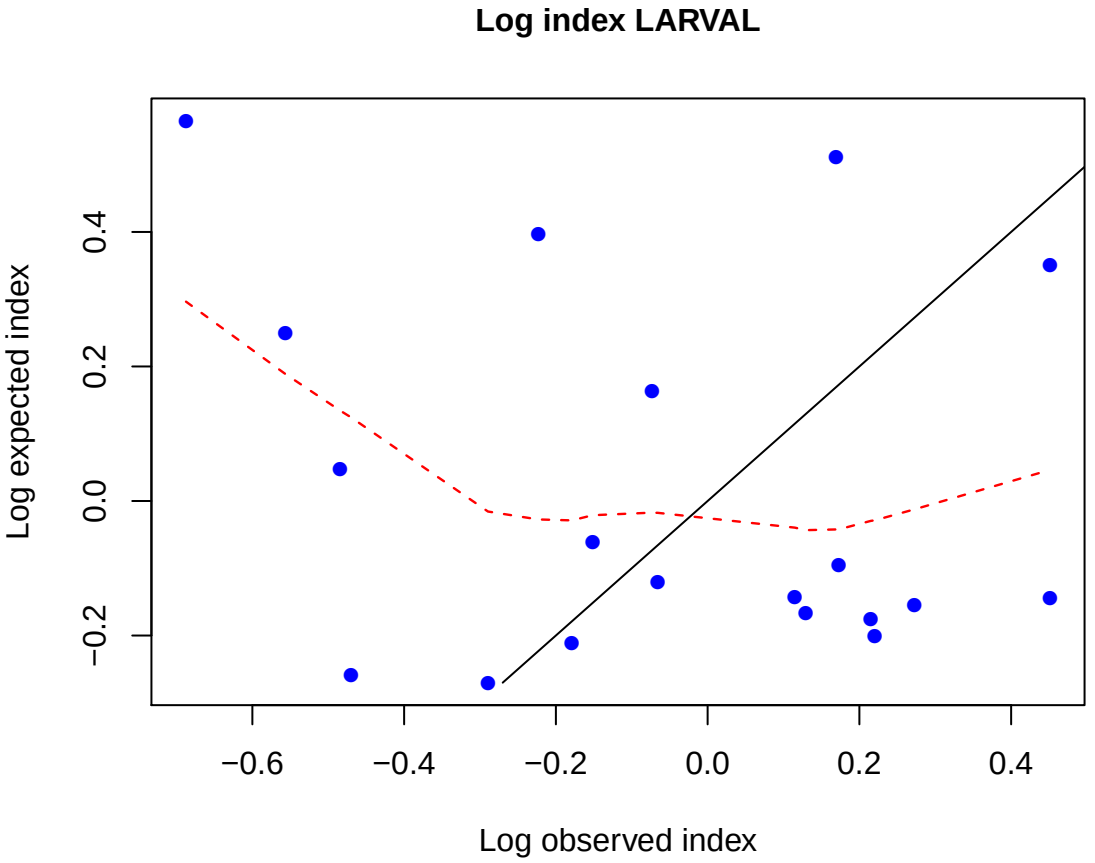
1985
1990
1995
2000
2005
2010
Year


Log index LARVAL
Log expected index
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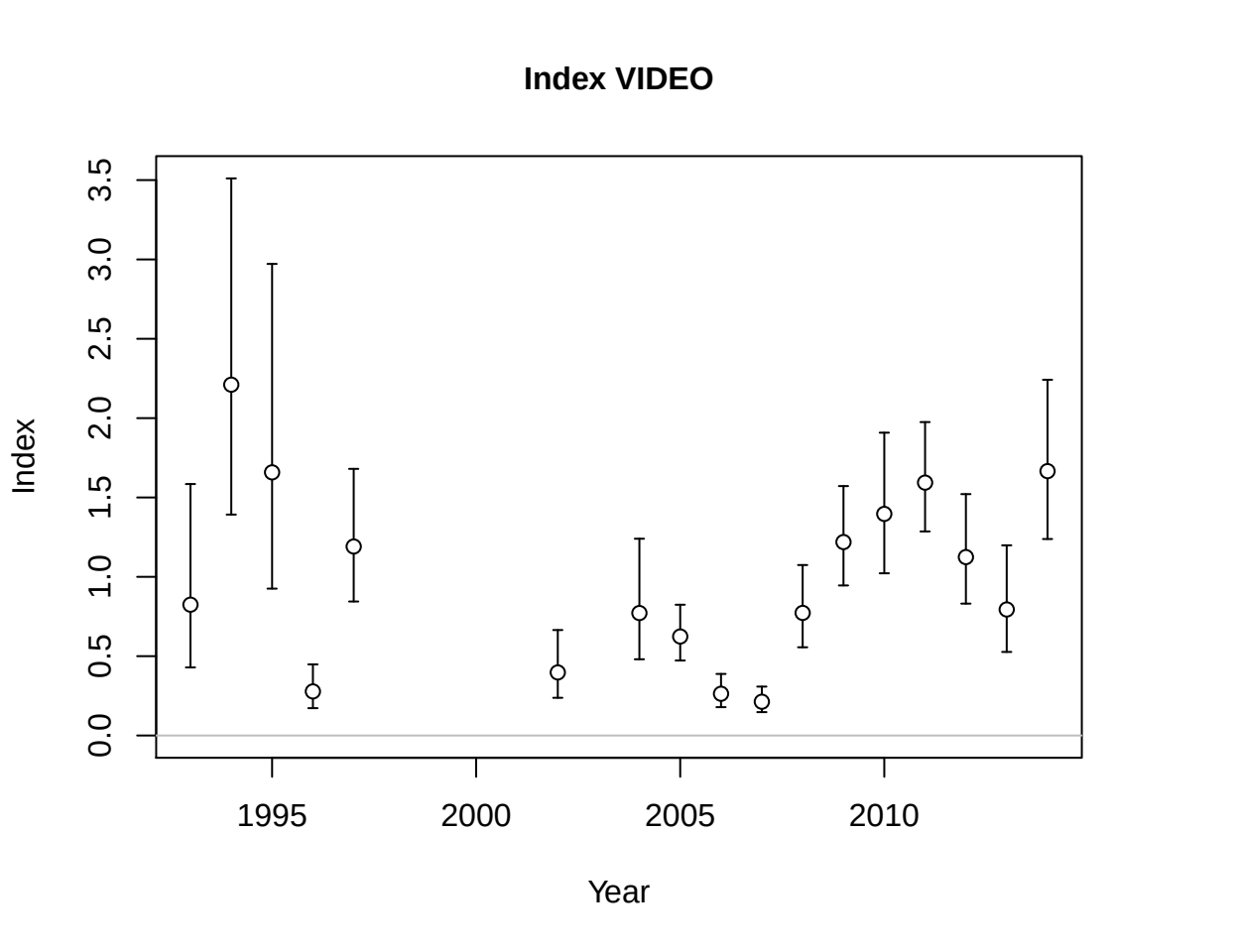
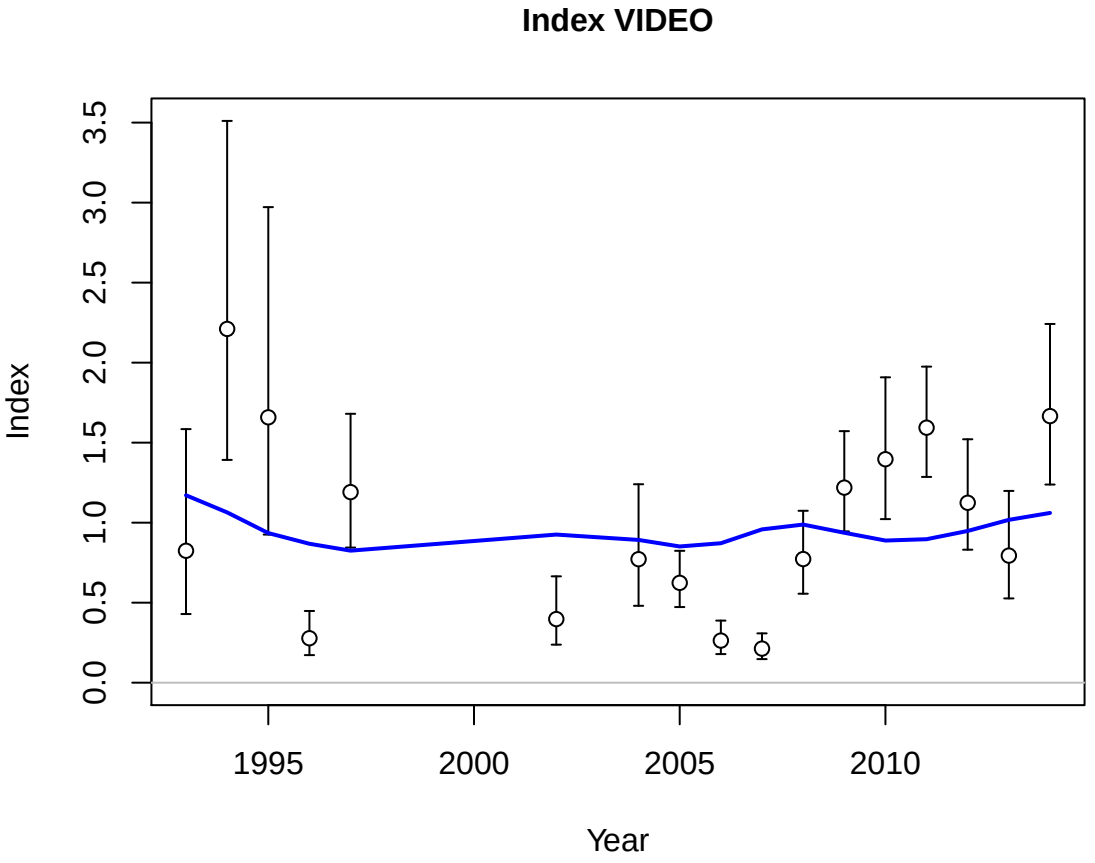
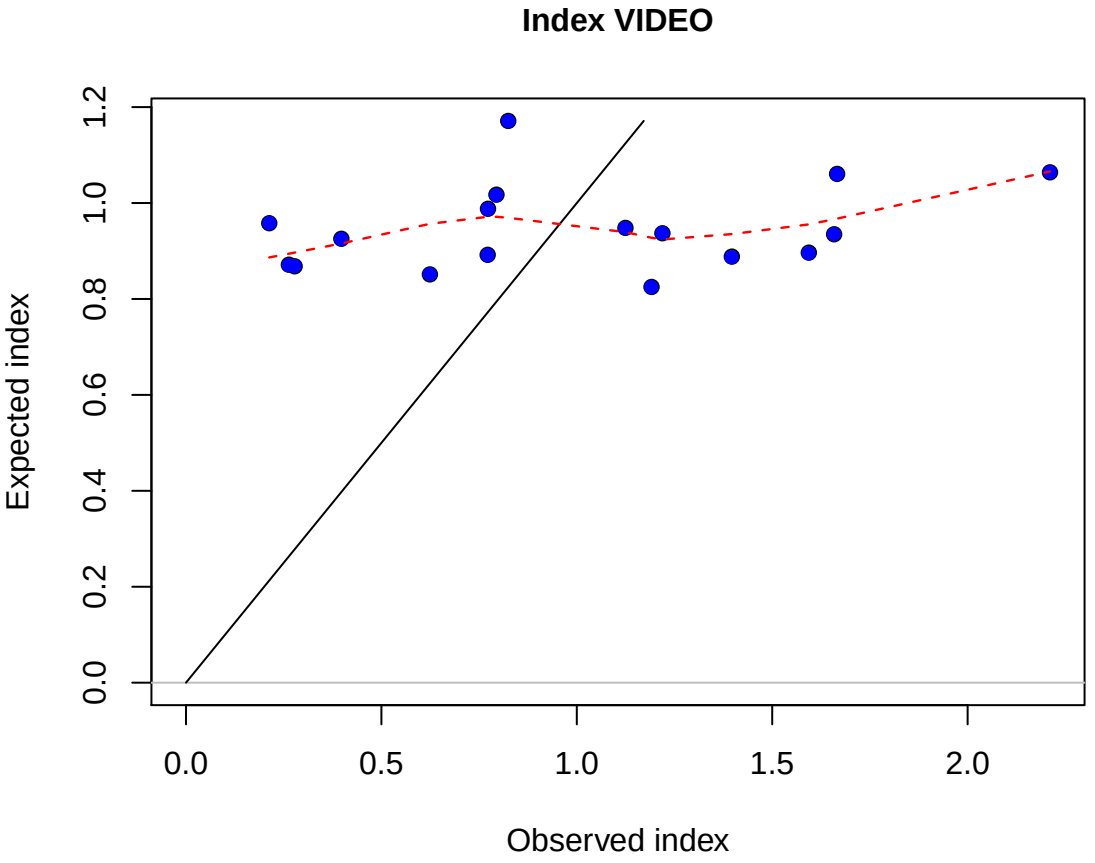
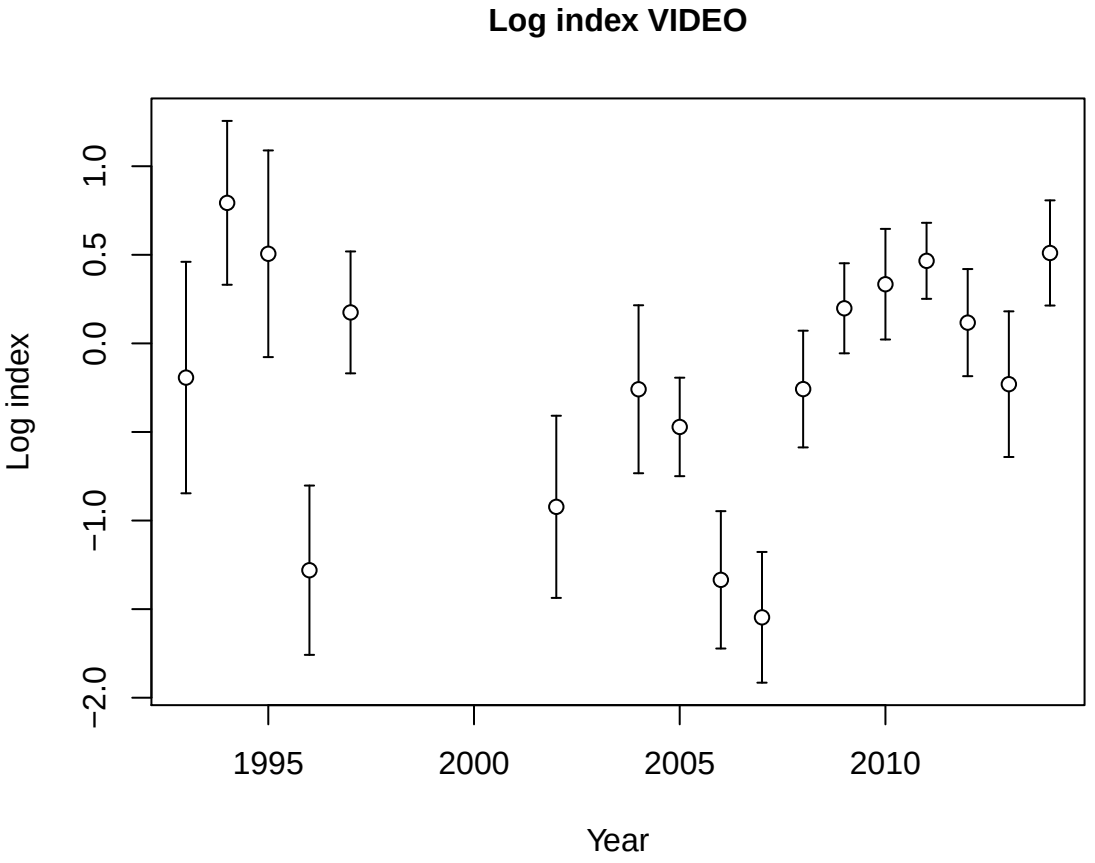
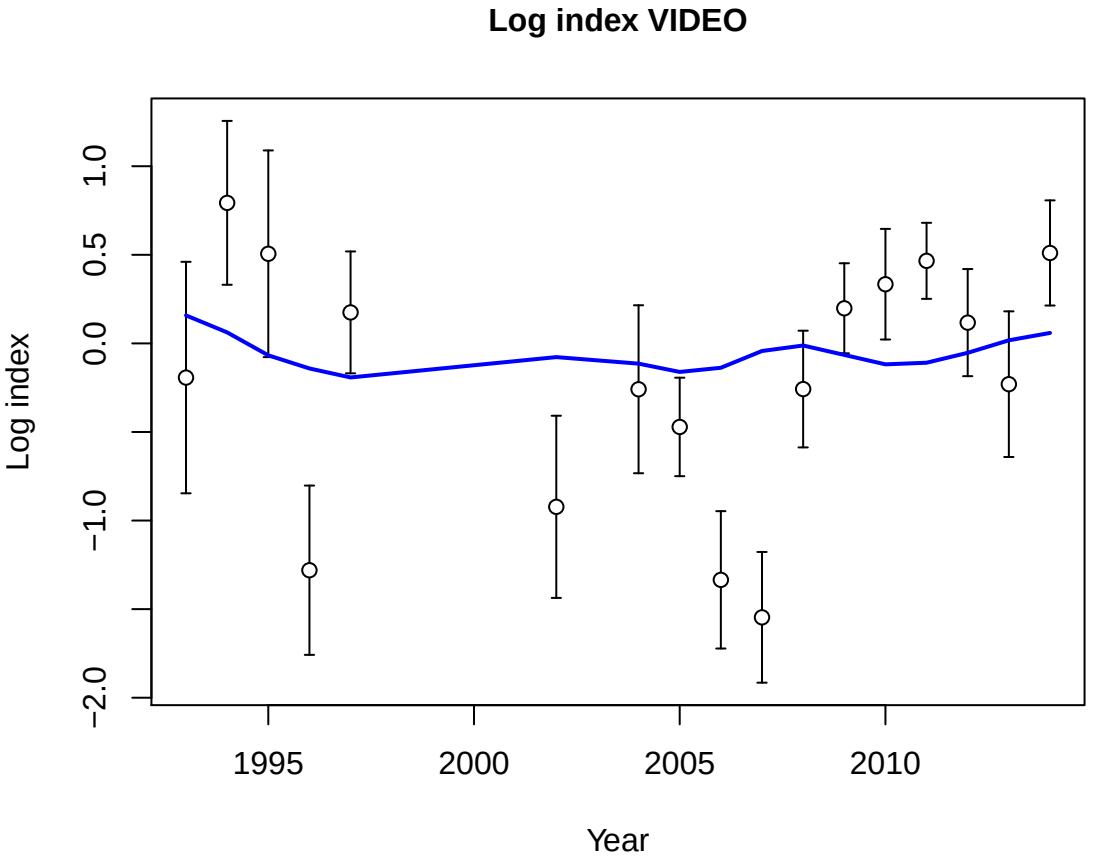
0.2
0.0
−0.2
−0.6
−0.4
−0.2
0.0
0.2
0.4
Log observed index

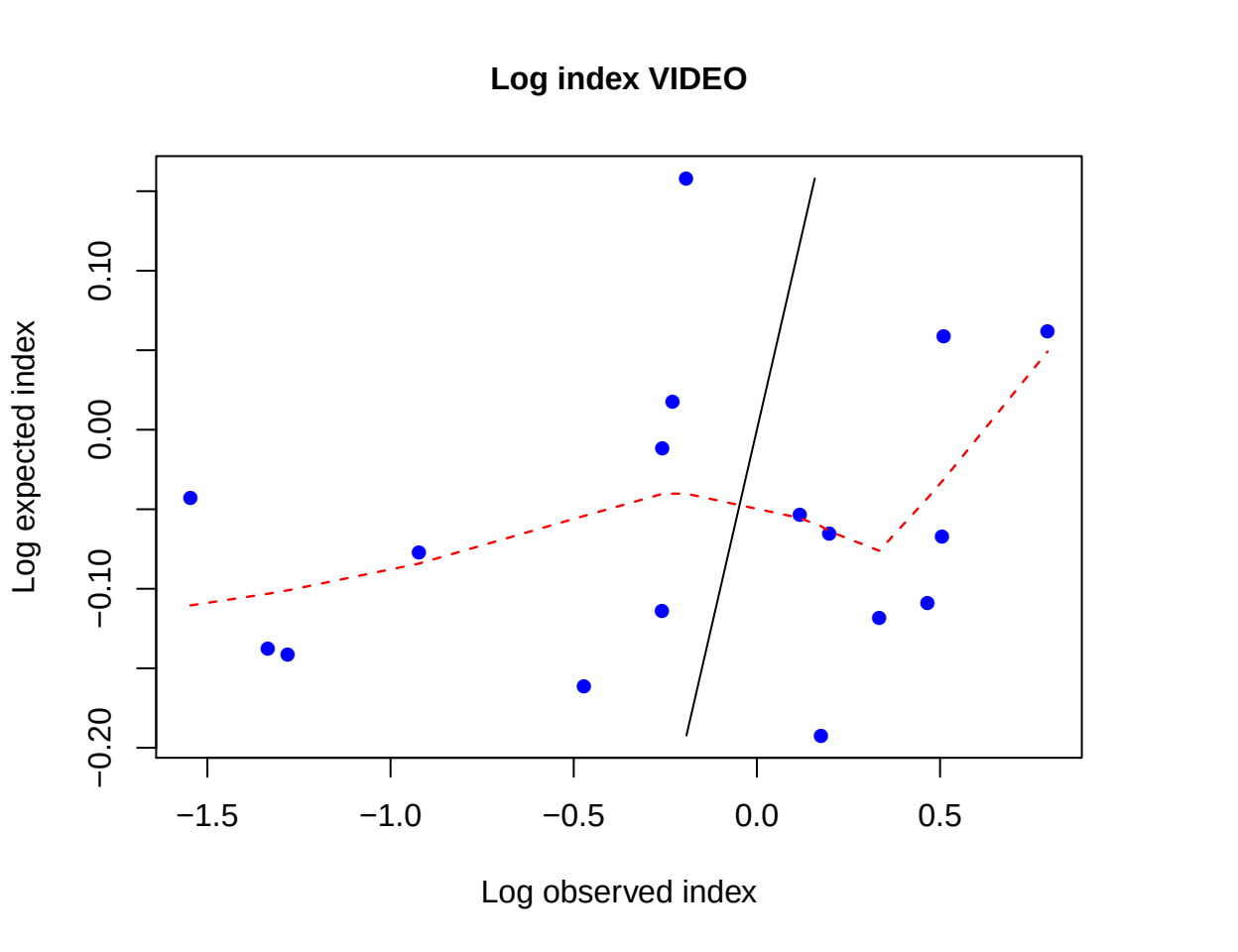

Index VIDEO
Index
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
1995
2000
2005
2010
Year

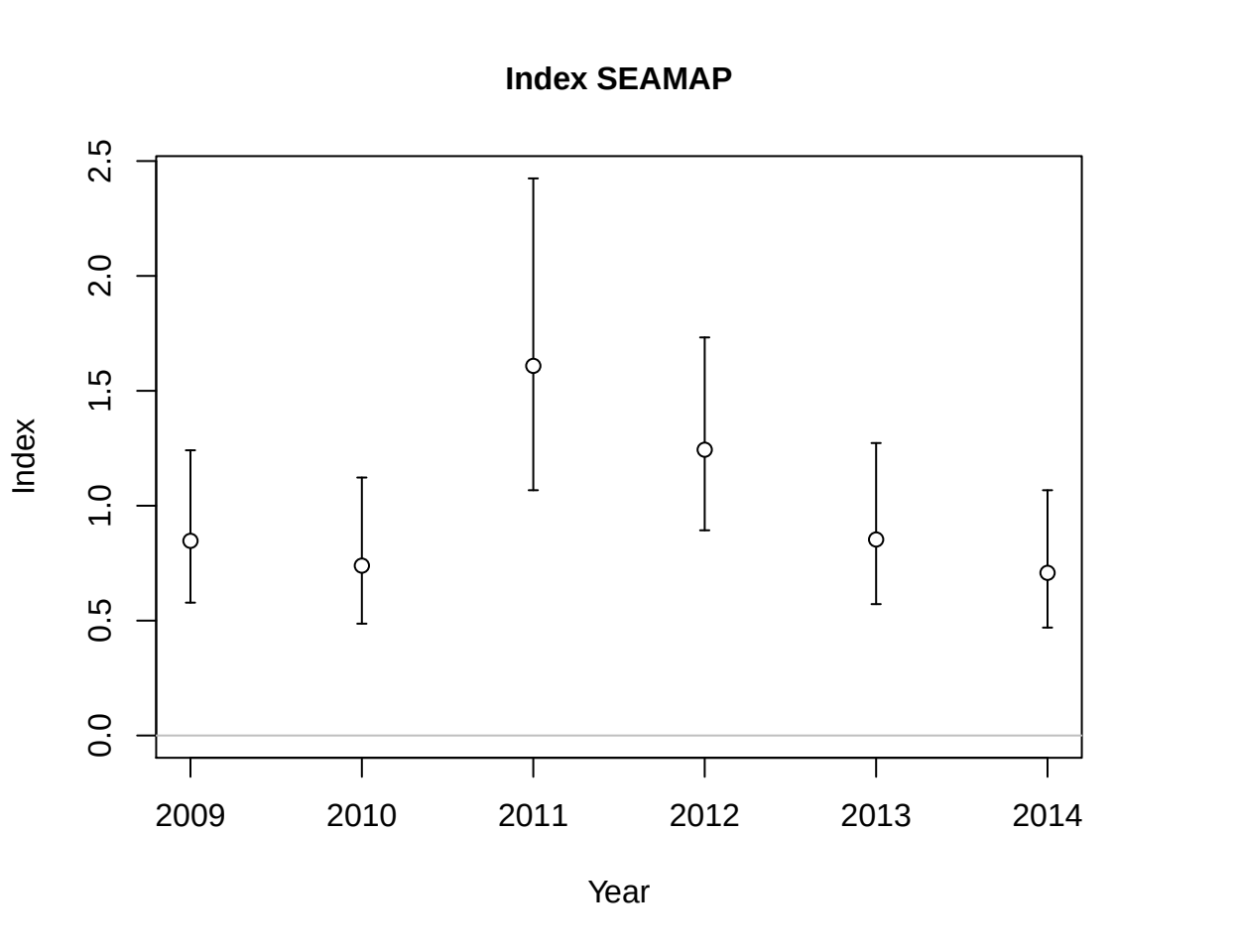

Index VIDEO
Index
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
1995
2000
2005
2010
Year

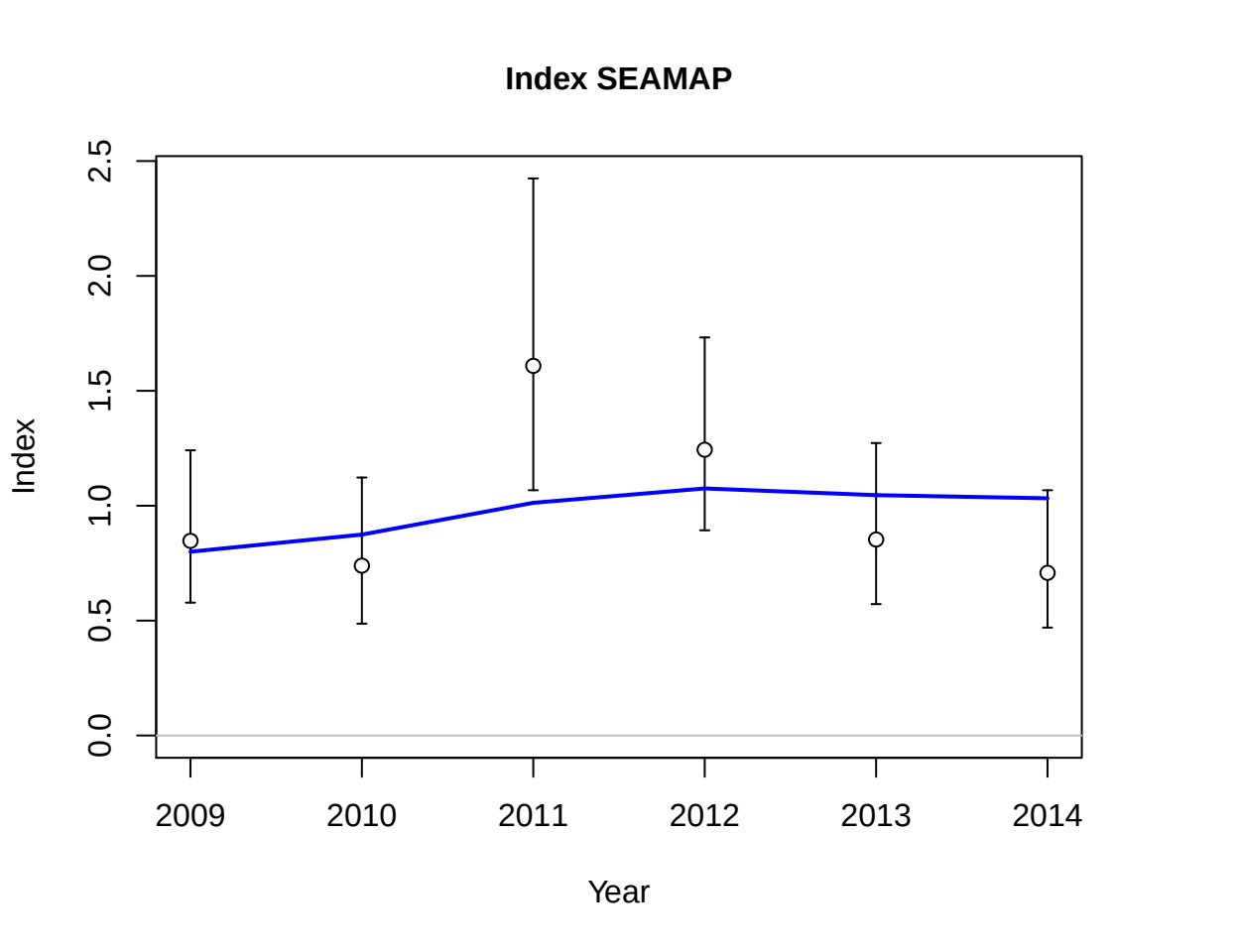

Index VIDEO
Expected index
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
0.5
1.0
1.5
2.0
Observed index

