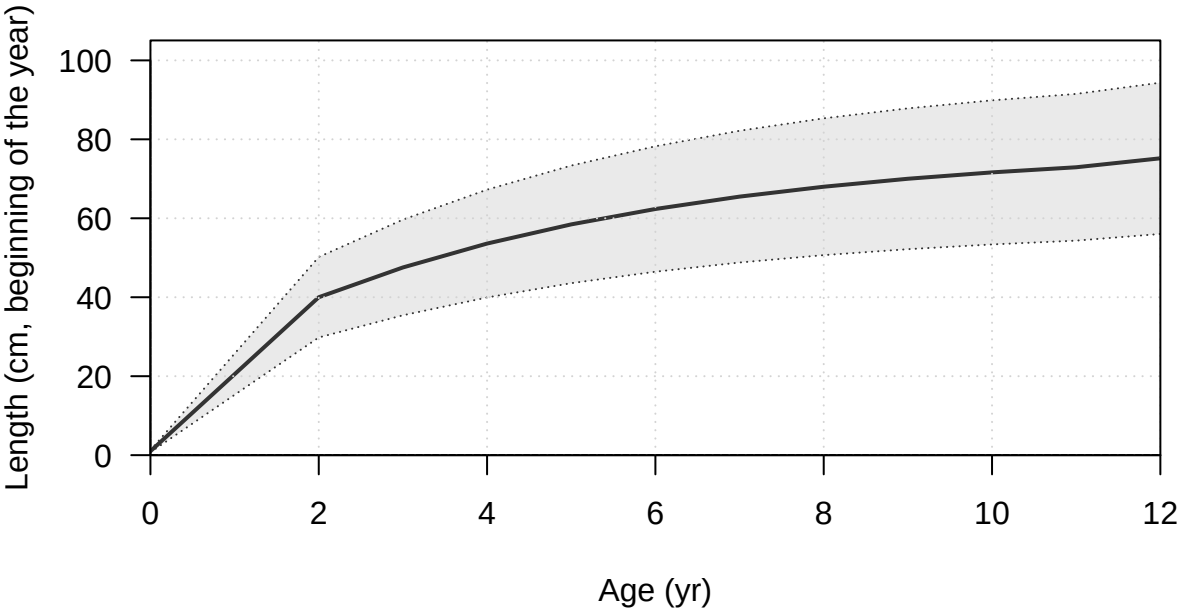
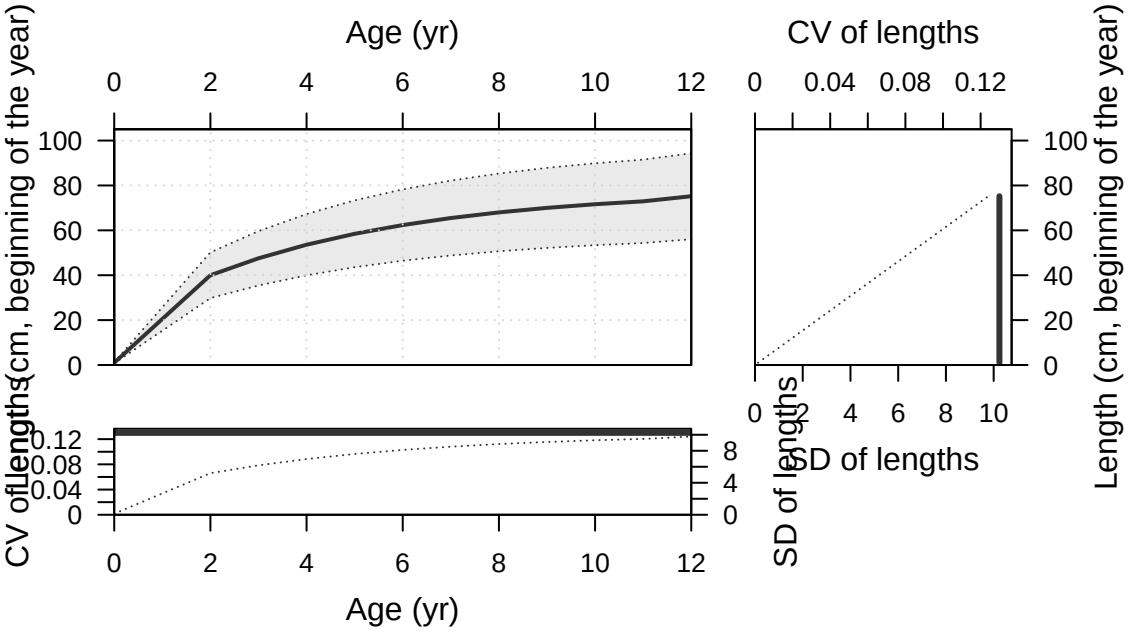
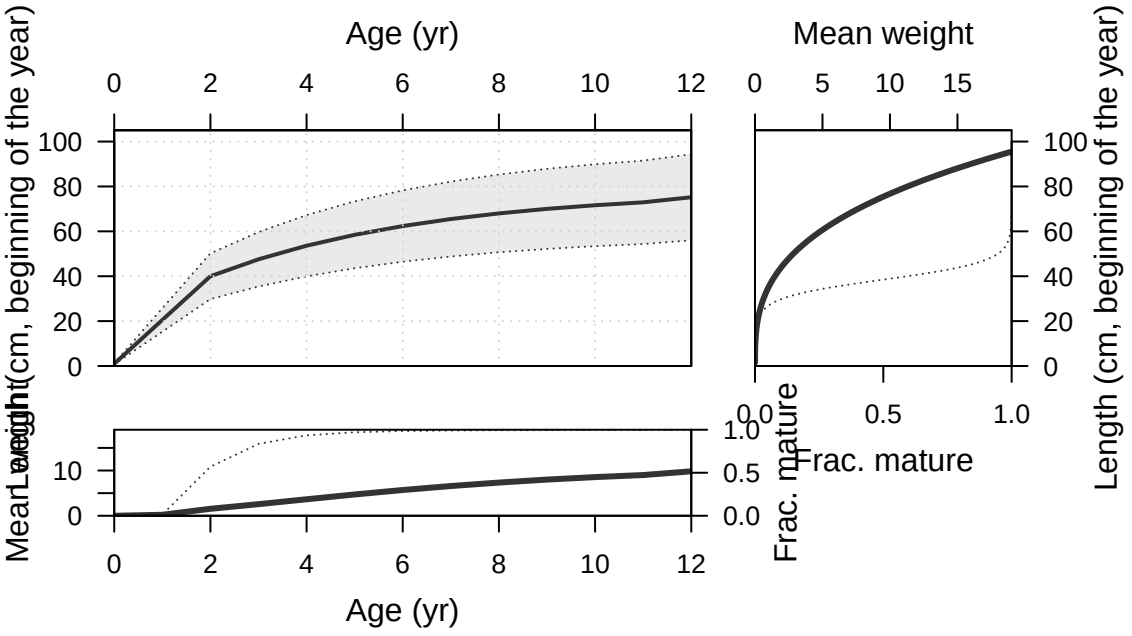
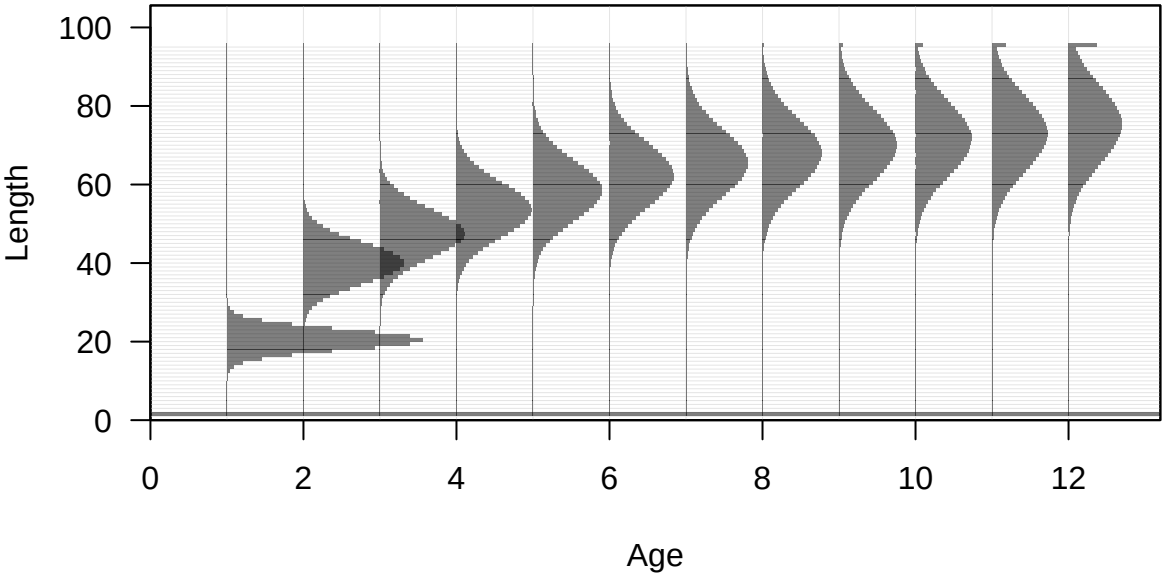
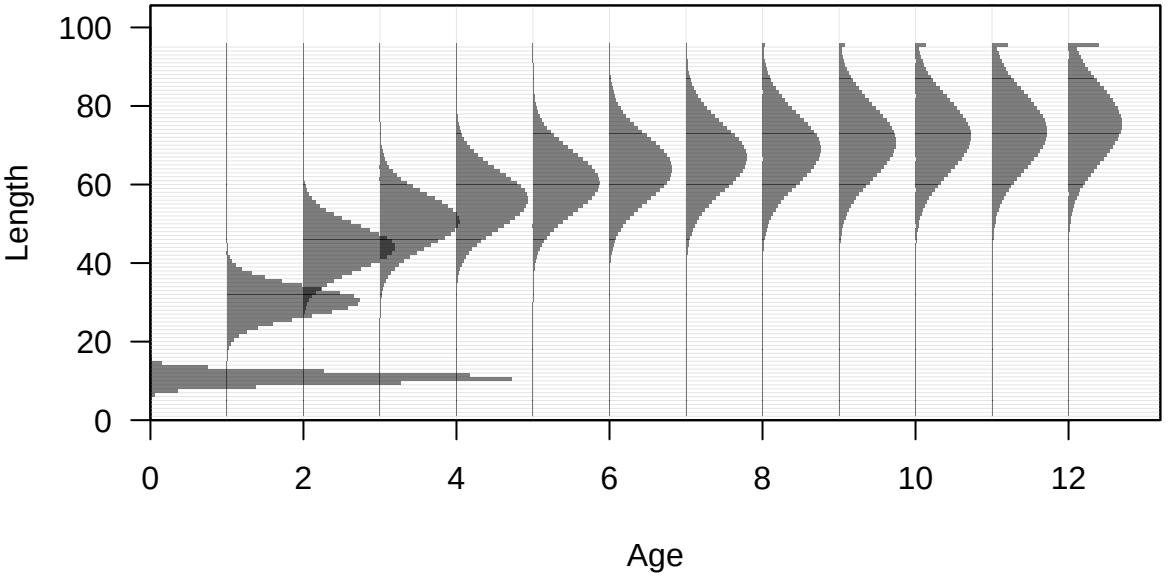
Plots created using the 'r4ss' package in R
Stock Synthesis version: 3.30.19.0
StartTime: Mon Jul 11 16:43:12 2022
Data_File: data.ss
Control_File: control.ss

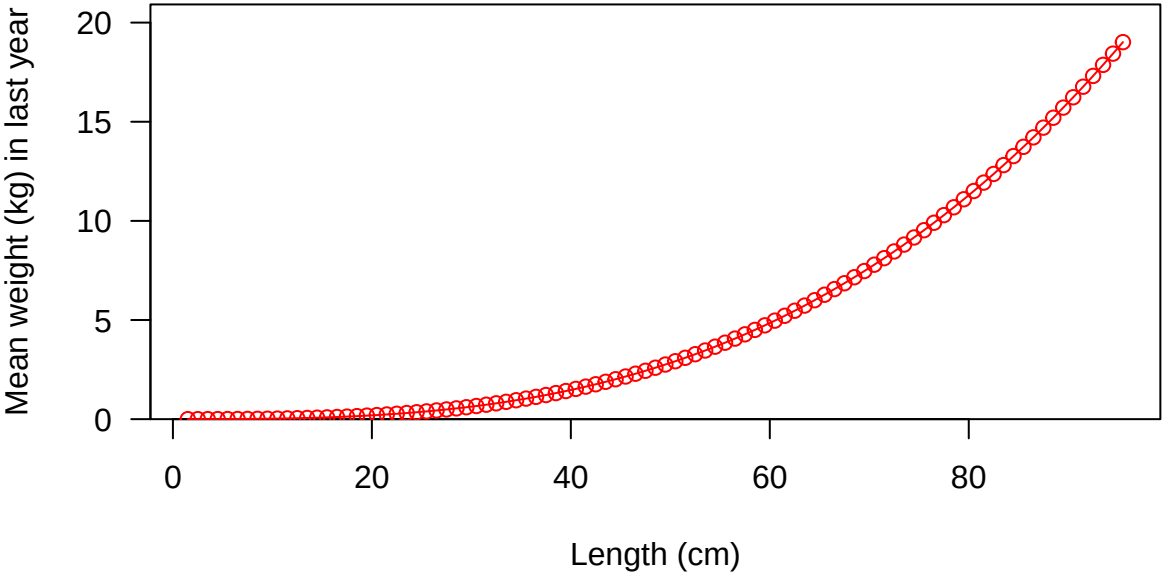

Length (cm, beginning of the year)
100
80
60
40
20
0
0
2
4
6
8
10
12
Age (yr)

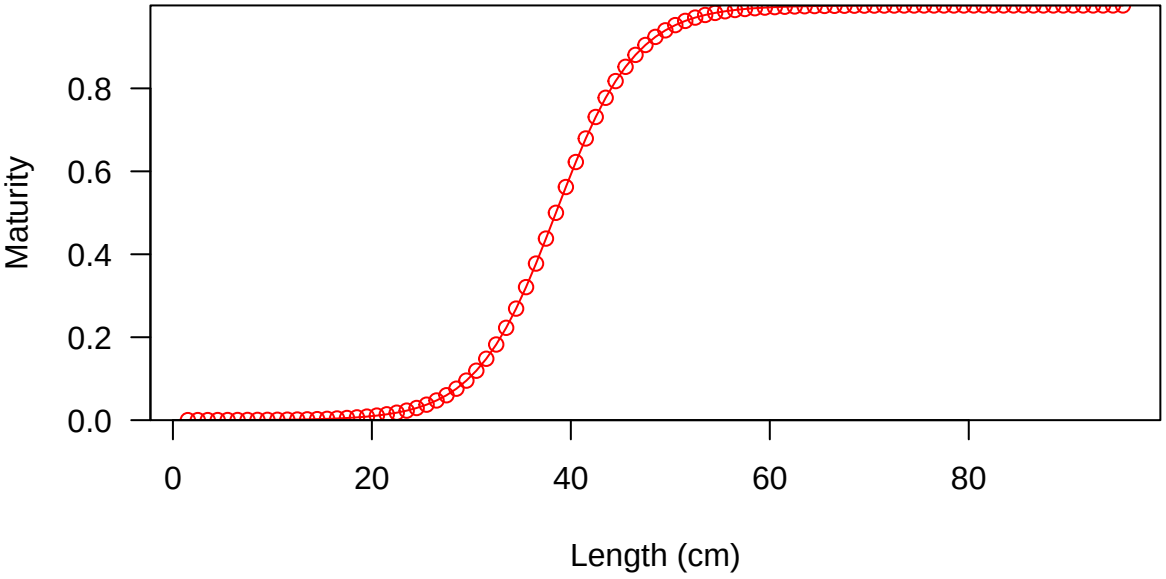

Age (yr)
0
2
4
6
8
10
12
Length (cm, beginning of the year)
0
20
40
60
80
100
CV of lengths
0
0.04
0.08
0.12
SD of lengths
0
2
4
6
8
10