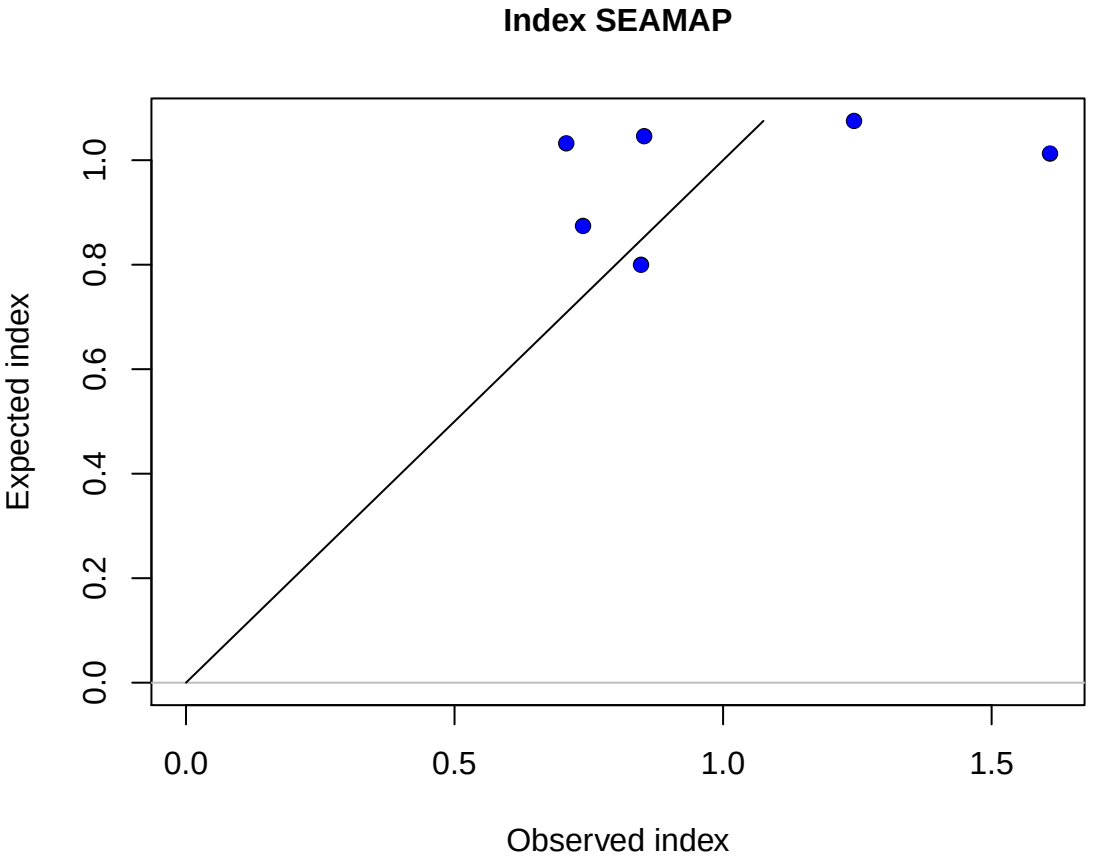

Log index VIDEO
Log index
1.0
0.5
0.0
−1.0
−2.0
1995
2000
2005
2010
Year

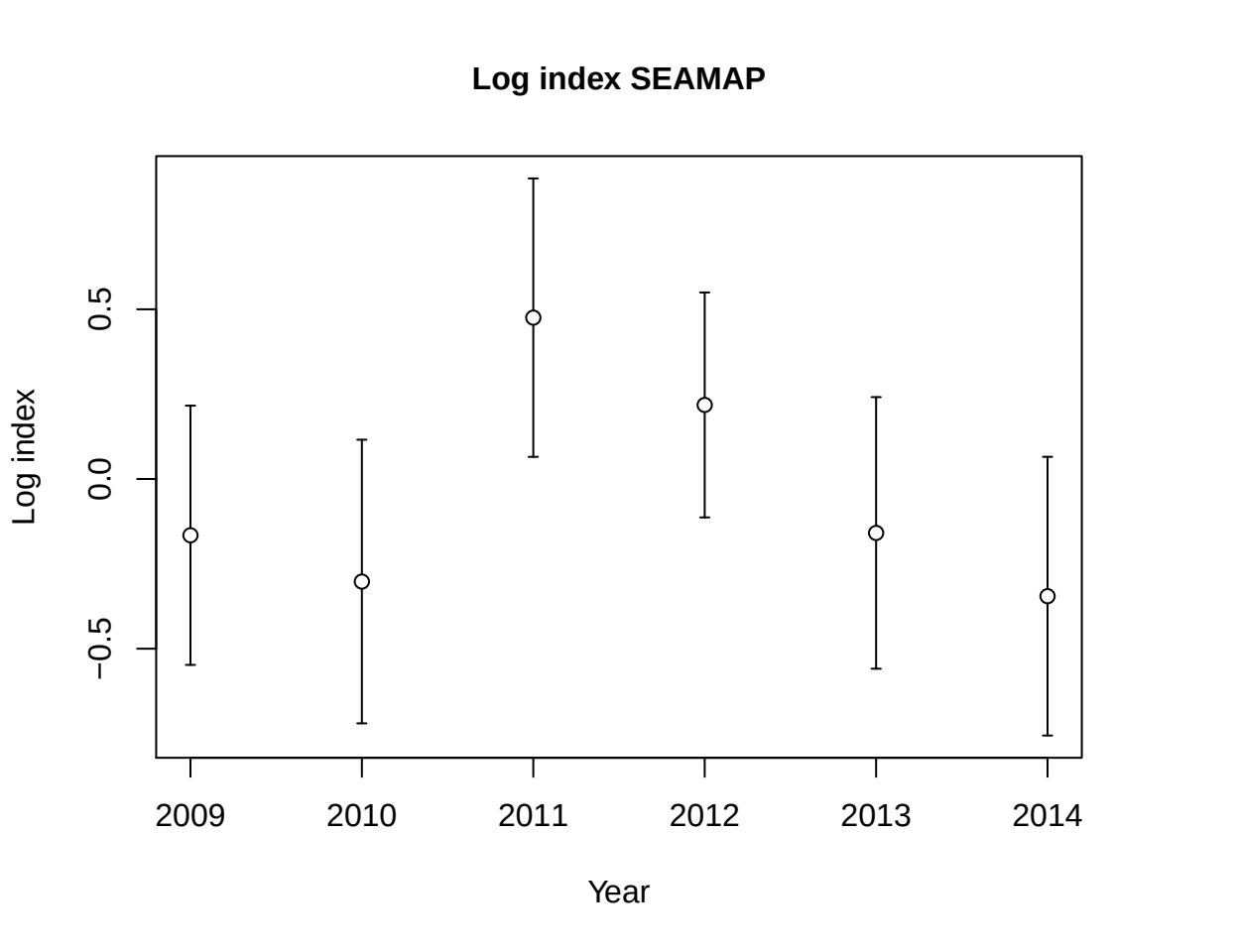

Log index VIDEO
Log index
1.0
0.5
0.0
−1.0
−2.0
1995
2000
2005
2010
Year

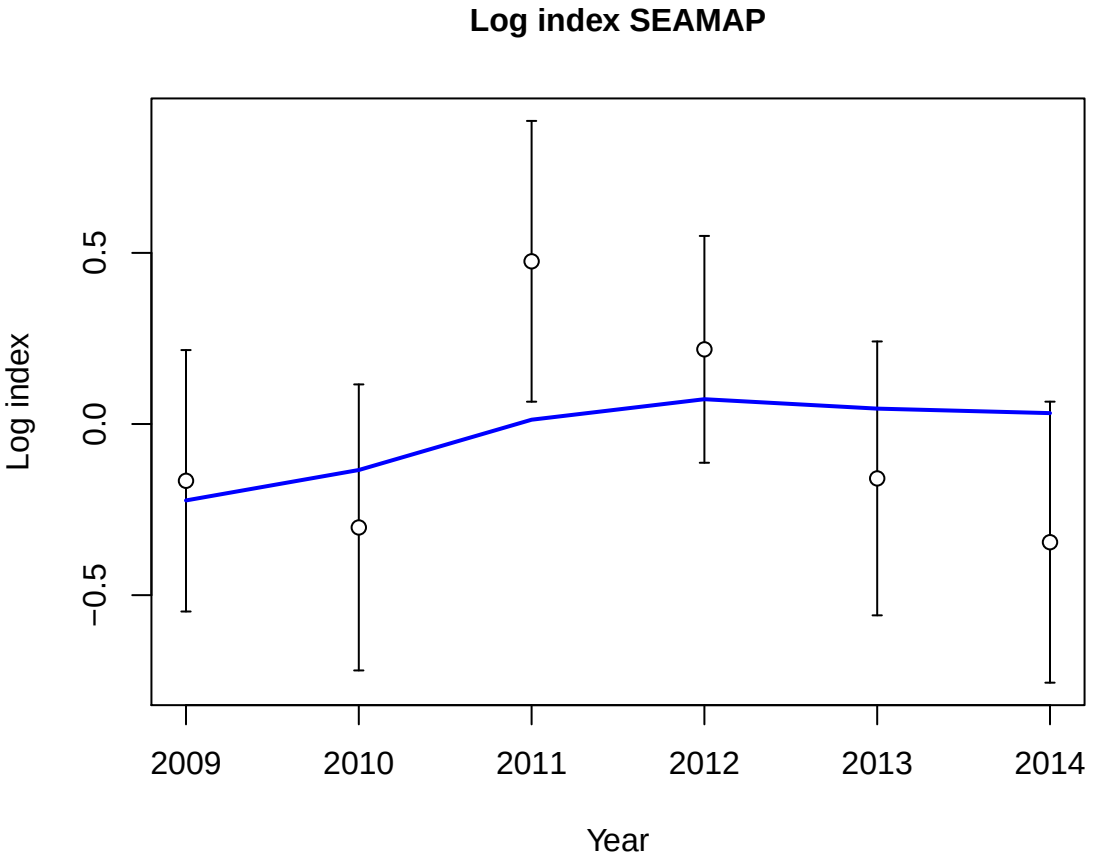

Log index VIDEO
Log expected index
0.10
0.00
−0.10
−0.20
−1.5
−1.0
−0.5
0.0
0.5
Log observed index

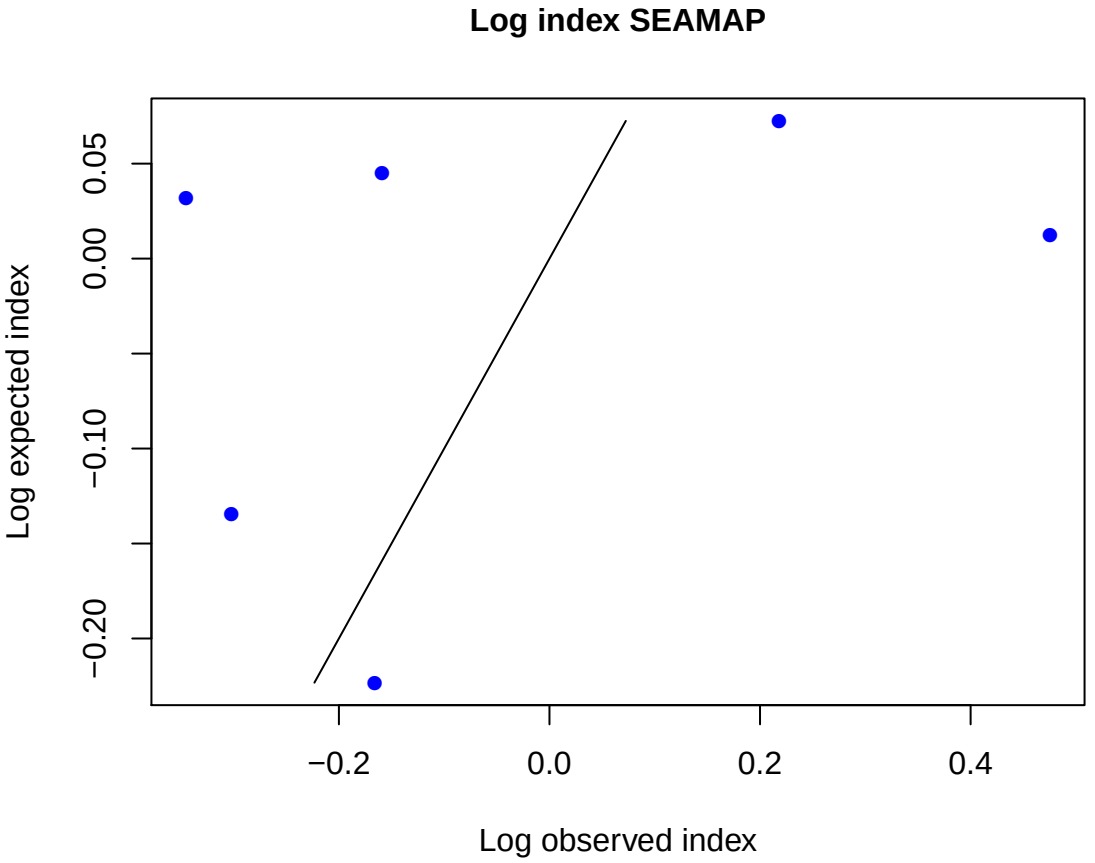

Index SEAMAP
Index
0.0
0.5
1.0
1.5
2.0
2.5
2009
2010
2011
2012
2013
2014
Year

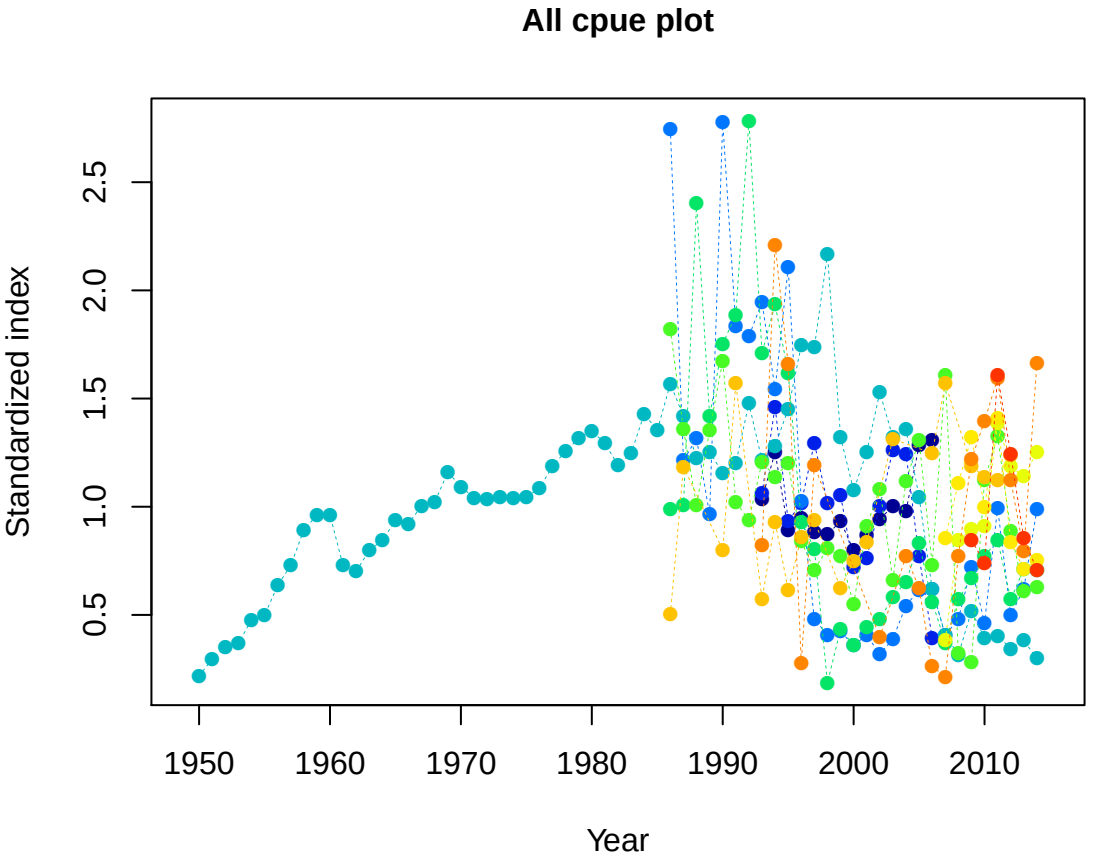

Index SEAMAP
Index
0.0
0.5
1.0
1.5
2.0
2.5
2009
2010
2011
2012
2013
2014
Year

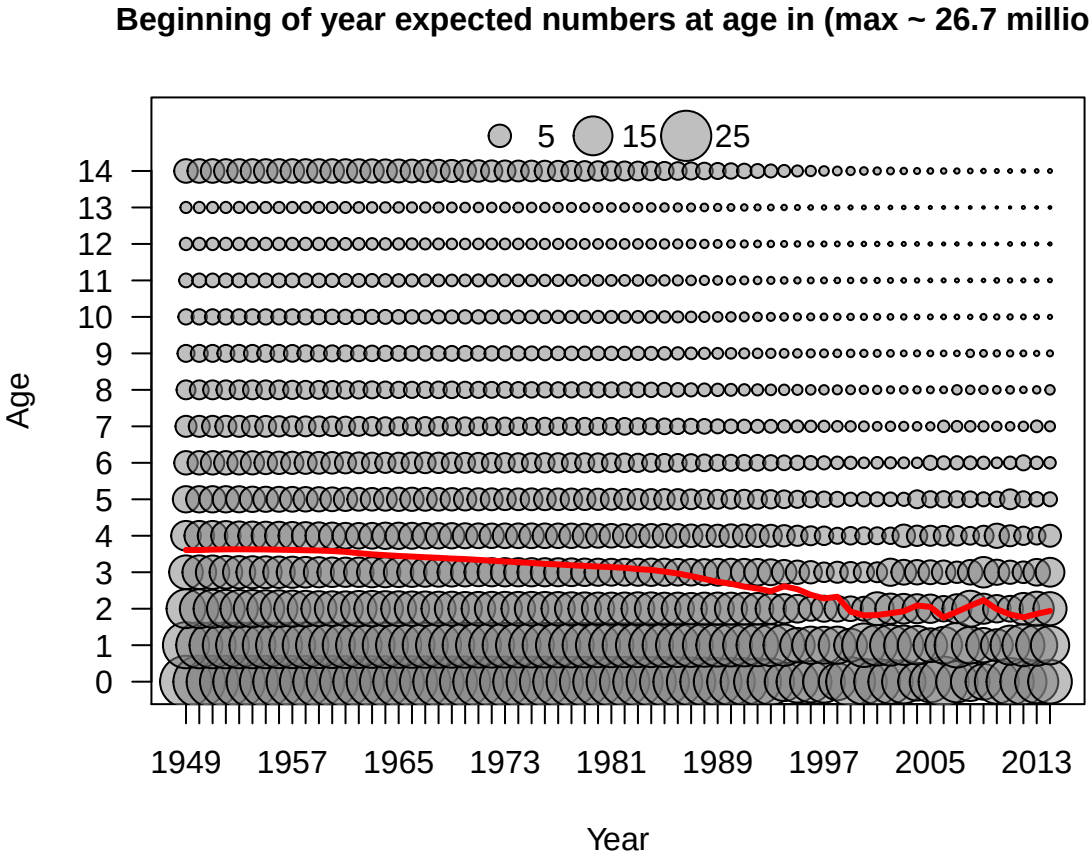

Index SEAMAP
Expected index
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
Observed index

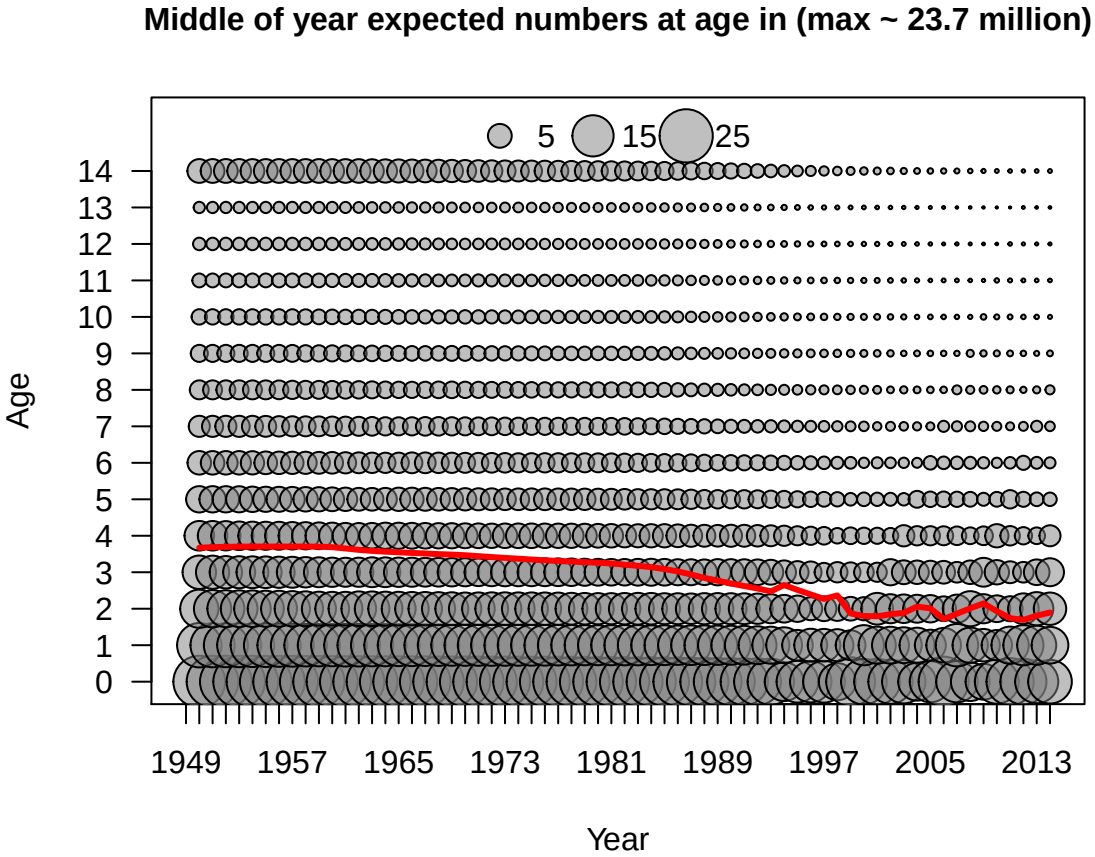

Log index SEAMAP
Log index
0.5
0.0
−0.5
2009
2010
2011
2012
2013
2014
Year

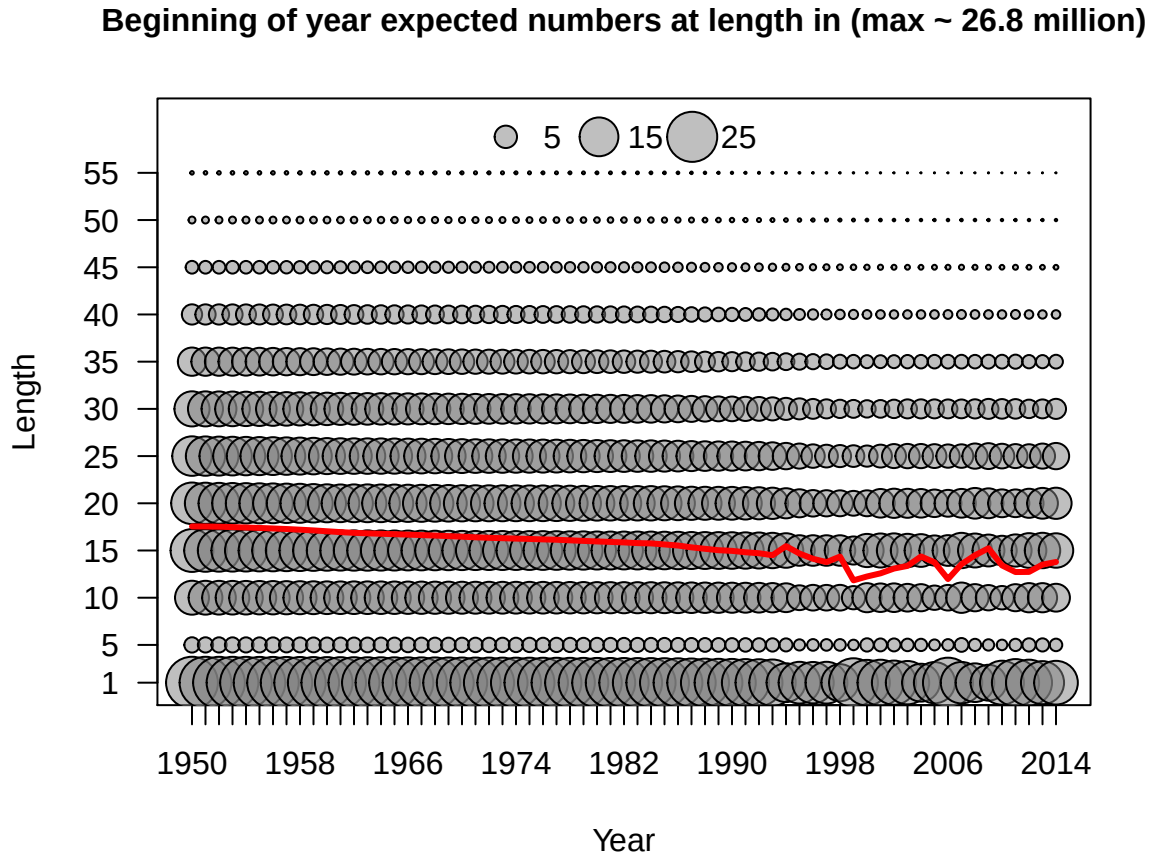

Log index SEAMAP
Log index
0.5
0.0
−0.5
2009
2010
2011
2012
2013
2014
Year

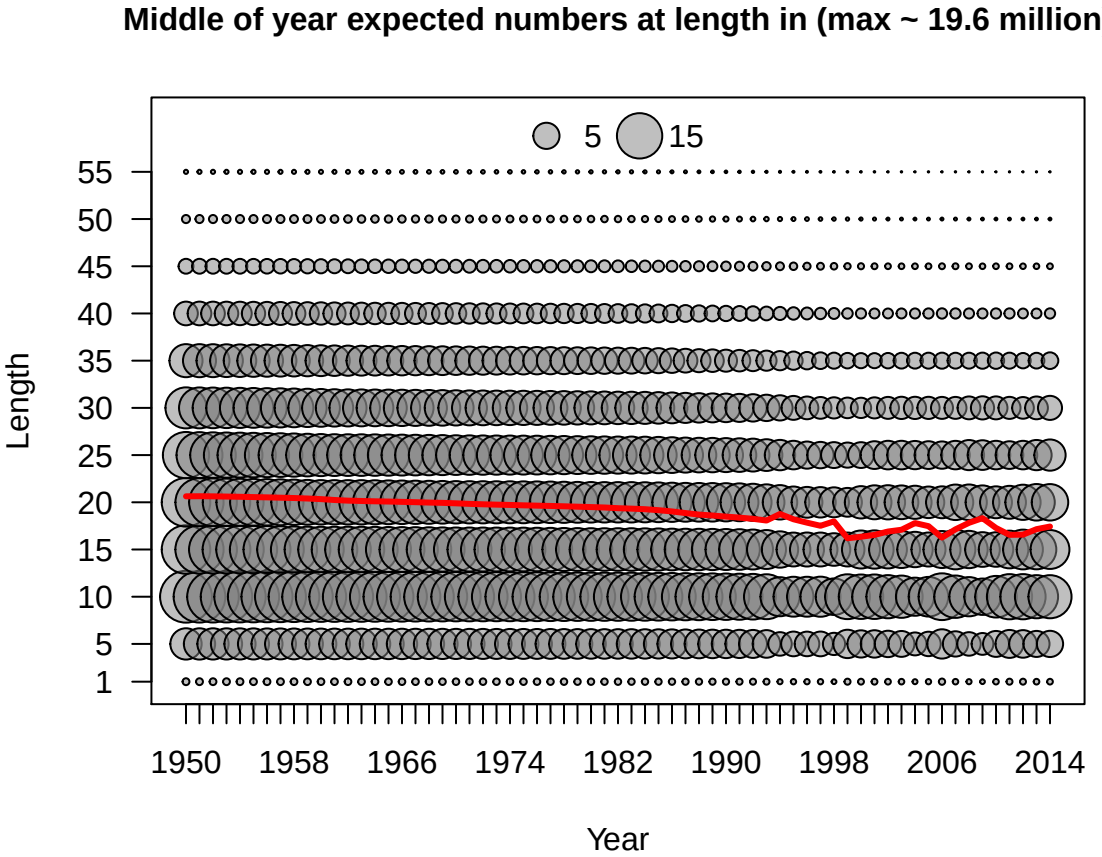

Log index SEAMAP
Log expected index
0.05
0.00
−0.10
−0.20
−0.2
0.0
0.2
0.4
Log observed index

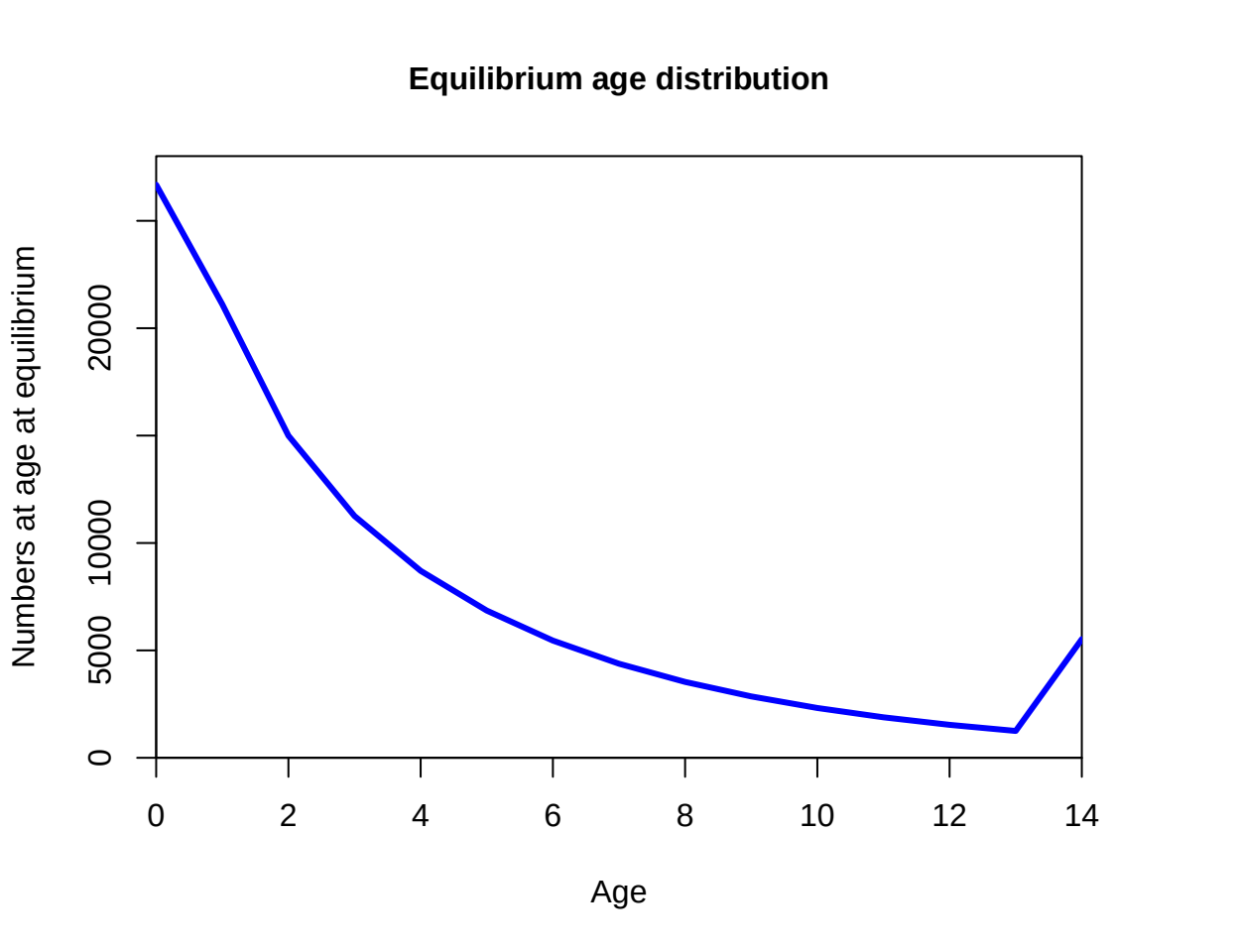

All cpue plot
Standardized index
0.5
1.0
1.5
2.0
2.5
1950
1960
1970
1980
1990
2000
2010
Year


Beginning of year expected numbers at age in (max ~ 26.7 million)
5
15
25
Age
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1949
1957
1965
1973
1981
1989
1997
2005
2013
Year


Middle of year expected numbers at age in (max ~ 23.7 million)
5
15
25
Age
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1949
1957
1965
1973
1981
1989
1997
2005
2013
Year

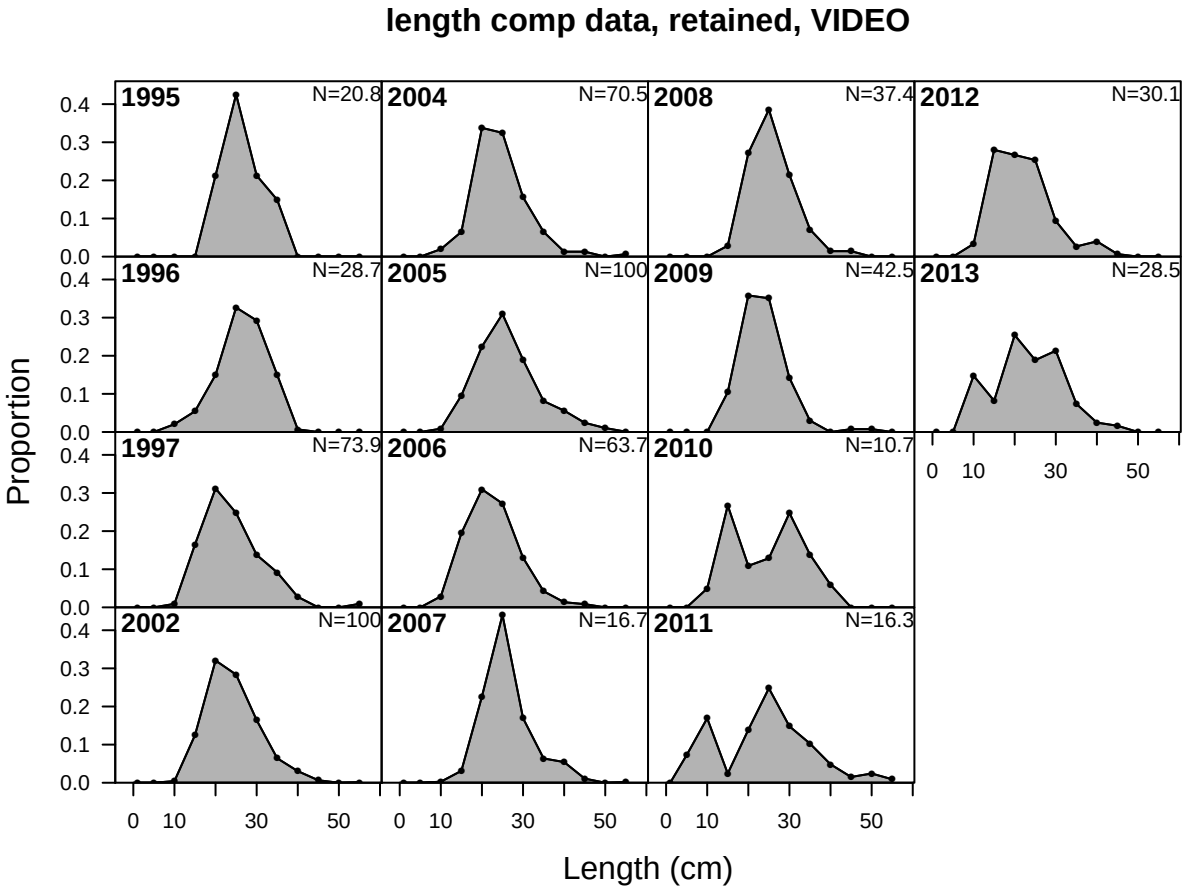

Beginning of year expected numbers at length in (max ~ 26.8 million)
5
15
25
Length
55
50
45
40
35
30
25
20
15
10
5
1
1950
1958
1966
1974
1982
1990
1998
2006
2014
Year

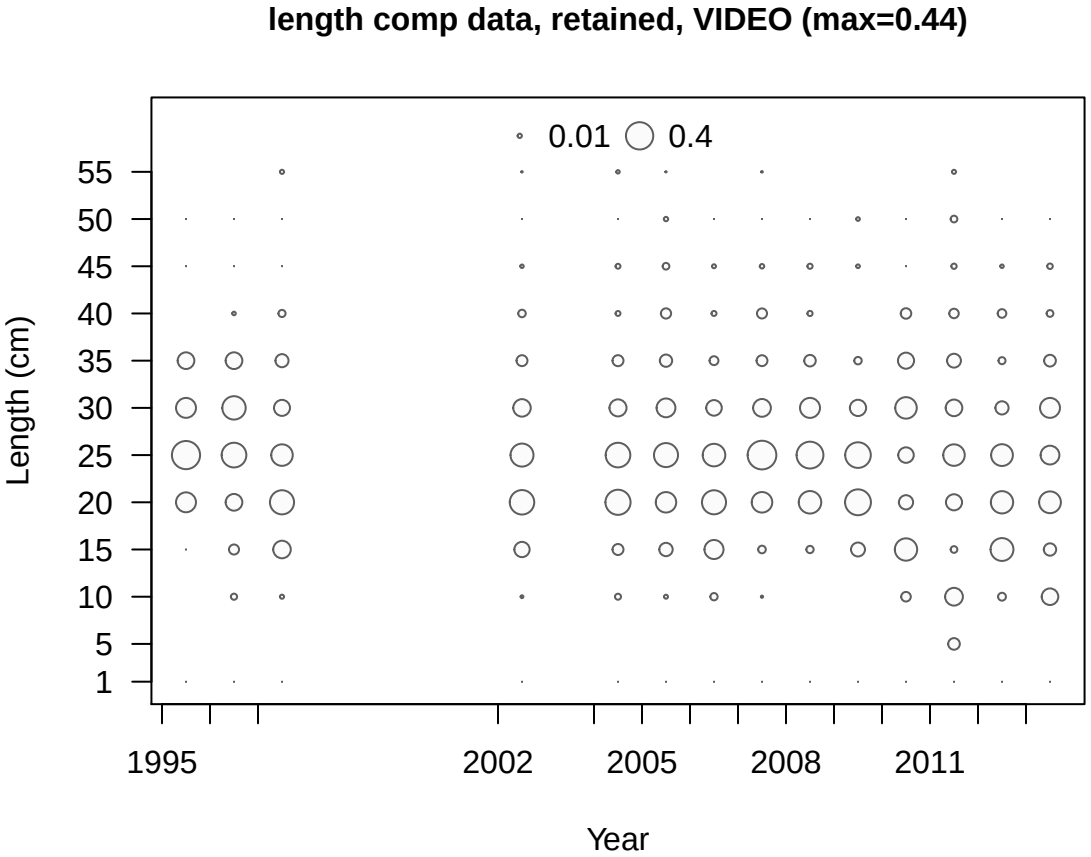

Middle of year expected numbers at length in (max ~ 19.6 million)
5
15
55
50
45
40
35
30
25
20
15
10
5
1
Length
1950
1958
1966
1974
1982
1990
1998
2006
2014
Year

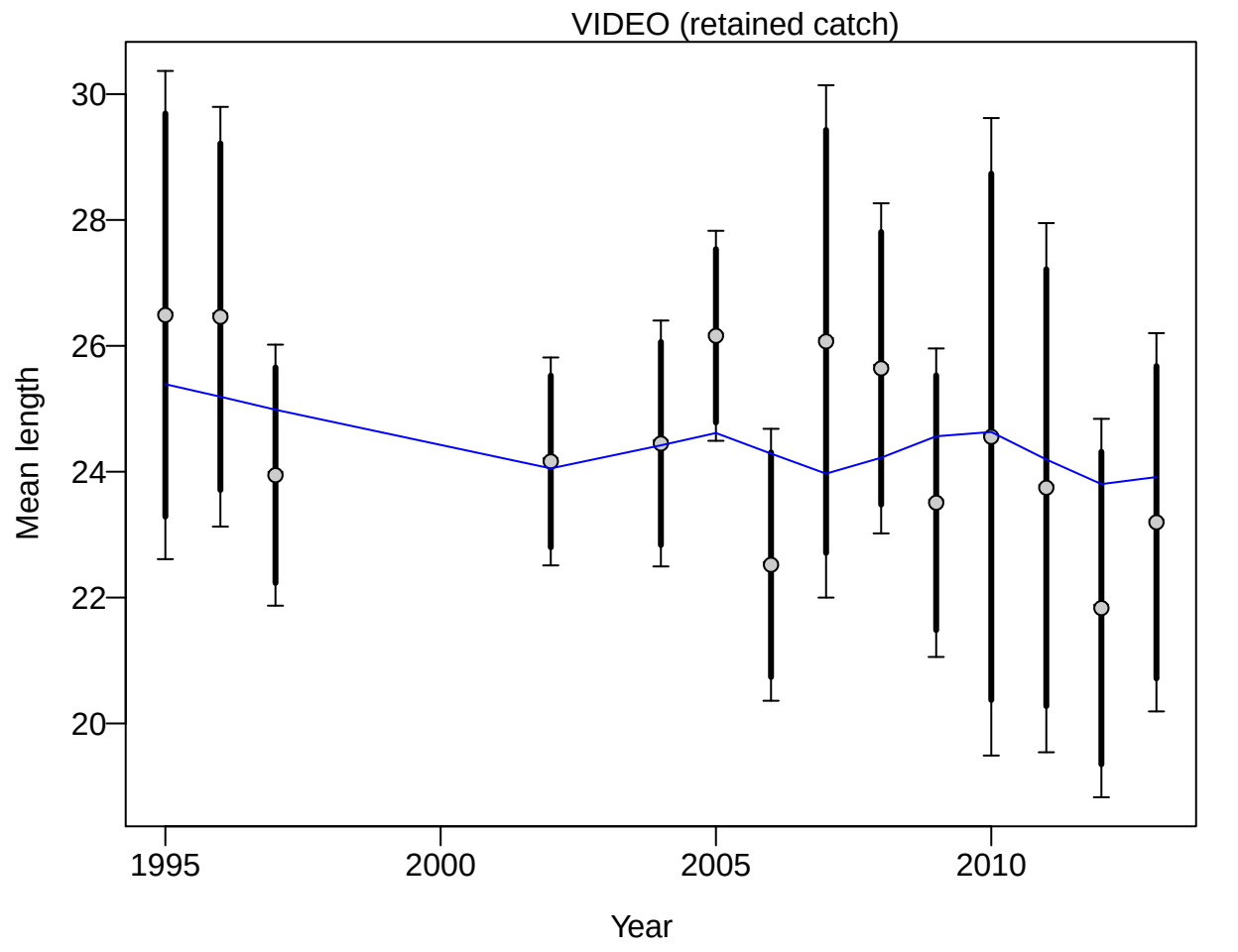

Equilibrium age distribution
Numbers at age at equilibrium
0
5000
10000
20000
0
2
4
6
8
10
12
14
Age

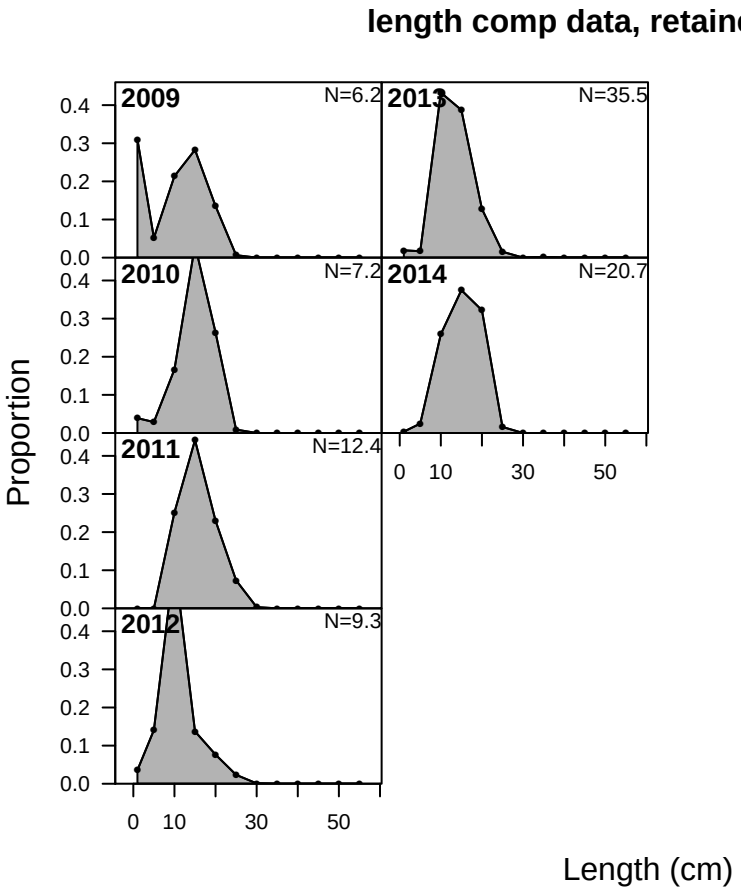
Ageing imprecision
Ageing method 1
SD of observed age (yr)
0e+00
4e−04
8e−04
0
2
4
6
8
10
12
14
True age (yr)

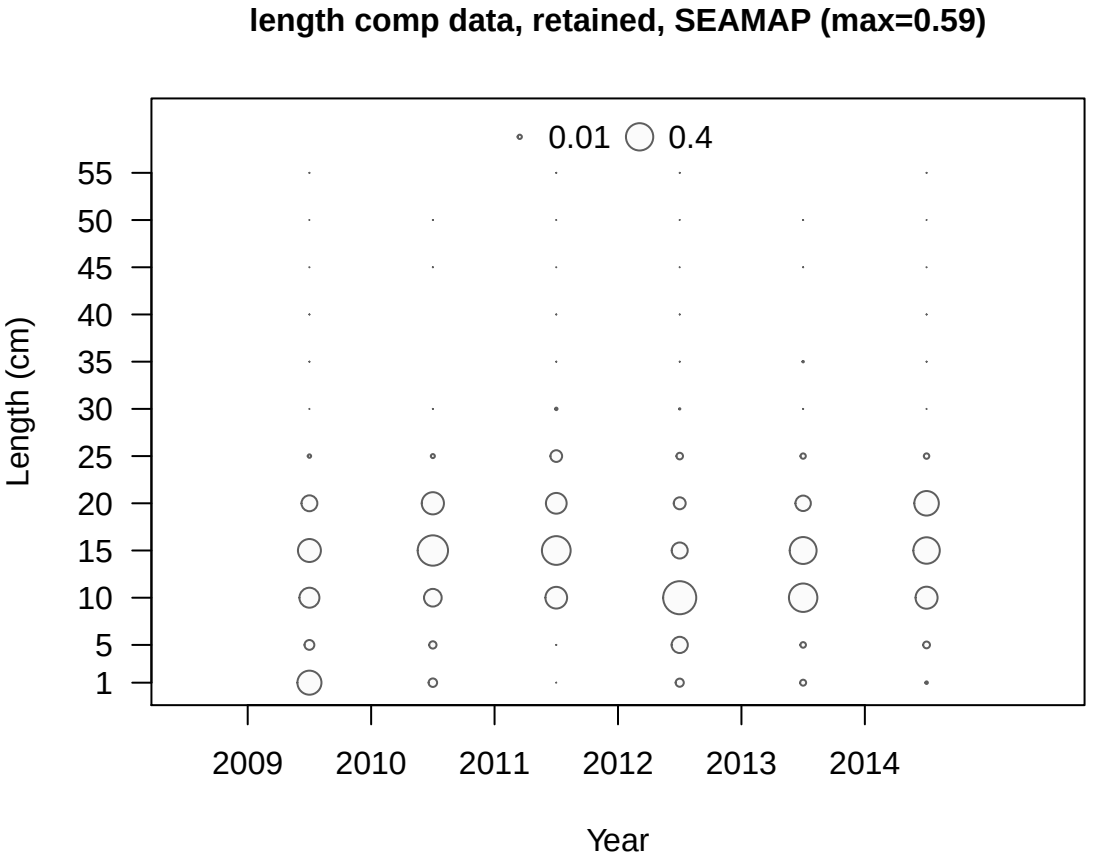
Ageing imprecision: matrix for method 1
Observed age (yr)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
8
9
10
12
14
True age (yr)

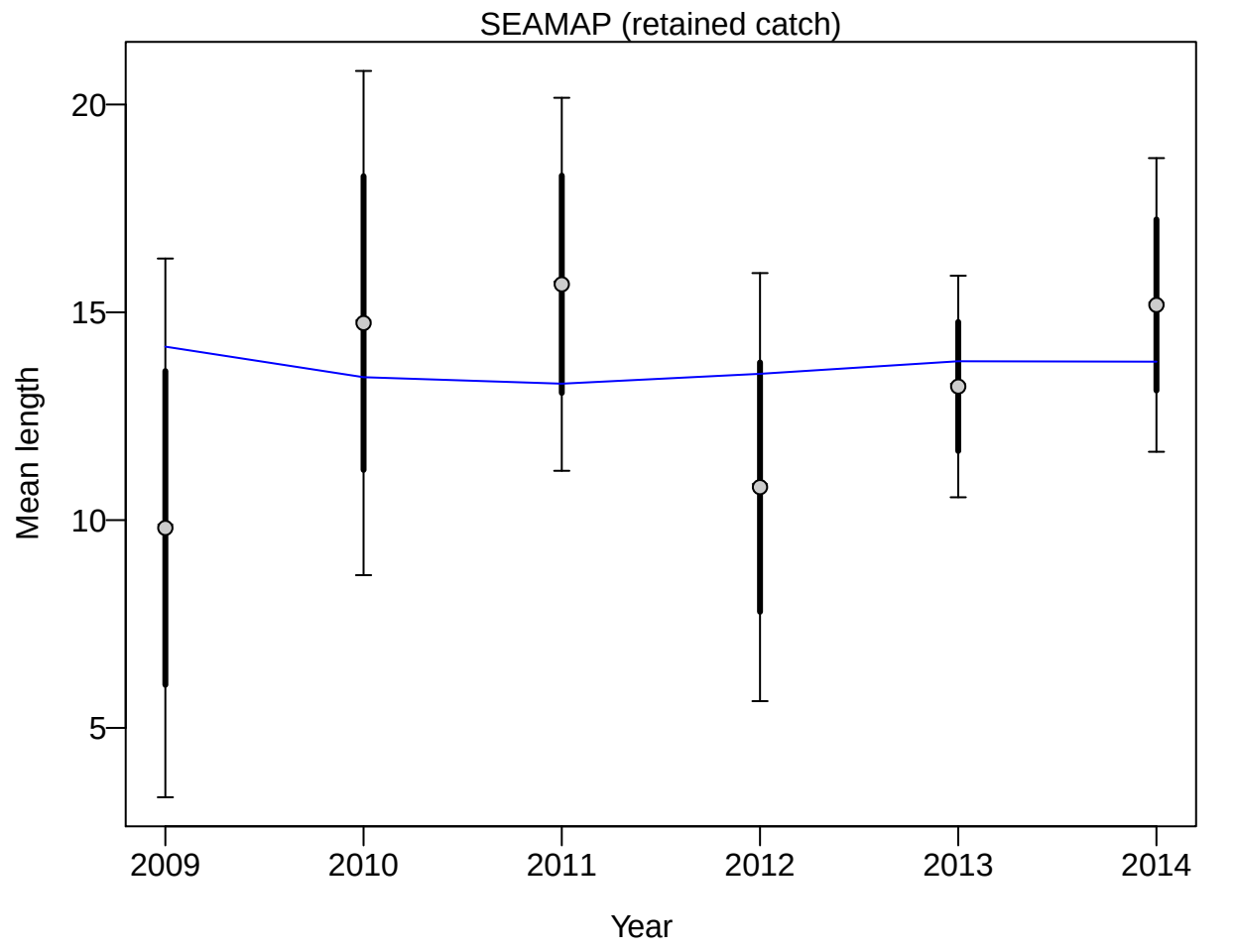

length comp data, retained, VIDEO
1995 N=20.8
2004 N=70.5
2008 N=37.4
2012 N=30.1
1996 N=28.7
2005 N=100
2009 N=42.5
2013 N=28.5
1997 N=73.9
2006 N=63.7
2010 N=10.7
2002 N=100
2007 N=16.7
2011 N=16.3
Proportion
0.0
0.1
0.2
0.3
0.4
0 10 30 50
Length (cm)

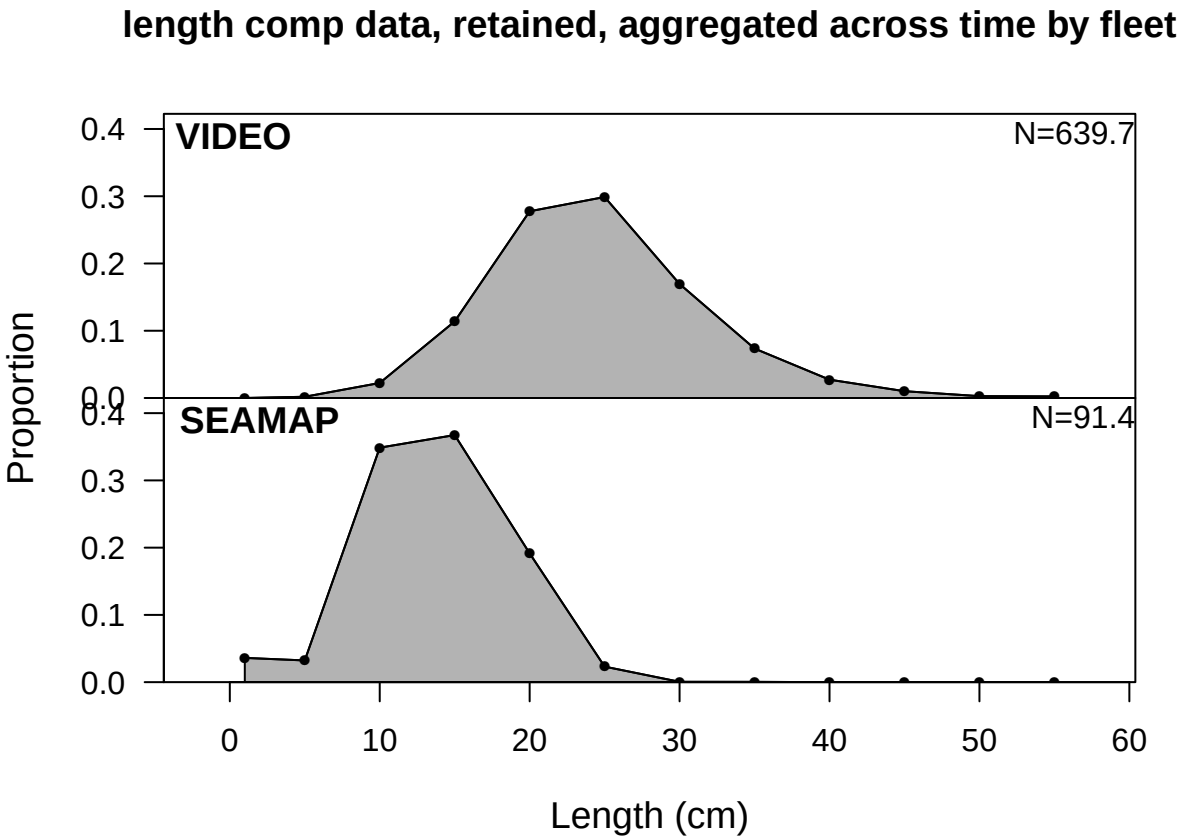

length comp data, retained, VIDEO (max=0.44)
0.01
0.4
55
50
45
40
35
30
25
20
15
10
5
1
Length (cm)
1995
2002
2005
2008
2011
Year

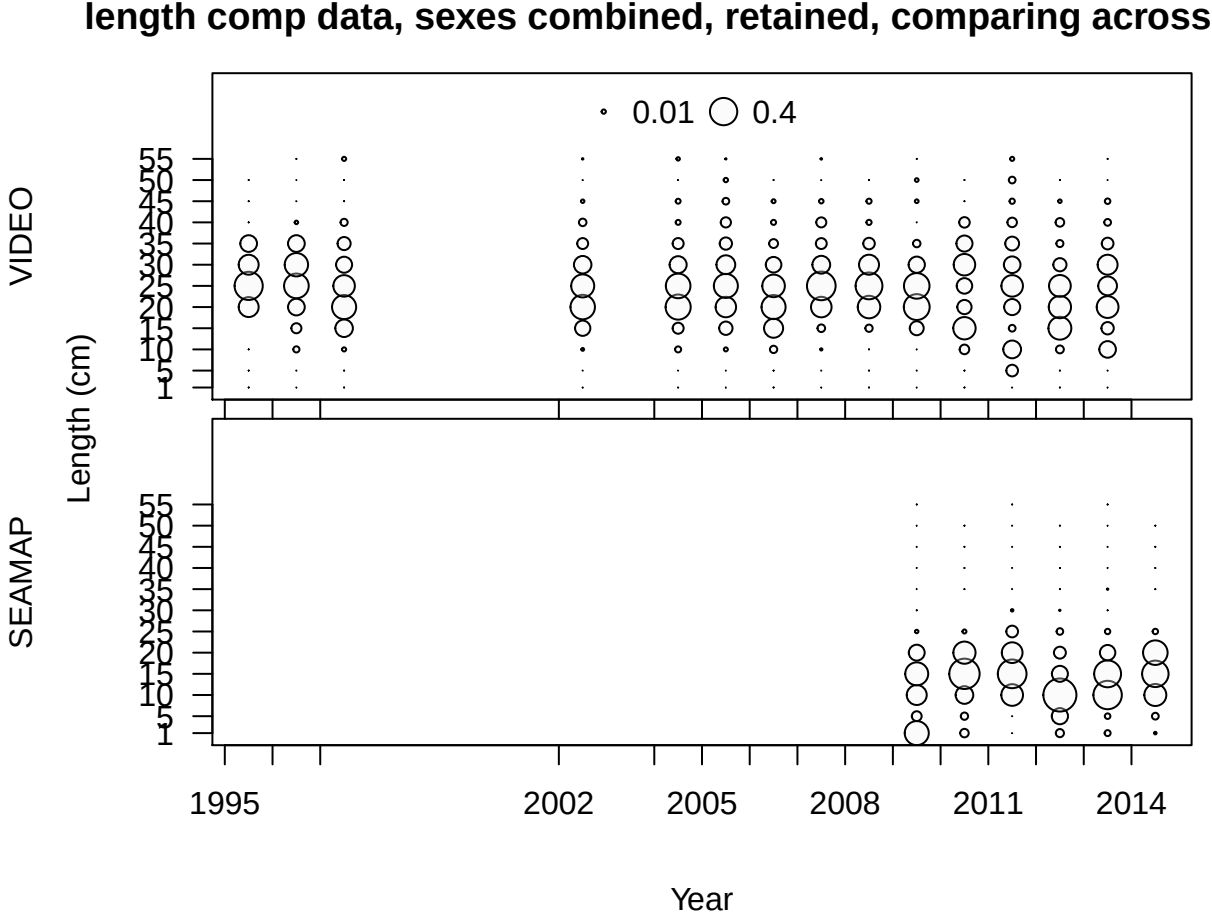

VIDEO (retained catch)
Mean length
30
28
26
24
22
20
1995
2000
2005
2010
Year

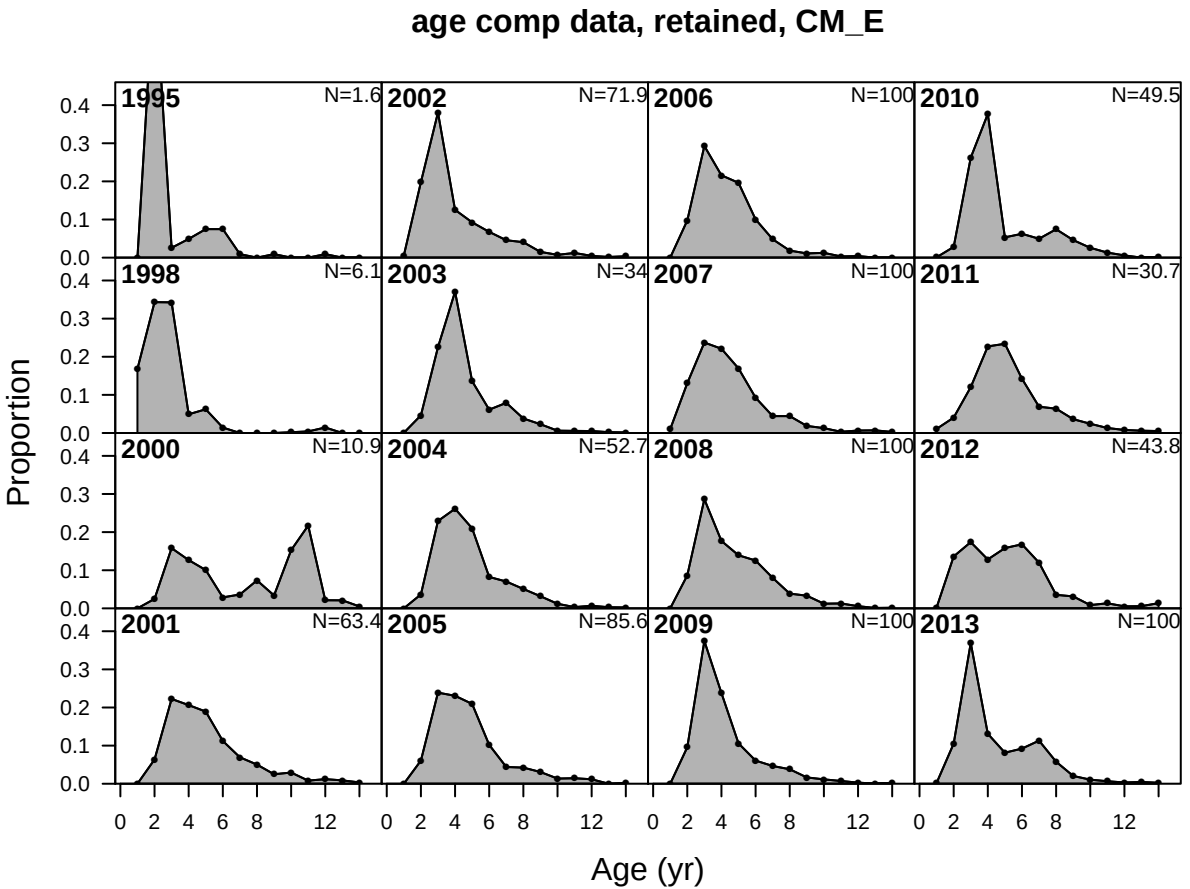

length comp data, retained, SEAMAP
2009
N=6.2
2013
N=35.5
2010
N=7.2
2014
N=20.7
2011
N=12.4
2012
N=9.3
Proportion
Length (cm)
0.0
0.1
0.2
0.3
0.4
0
10
30
50


length comp data, retained, SEAMAP (max=0.59)
0.01
0.4
55
50
45
40
35
30
25
20
15
10
5
1
Length (cm)
2009
2010
2011
2012
2013
2014
Year

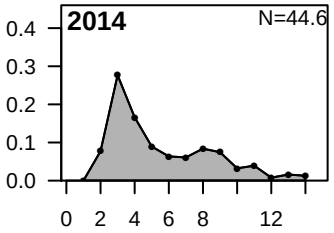

SEAMAP (retained catch)
Mean length
20
15
10
5
2009
2010
2011
2012
2013
2014
Year


length comp data, retained, aggregated across time by fleet
VIDEO
N=639.7
SEAMAP
N=91.4
Proportion
0.0
0.1
0.2
0.3
0.4
0
10
20
30
40
50
60
Length (cm)


length comp data, sexes combined, retained, comparing across f
0.01
0.4
VIDEO
SEAMAP
Length (cm)
55
50
45
40
35
30
25
20
15
10
5
1
1995
2002
2005
2008
2011
2014
Year

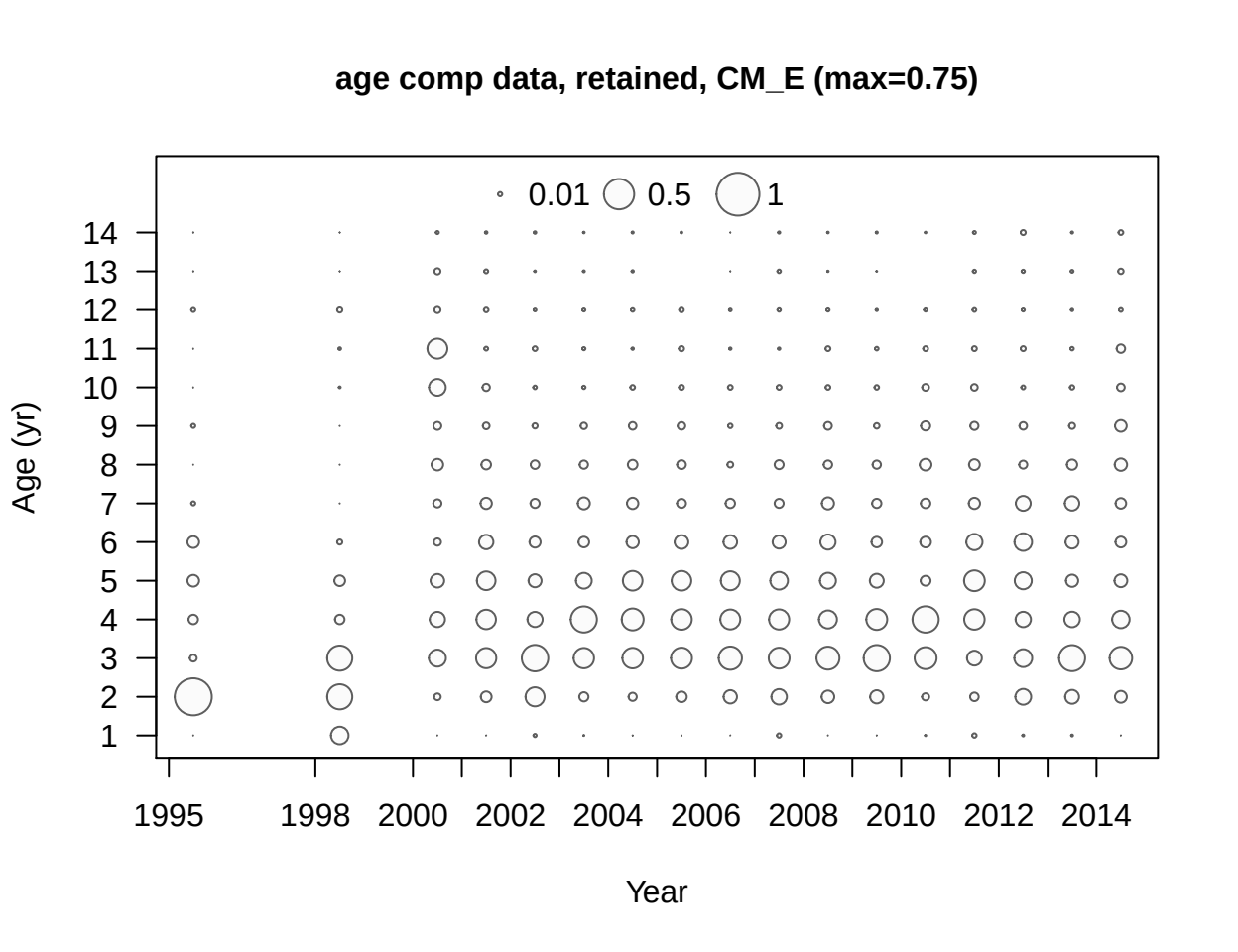

age comp data, retained, CM_E
1995 N=1.6
2002 N=71.9
2006 N=100
2010 N=49.5
1998 N=6.1
2003 N=34
2007 N=100
2011 N=30.7
2000 N=10.9
2004 N=52.7
2008 N=100
2012 N=43.8
2001 N=63.4
2005 N=85.6
2009 N=100
2013 N=100
Proportion
0.0
0.1
0.2
0.3
0.4
0 2 4 6 8 12
Age (yr)