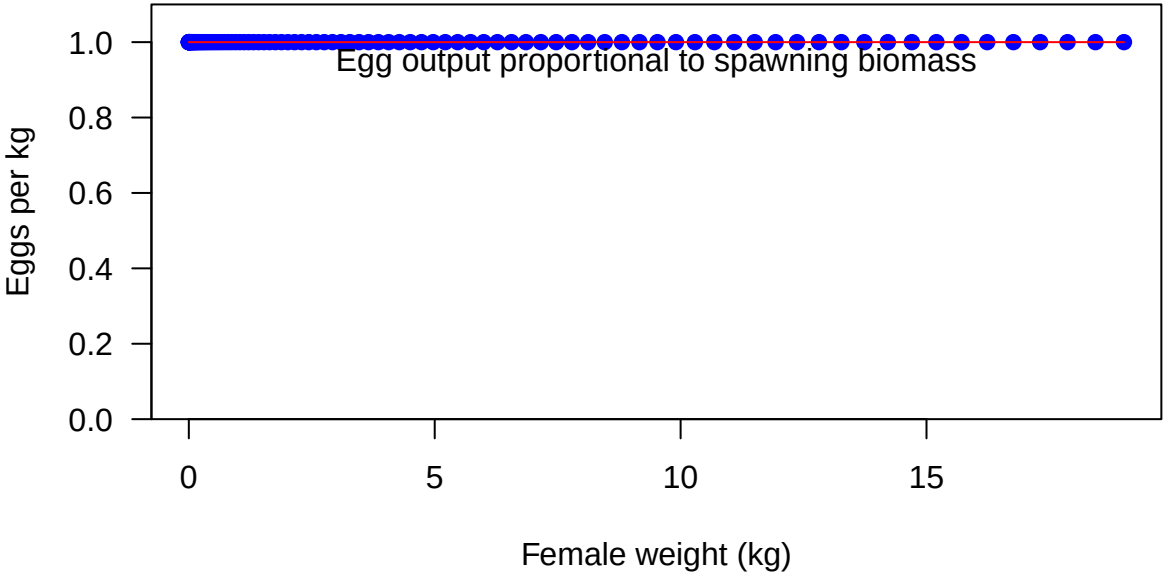

Age (yr)
0
2
4
6
8
10
12
Length (cm, beginning of the year)
100
80
60
40
20
0
Mean weight
0
5
10
15
Frac. mature
0.0
0.5
1.0
Age (yr)

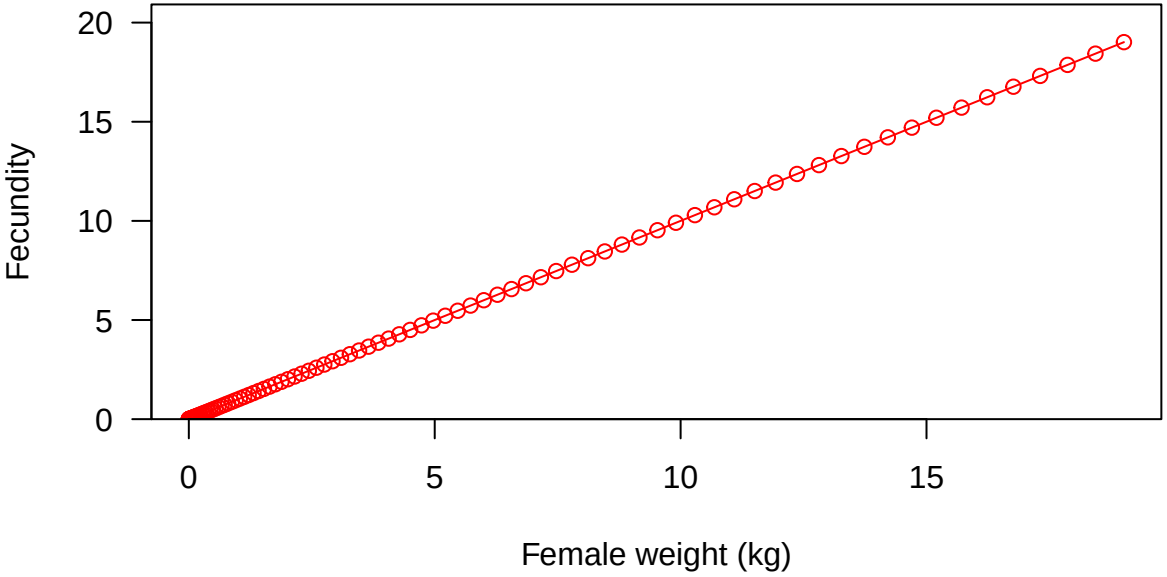

Length
100
80
60
40
20
0
0
2
4
6
8
10
12
Age

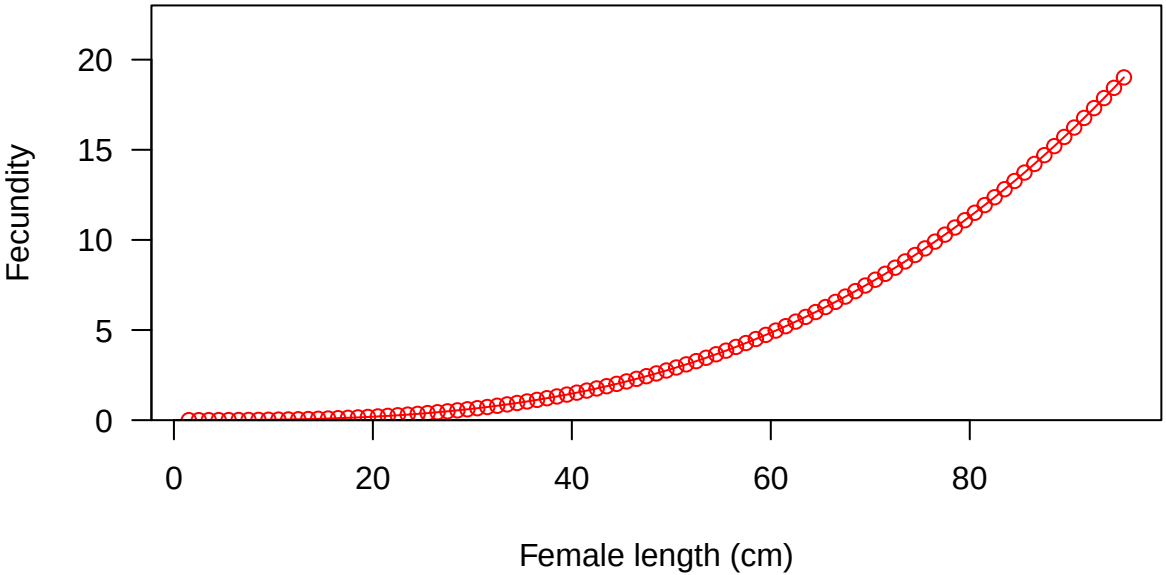

Length
100
80
60
40
20
0
0
2
4
6
8
10
12
Age

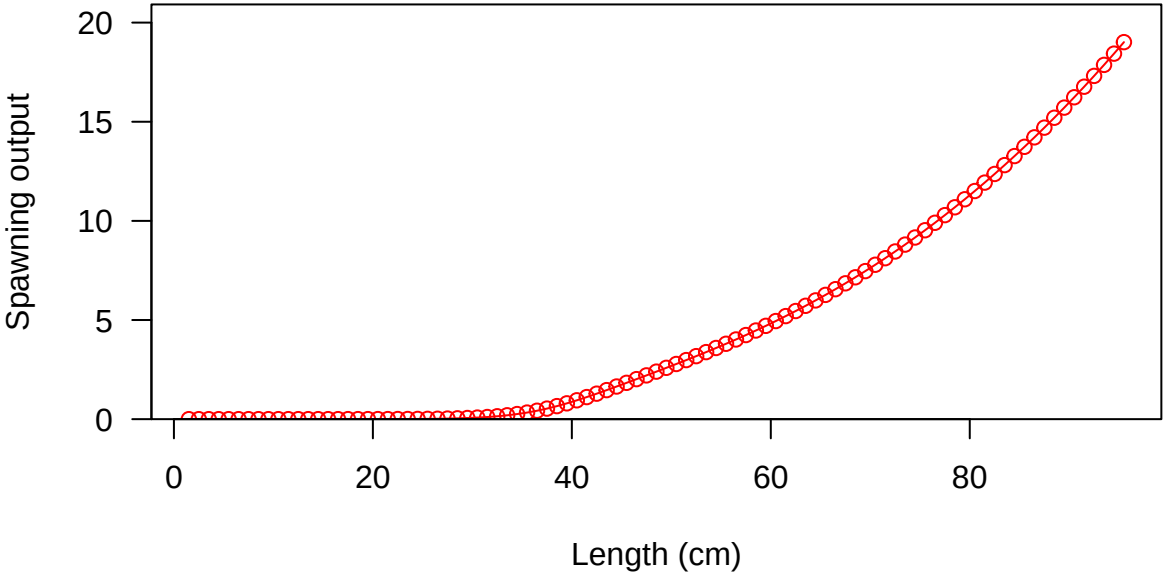

Mean weight (kg) in last year
20
15
10
5
0
0
20
40
60
80
Length (cm)

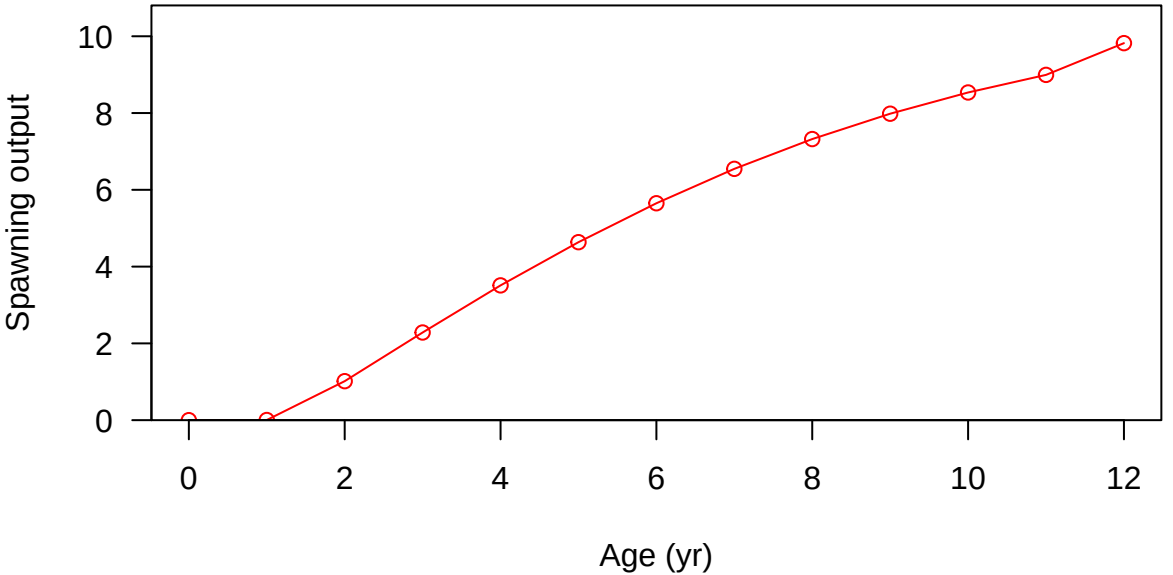

Maturity
0.0
0.2
0.4
0.6
0.8
0
20
40
60
80
Length (cm)

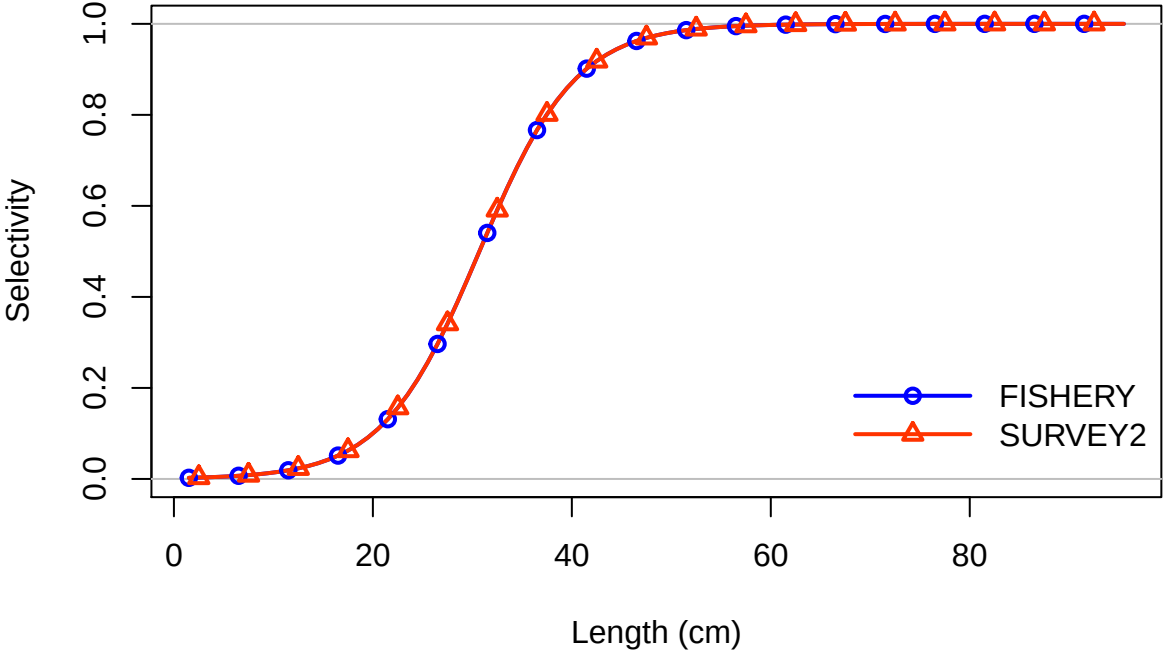

Egg output proportional to spawning biomass
Eggs per kg
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
Female weight (kg)

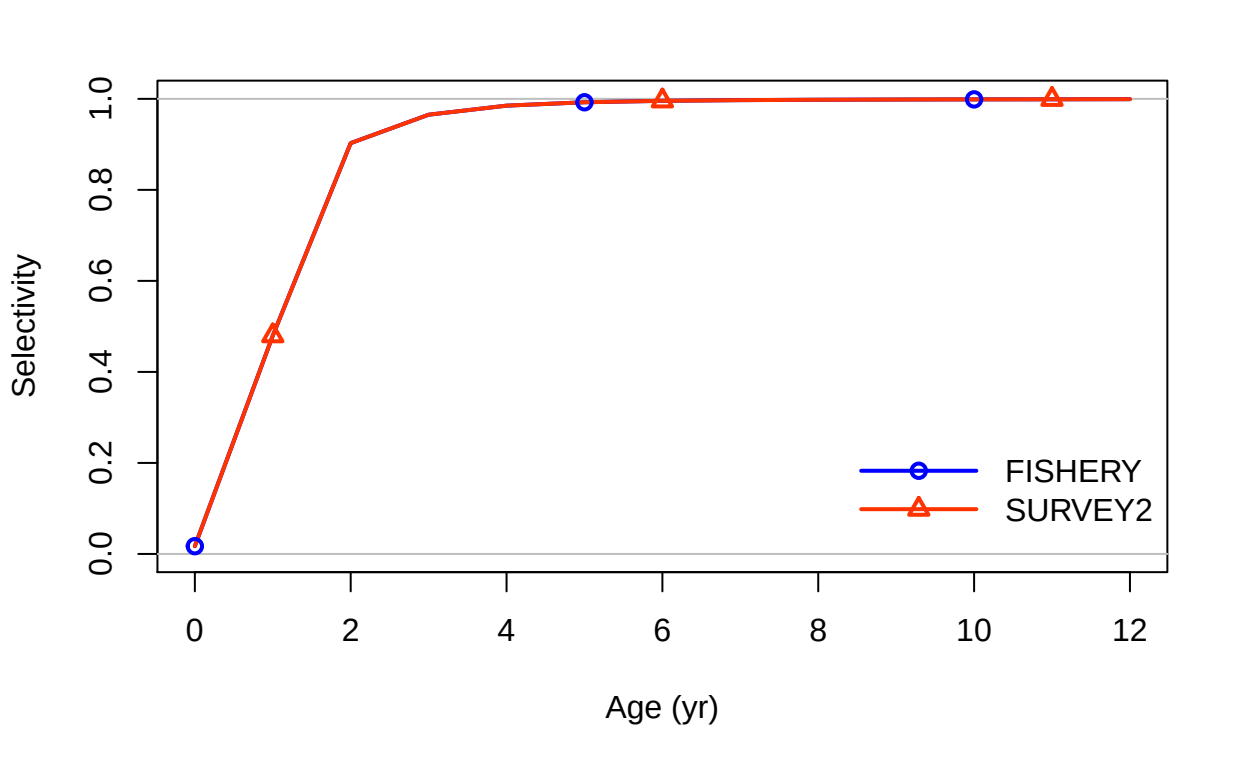

Fecundity
20
15
10
5
0
0
5
10
15
Female weight (kg)