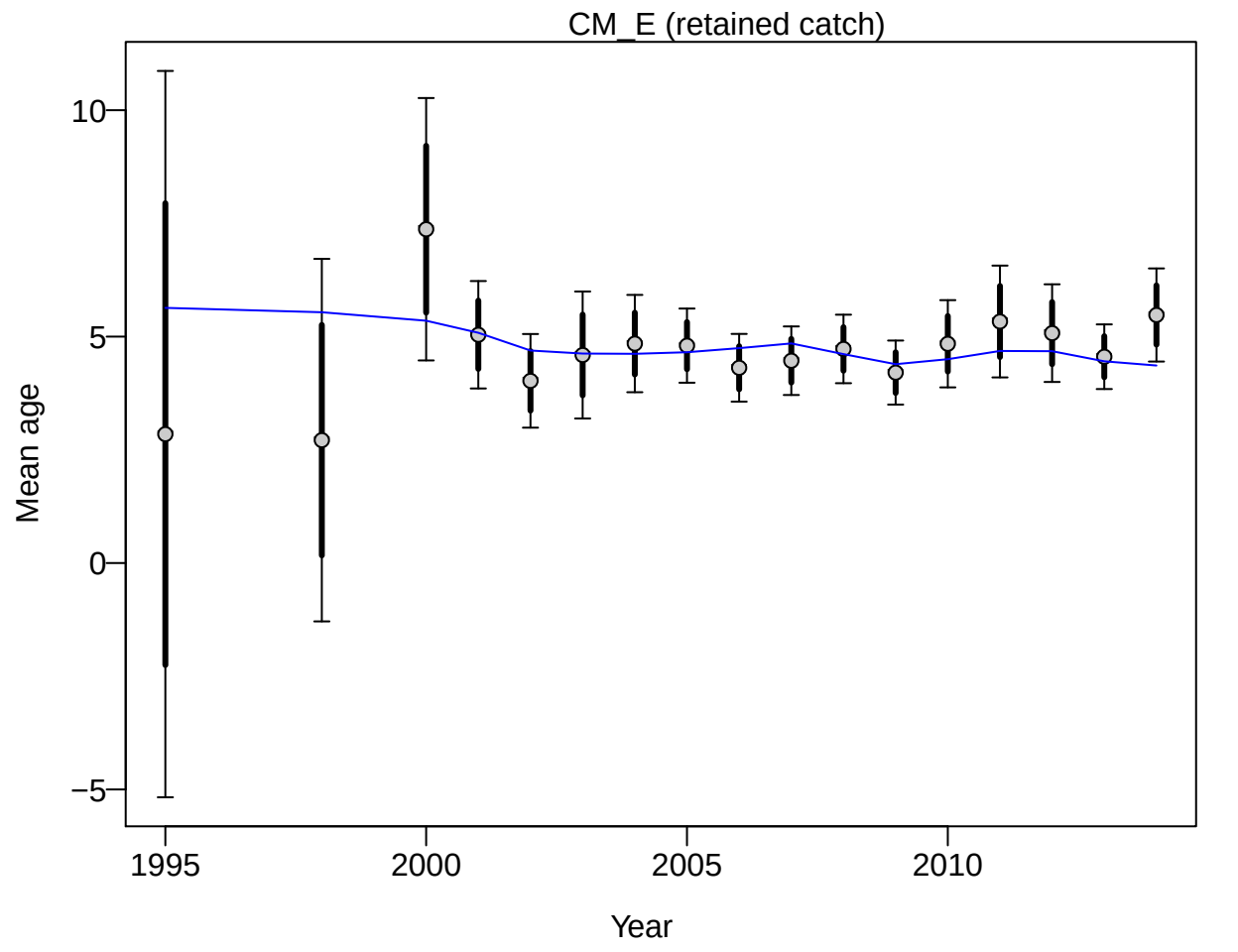
age comp data, retained, CM_E

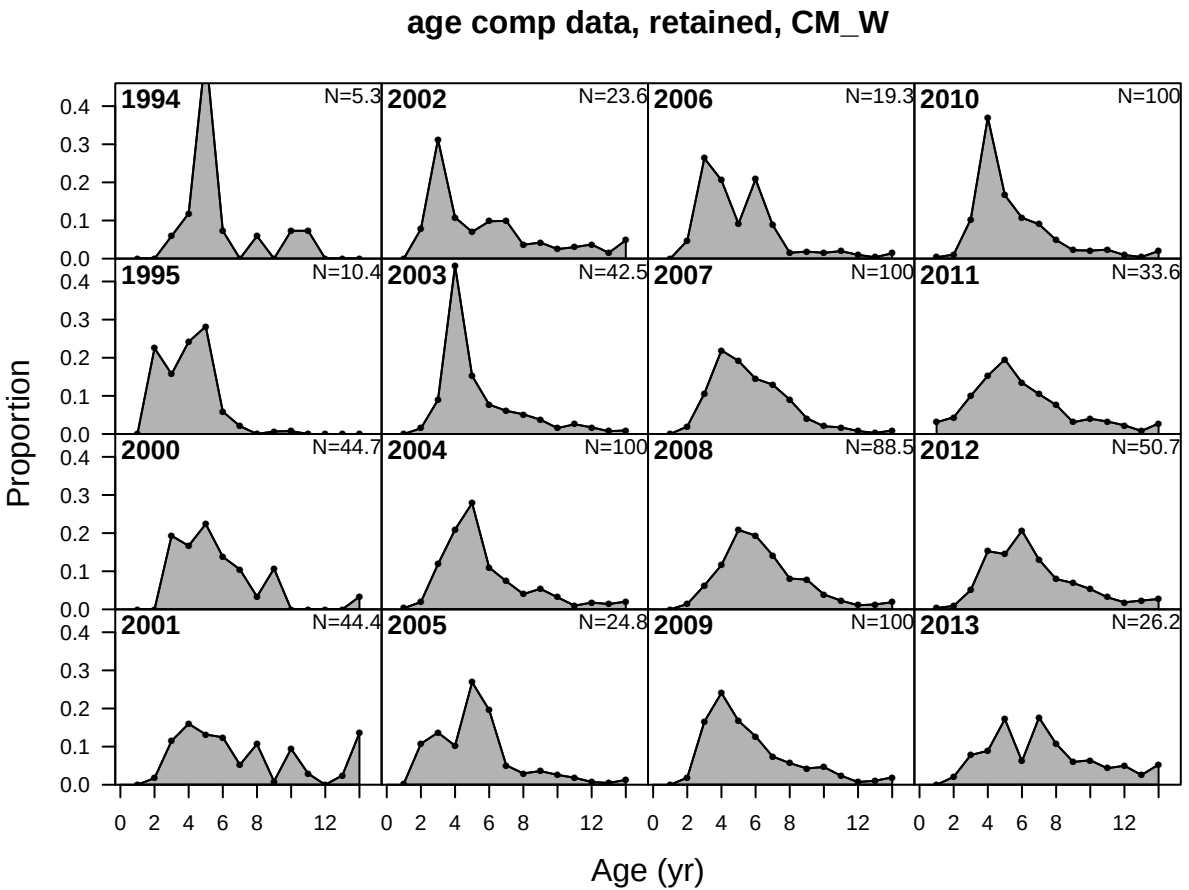


Proportion

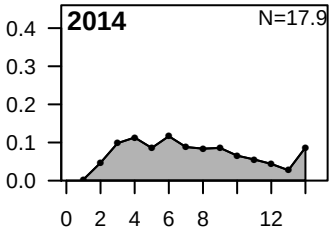
Age (yr)


age comp data, retained, CM_E (max=0.75)
0.01
0.5
1
Age (yr)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1995
1998
2000
2002
2004
2006
2008
2010
2012
2014
Year


CM_E (retained catch)
Mean age
10
5
0
−5
1995
2000
2005
2010
Year

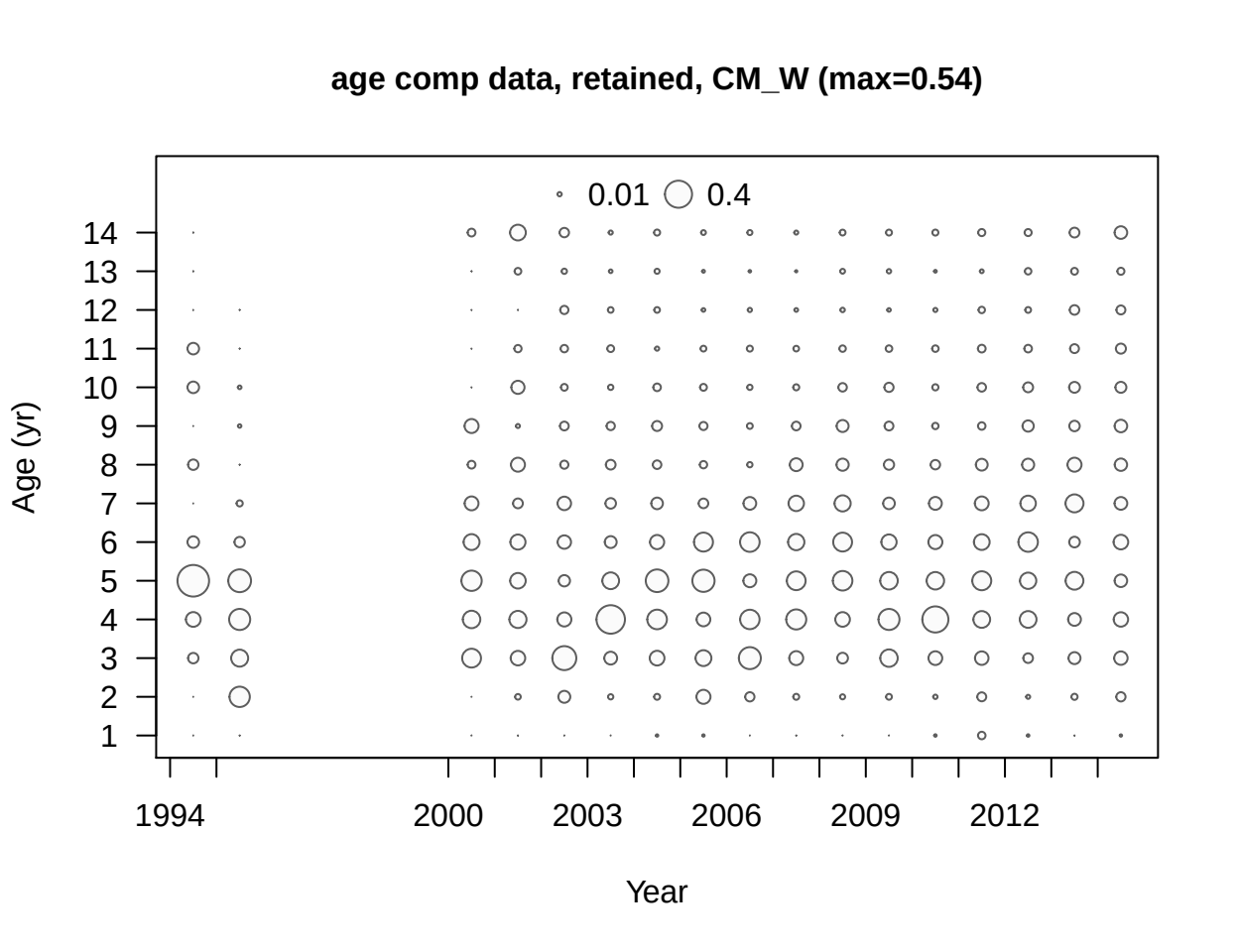

age comp data, retained, CM_W
1994 N=5.3
2002 N=23.6
2006 N=19.3
2010 N=100
1995 N=10.4
2003 N=42.5
2007 N=100
2011 N=33.6
2000 N=44.7
2004 N=100
2008 N=88.5
2012 N=50.7
2001 N=44.4
2005 N=24.8
2009 N=100
2013 N=26.2
Proportion
0.0
0.1
0.2
0.3
0.4
0 2 4 6 8 12
Age (yr)

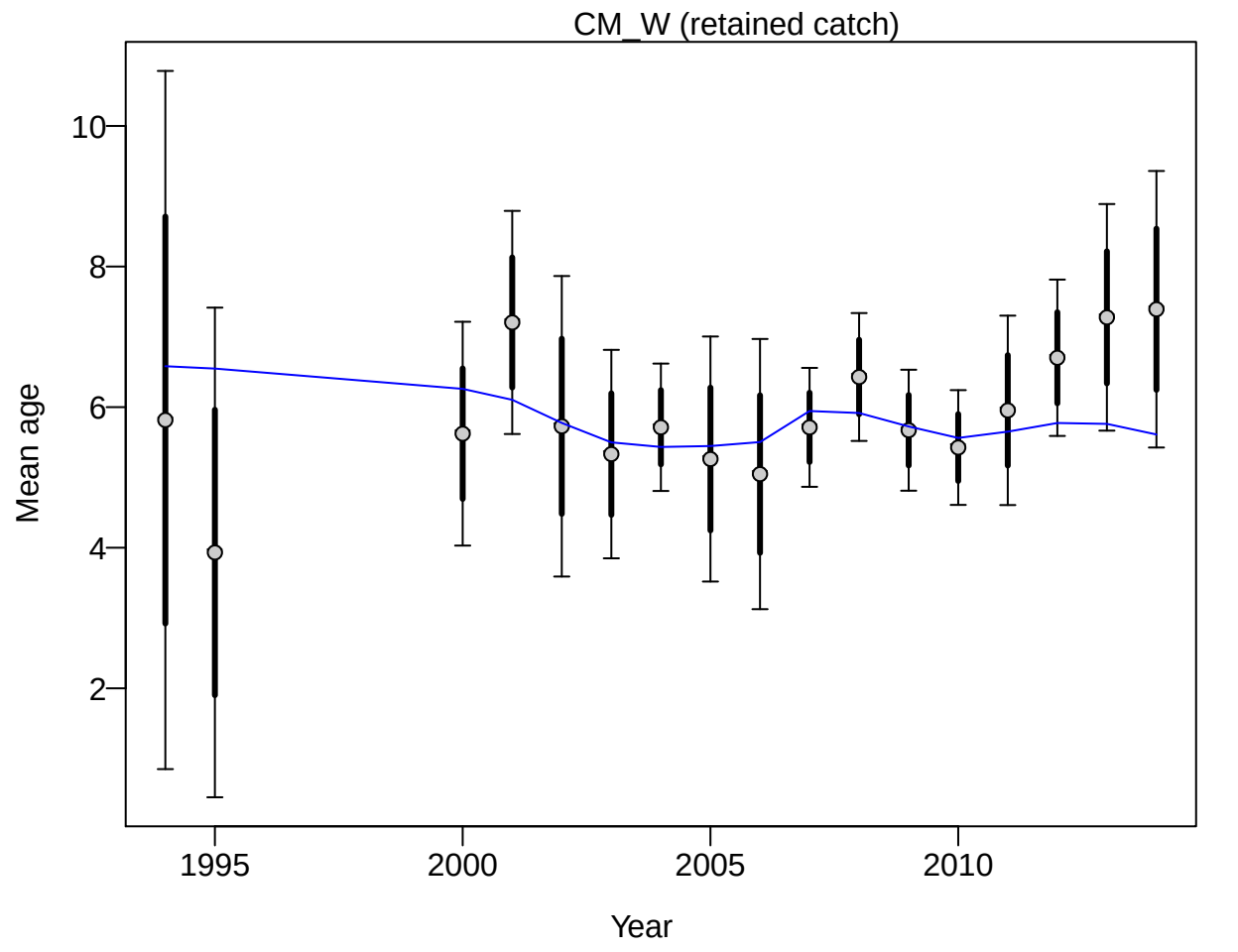
age comp data, retained, CM_W

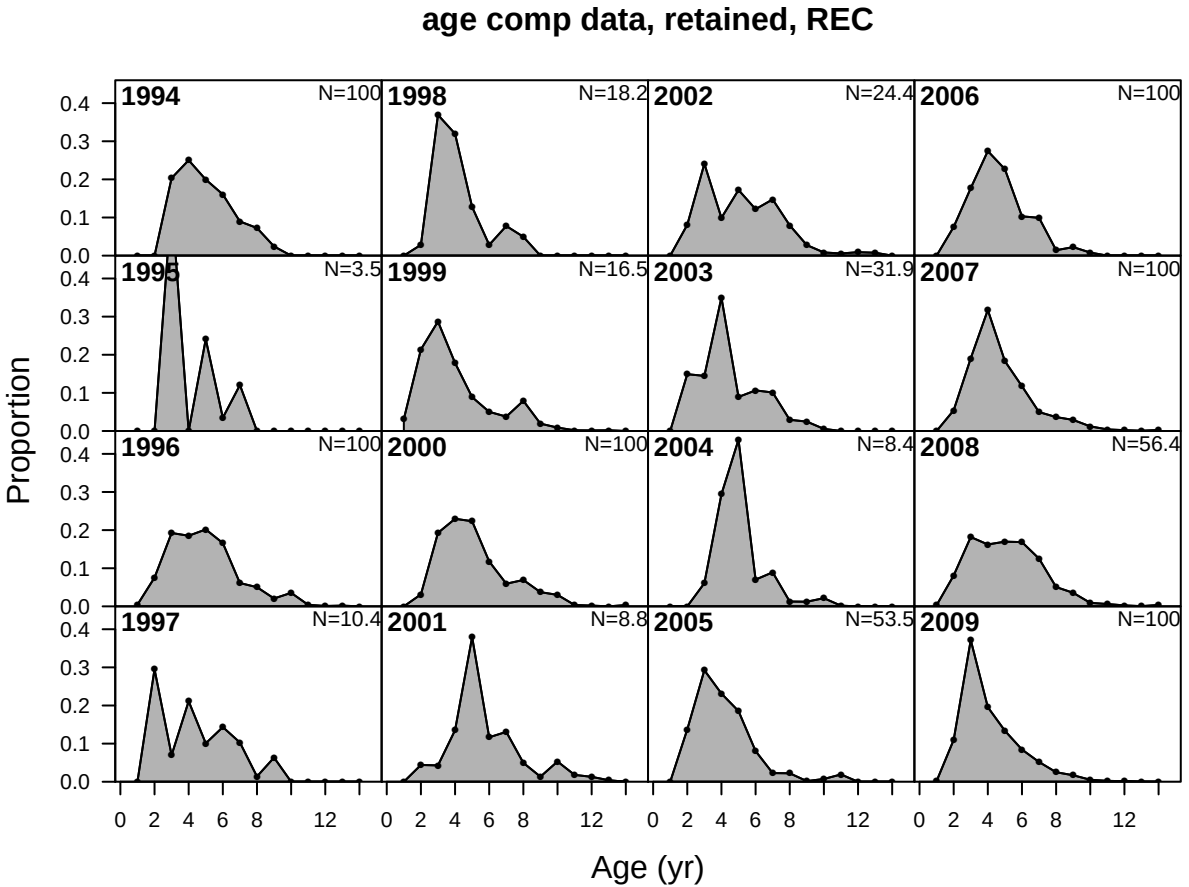


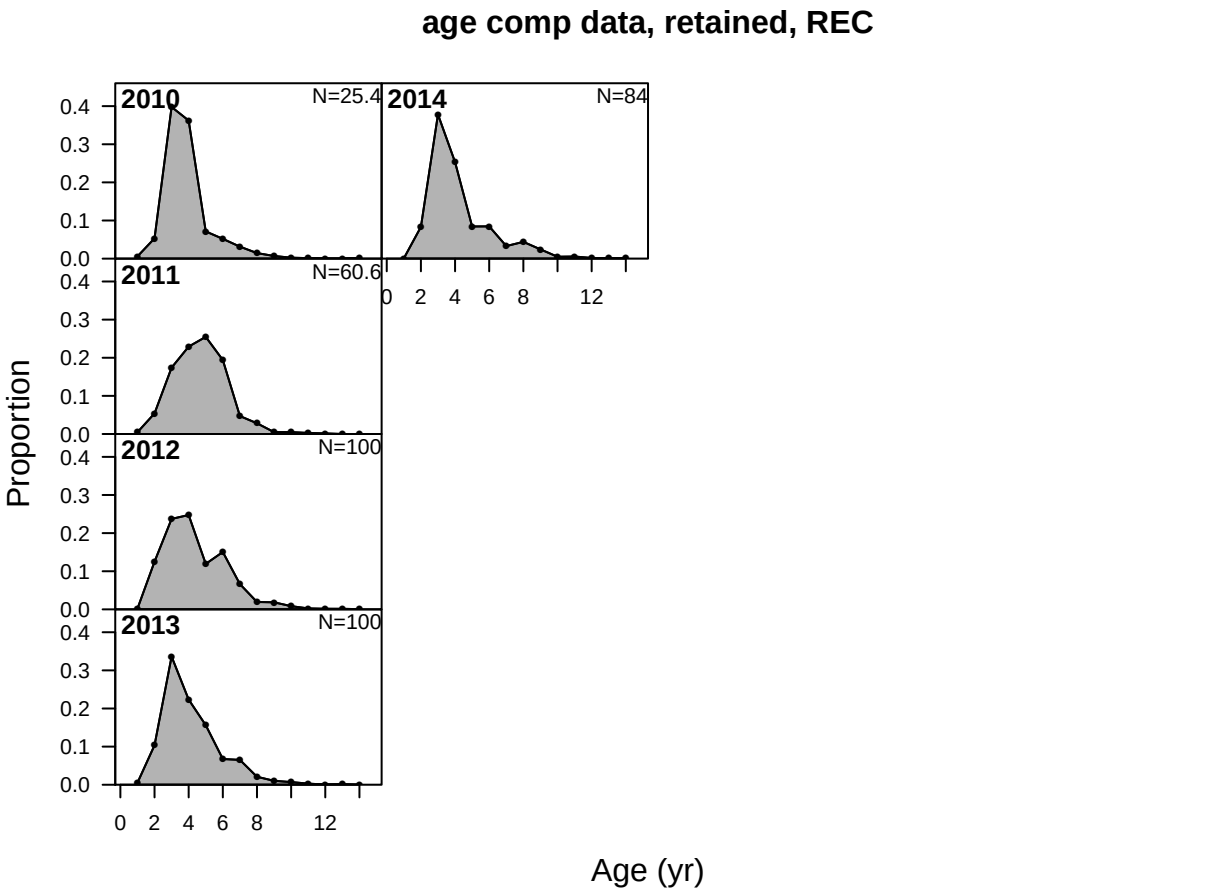
Proportion

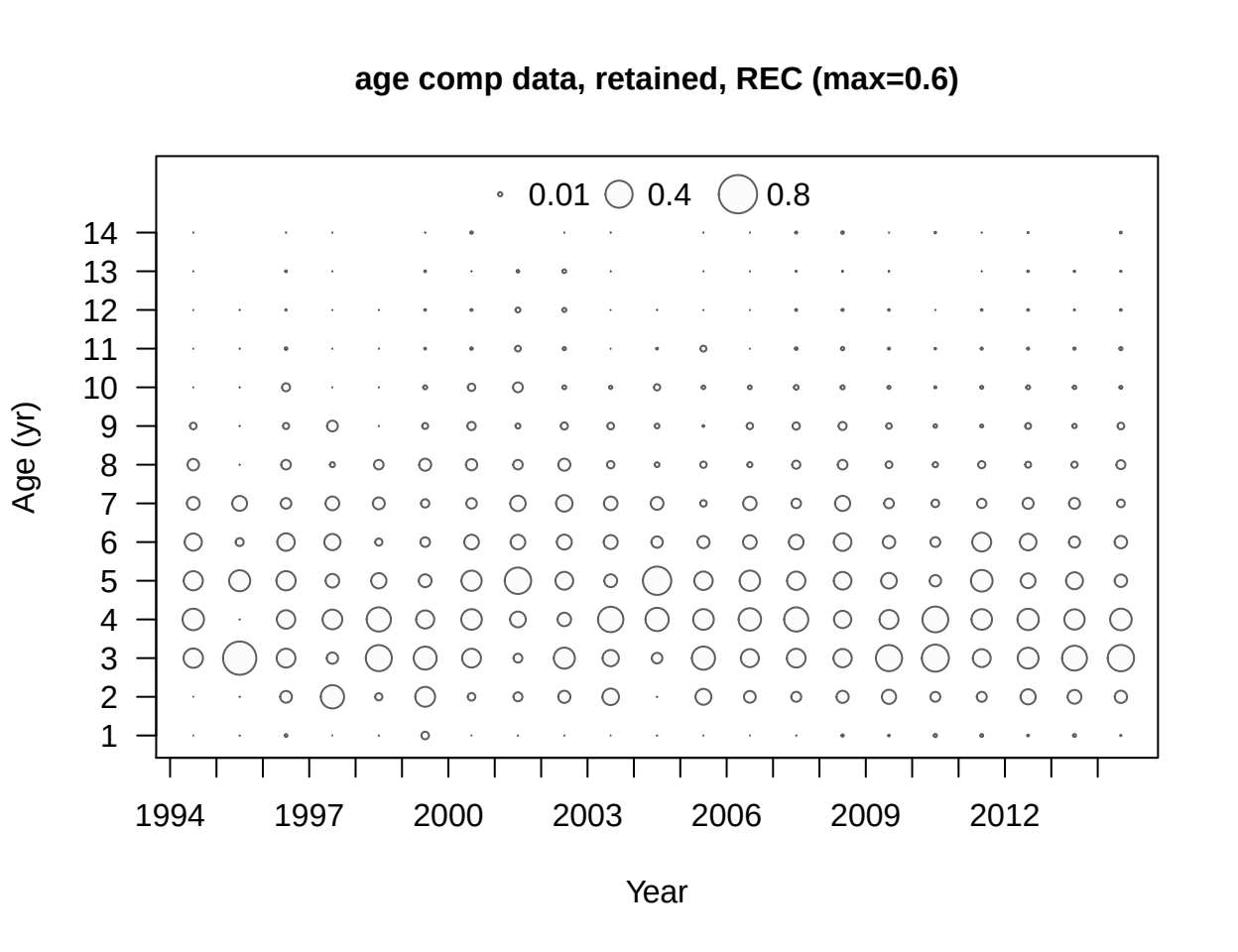
Age (yr)

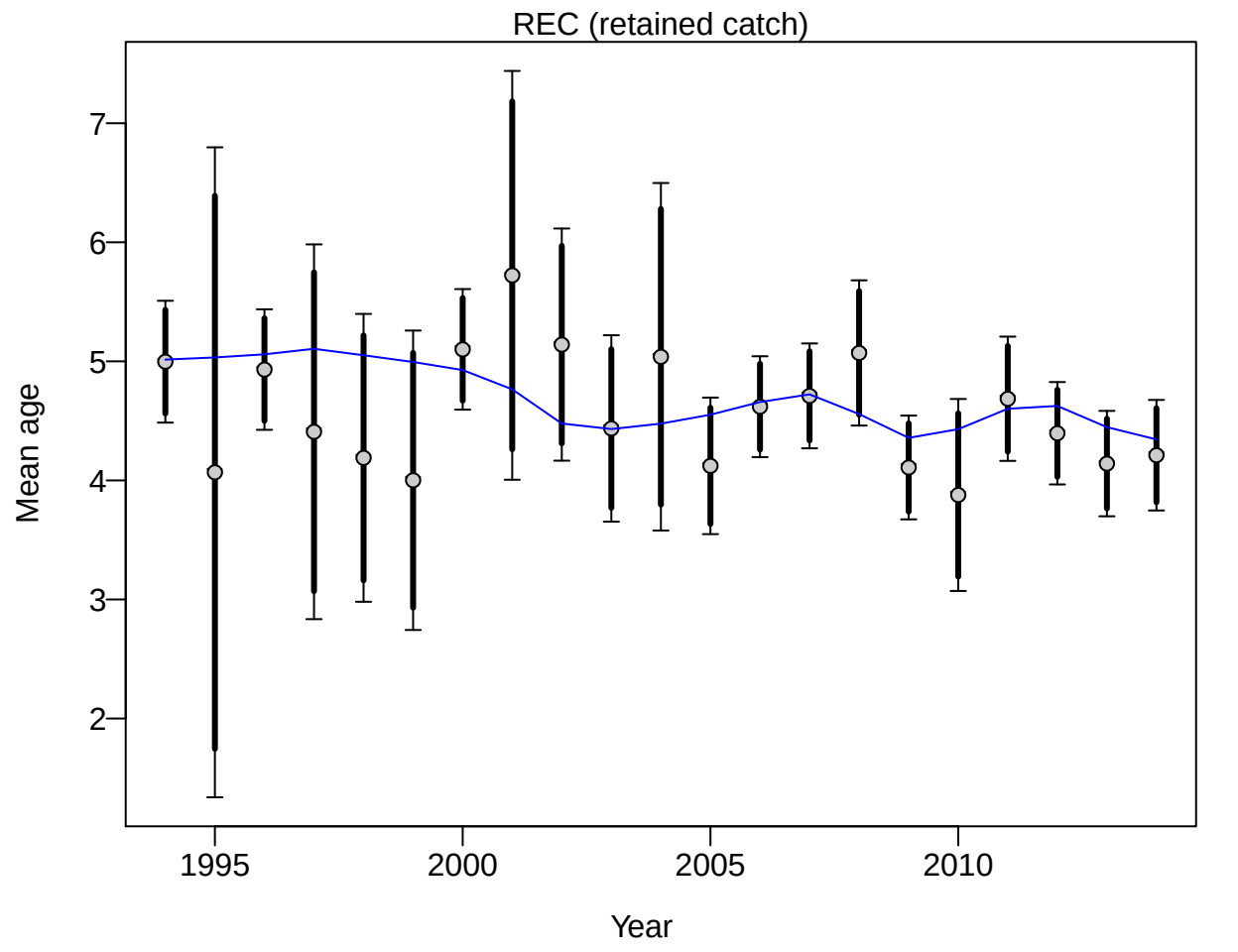

age comp data, retained, CM_W (max=0.54)
0.01
0.4
Age (yr)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1994
2000
2003
2006
2009
2012
Year

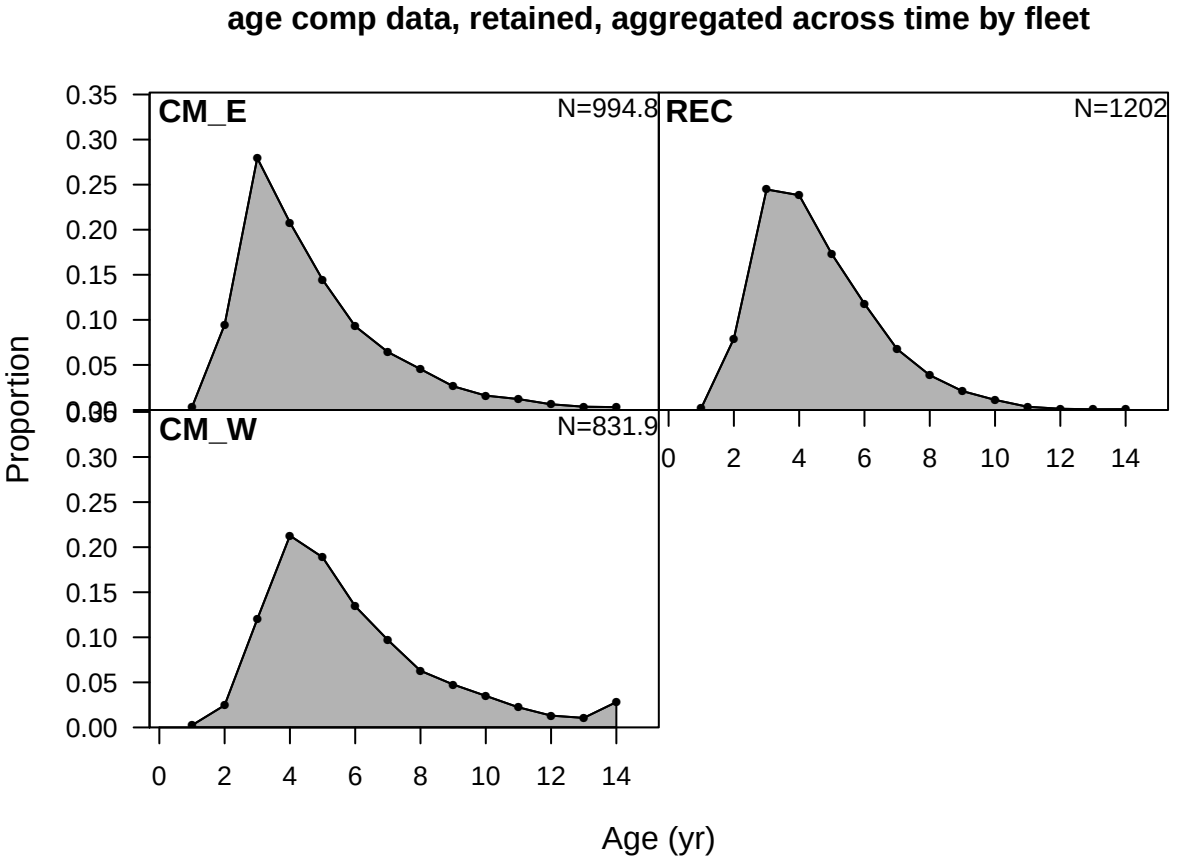

CM_W (retained catch)
Mean age
10
8
6
4
2
1995
2000
2005
2010
Year

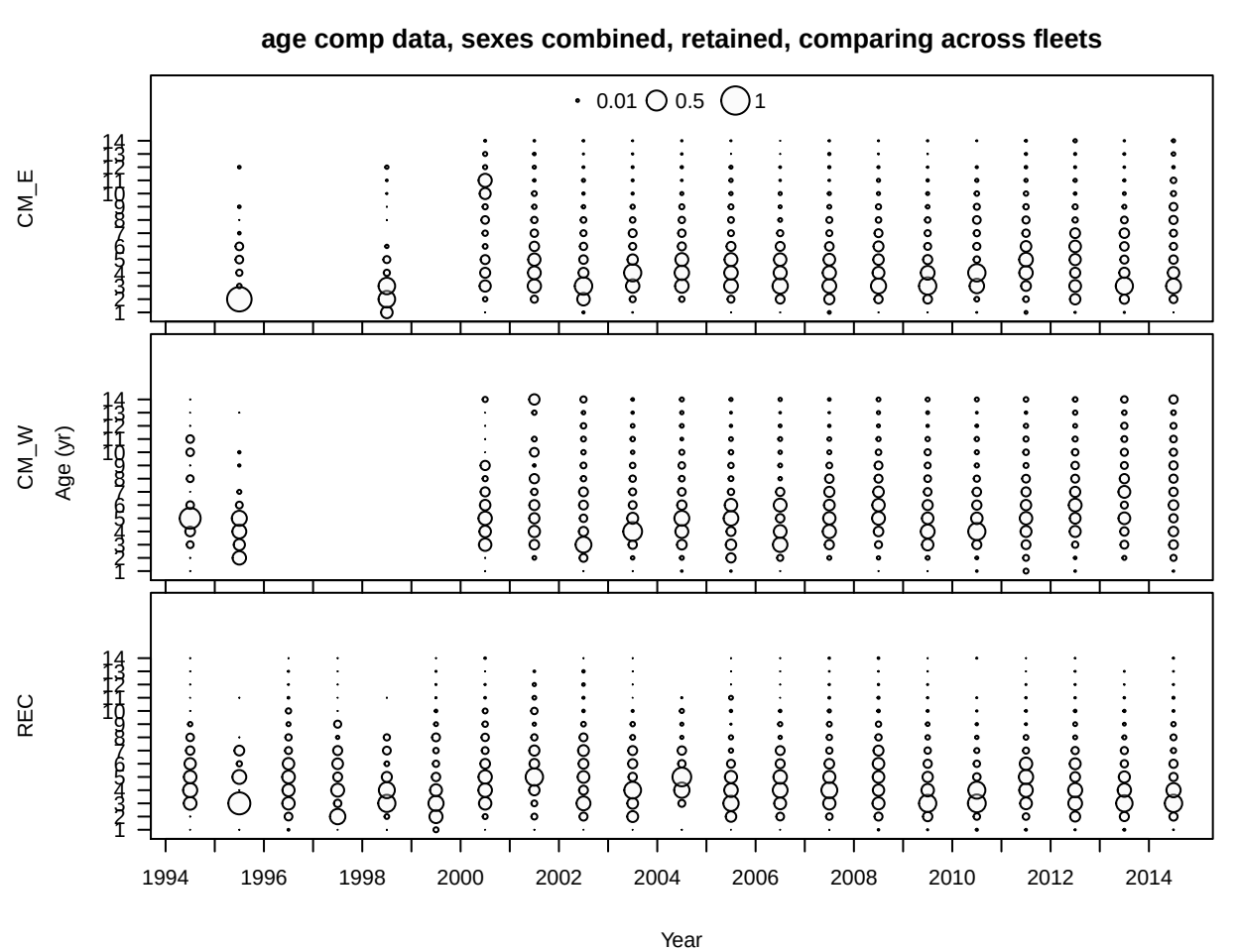

age comp data, retained, REC
1994 N=100
1998 N=18.2
2002 N=24.4
2006 N=100
1995 N=3.5
1999 N=16.5
2003 N=31.9
2007 N=100
1996 N=100
2000 N=100
2004 N=8.4
2008 N=56.4
1997 N=10.4
2001 N=8.8
2005 N=53.5
2009 N=100
Proportion
0.0 0.1 0.2 0.3 0.4
0 2 4 6 8 12
Age (yr)