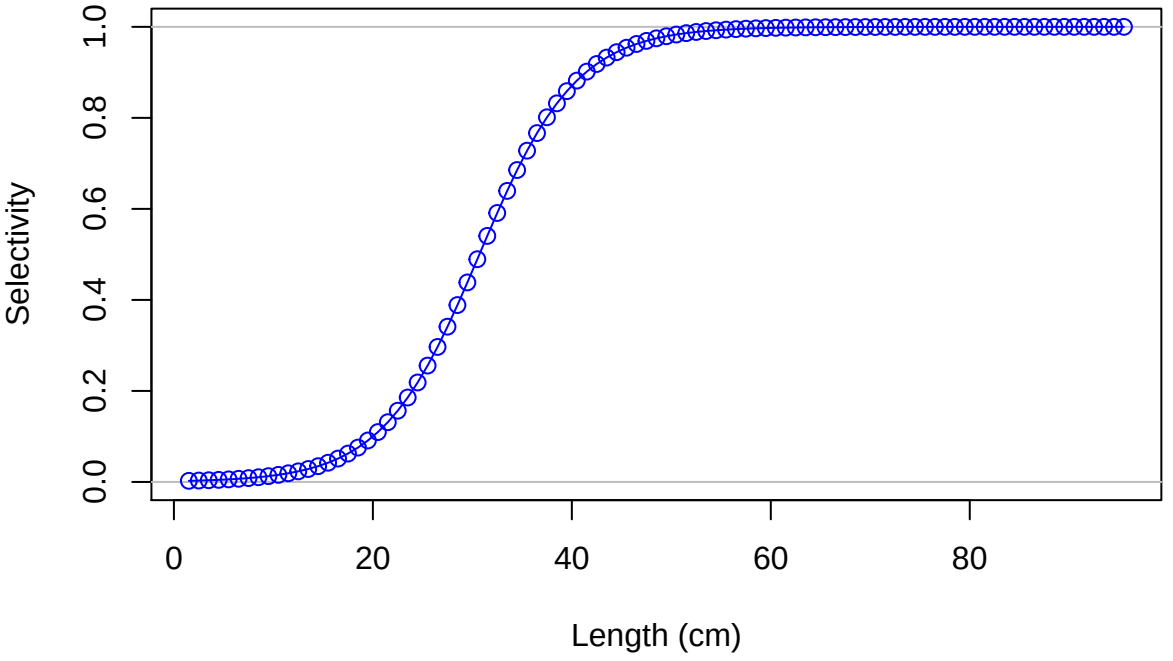

Fecundity
0
5
10
15
20
0
20
40
60
80
Female length (cm)

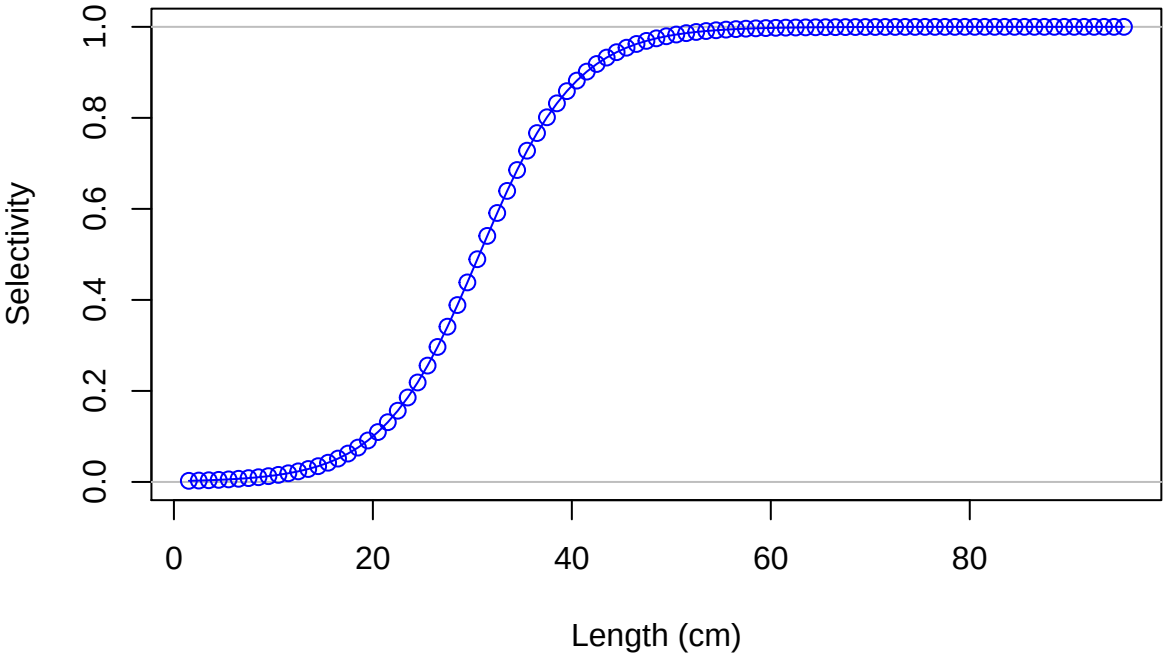

Spawning output
20
15
10
5
0
0
20
40
60
80
Length (cm)

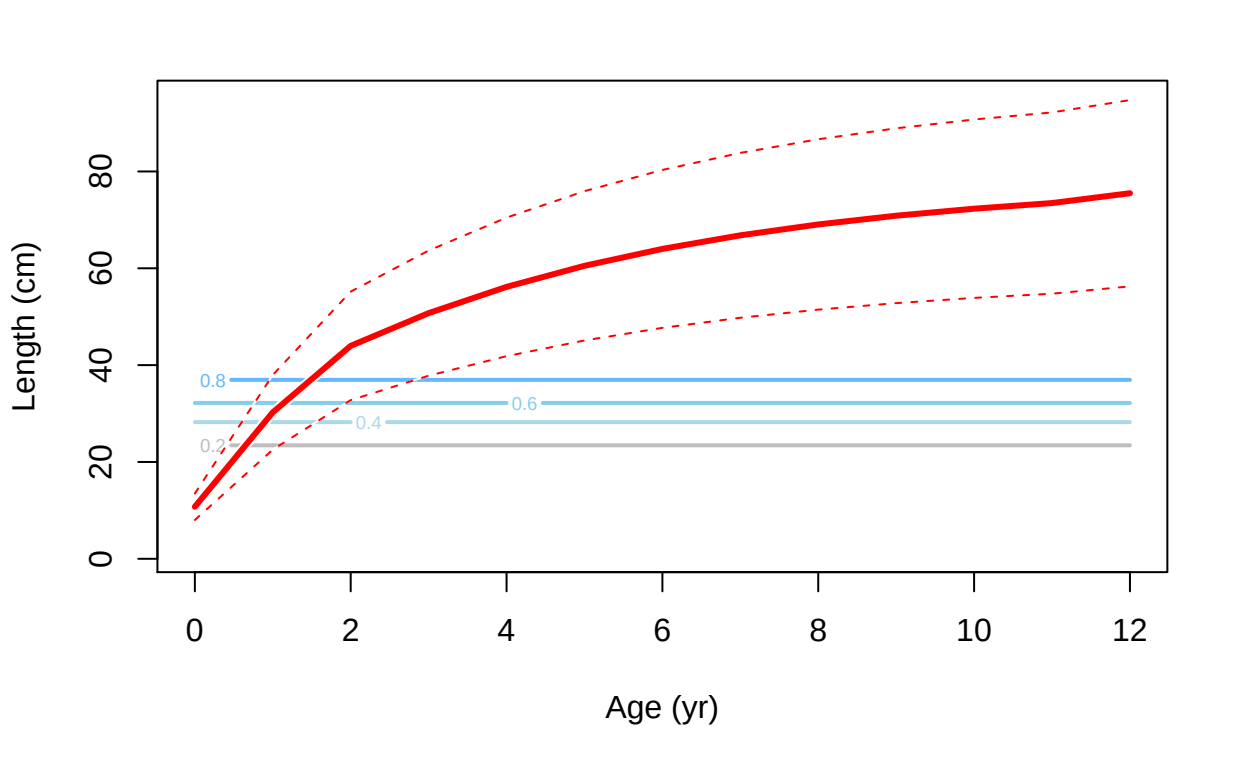

Spawning output
0
2
4
6
8
10
0
2
4
6
8
10
12
Age (yr)

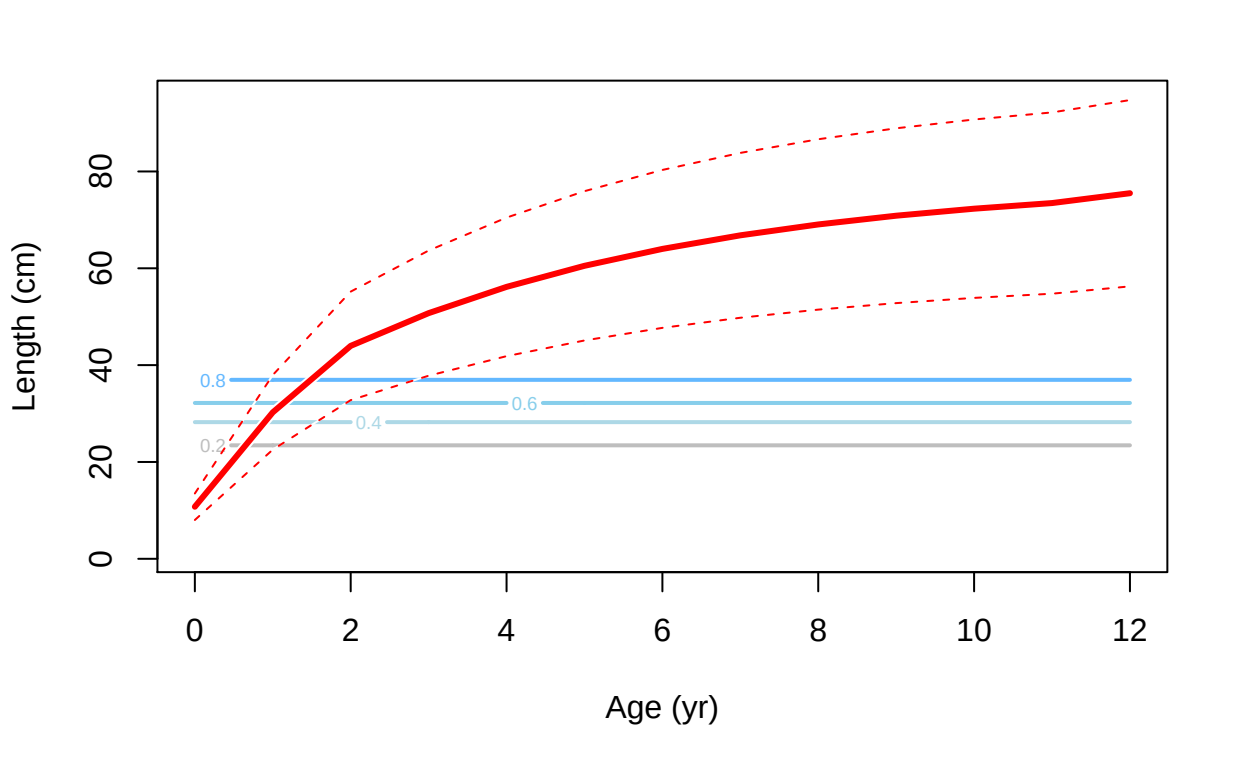

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
Length (cm)
FISHERY
SURVEY2

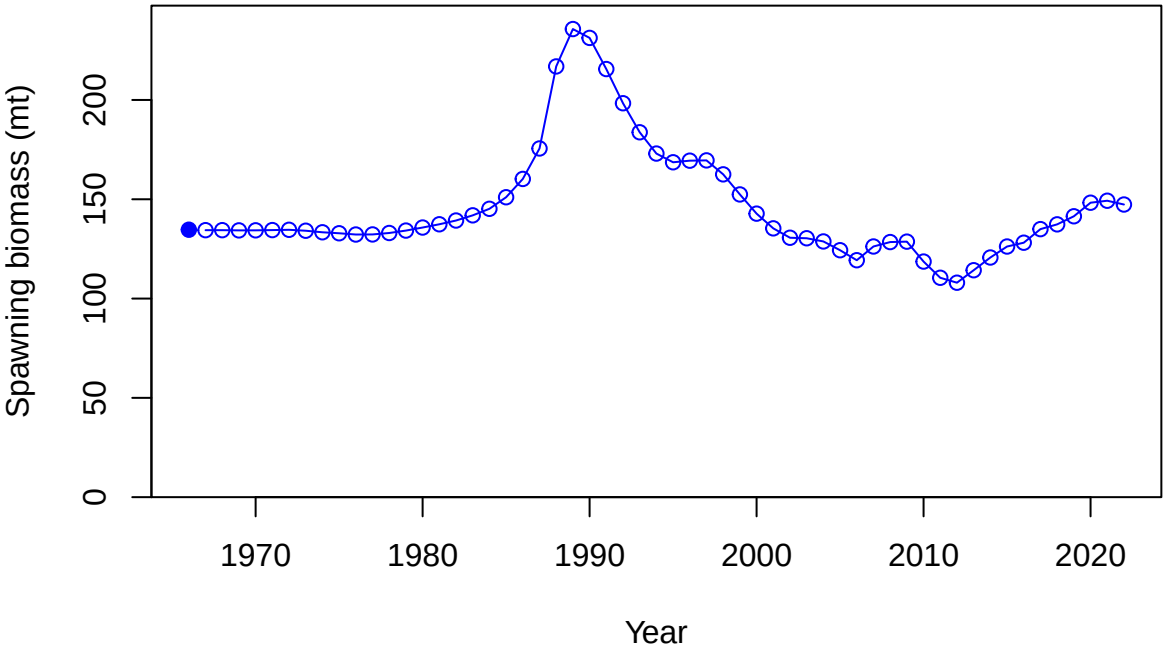

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
Age (yr)
FISHERY
SURVEY2

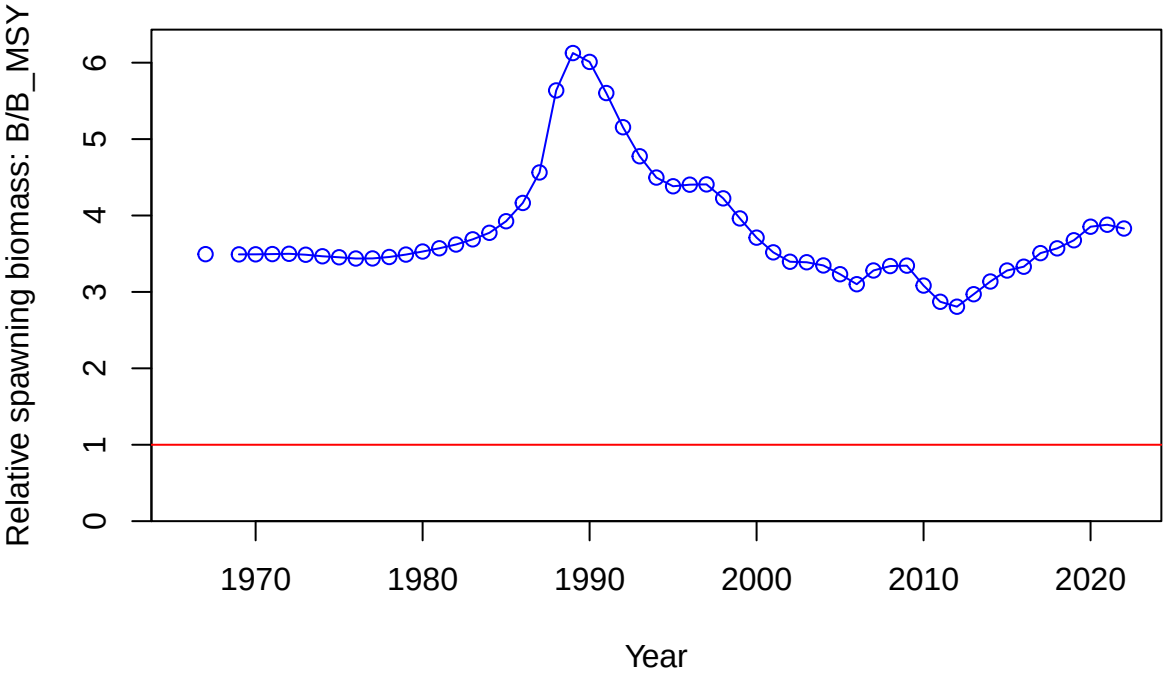

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
Length (cm)