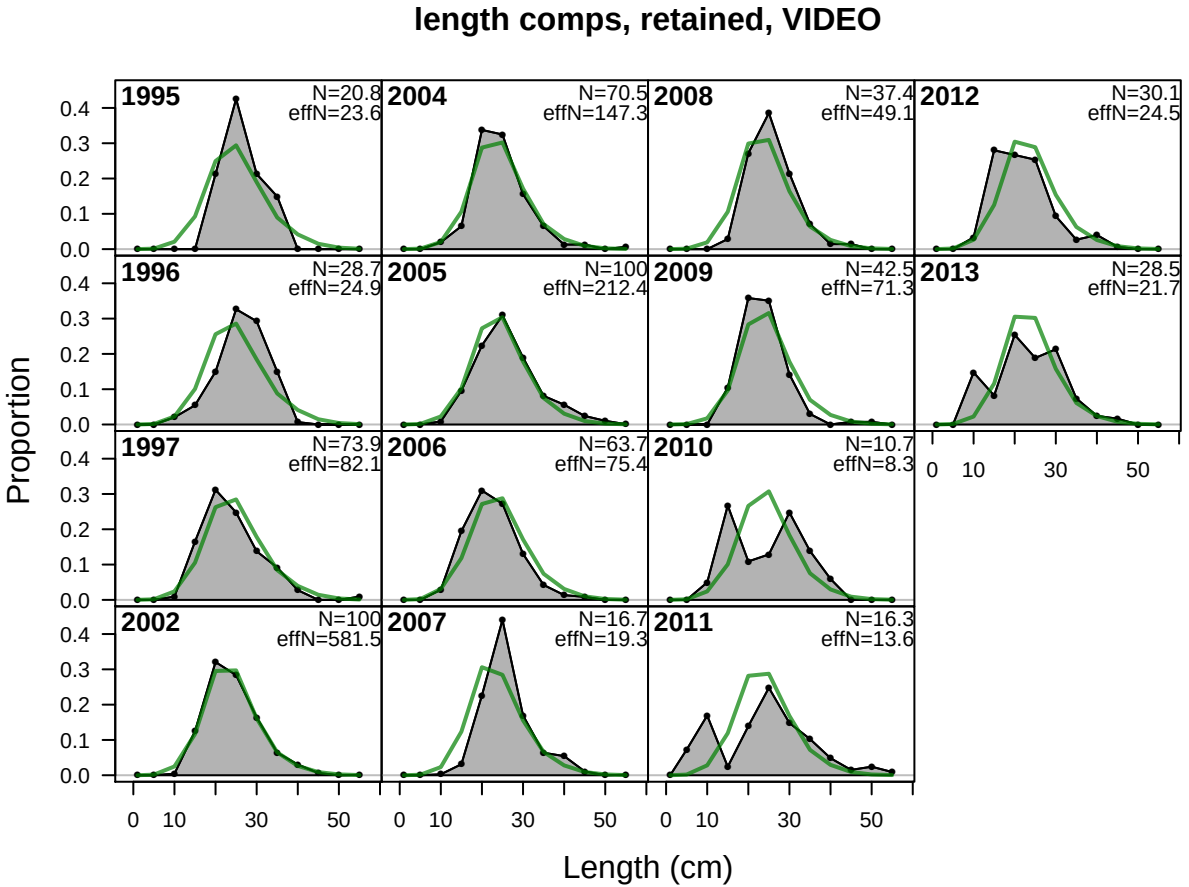

age comp data, retained, REC
2010
N=25.4
2014
N=84
2011
N=60.6
2012
N=100
2013
N=100
0.0
0.1
0.2
0.3
0.4
0 2 4 6 8 12
Proportion
Age (yr)

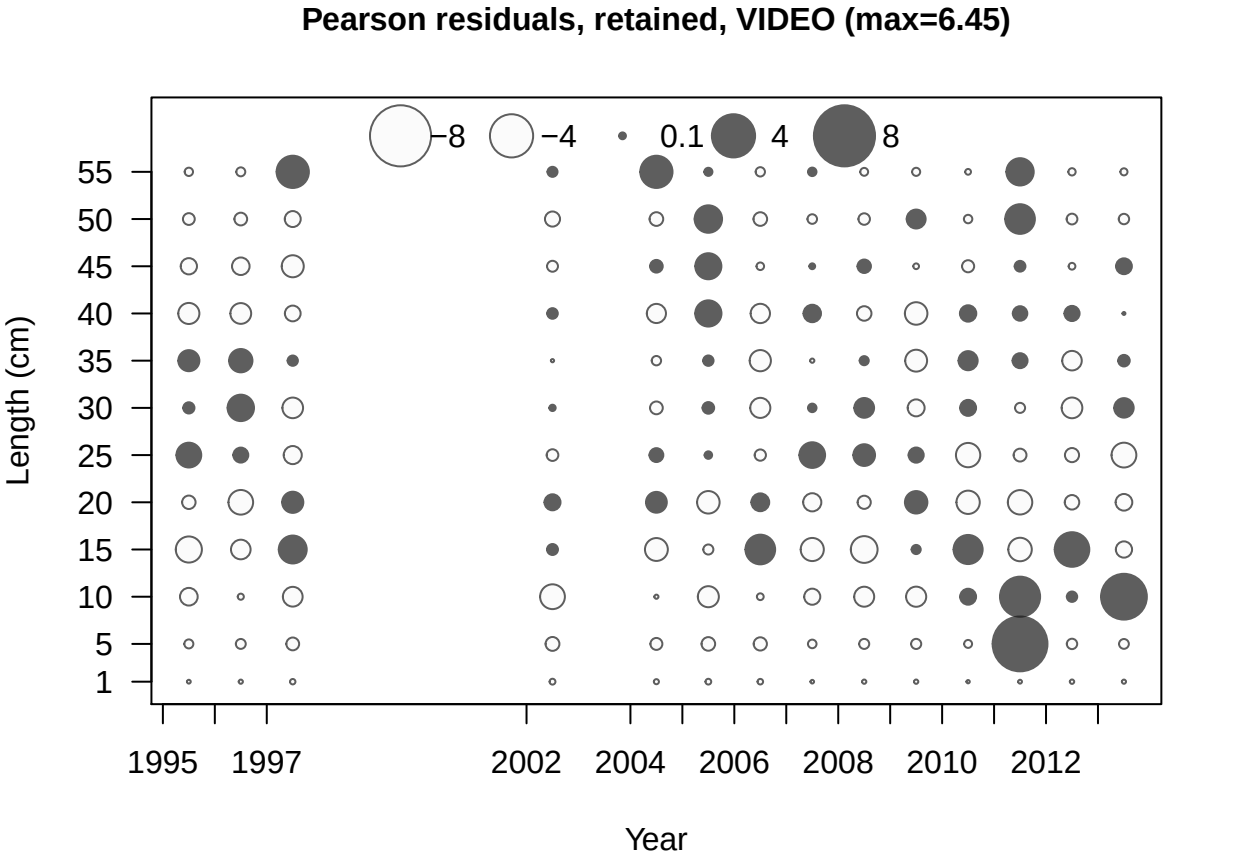

age comp data, retained, REC (max=0.6)
0.01
0.4
0.8
Age (yr)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1994
1997
2000
2003
2006
2009
2012
Year

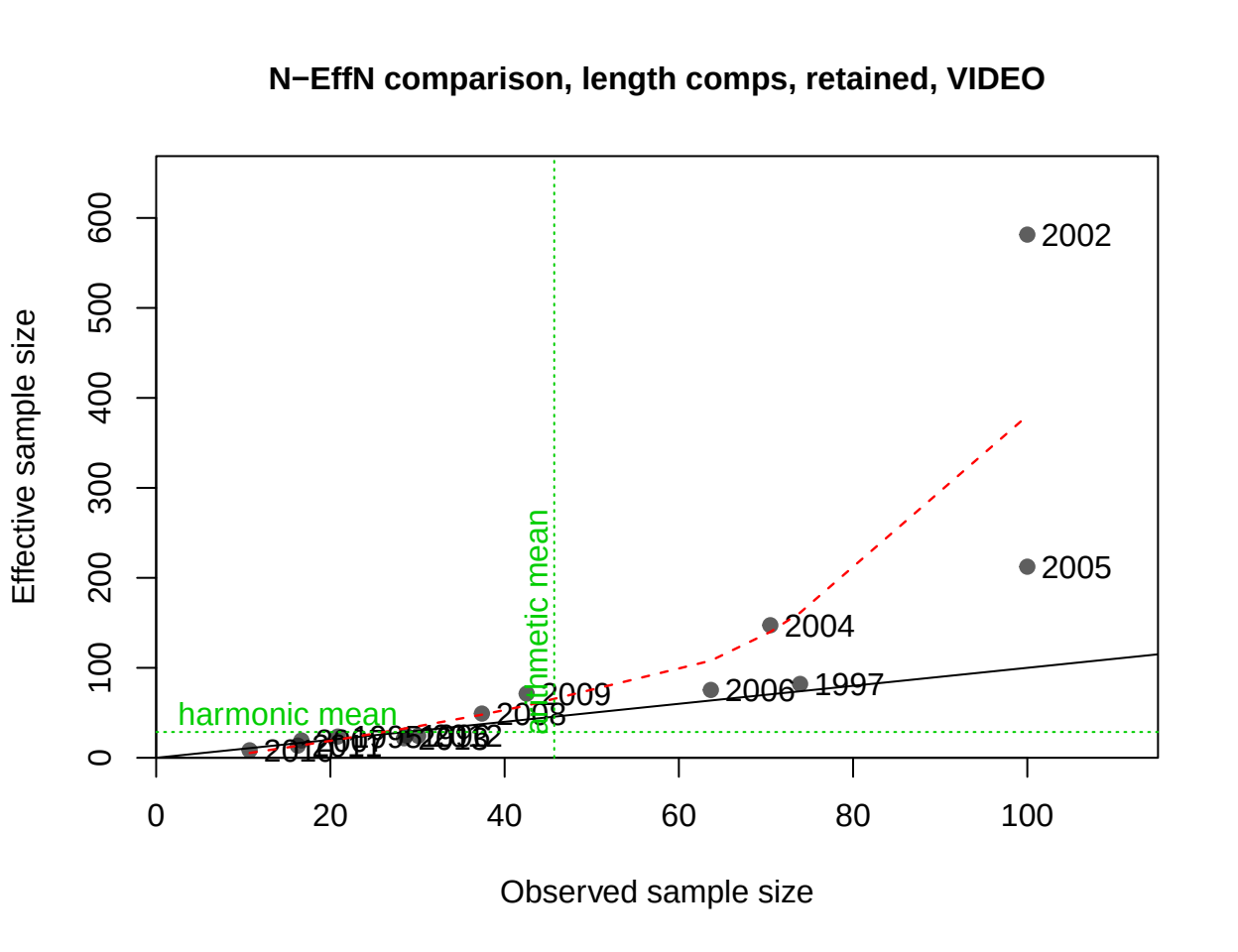

REC (retained catch)
Mean age
7
6
5
4
3
2
1995
2000
2005
2010
Year

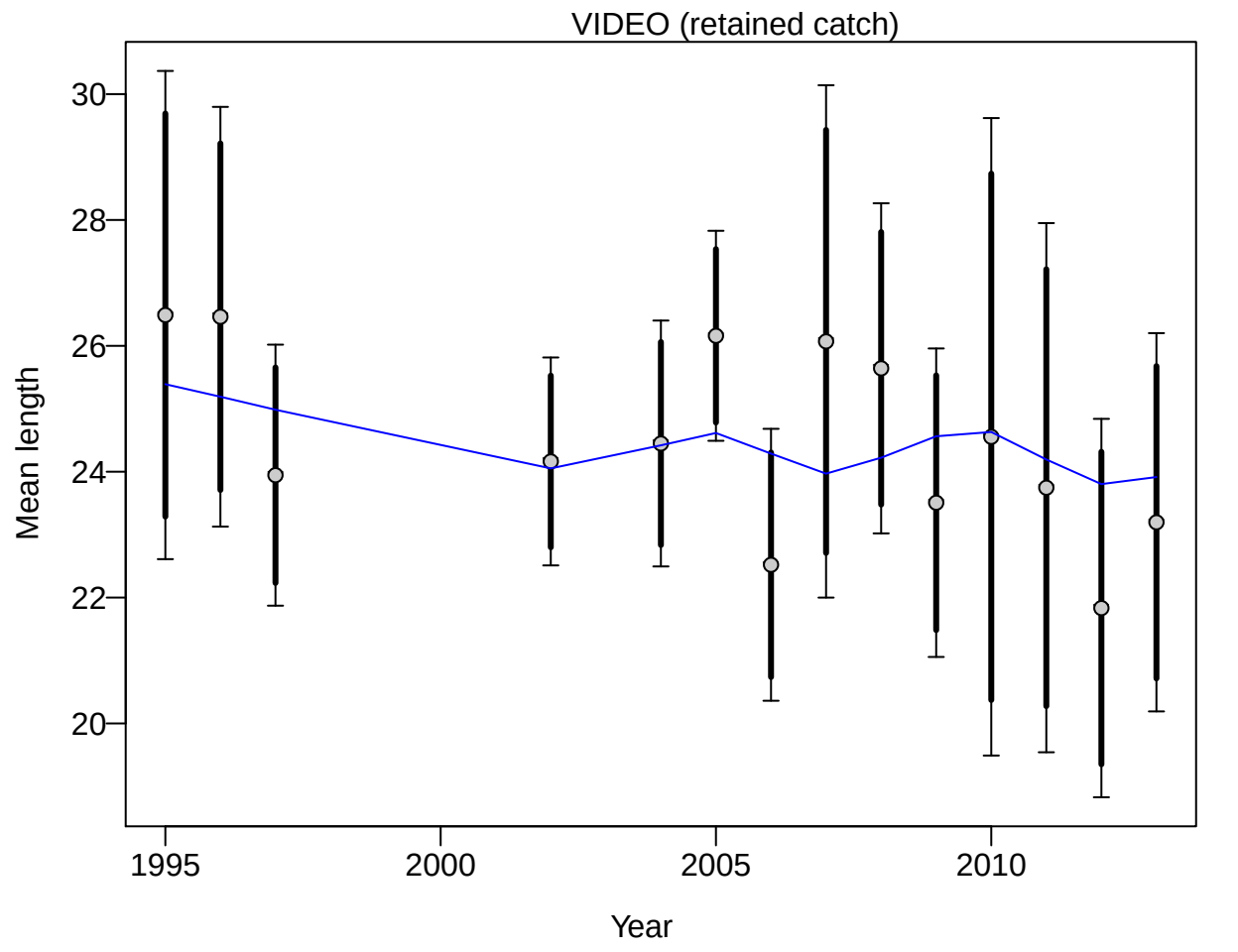

age comp data, retained, aggregated across time by fleet
CM_E
N=994.8
REC
N=1202
CM_W
N=831.9
Proportion
Age (yr)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
2
4
6
8
10
12
14


age comp data, sexes combined, retained, comparing across fleets
0.01
0.5
1
CM_E
CM_W
REC
Age (yr)
Year
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014

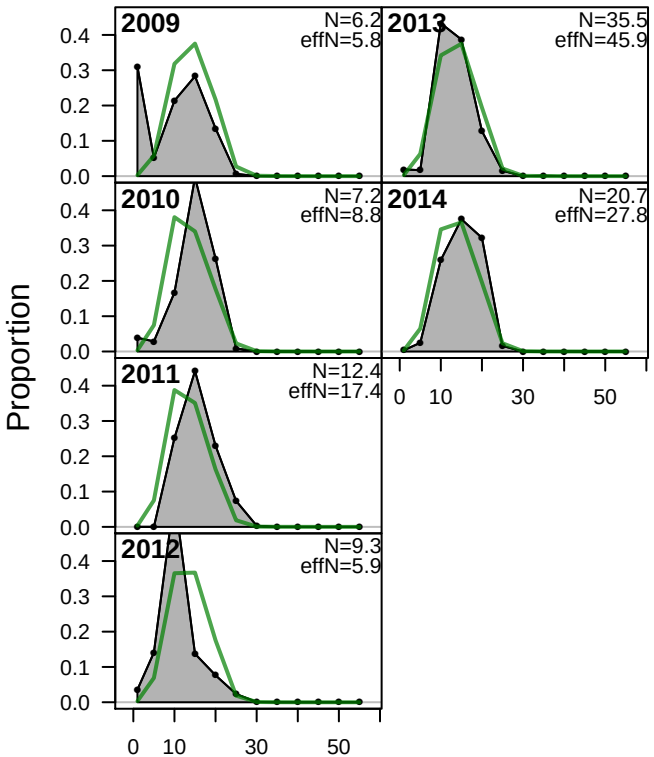

length comps, retained, VIDEO
1995
N=20.8
effN=23.6
2004
N=70.5
effN=147.3
2008
N=37.4
effN=49.1
2012
N=30.1
effN=24.5
1996
N=28.7
effN=24.9
2005
N=100
effN=212.4
2009
N=42.5
effN=71.3
2013
N=28.5
effN=21.7
1997
N=73.9
effN=82.1
2006
N=63.7
effN=75.4
2010
N=10.7
effN=8.3
2002
N=100
effN=581.5
2007
N=16.7
effN=19.3
2011
N=16.3
effN=13.6
Proportion
0.0
0.1
0.2
0.3
0.4
0
10
30
50
Length (cm)

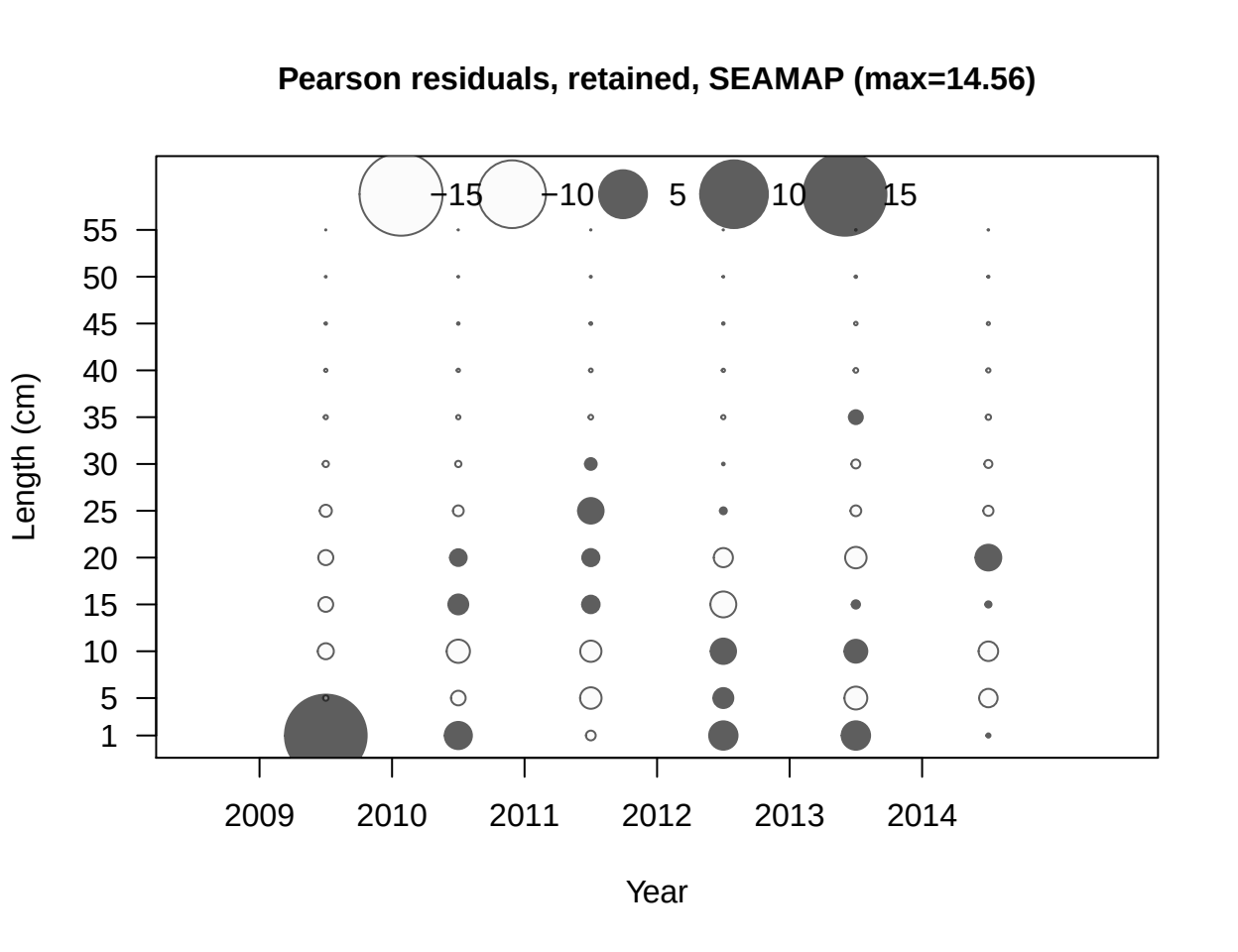

Pearson residuals, retained, VIDEO (max=6.45)
−8
−4
0.1
4
8
Length (cm)
55
50
45
40
35
30
25
20
15
10
5
1
1995
1997
2002
2004
2006
2008
2010
2012
Year

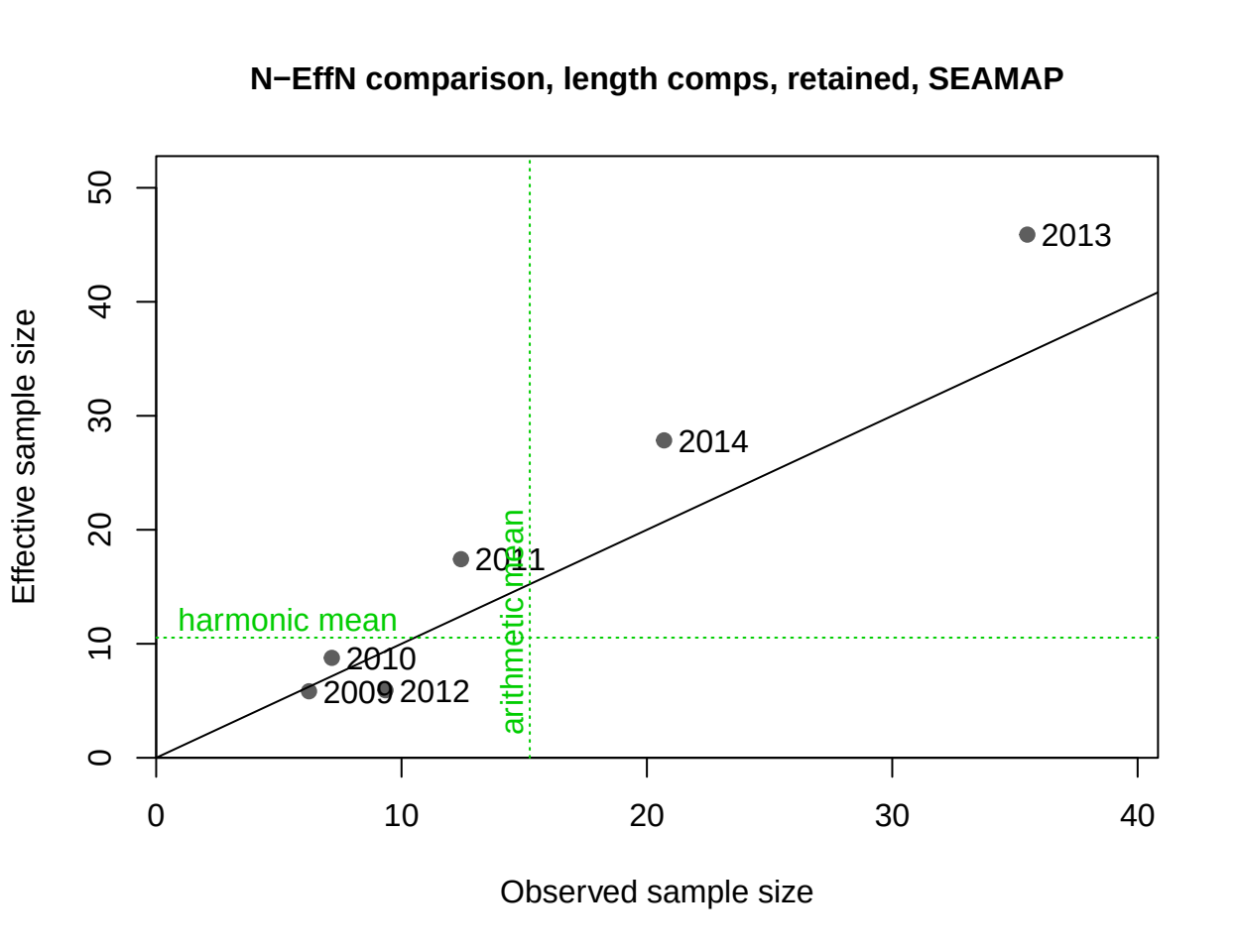

N−EffN comparison, length comps, retained, VIDEO
Effective sample size
Observed sample size
0
100
200
300
400
500
600
0
20
40
60
80
100
2002
2005
2004
1997
2006
2009
2008
harmonic mean
arithmetic mean

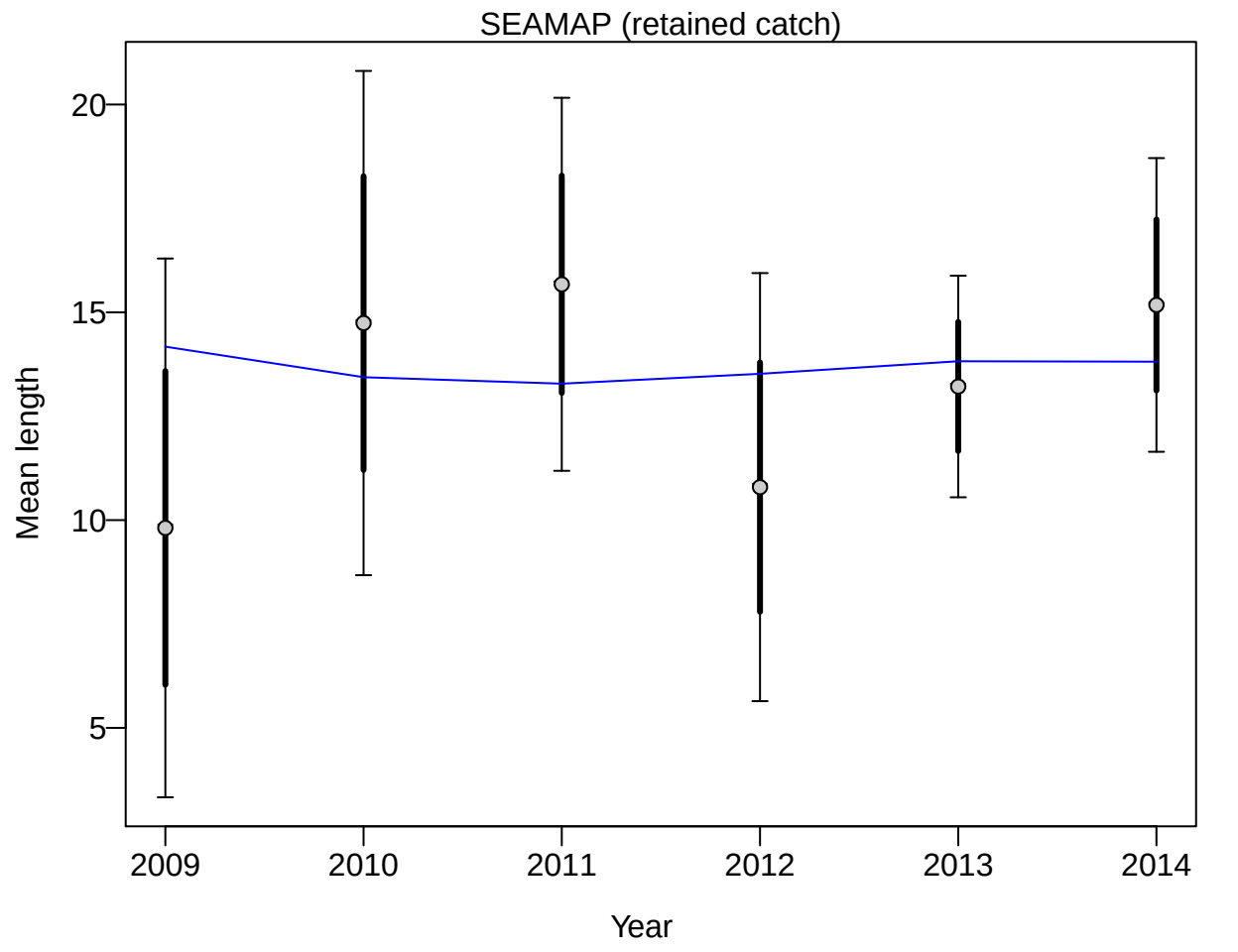

VIDEO (retained catch)
Mean length
30
28
26
24
22
20
1995
2000
2005
2010
Year

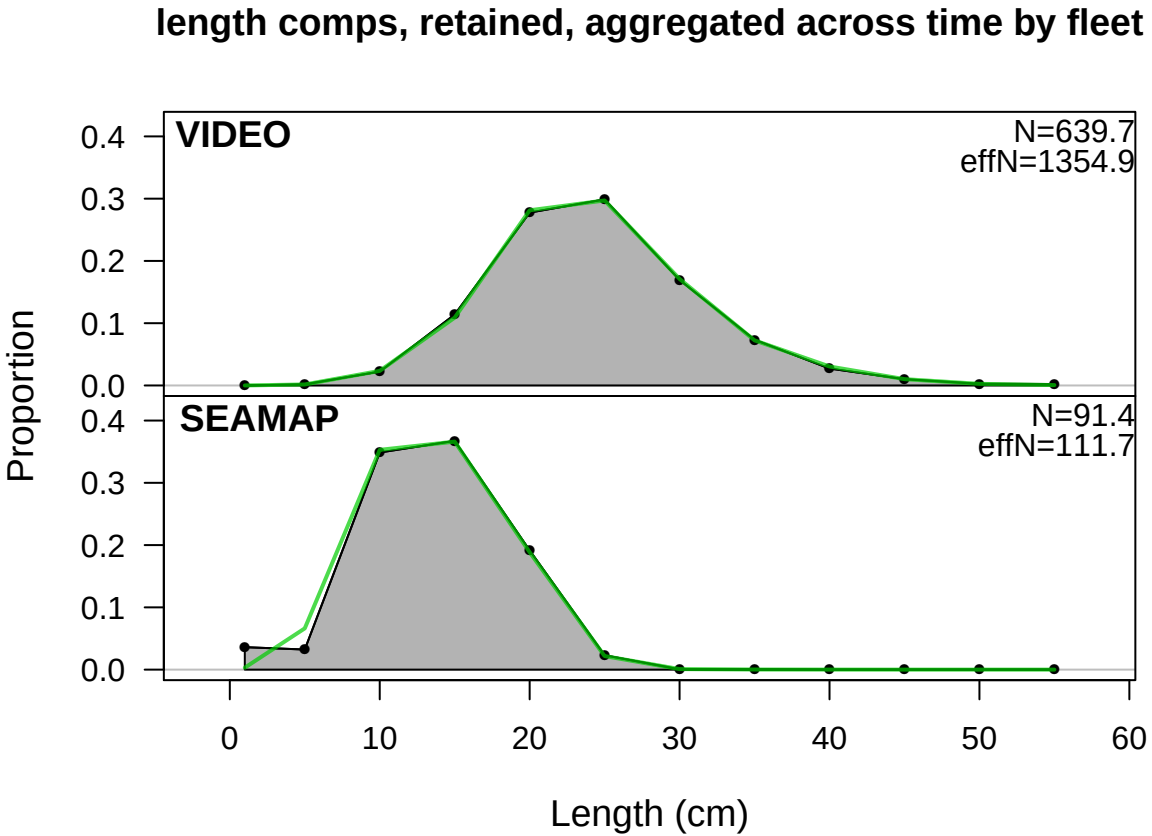
length comps, retained, SEAMAP

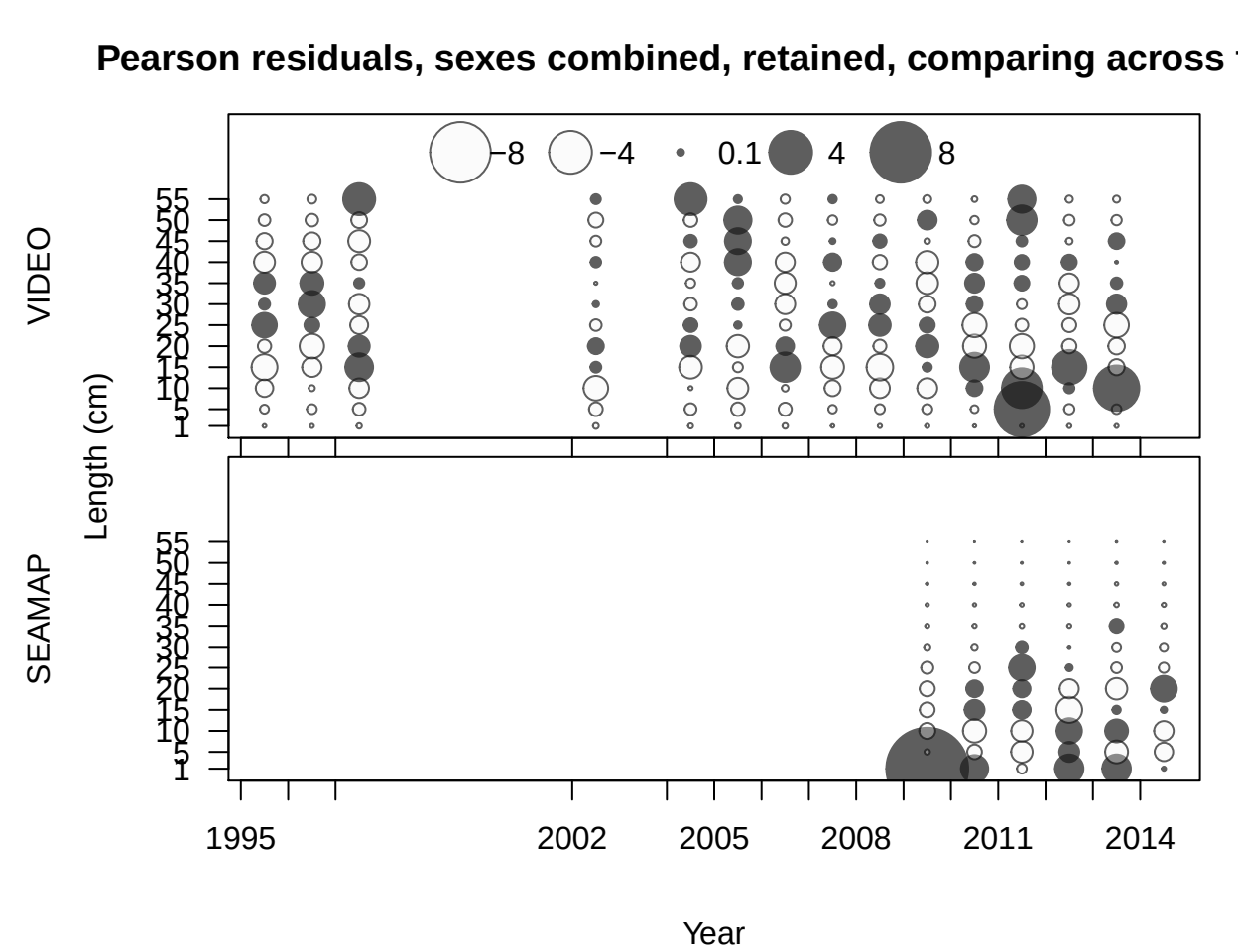


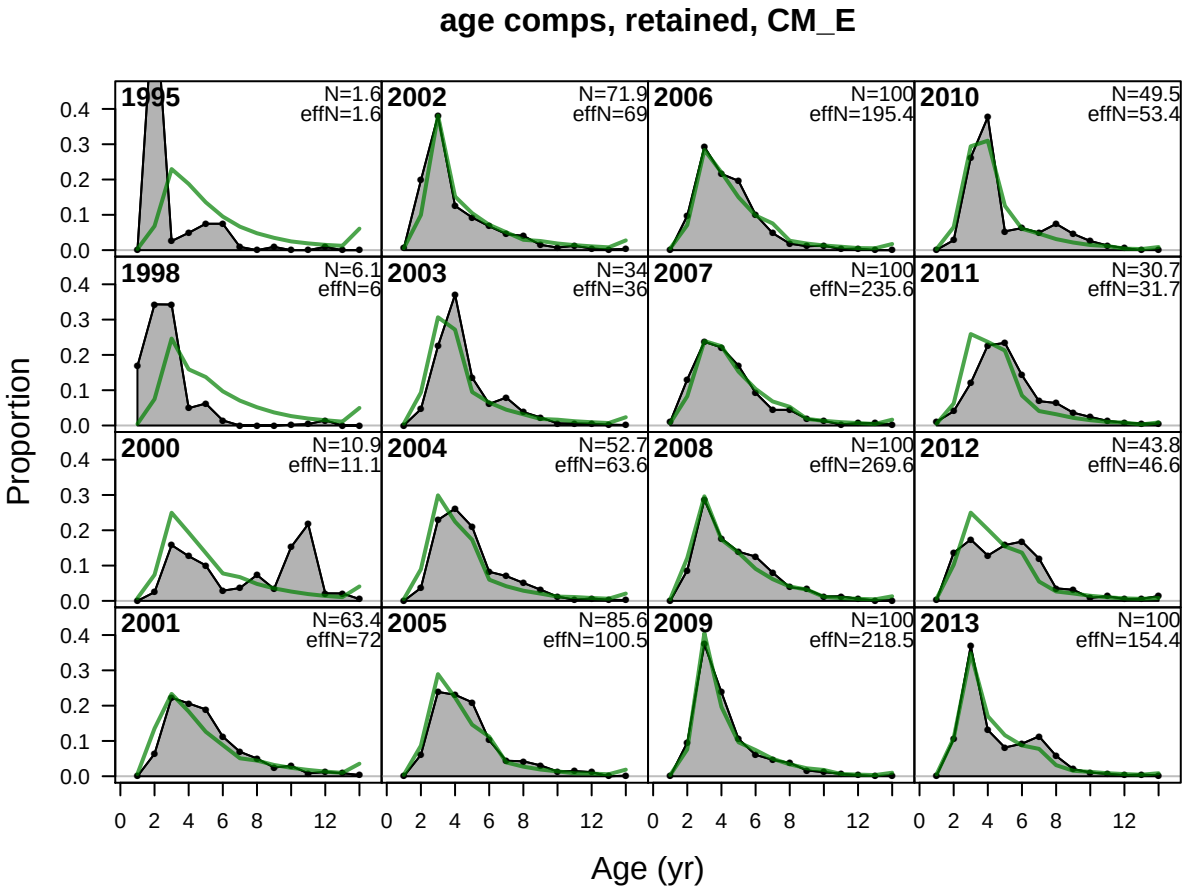

Pearson residuals, retained, SEAMAP (max=14.56)
−15
−10
5
10
15
Length (cm)
55
50
45
40
35
30
25
20
15
10
5
1
2009
2010
2011
2012
2013
2014
Year


N−EffN comparison, length comps, retained, SEAMAP
Effective sample size
Observed sample size
0
10
20
30
40
50
2013
2014
2011
2010
2009
2012
harmonic mean
arithmetic mean

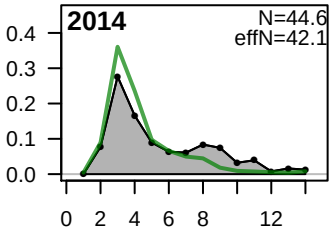

SEAMAP (retained catch)
Mean length
20
15
10
5
2009
2010
2011
2012
2013
2014
Year


length comps, retained, aggregated across time by fleet
VIDEO
N=639.7
effN=1354.9
SEAMAP
N=91.4
effN=111.7
Proportion
0.0
0.1
0.2
0.3
0.4
0
10
20
30
40
50
60
Length (cm)


Pearson residuals, sexes combined, retained, comparing across
−8
−4
0.1
4
8
VIDEO
SEAMAP
Length (cm)
55
50
45
40
35
30
25
20
15
10
5
1
1995
2002
2005
2008
2011
2014
Year

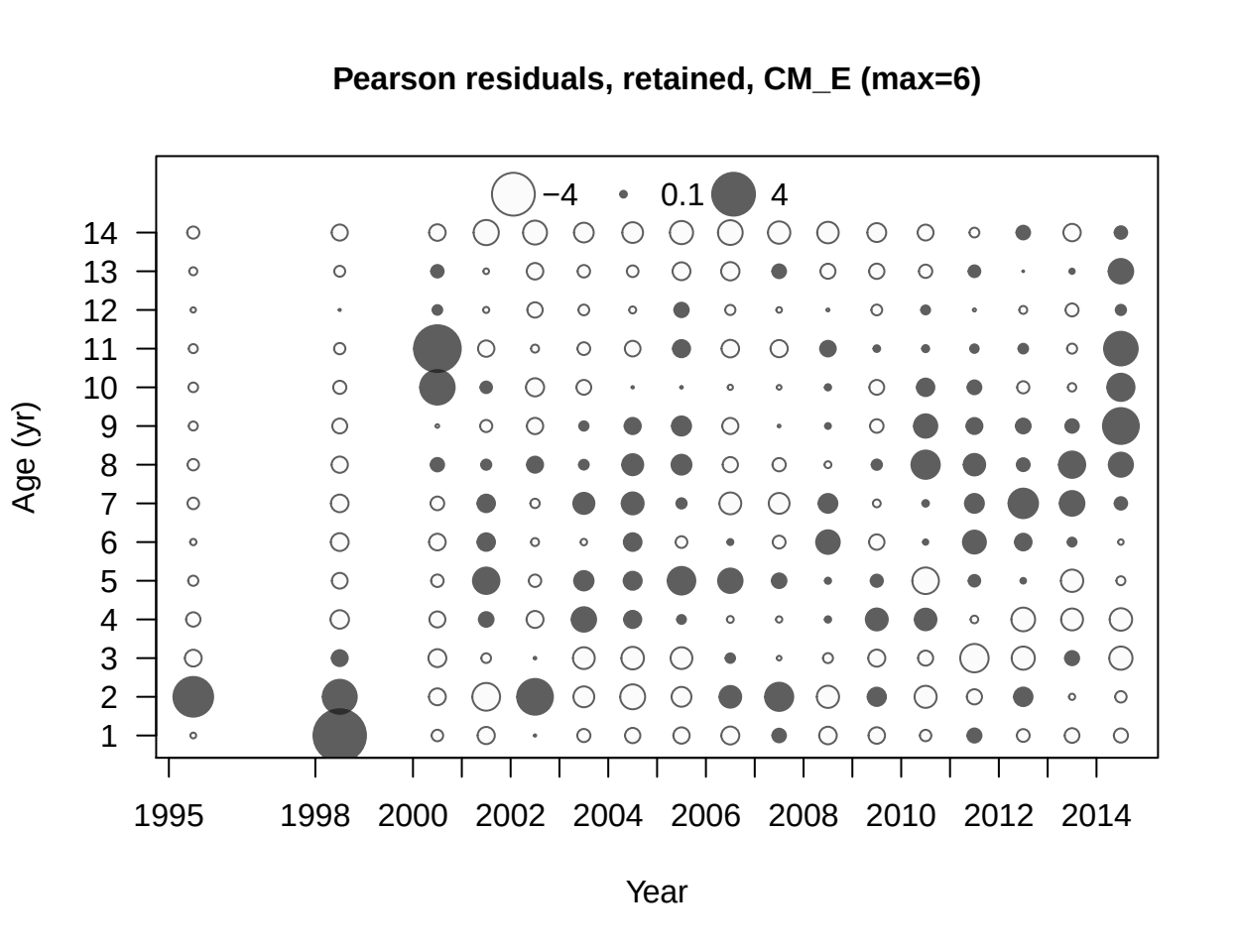

age comps, retained, CM_E
1995 N=1.6 effN=1.6
2002 N=71.9 effN=69
2006 N=100 effN=195.4
2010 N=49.5 effN=53.4
1998 N=6.1 effN=6
2003 N=34 effN=36
2007 N=100 effN=235.6
2011 N=30.7 effN=31.7
2000 N=10.9 effN=11.1
2004 N=52.7 effN=63.6
2008 N=100 effN=269.6
2012 N=43.8 effN=46.6
2001 N=63.4 effN=72
2005 N=85.6 effN=100.5
2009 N=100 effN=218.5
2013 N=100 effN=154.4
Proportion
0.0 0.1 0.2 0.3 0.4
0 2 4 6 8 12
Age (yr)

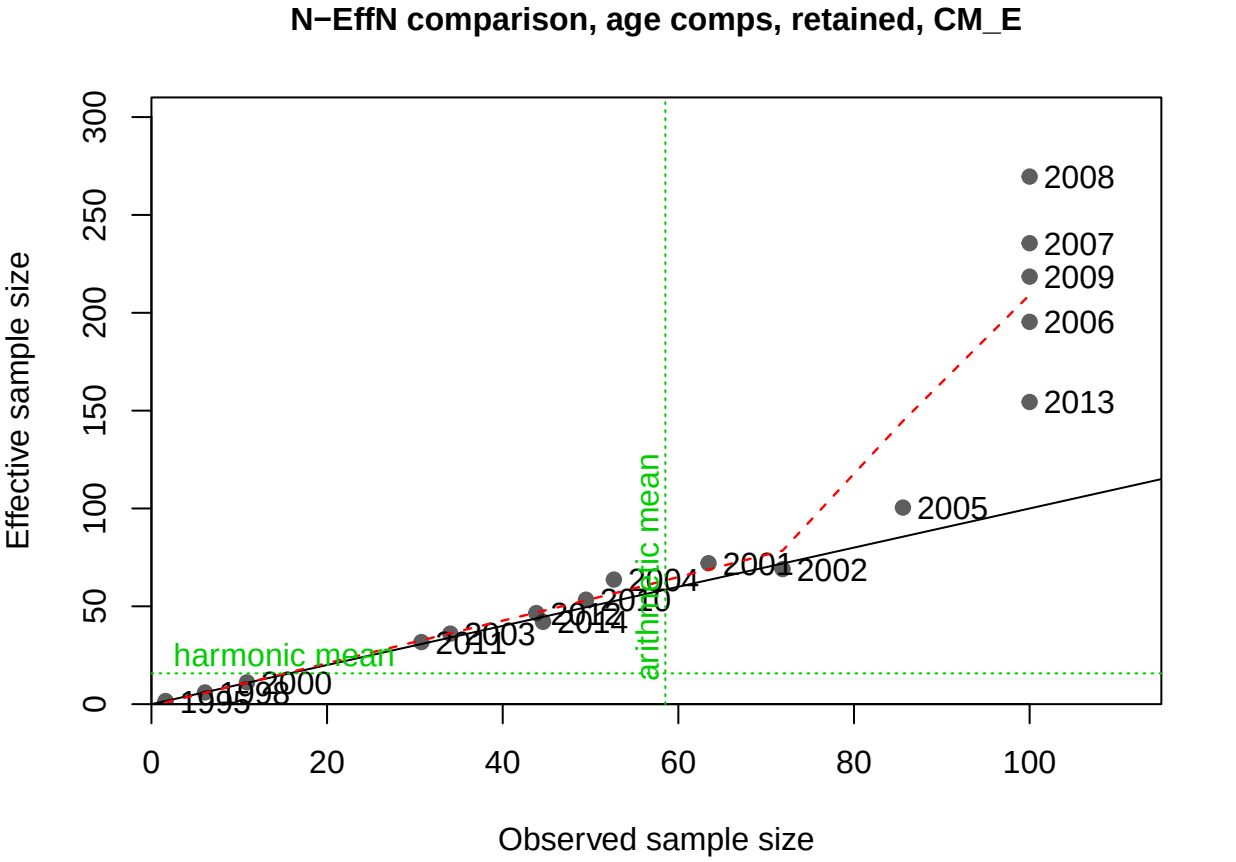
age comps, retained, CM_E

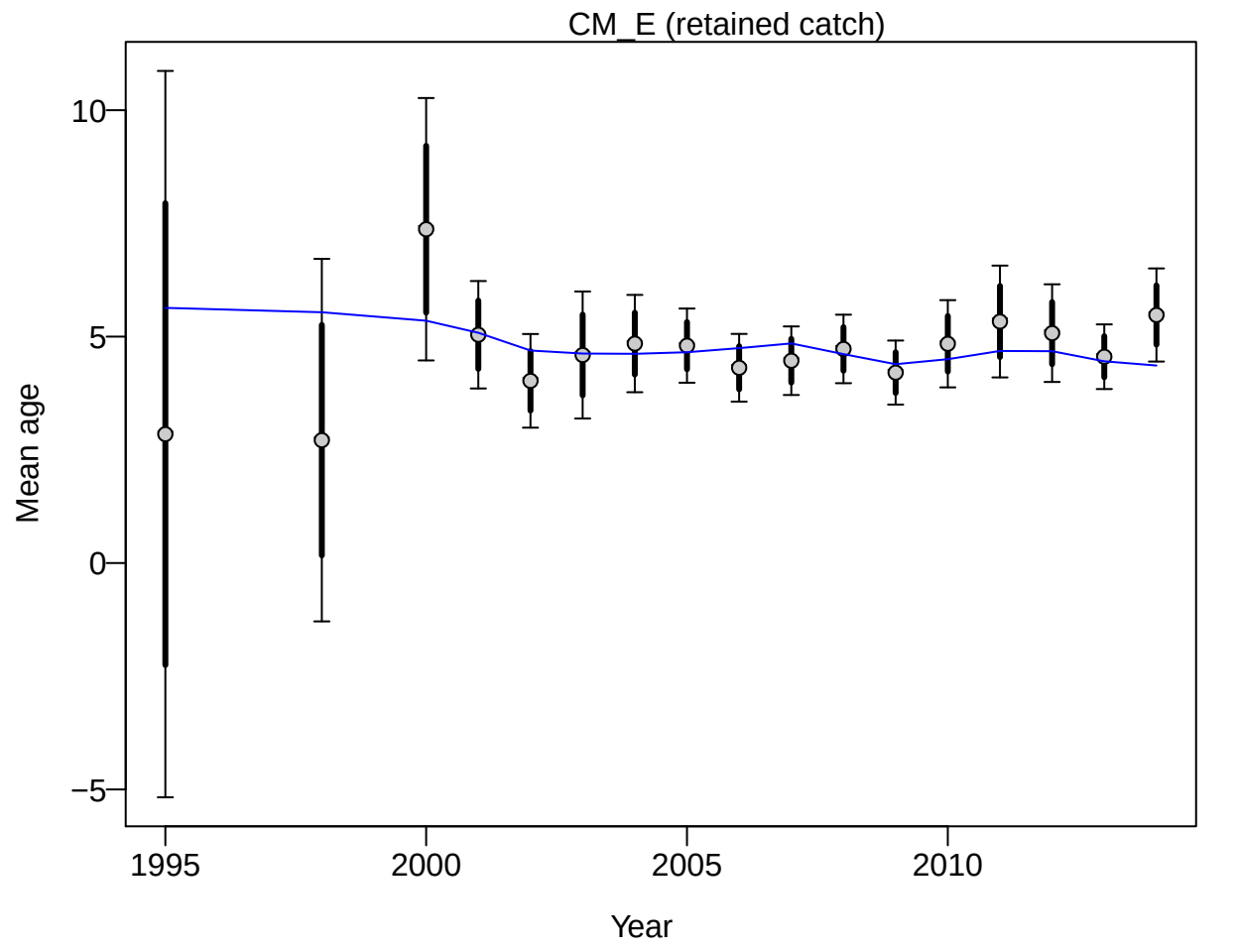


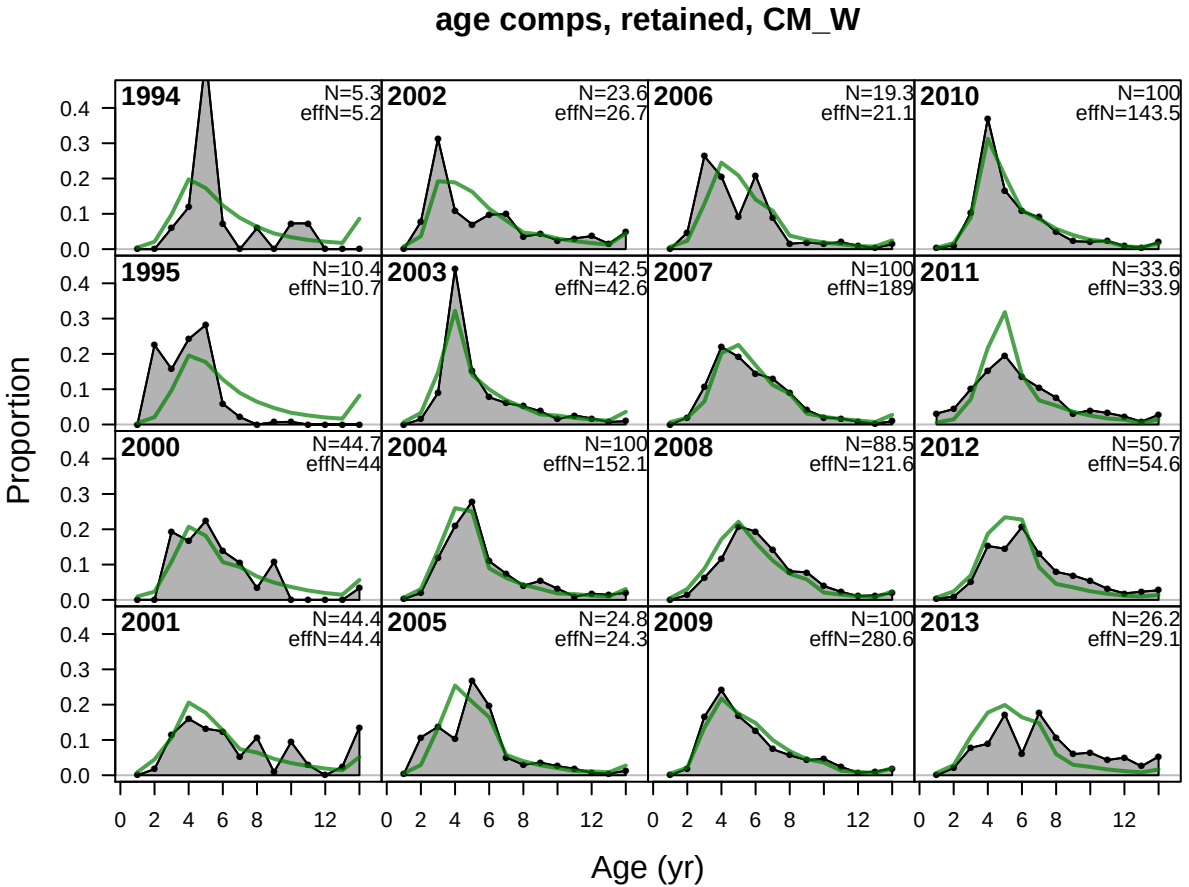
Proportion

Age (yr)

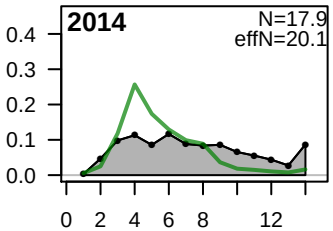

Pearson residuals, retained, CM_E (max=6)
−4
0.1
4
Age (yr)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1995
1998
2000
2002
2004
2006
2008
2010
2012
2014
Year


N−EffN comparison, age comps, retained, CM_E
Effective sample size
Observed sample size
0
50
100
150
200
250
300
0
20
40
60
80
100
harmonic mean
arithmetic mean
2008
2007
2009
2006
2013
2005
2001
2002
2004
2010
2012
2014
2003
2011
2000
1998
1995


CM_E (retained catch)
Mean age
10
5
0
−5
1995
2000
2005
2010
Year

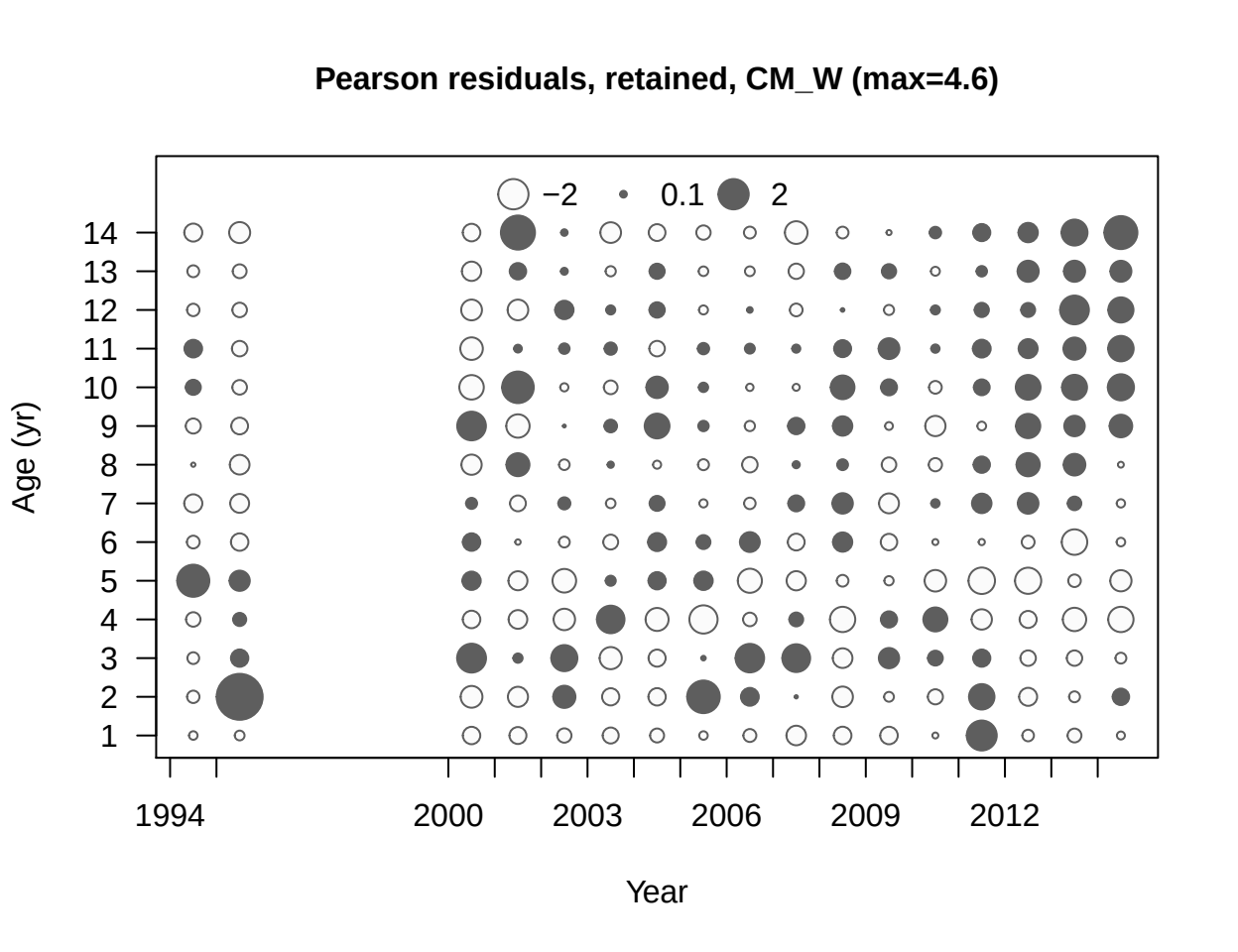

age comps, retained, CM_W
1994 N=5.3 effN=5.2
2002 N=23.6 effN=26.7
2006 N=19.3 effN=21.1
2010 N=100 effN=143.5
1995 N=10.4 effN=10.7
2003 N=42.5 effN=42.6
2007 N=100 effN=189
2011 N=33.6 effN=33.9
2000 N=44.7 effN=44
2004 N=100 effN=152.1
2008 N=88.5 effN=121.6
2012 N=50.7 effN=54.6
2001 N=44.4 effN=44.4
2005 N=24.8 effN=24.3
2009 N=100 effN=280.6
2013 N=26.2 effN=29.1
Proportion
0.0 0.1 0.2 0.3 0.4
0 2 4 6 8 12
Age (yr)