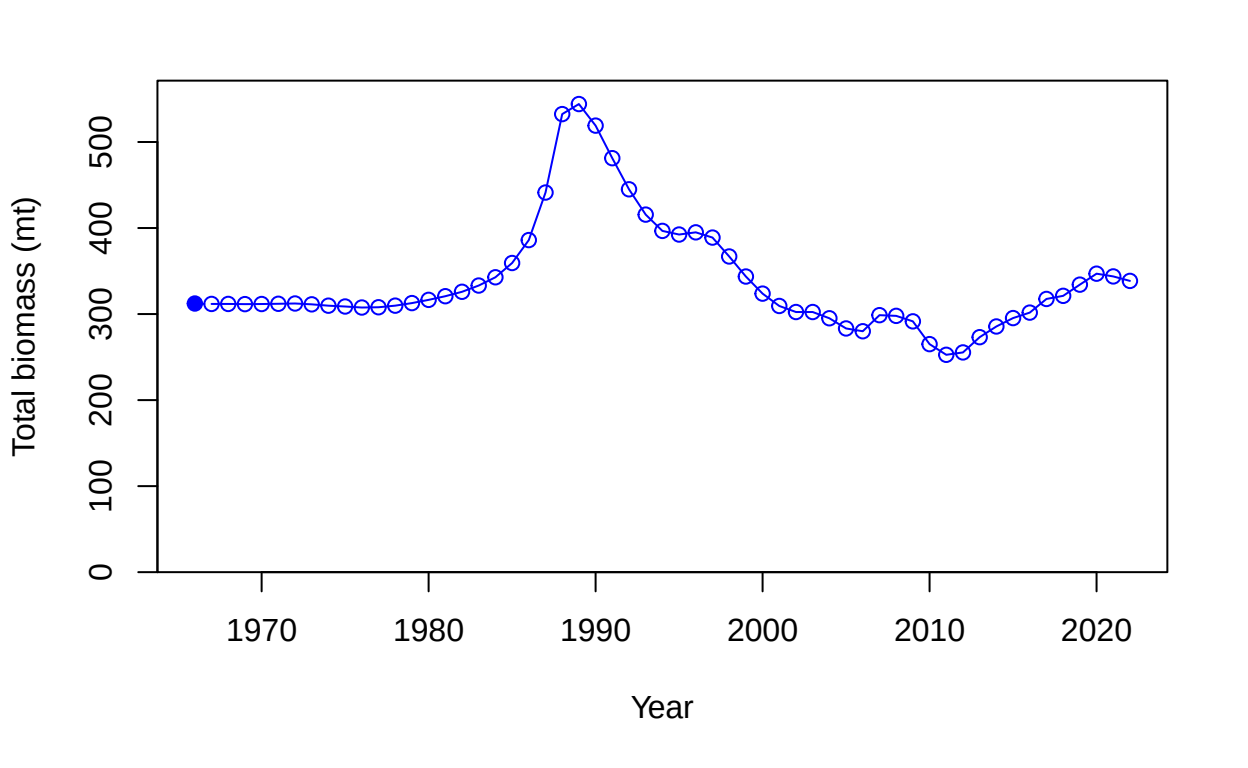

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
Length (cm)

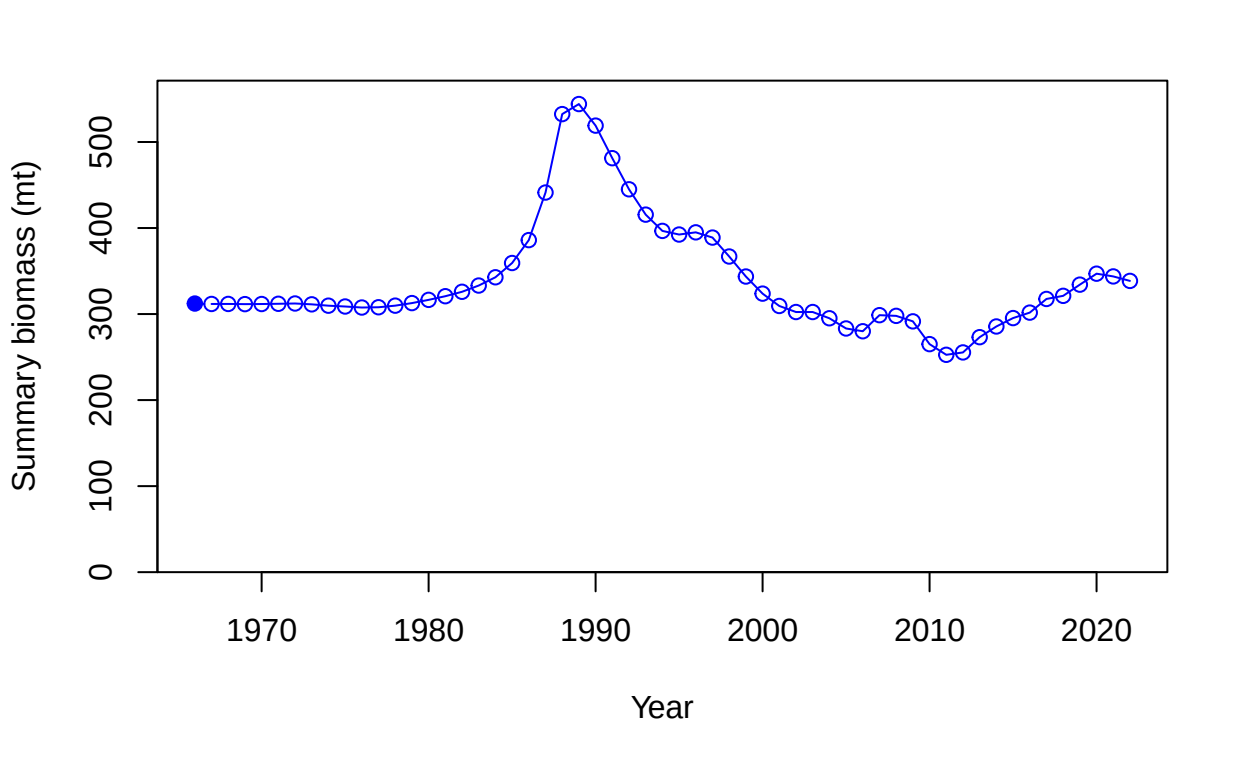

Length (cm)
0
20
40
60
80
0
2
4
6
8
10
12
Age (yr)
0.8
0.6
0.4
0.2

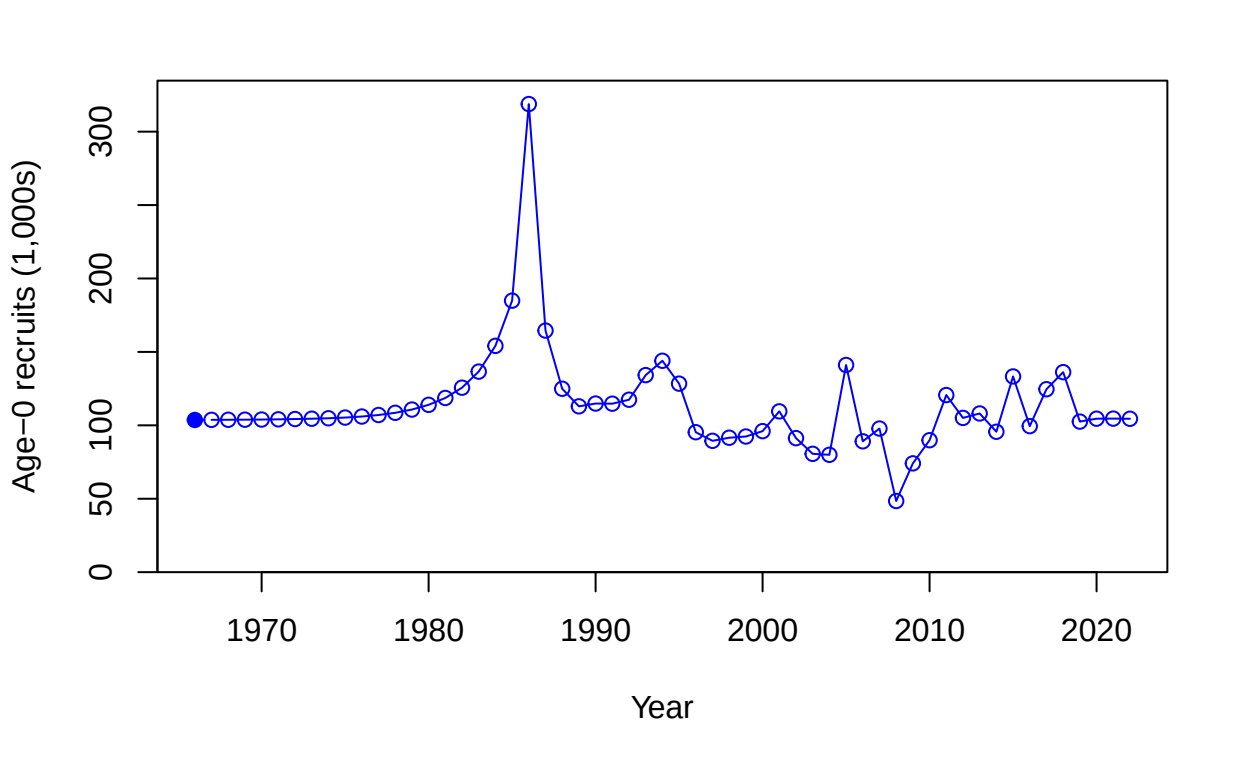

Length (cm)
0
20
40
60
80
0
2
4
6
8
10
12
Age (yr)
0.8
0.6
0.4
0.2

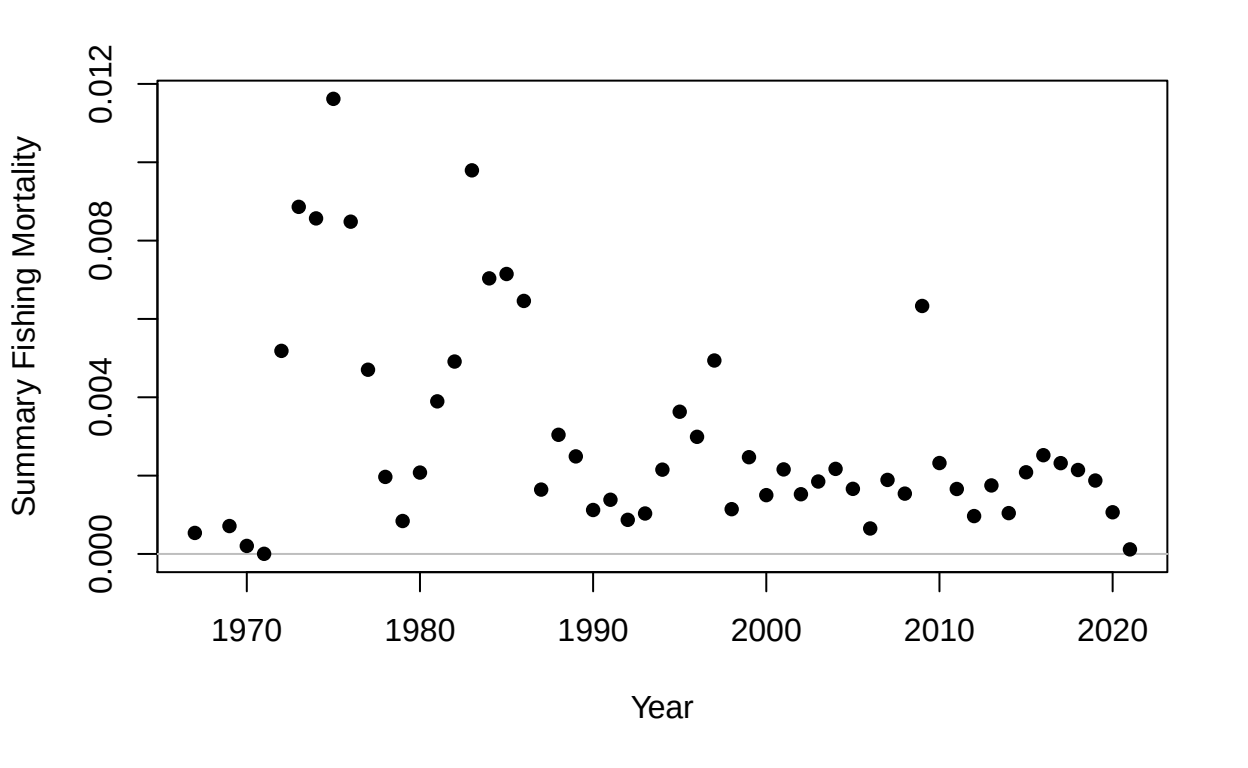

Spawning biomass (mt)
0
50
100
150
200
1970
1980
1990
2000
2010
2020
Year

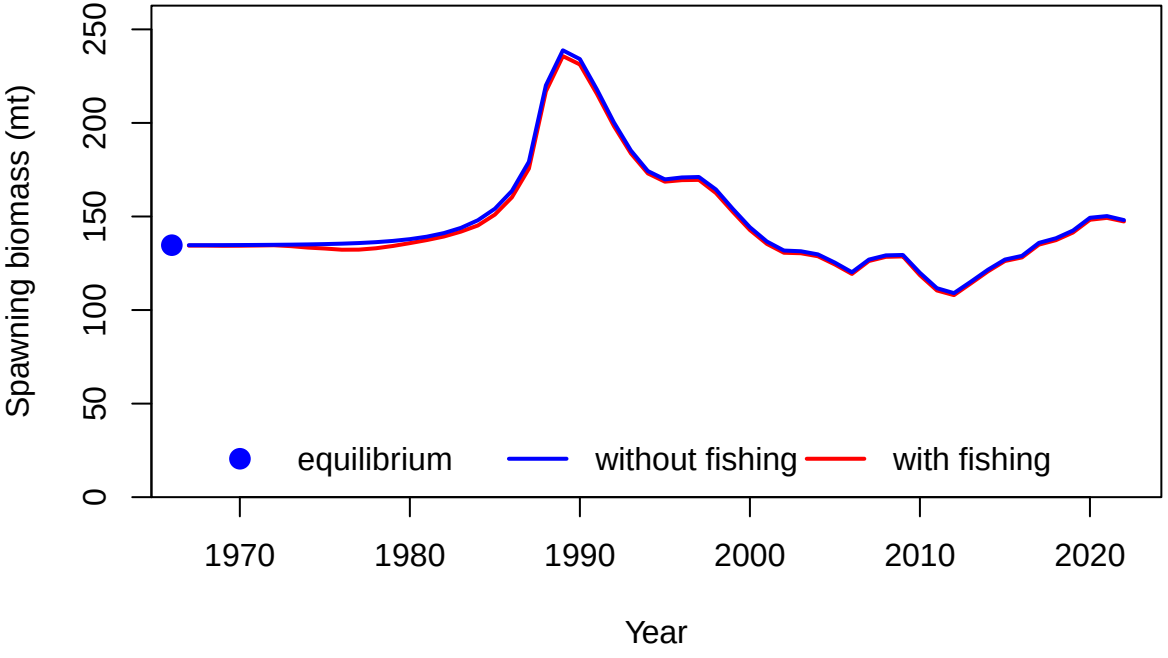

Relative spawning biomass: B/B_MSY
0
1
2
3
4
5
6
1970
1980
1990
2000
2010
2020
Year