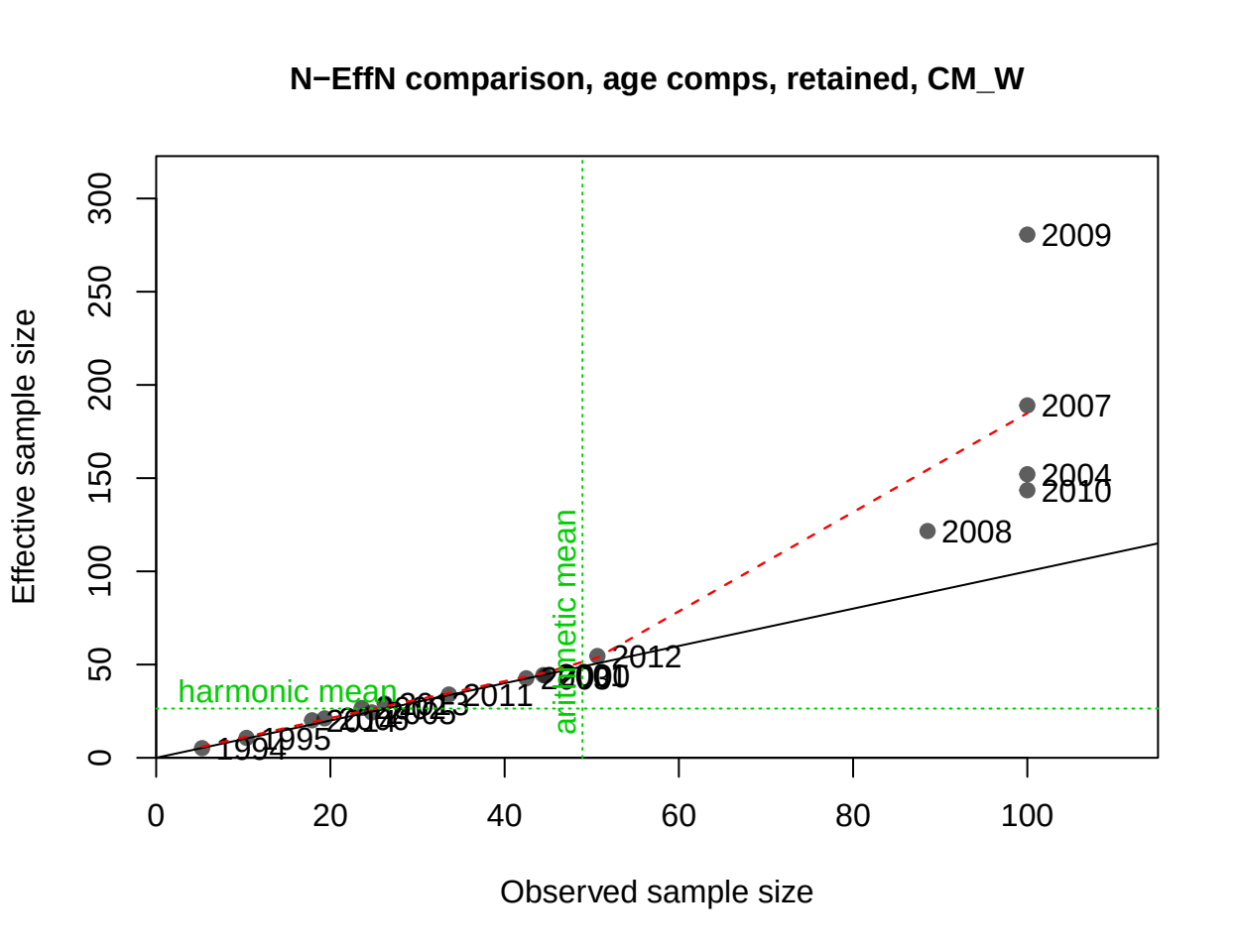
age comps, retained, CM_W

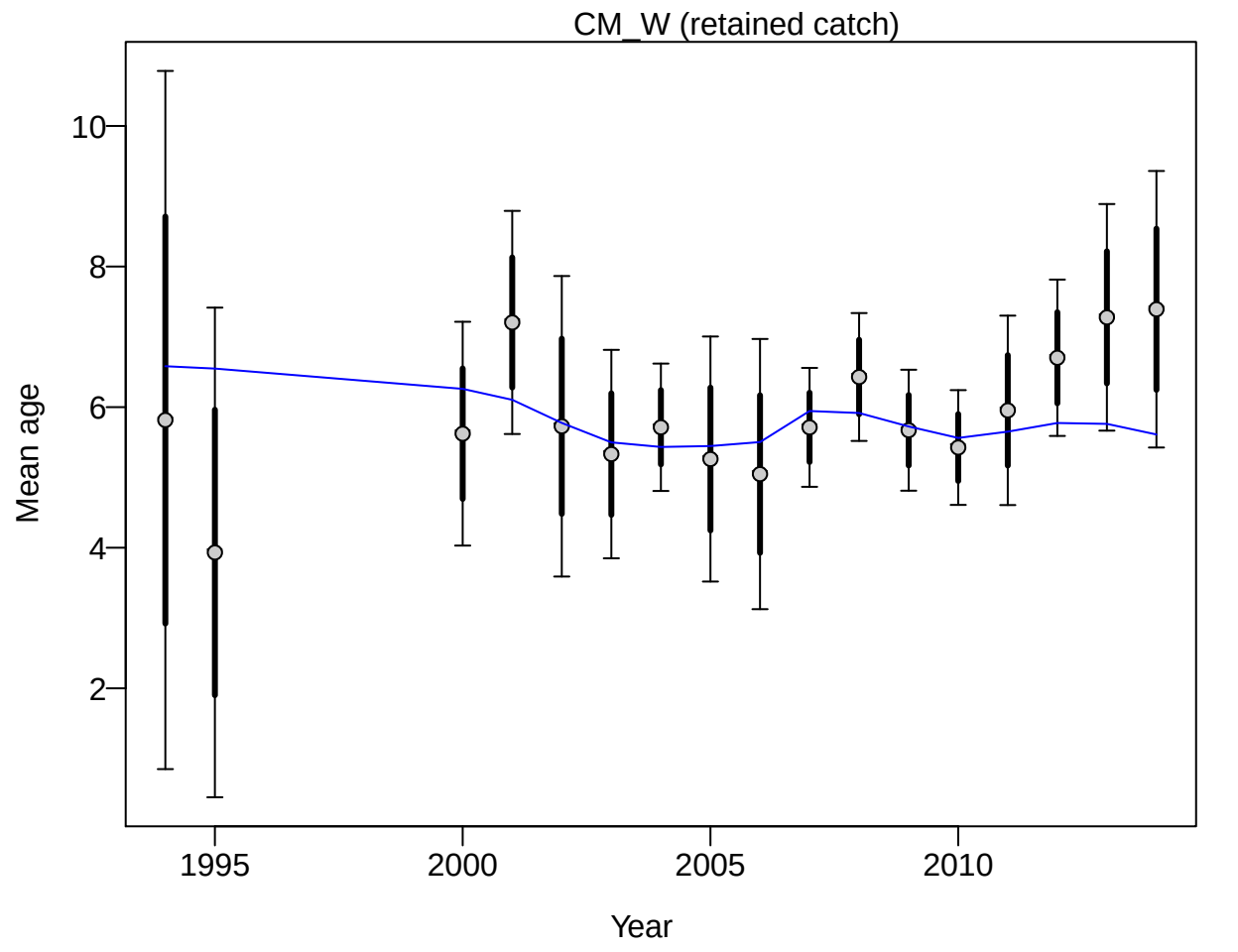


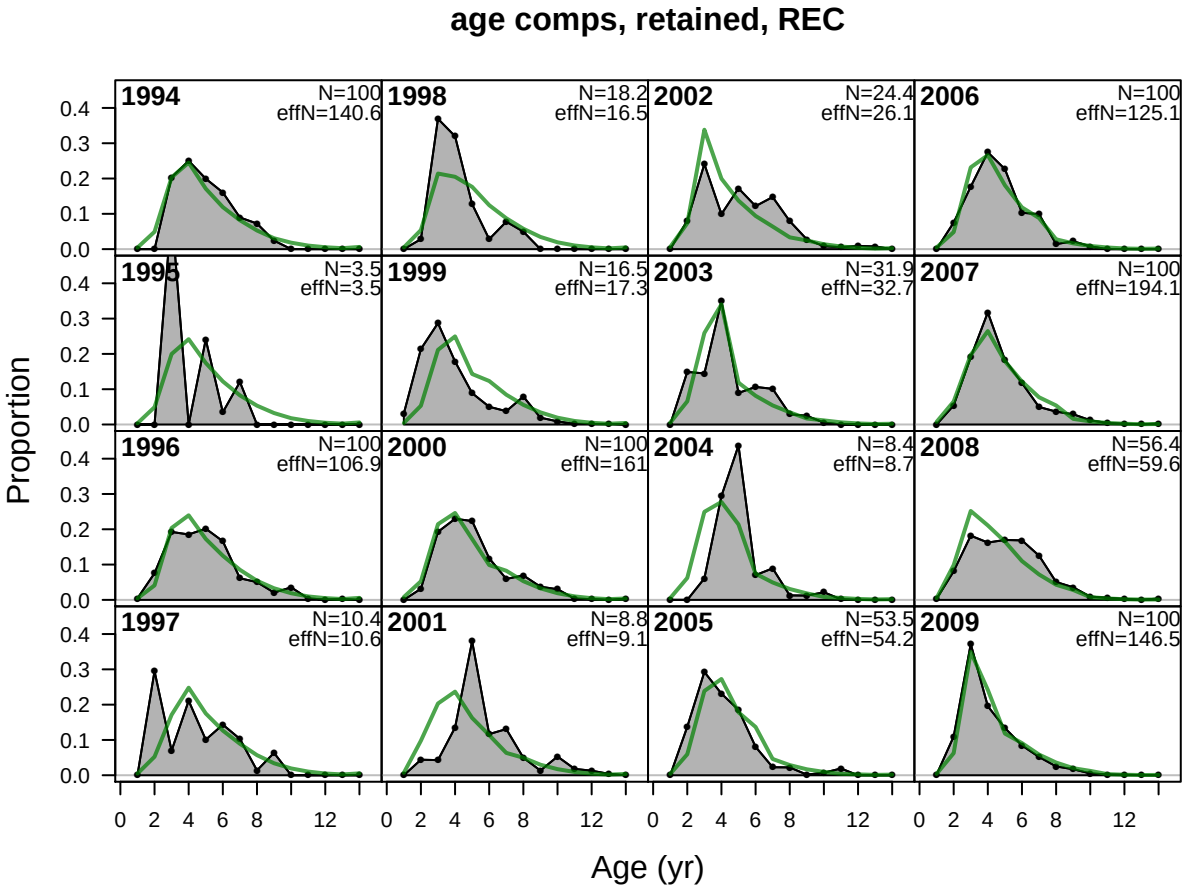
Proportion

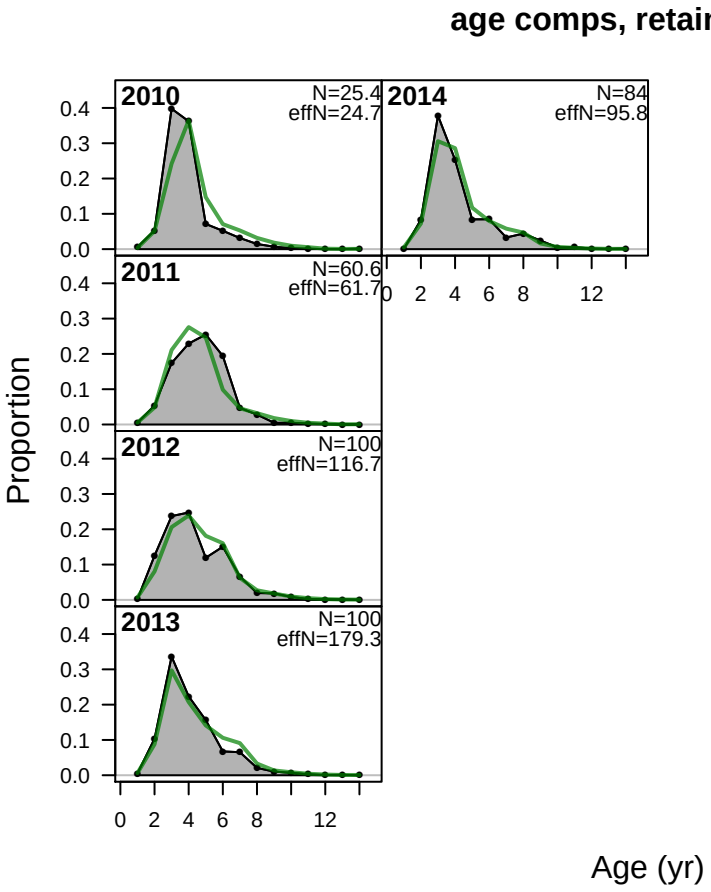
Age (yr)

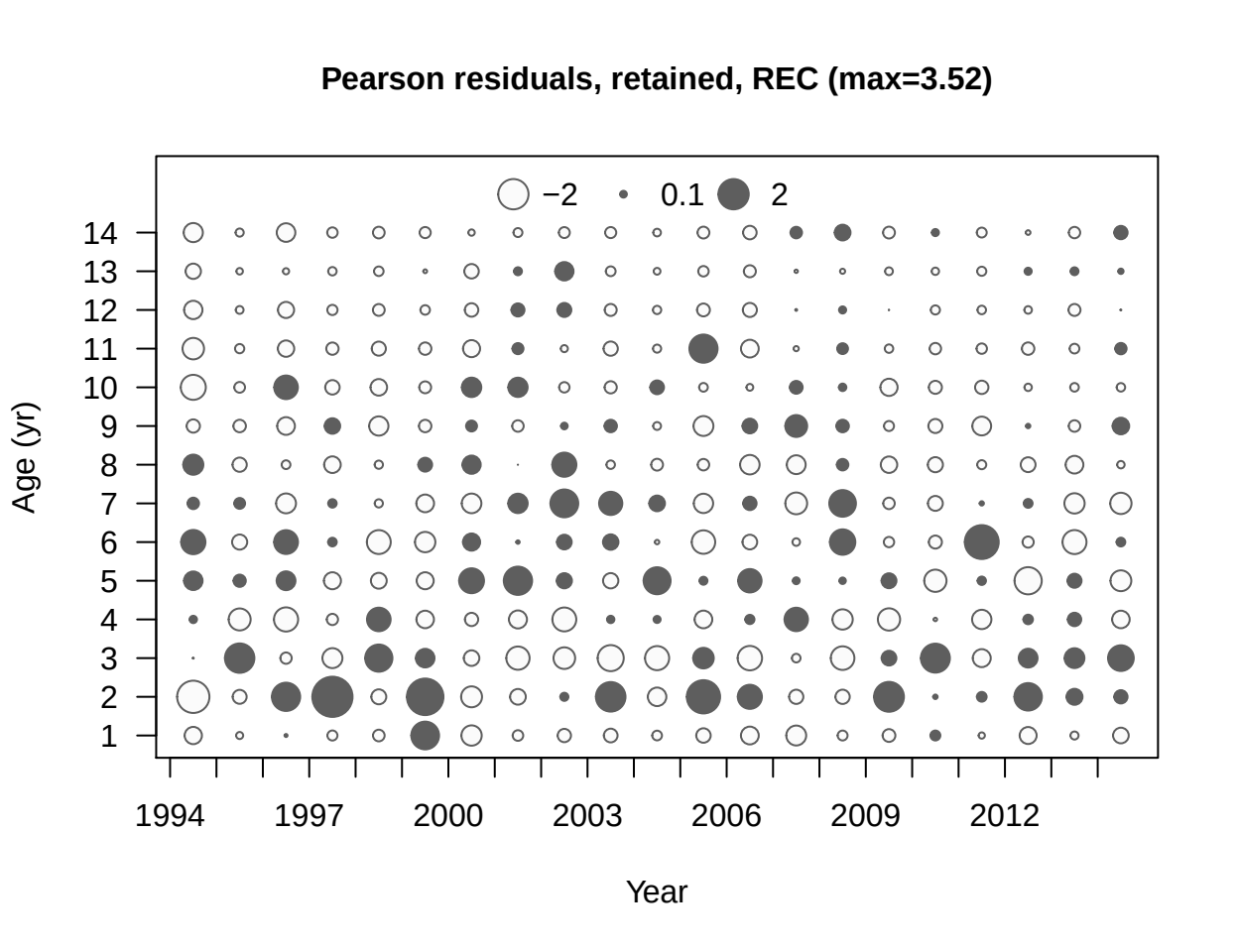

Pearson residuals, retained, CM_W (max=4.6)
−2
0.1
2
Age (yr)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1994
2000
2003
2006
2009
2012
Year

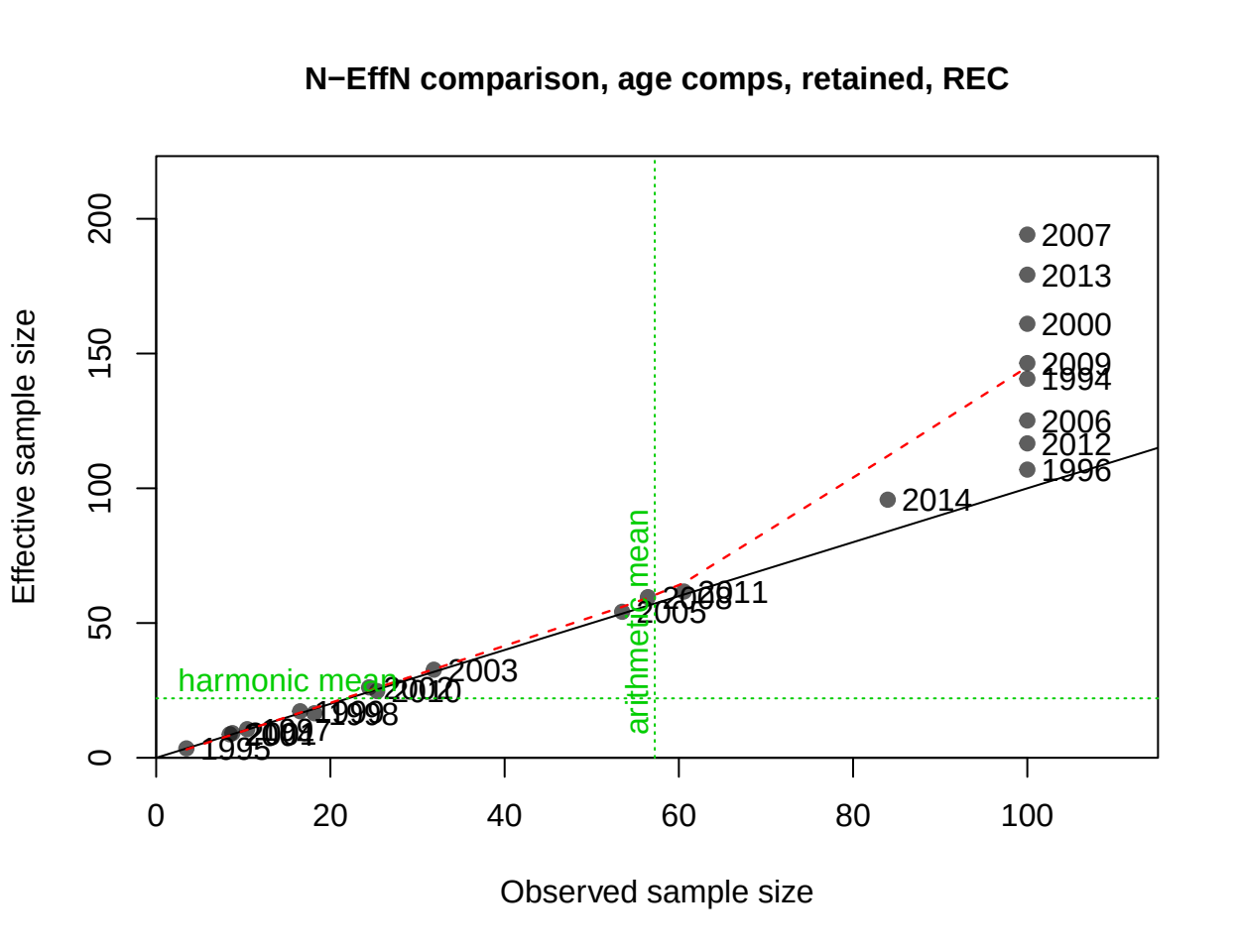

N−EffN comparison, age comps, retained, CM_W
Effective sample size
Observed sample size
0
50
100
150
200
250
300
0
20
40
60
80
100
2009
2007
2004
2010
2008
2012
2011
1995
1994
harmonic mean
arithmetic mean

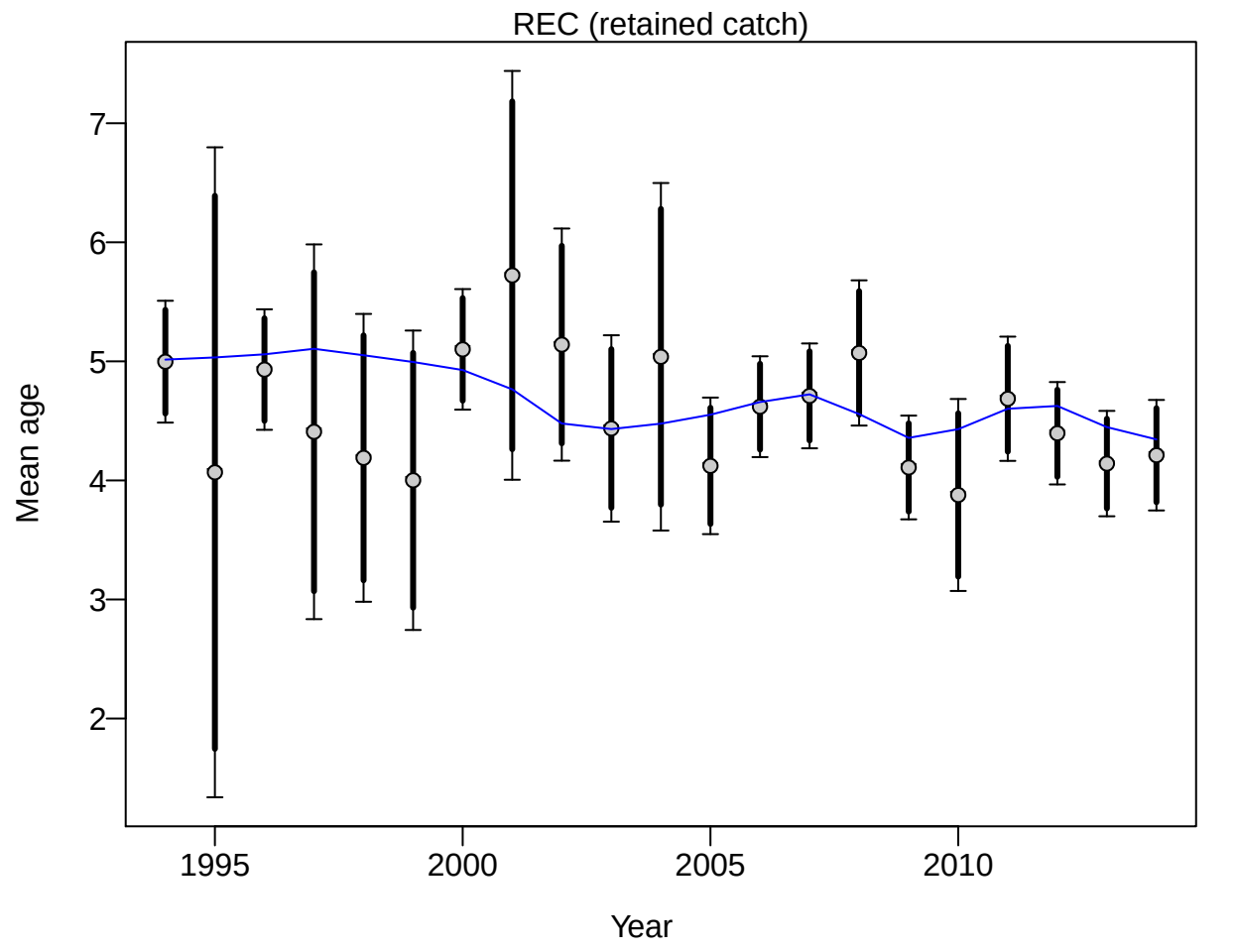

CM_W (retained catch)
Mean age
10
8
6
4
2
1995
2000
2005
2010
Year

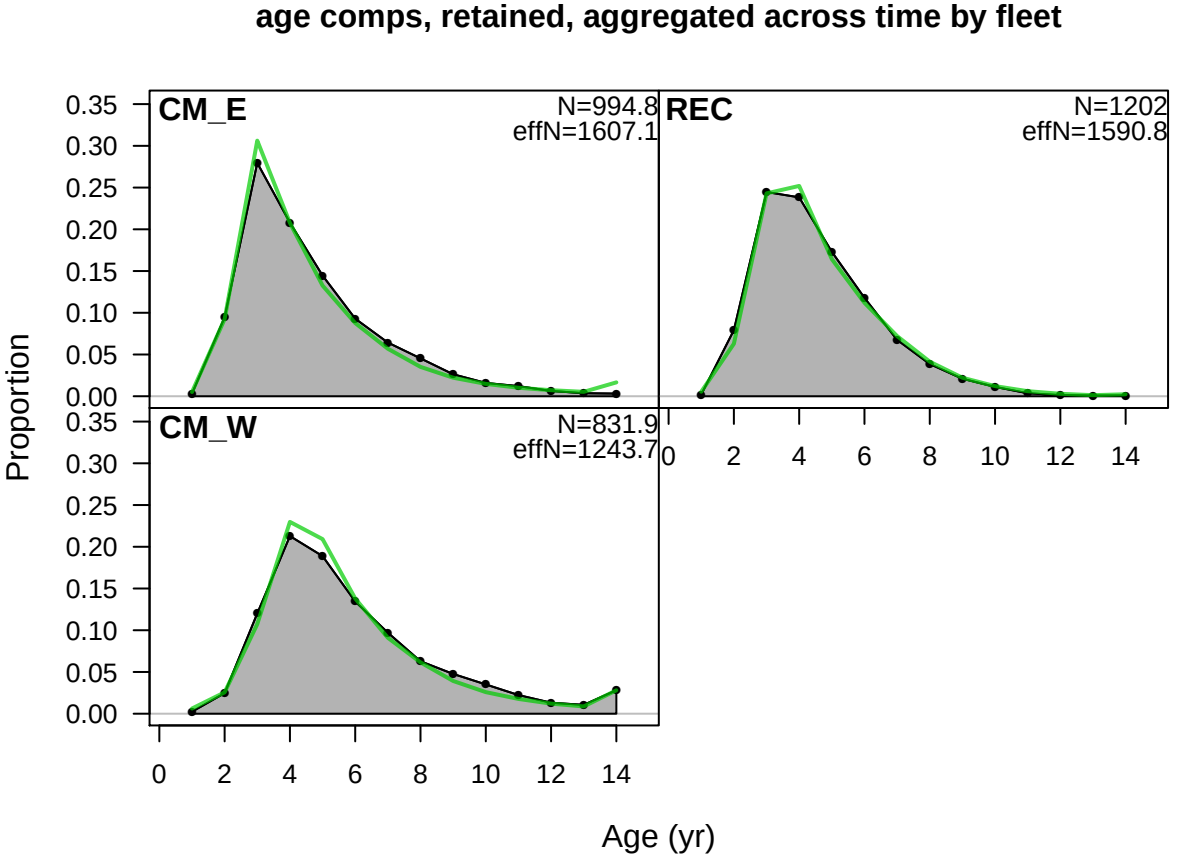

age comps, retained, REC
1994 N=100 effN=140.6
1998 N=18.2 effN=16.5
2002 N=24.4 effN=26.1
2006 N=100 effN=125.1
1995 N=3.5 effN=3.5
1999 N=16.5 effN=17.3
2003 N=31.9 effN=32.7
2007 N=100 effN=194.1
1996 N=100 effN=106.9
2000 N=100 effN=161
2004 N=8.4 effN=8.7
2008 N=56.4 effN=59.6
1997 N=10.4 effN=10.6
2001 N=8.8 effN=9.1
2005 N=53.5 effN=54.2
2009 N=100 effN=146.5
Proportion
0.0 0.1 0.2 0.3 0.4
0 2 4 6 8 12
Age (yr)

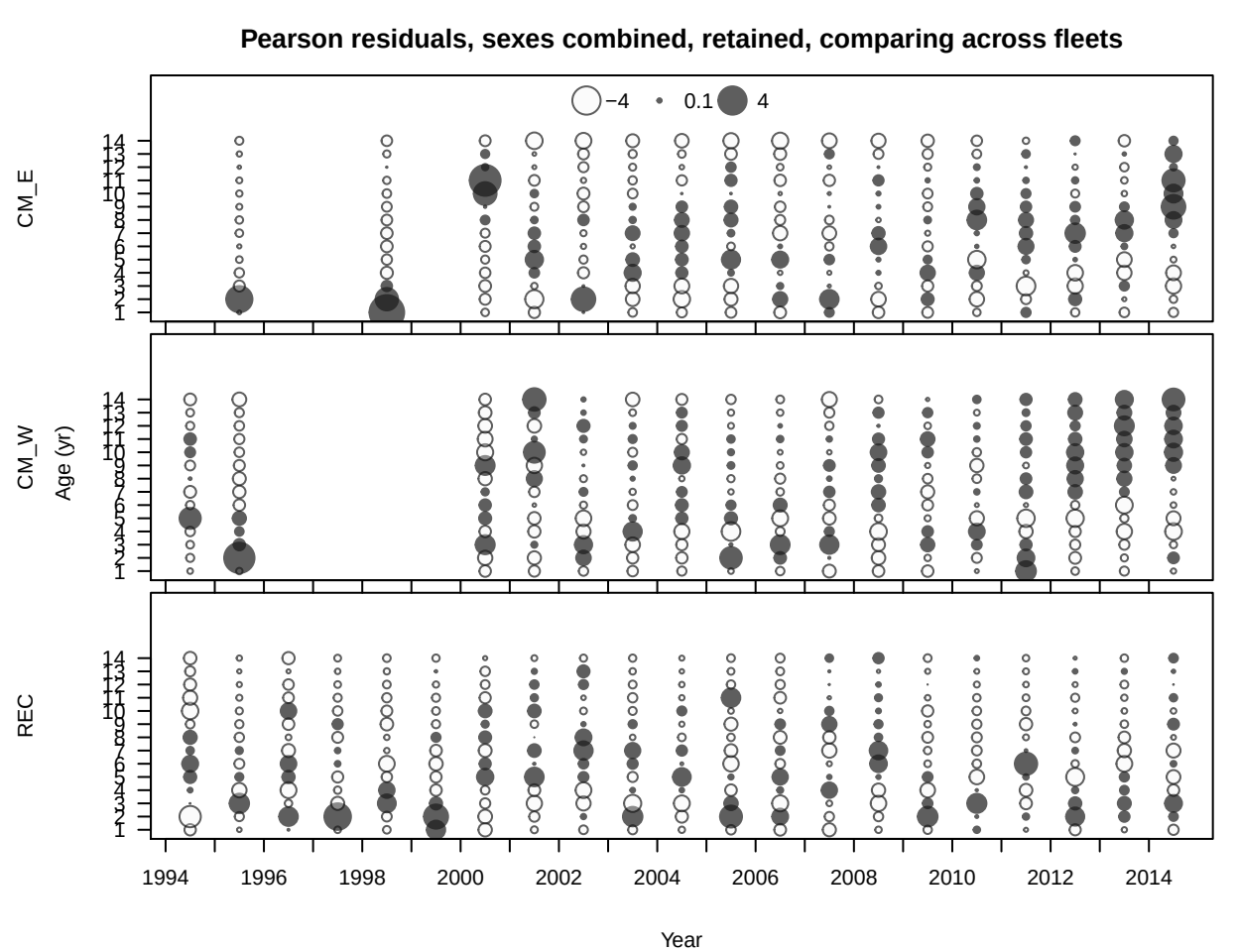

age comps, retained, REC
2010
N=25.4
effN=24.7
2014
N=84
effN=95.8
2011
N=60.6
effN=61.7
2012
N=100
effN=116.7
2013
N=100
effN=179.3
Proportion
Age (yr)
0.0
0.1
0.2
0.3
0.4
0
2
4
6
8
12

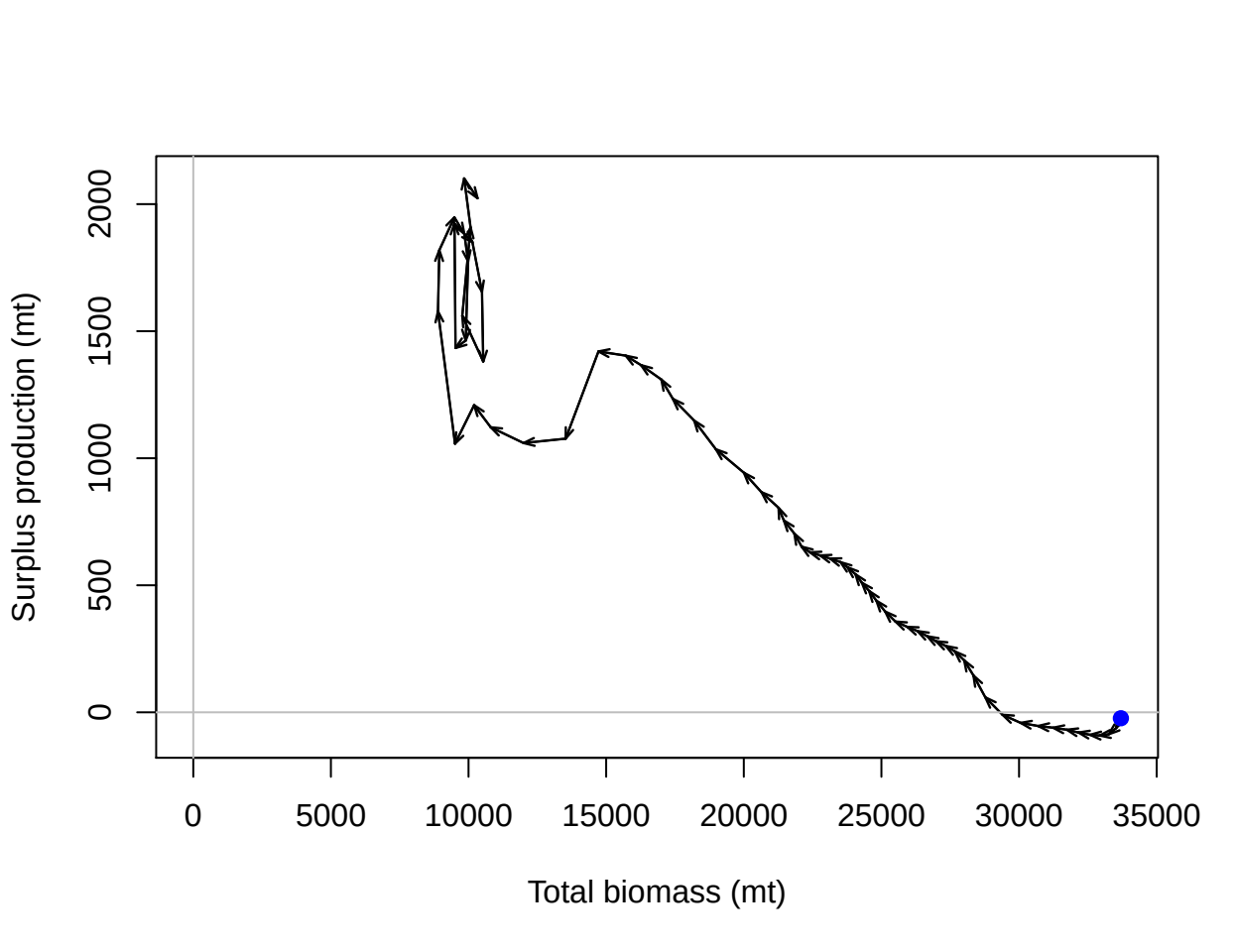

Pearson residuals, retained, REC (max=3.52)
−2
0.1
2
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Age (yr)
1994
1997
2000
2003
2006
2009
2012
Year