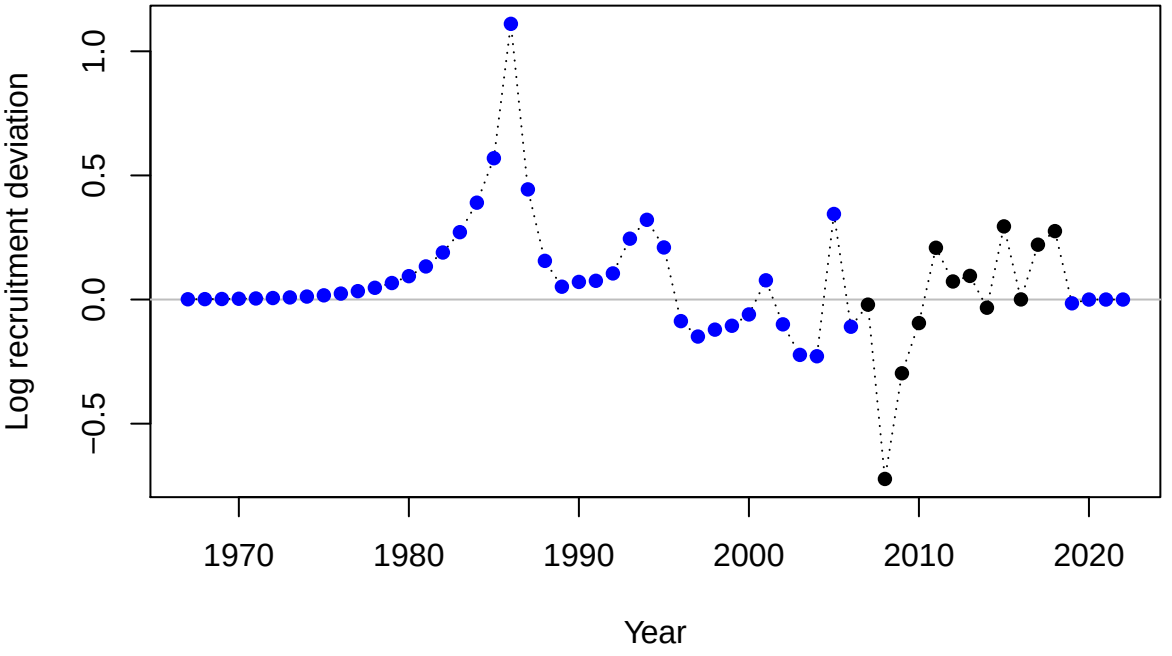

Total biomass (mt)
0
100
200
300
400
500
1970
1980
1990
2000
2010
2020
Year

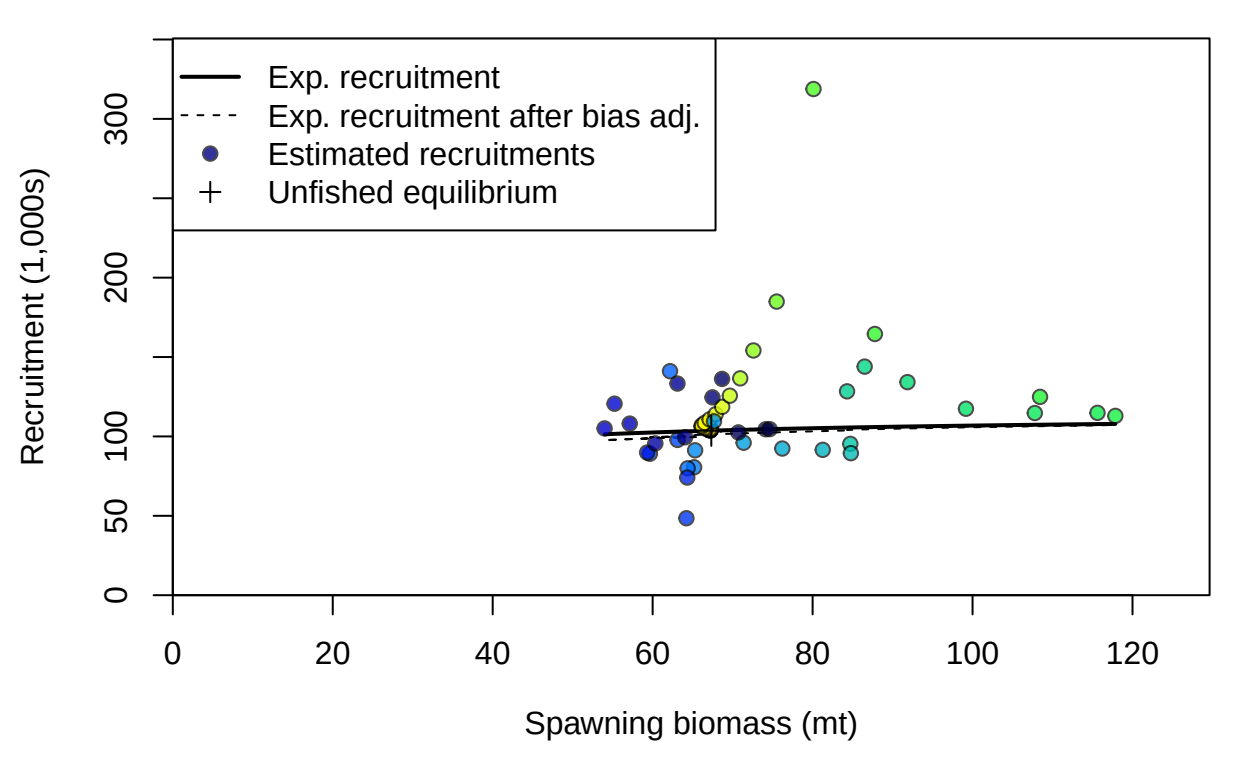

Summary biomass (mt)
0
100
200
300
400
500
1970
1980
1990
2000
2010
2020
Year

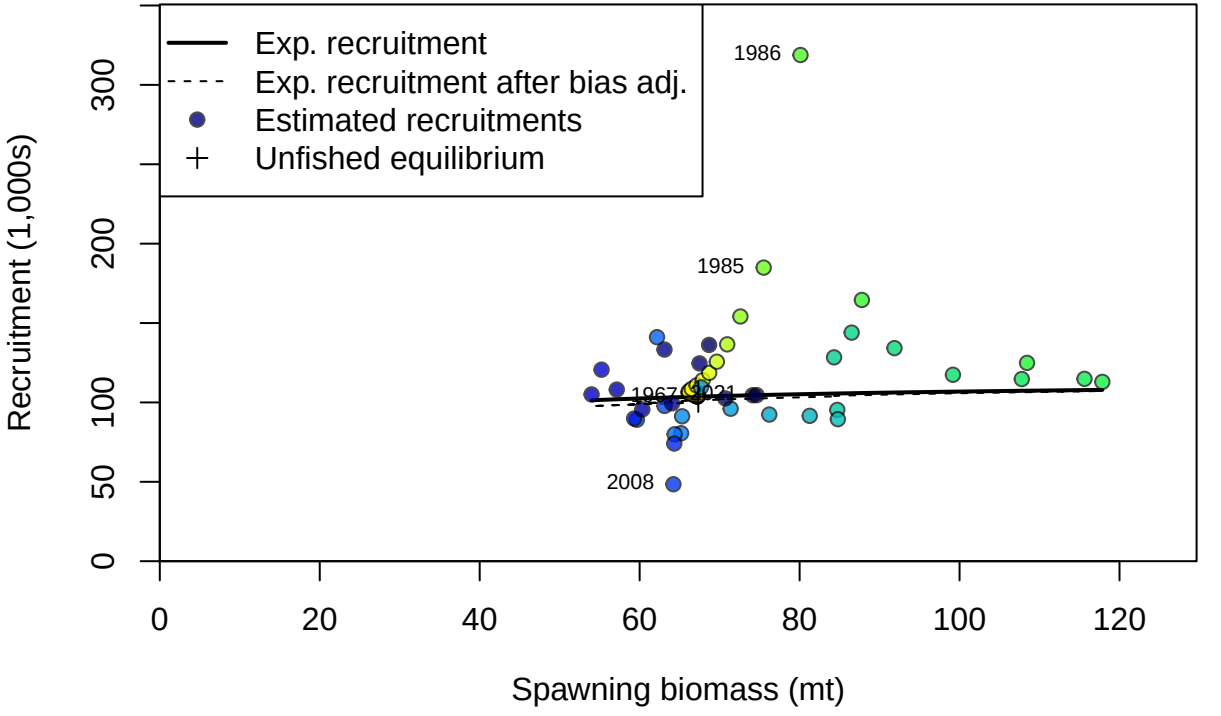

Age−0 recruits (1,000s)
0
50
100
200
300
1970
1980
1990
2000
2010
2020
Year

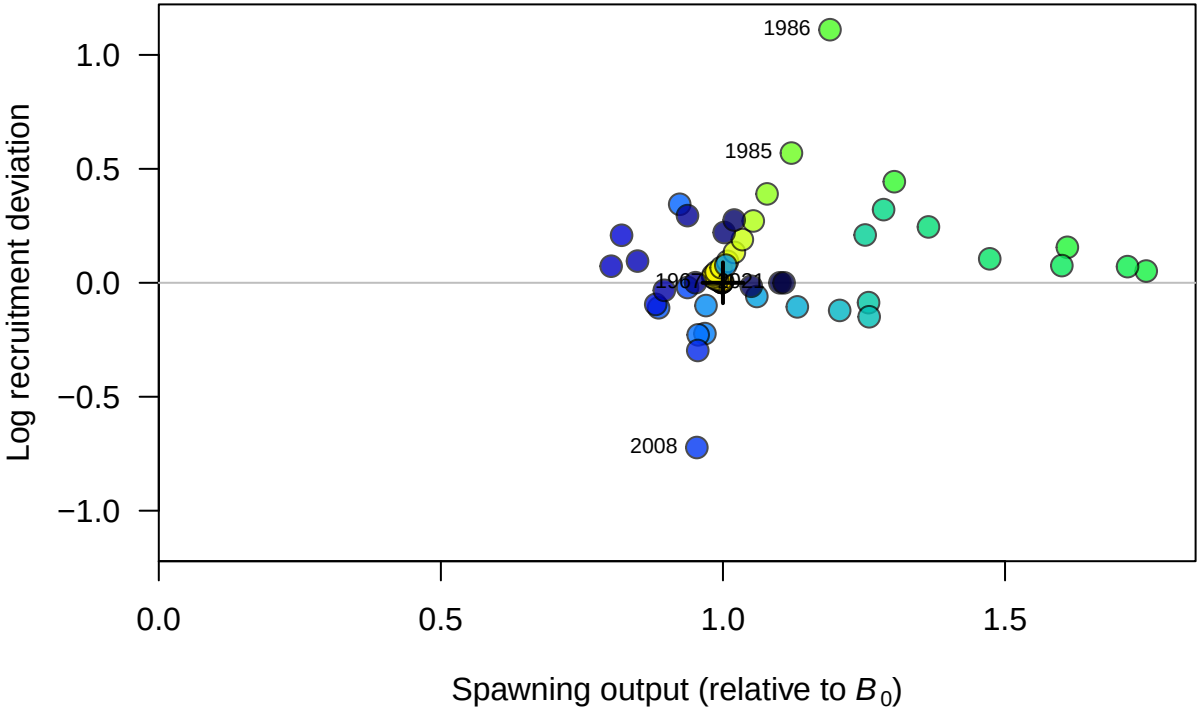

Summary Fishing Mortality
0.000
0.004
0.008
0.012
1970
1980
1990
2000
2010
2020
Year

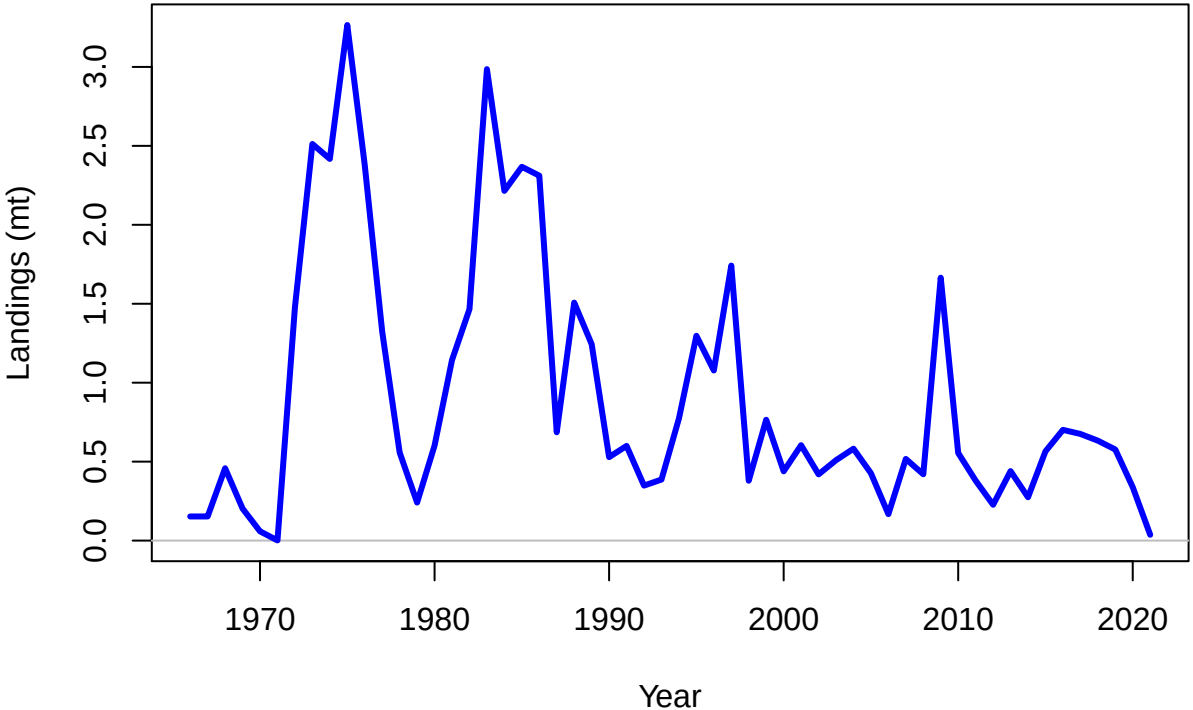

Spawning biomass (mt)
0
50
100
150
200
250
1970
1980
1990
2000
2010
2020
Year
equilibrium
without fishing
with fishing