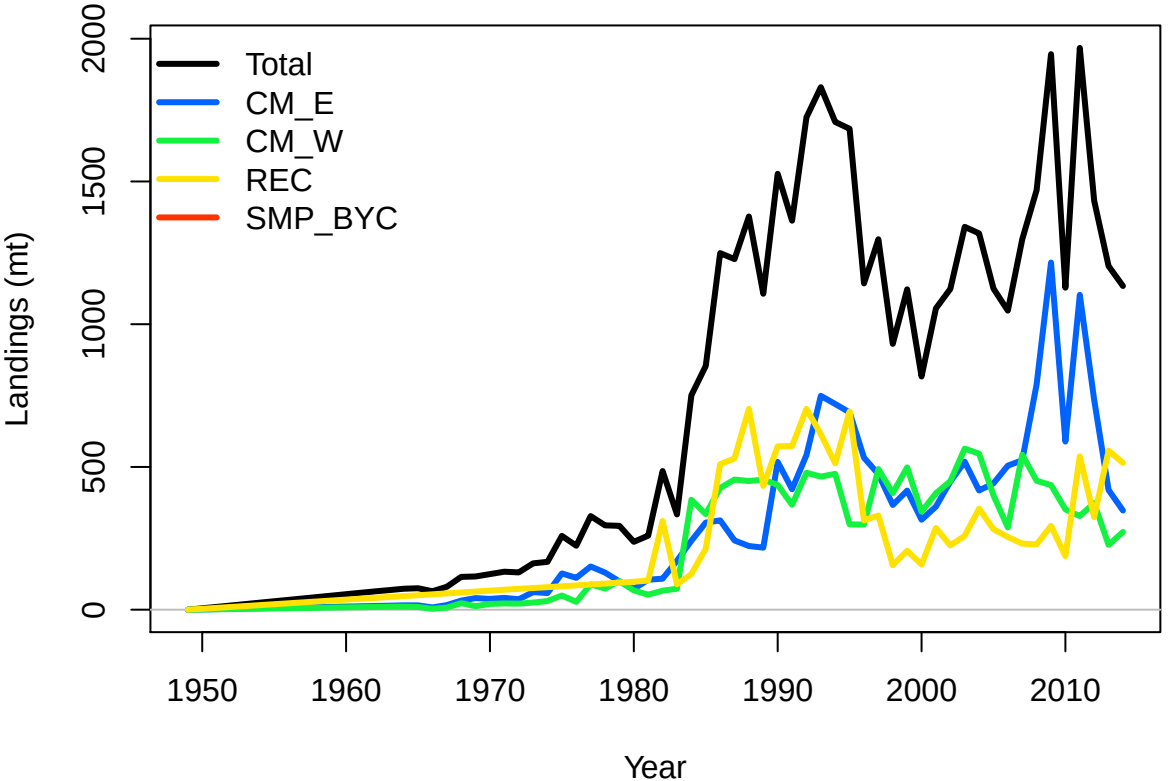

N−EffN comparison, age comps, retained, REC
Effective sample size
Observed sample size
0
50
100
150
200
0
20
40
60
80
100
harmonic mean
arithmetic mean
2007
2013
2000
2009
1994
2006
2012
1996
2014
2011
2005
2003
1995

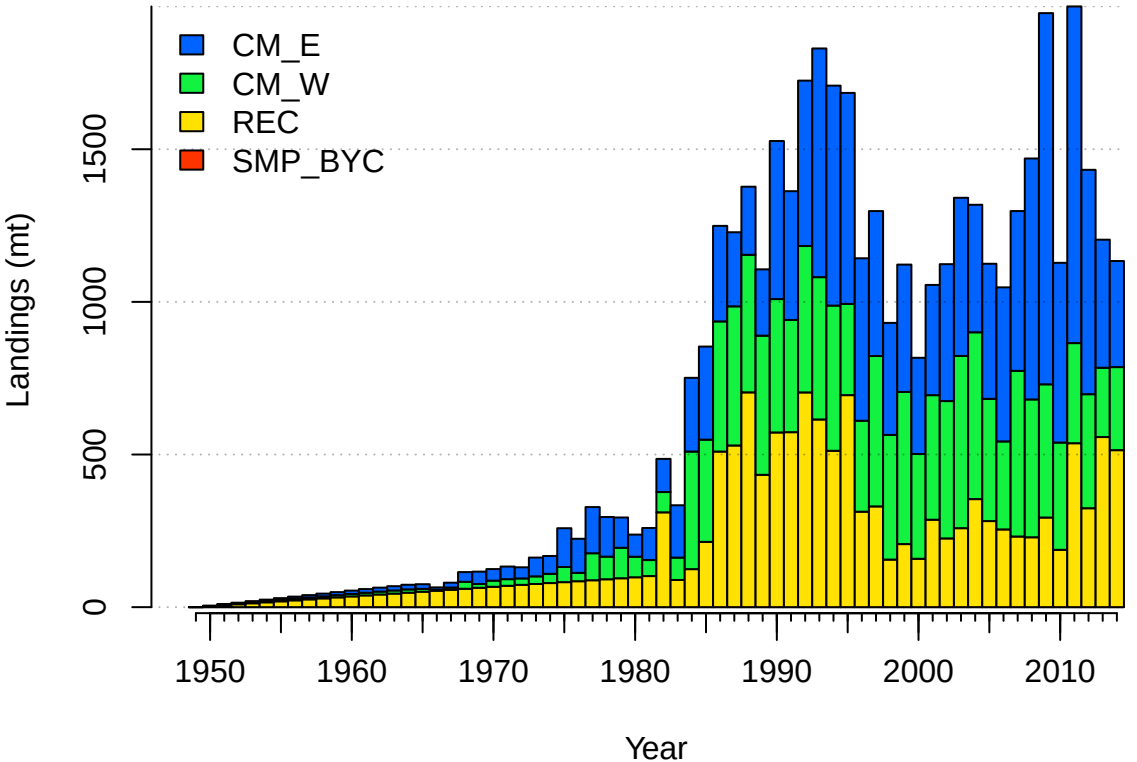

REC (retained catch)
Mean age
7
6
5
4
3
2
1995
2000
2005
2010
Year

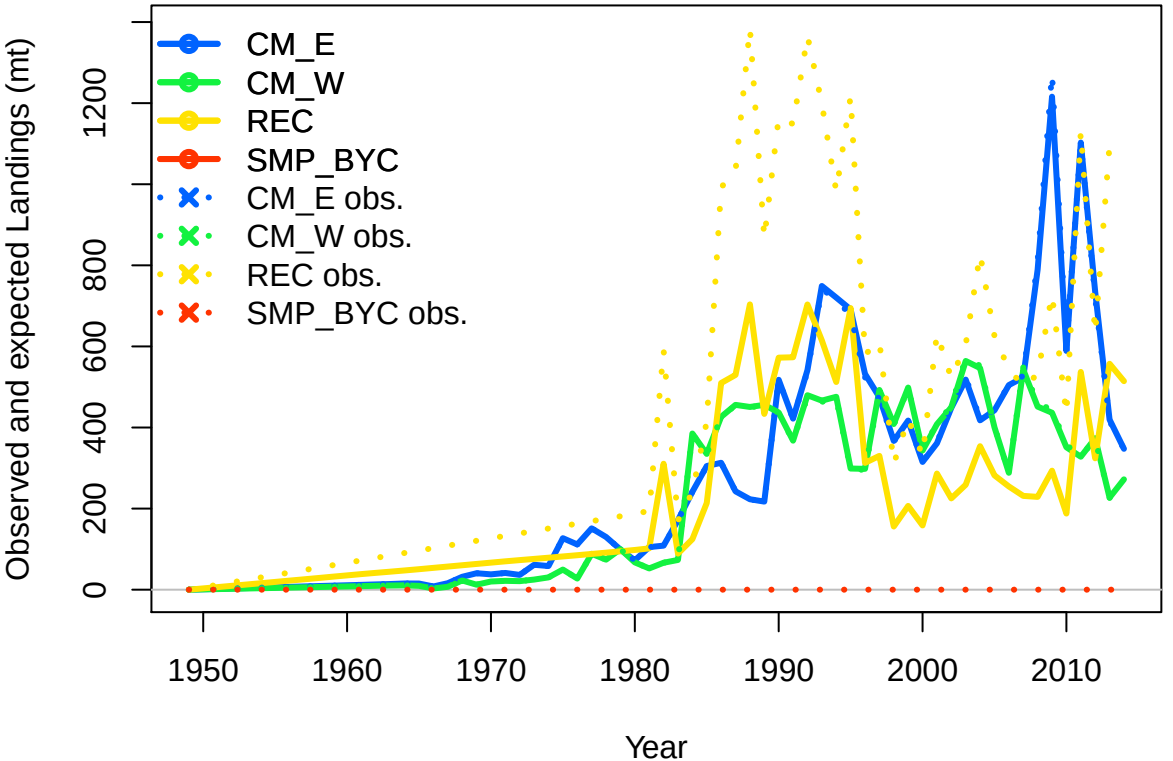

age comps, retained, aggregated across time by fleet
CM_E
N=994.8
effN=1607.1
REC
N=1202
effN=1590.8
CM_W
N=831.9
effN=1243.7
Proportion
Age (yr)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
2
4
6
8
10
12
14

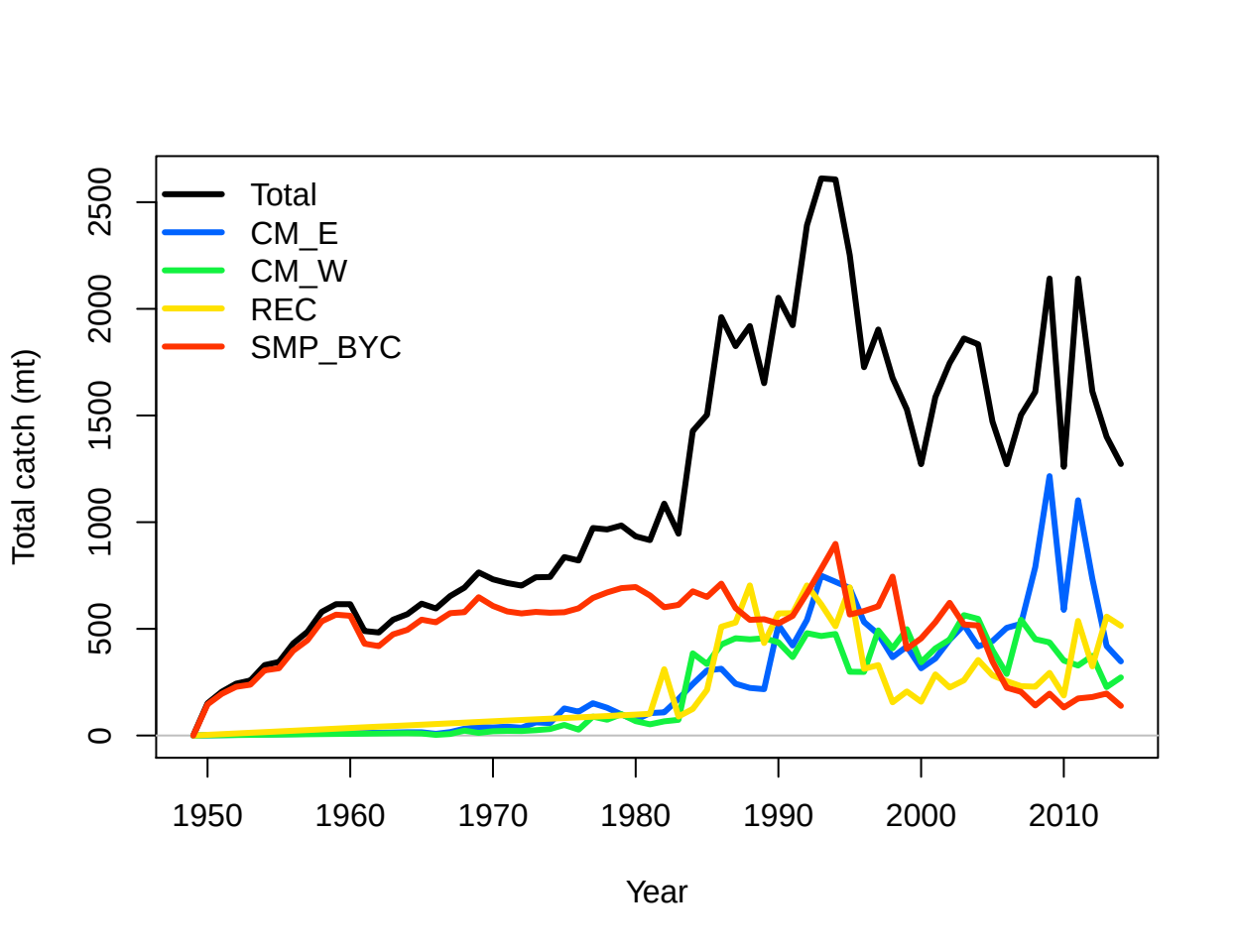

Pearson residuals, sexes combined, retained, comparing across fleets
−4
0.1
4
CM_E
CM_W
REC
Age (yr)
Year
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014

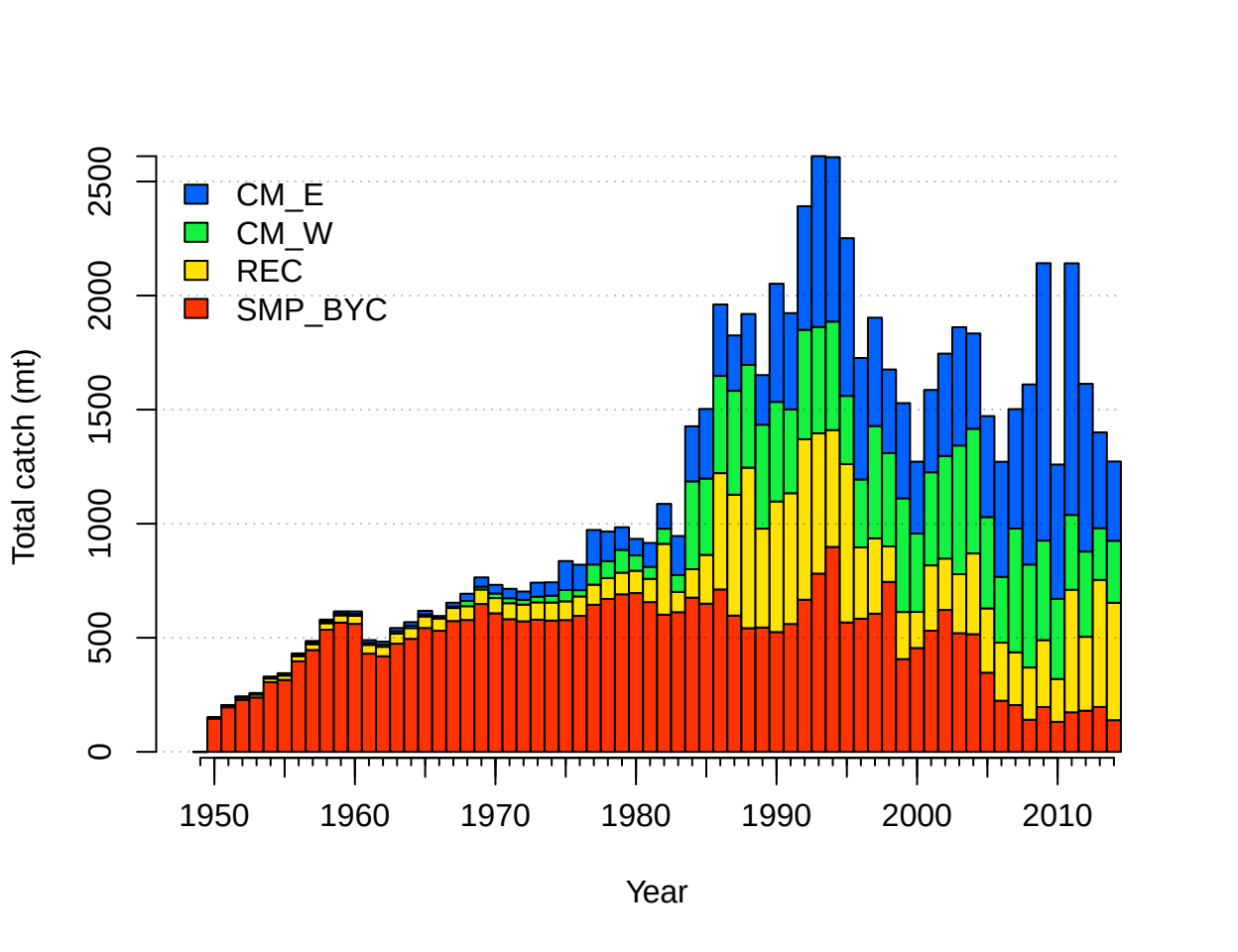

Surplus production (mt)
0
500
1000
1500
2000
0
5000
10000
15000
20000
25000
30000
35000
Total biomass (mt)

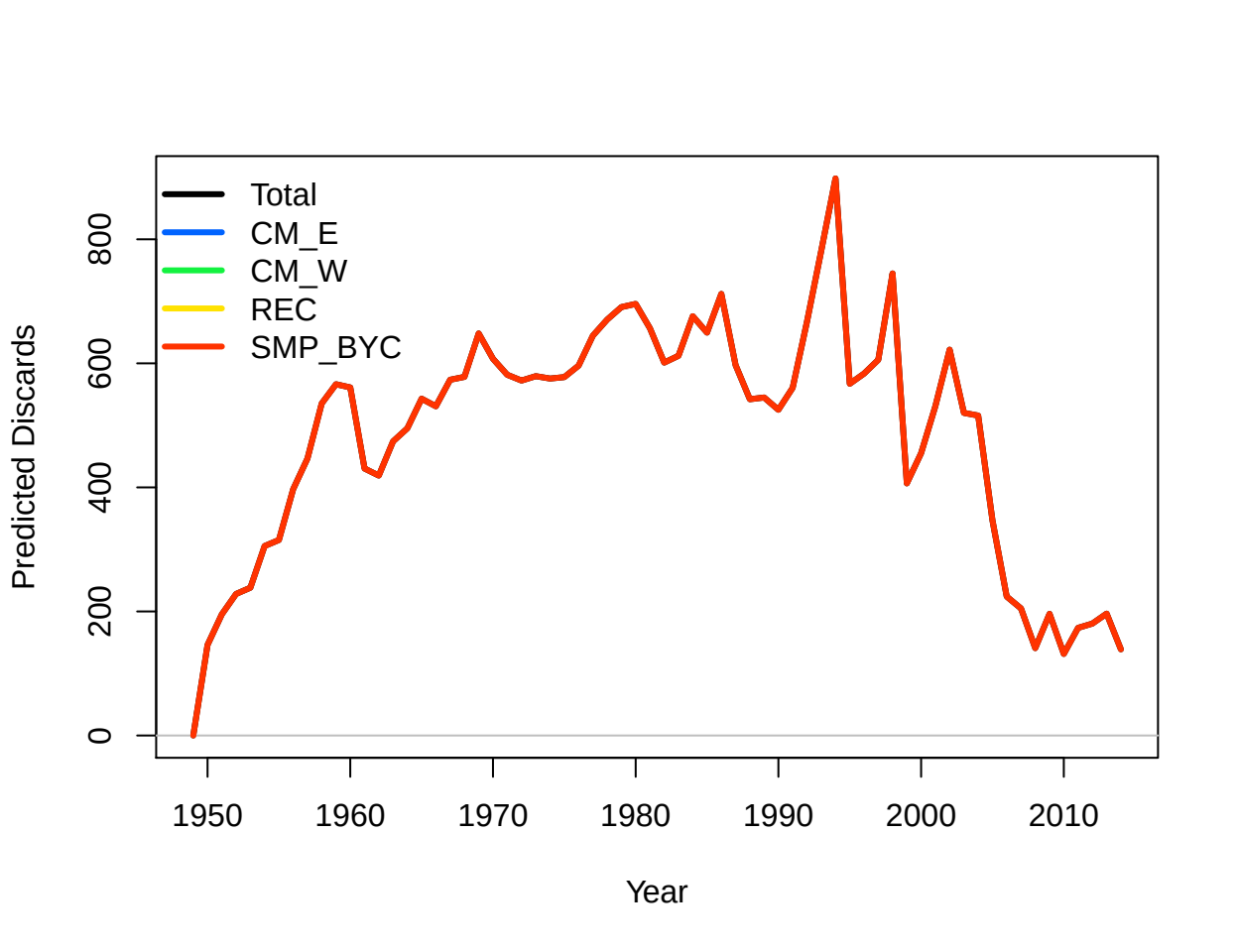

Total
CM_E
CM_W
REC
SMP_BYC
Landings (mt)
0
500
1000
1500
2000
1950
1960
1970
1980
1990
2000
2010
Year

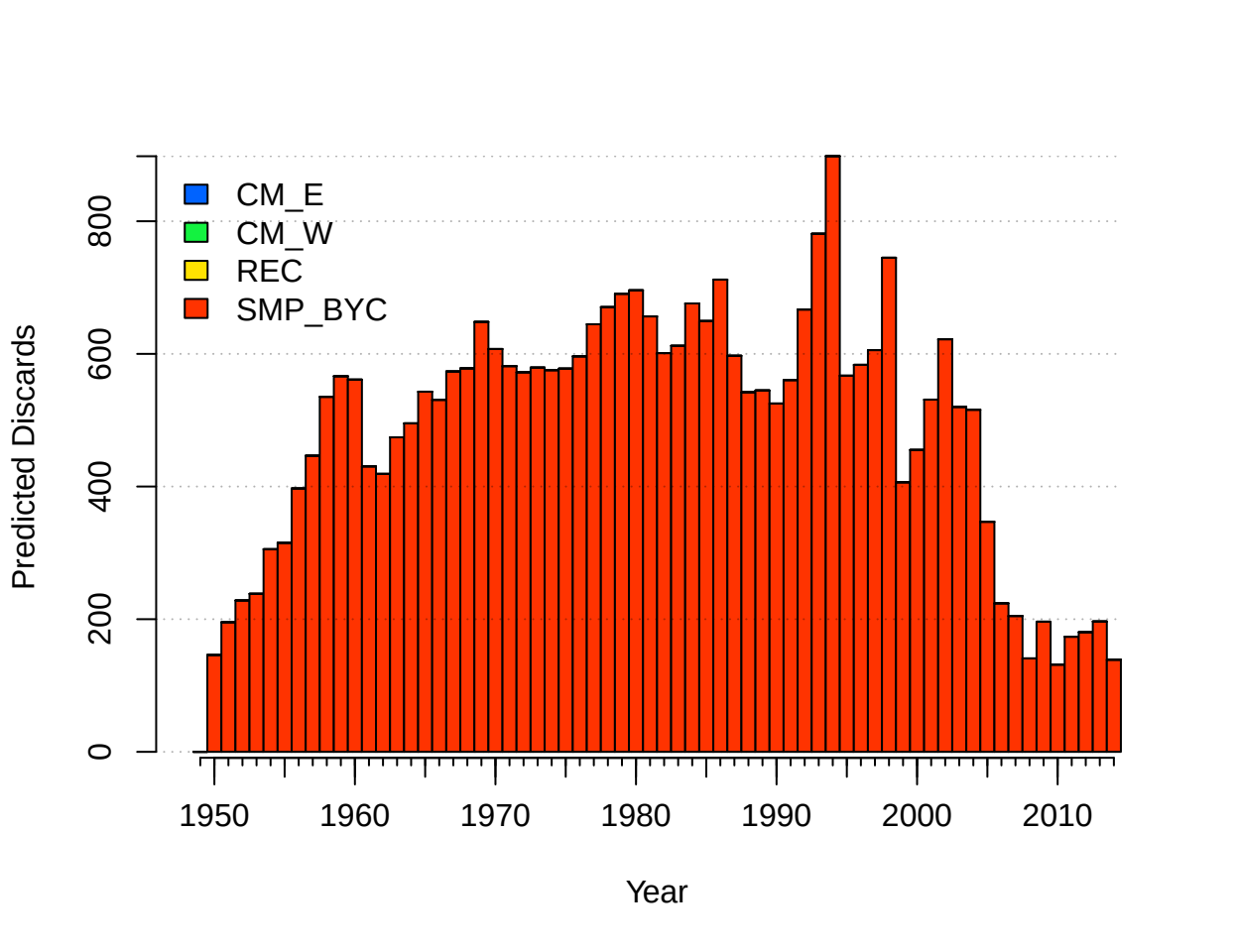

CM_E
CM_W
REC
SMP_BYC
Landings (mt)
0
500
1000
1500
1950
1960
1970
1980
1990
2000
2010
Year

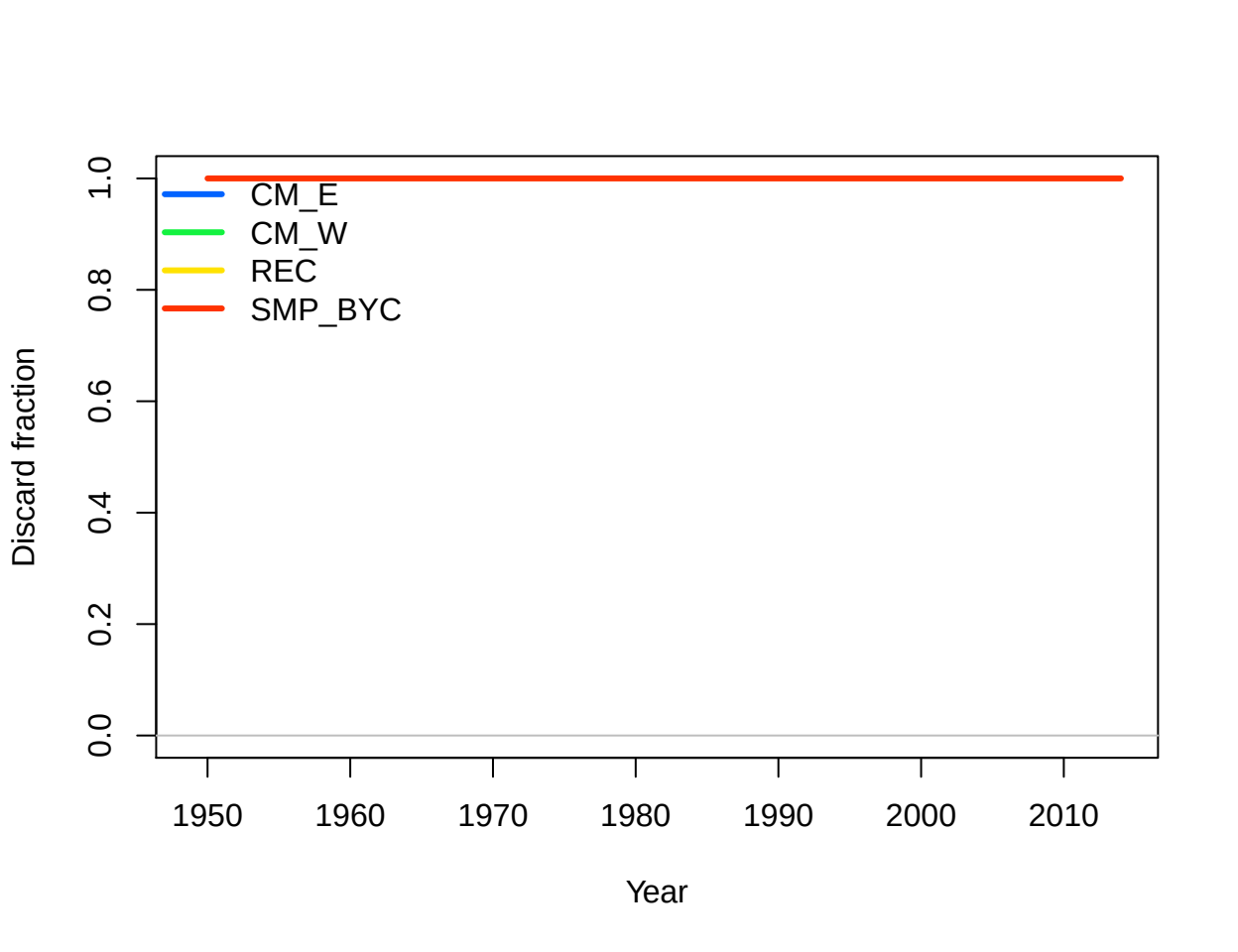

CM_E
CM_W
REC
SMP_BYC
CM_E obs.
CM_W obs.
REC obs.
SMP_BYC obs.
Observed and expected Landings (mt)
0
200
400
600
800
1200
1950
1960
1970
1980
1990
2000
2010
Year

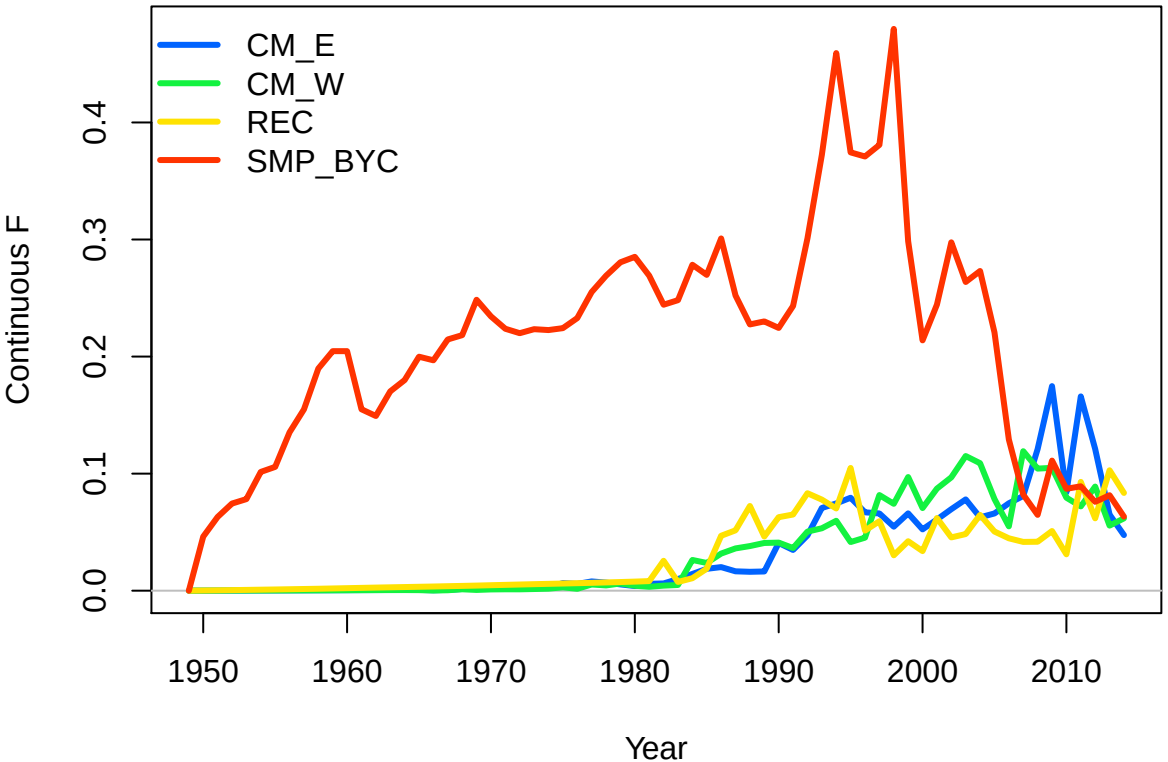

Total
CM_E
CM_W
REC
SMP_BYC
Total catch (mt)
0
500
1000
1500
2000
2500
1950
1960
1970
1980
1990
2000
2010
Year


CM_E
CM_W
REC
SMP_BYC
Total catch (mt)
0
500
1000
1500
2000
2500
1950
1960
1970
1980
1990
2000
2010
Year


Total
CM_E
CM_W
REC
SMP_BYC
Predicted Discards
0
200
400
600
800
1950
1960
1970
1980
1990
2000
2010
Year


CM_E
CM_W
REC
SMP_BYC
Predicted Discards
0
200
400
600
800
1950
1960
1970
1980
1990
2000
2010
Year


CM_E
CM_W
REC
SMP_BYC
Discard fraction
0.0
0.2
0.4
0.6
0.8
1.0
1950
1960
1970
1980
1990
2000
2010
Year


CM_E
CM_W
REC
SMP_BYC
Continuous F
0.0
0.1
0.2
0.3
0.4
1950
1960
1970
1980
1990
2000
2010
Year