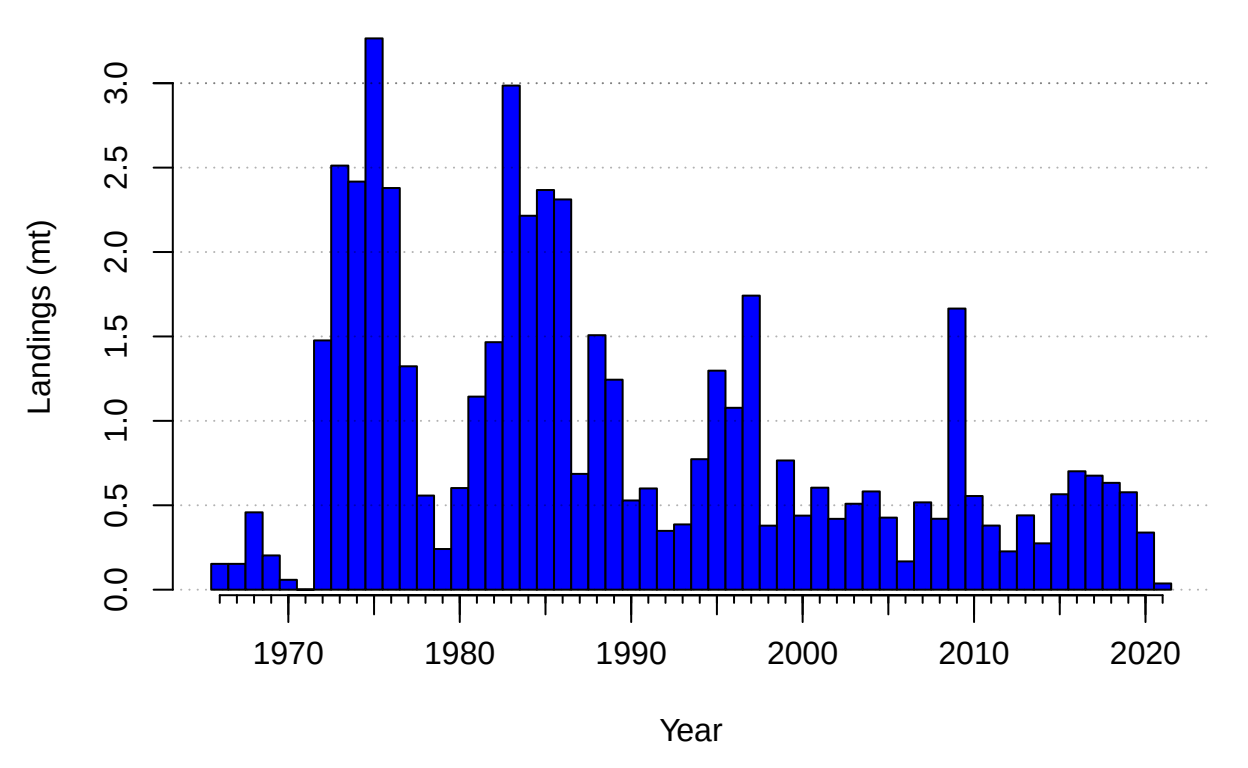

Log recruitment deviation
1.0
0.5
0.0
−0.5
1970
1980
1990
2000
2010
2020
Year

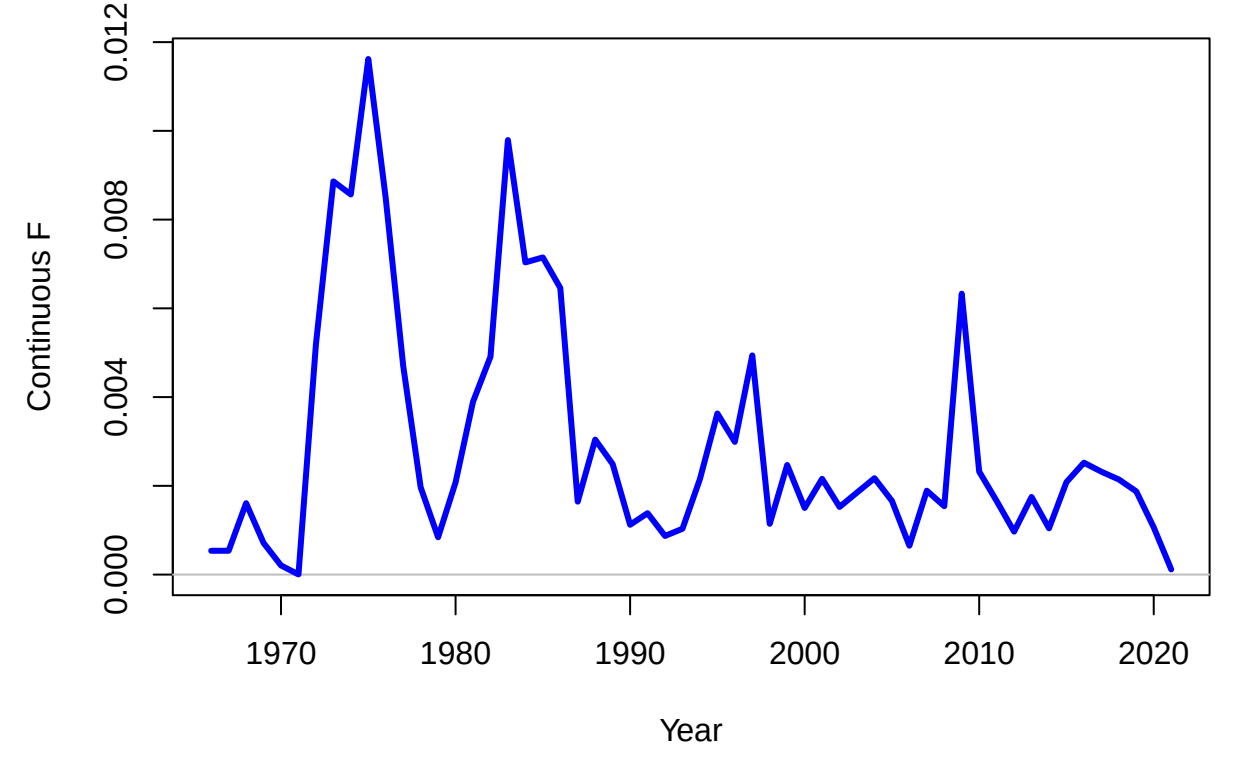

Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium
Recruitment (1,000s)
0
50
100
200
300
0
20
40
60
80
100
120
Spawning biomass (mt)

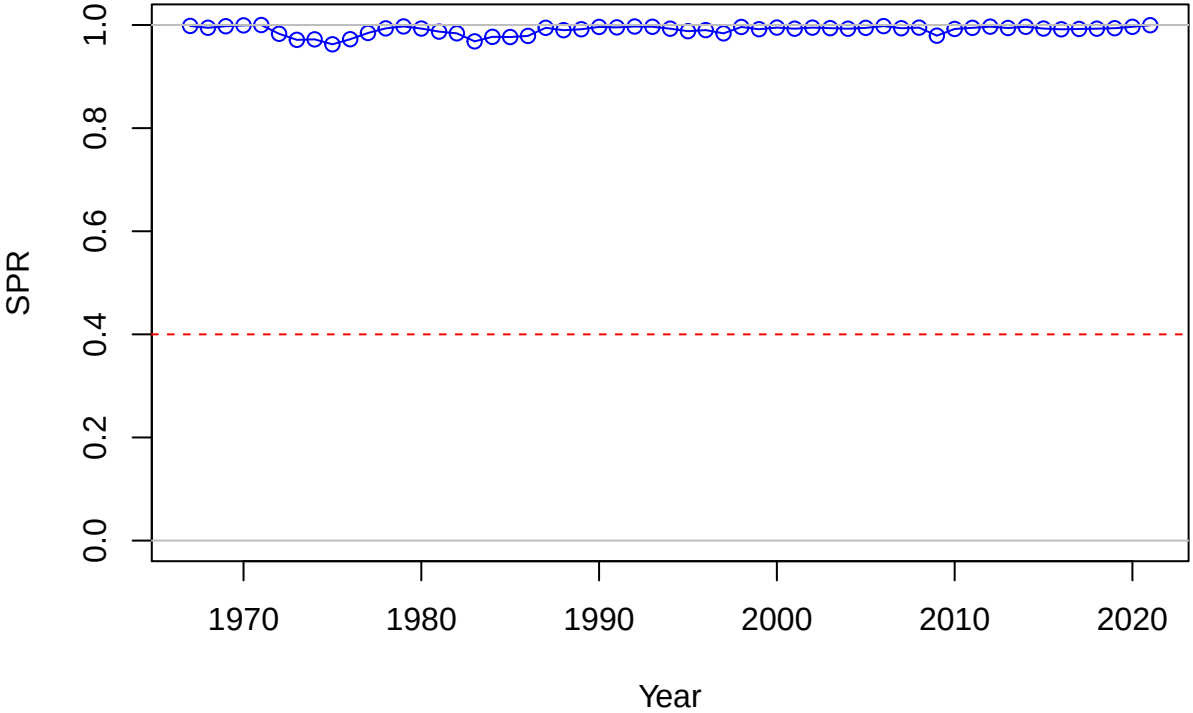

Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium
1986
1985
1967
2021
2008
Recruitment (1,000s)
0
50
100
200
300
0
20
40
60
80
100
120
Spawning biomass (mt)

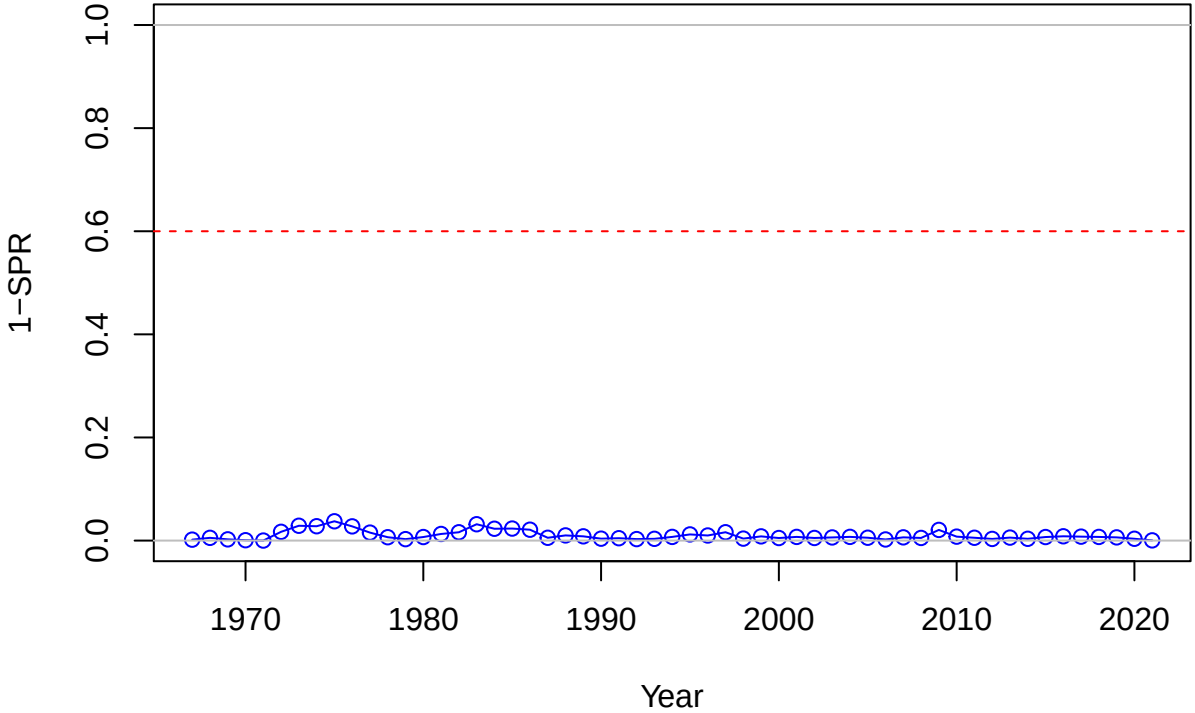

1986
1985
2008
1.0
0.5
0.0
−0.5
−1.0
Log recruitment deviation
0.0
0.5
1.0
1.5
Spawning output (relative to B_0)

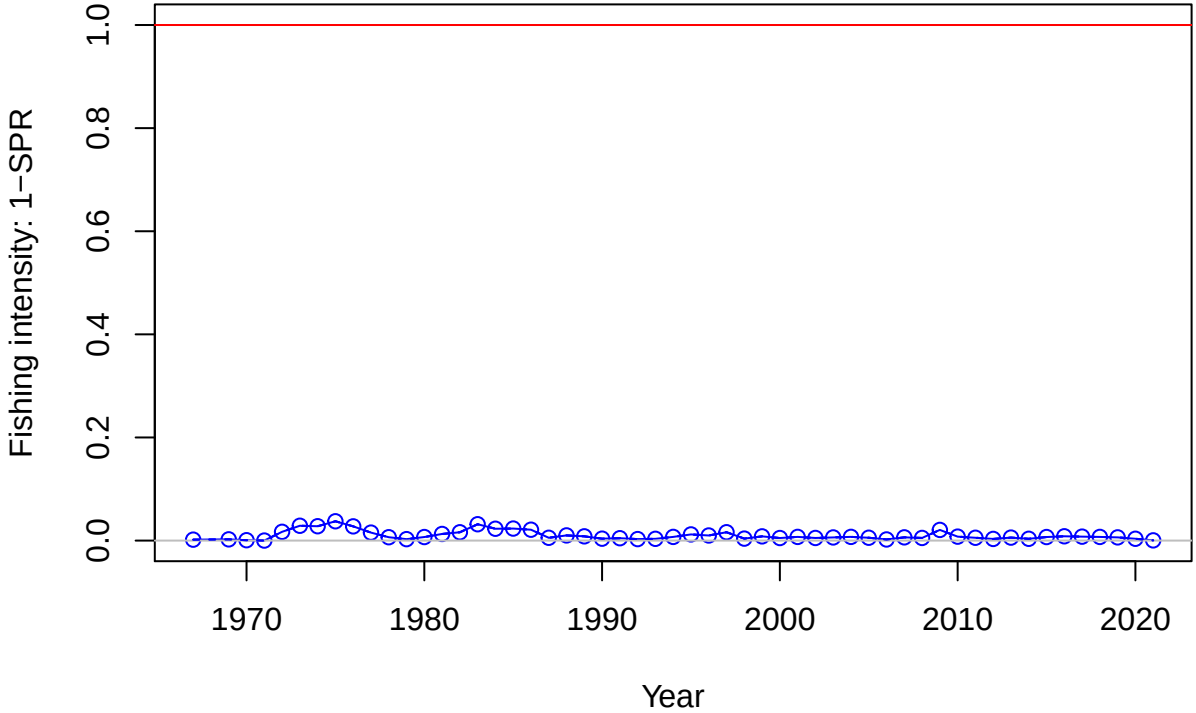

Landings (mt)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

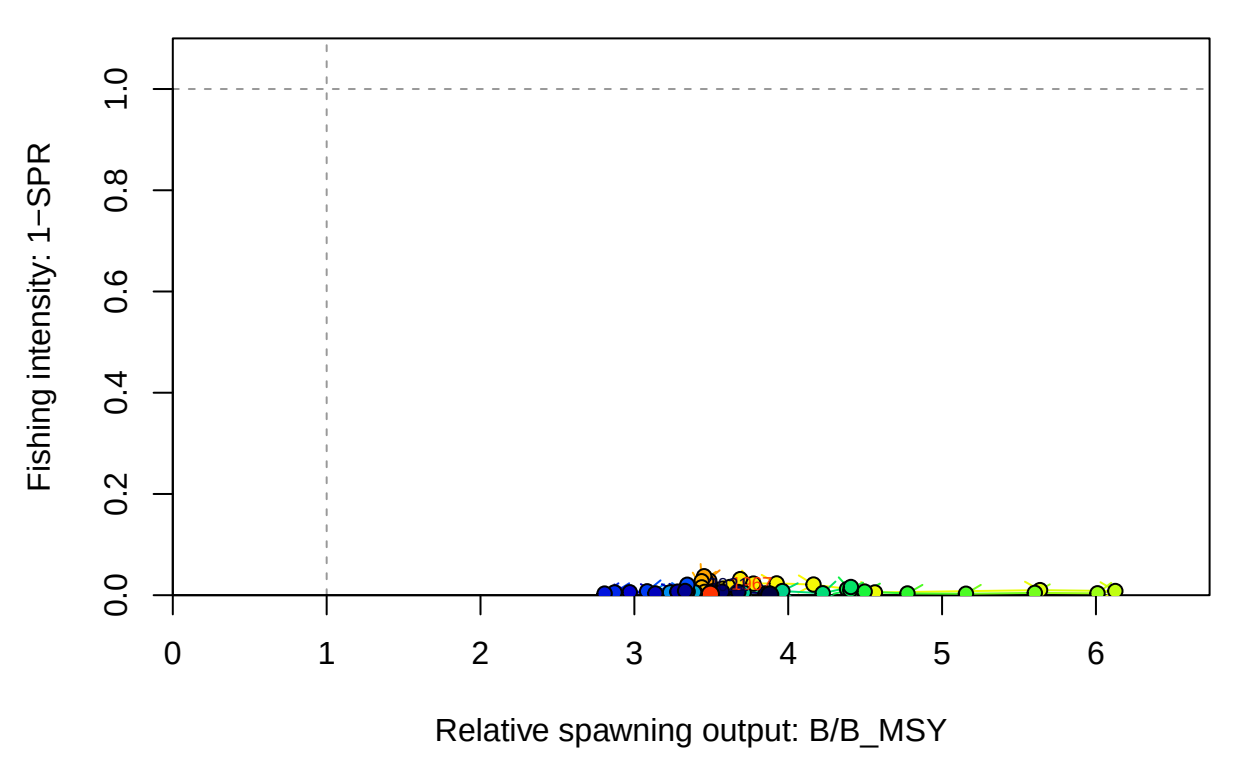

Landings (mt)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

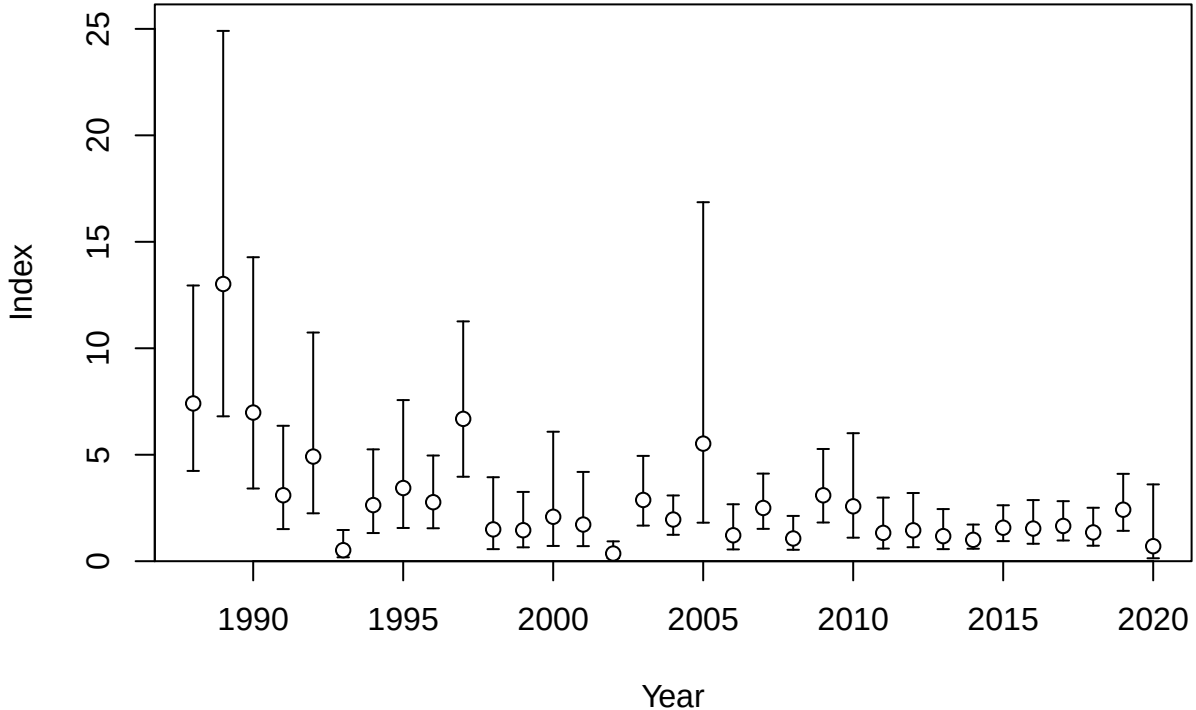

Continuous F
0.000
0.004
0.008
0.012
1970
1980
1990
2000
2010
2020
Year

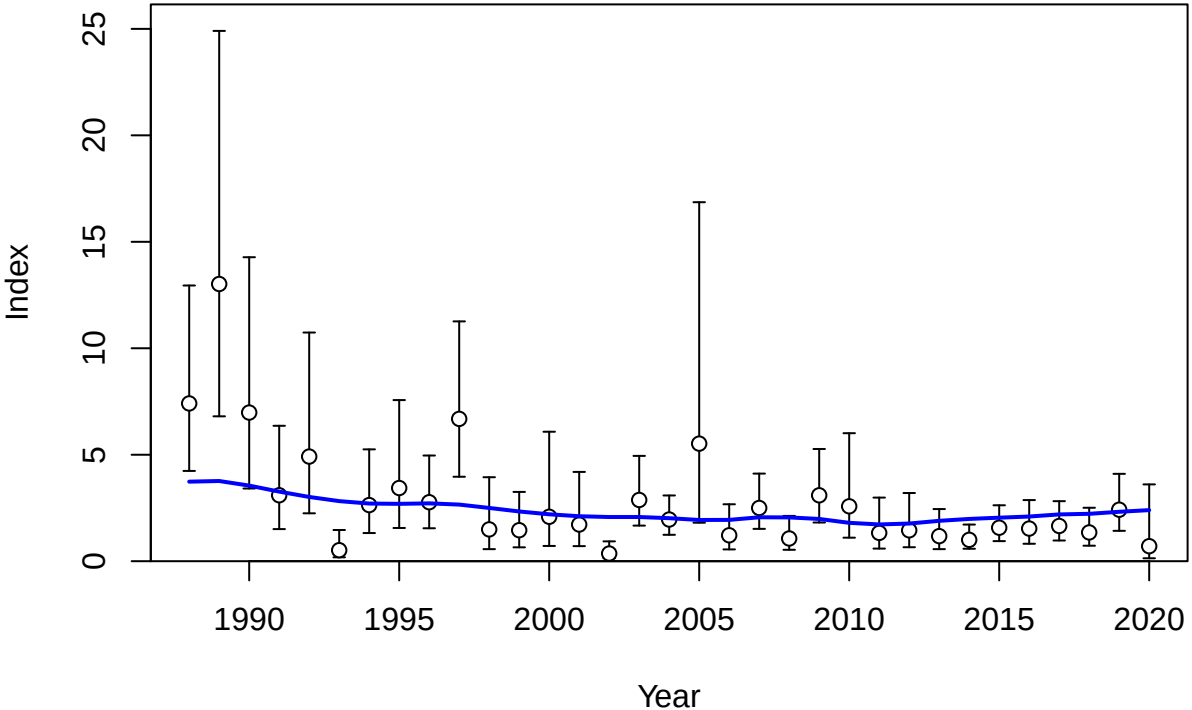

SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

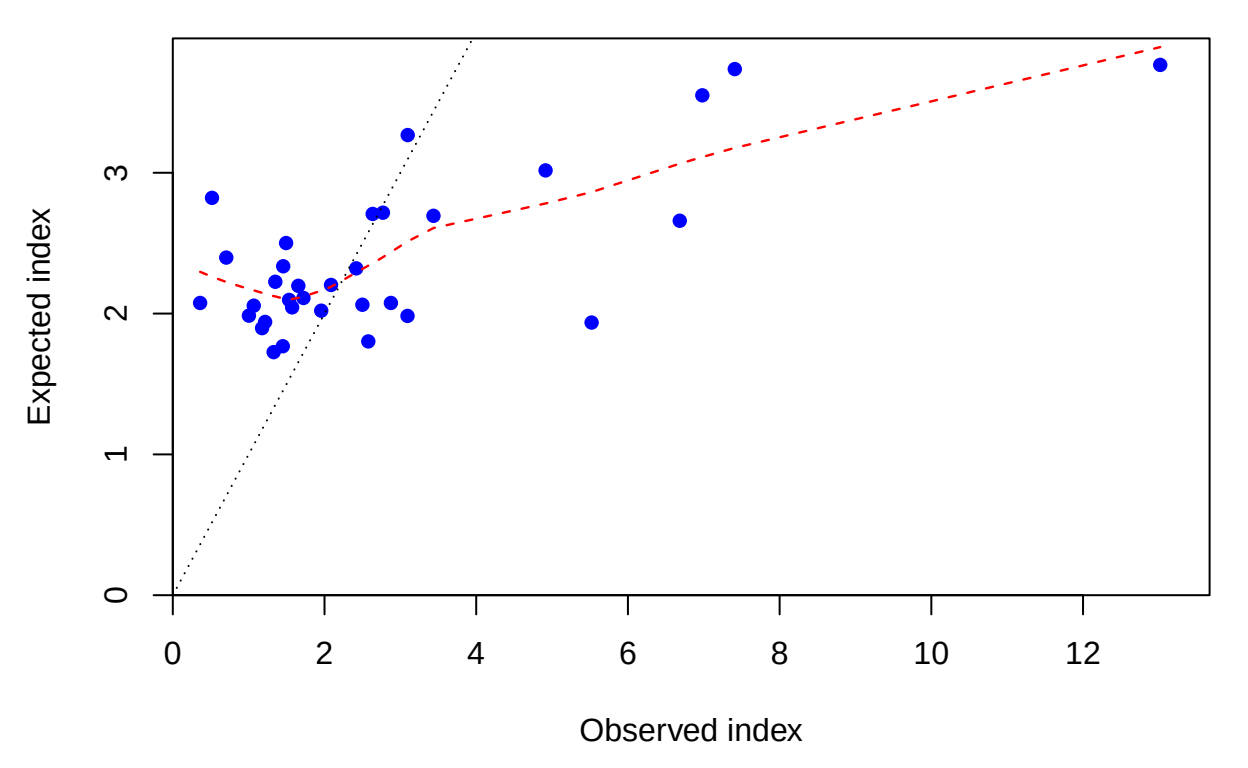

1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

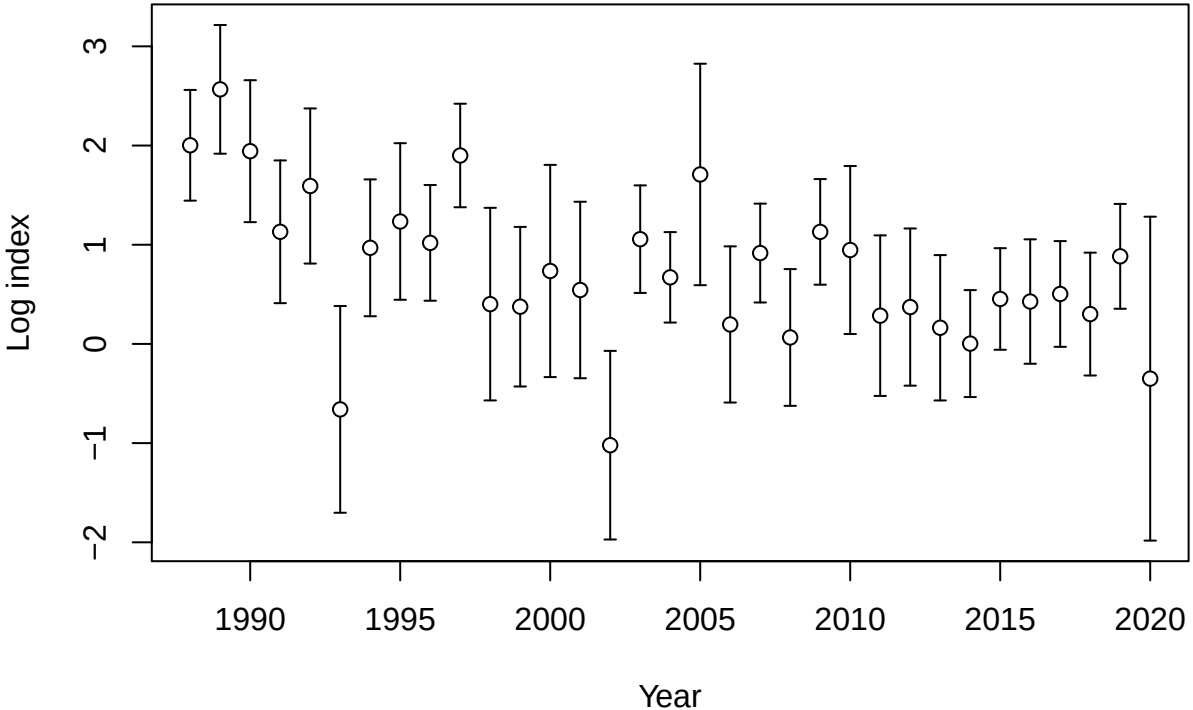

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

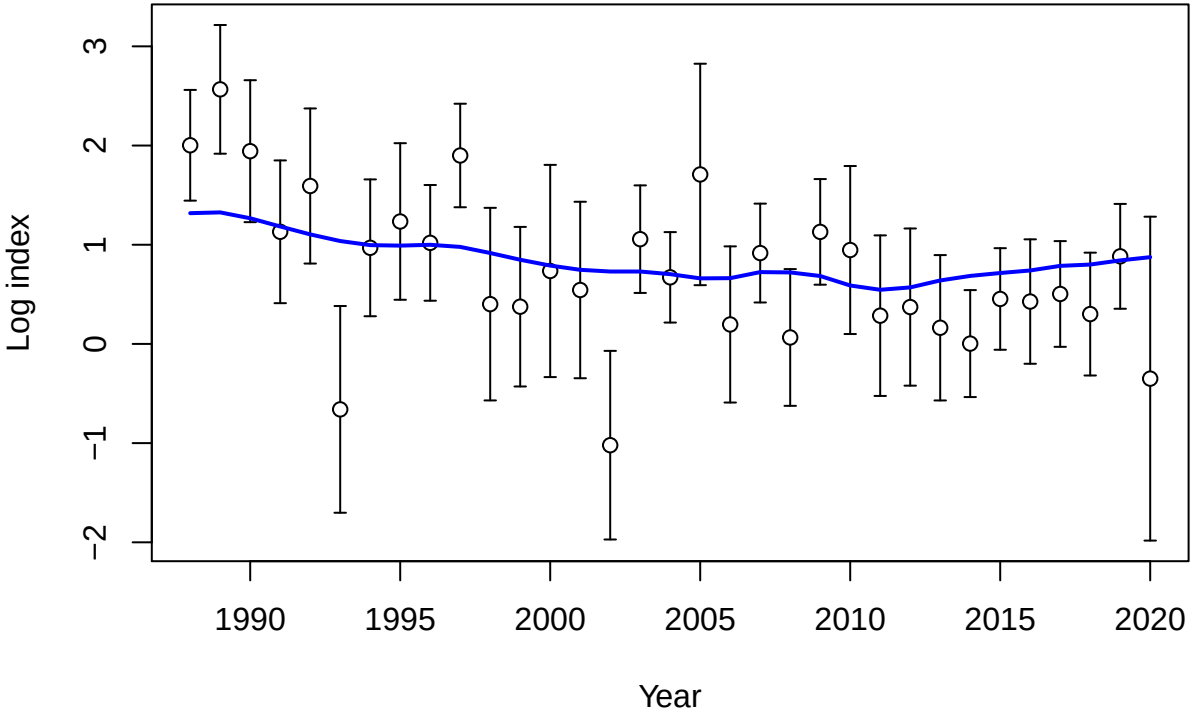

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
6
Relative spawning output: B/B_MSY

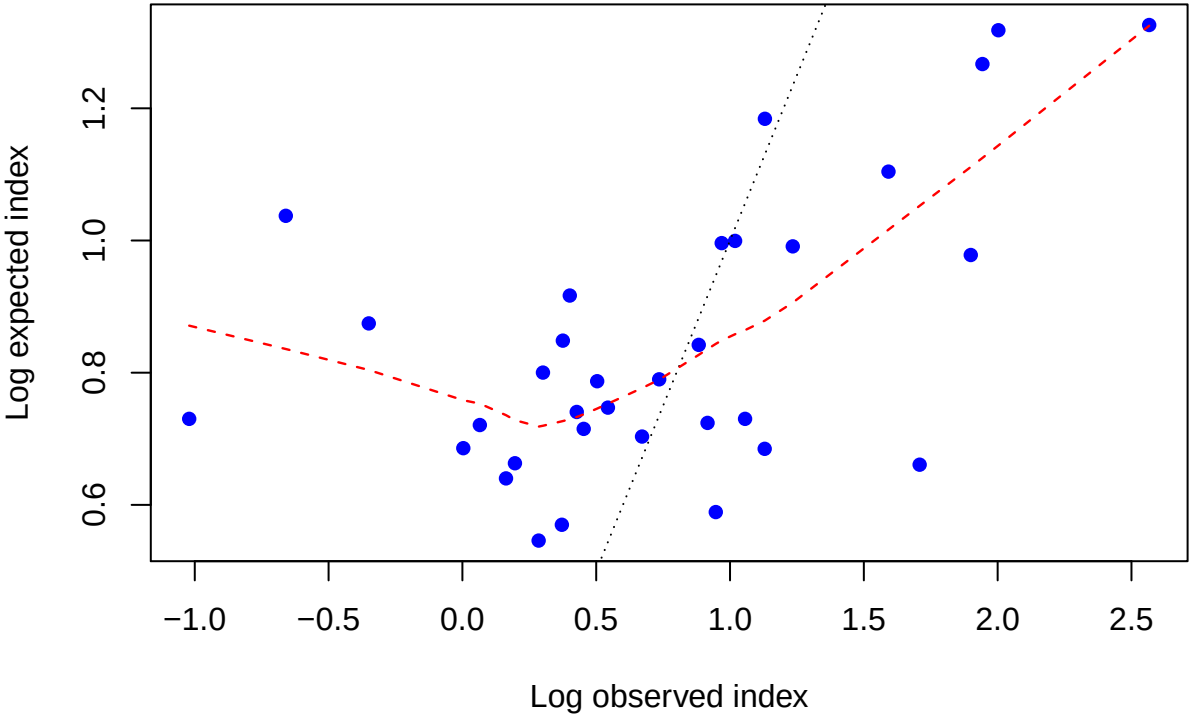

Index
0
5
10
15
20
25
1990
1995
2000
2005
2010
2015
2020
Year

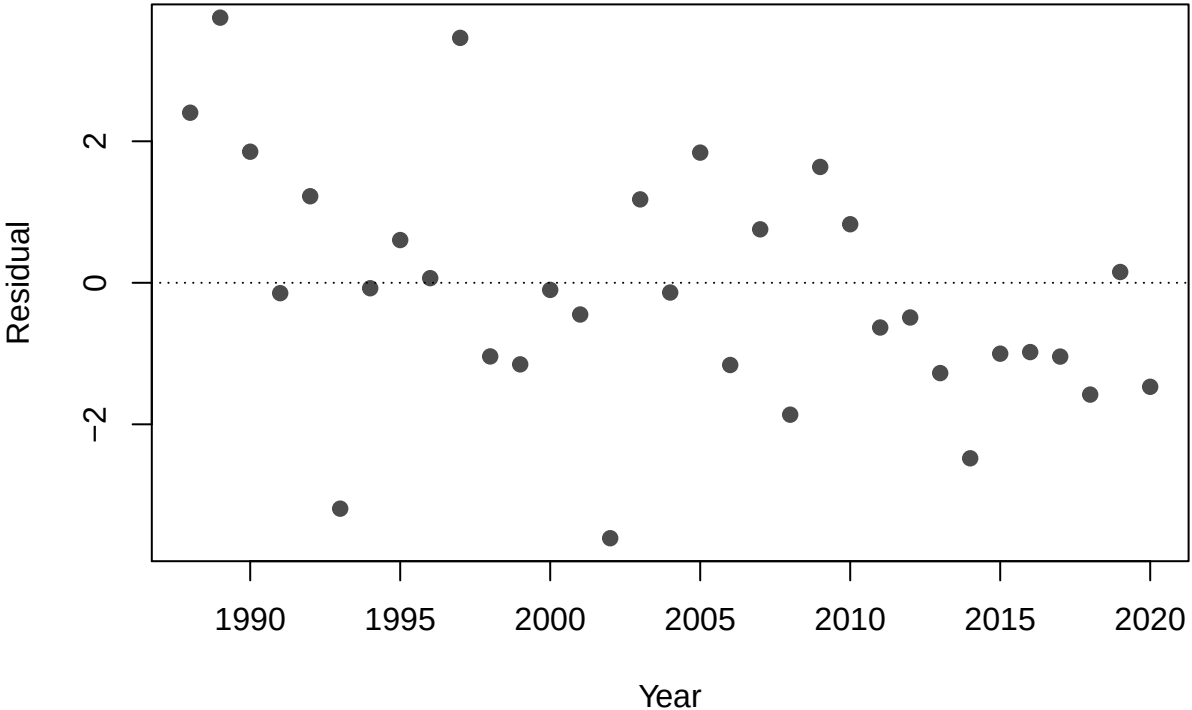

Index
0
5
10
15
20
25
1990
1995
2000
2005
2010
2015
2020
Year

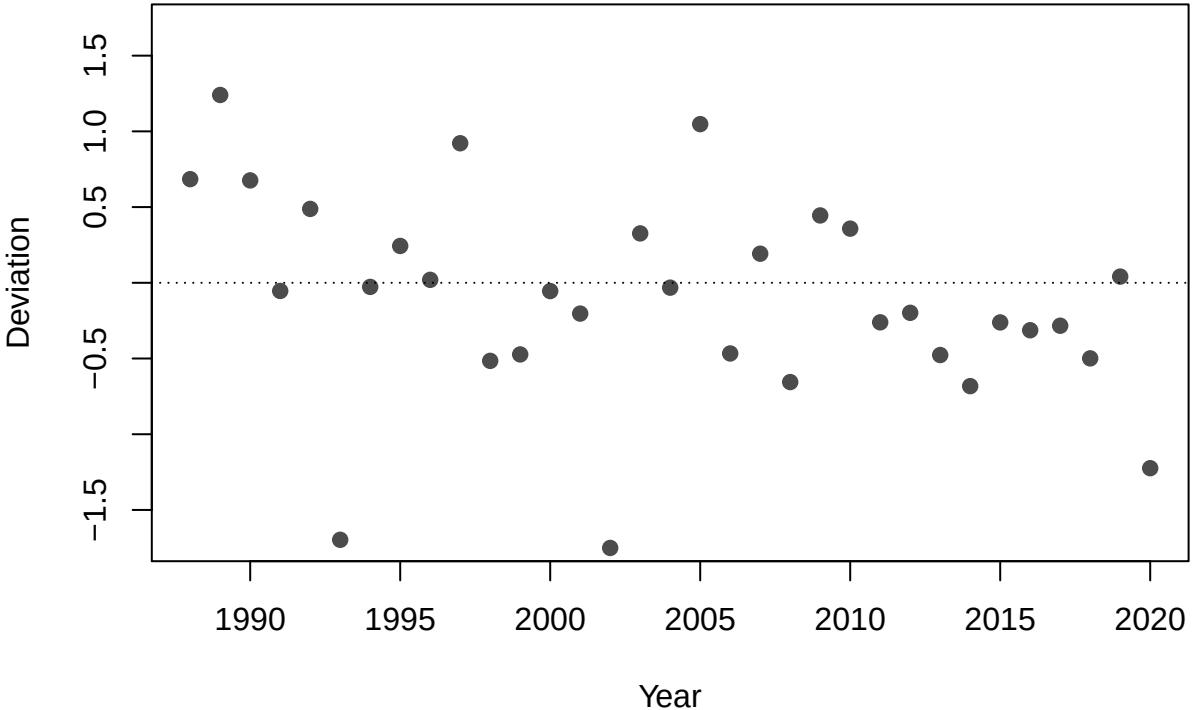

Expected index
Observed index
0
1
2
3
0
2
4
6
8
10
12

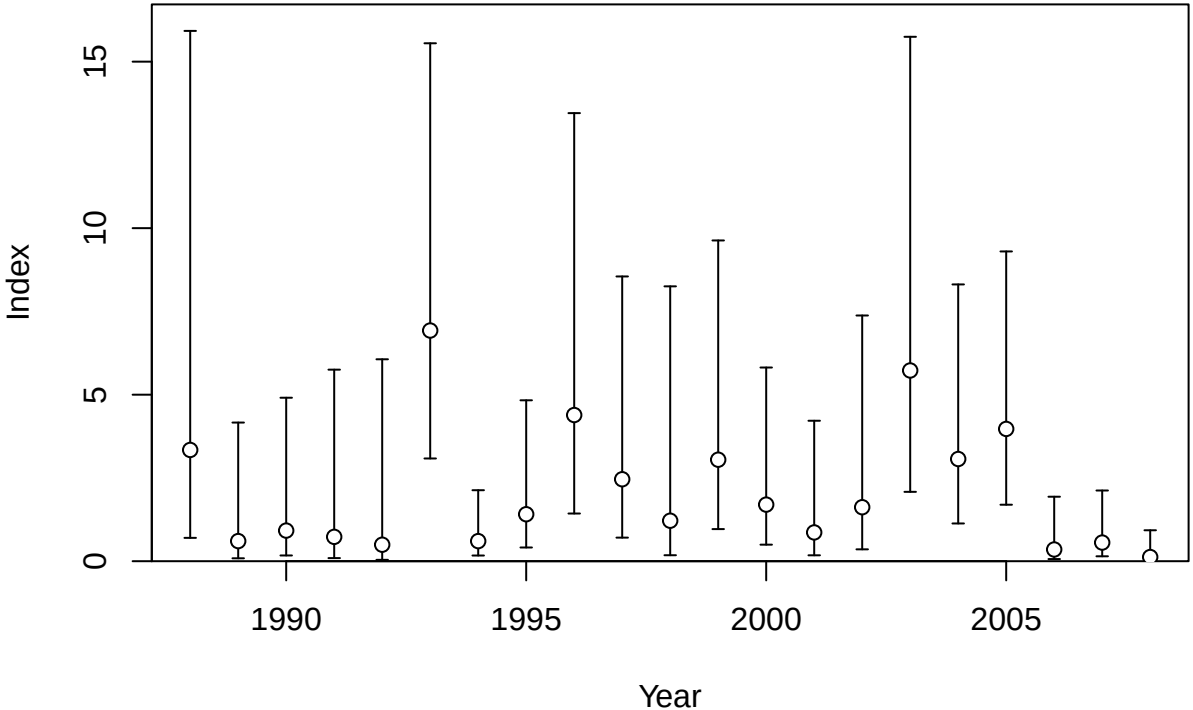

Log index
3
2
1
0
−1
−2
1990
1995
2000
2005
2010
2015
2020
Year

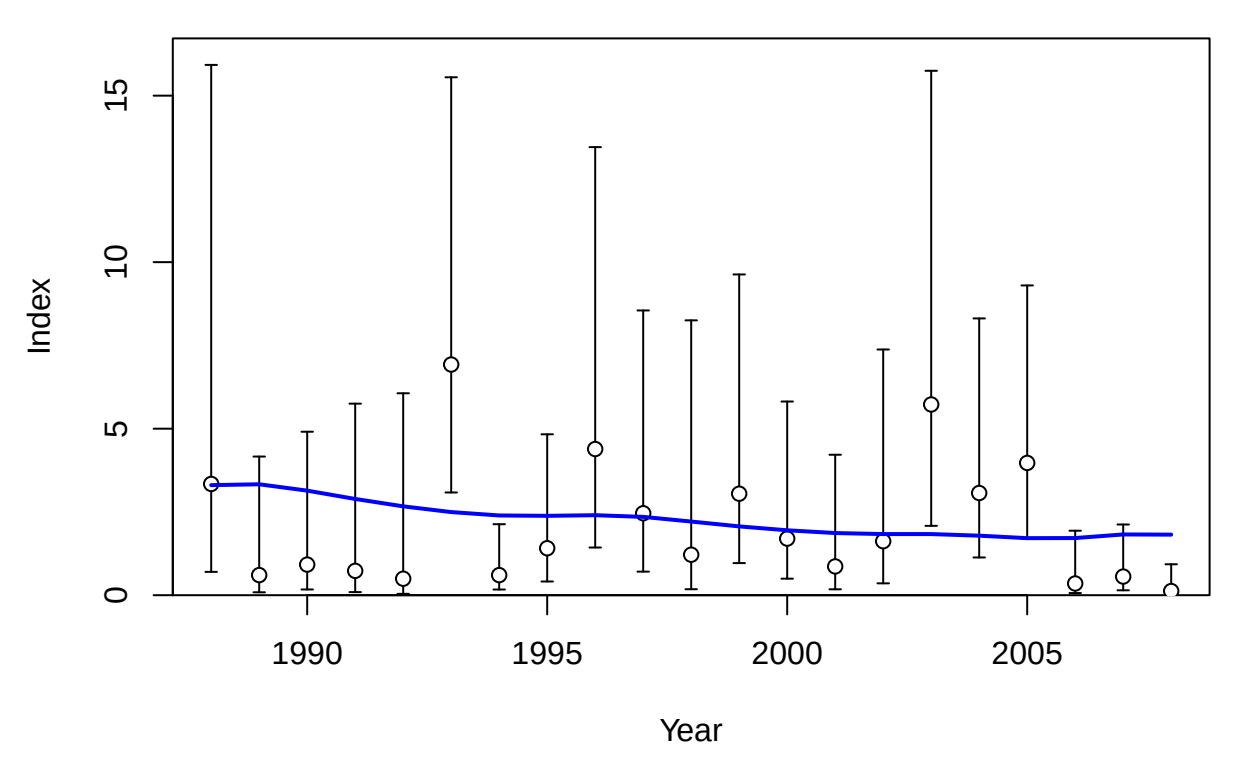

Log index
3
2
1
0
−1
−2
1990
1995
2000
2005
2010
2015
2020
Year

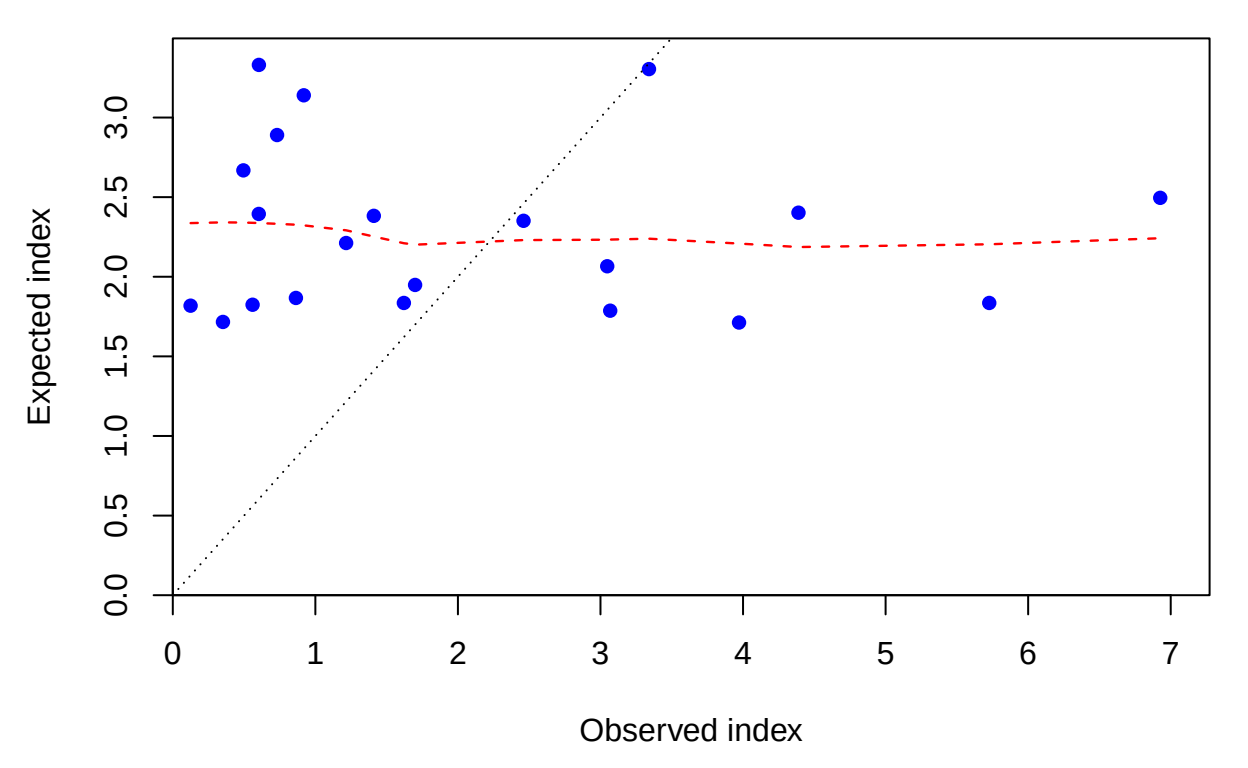

Log expected index
0.6
0.8
1.0
1.2
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
2.5
Log observed index

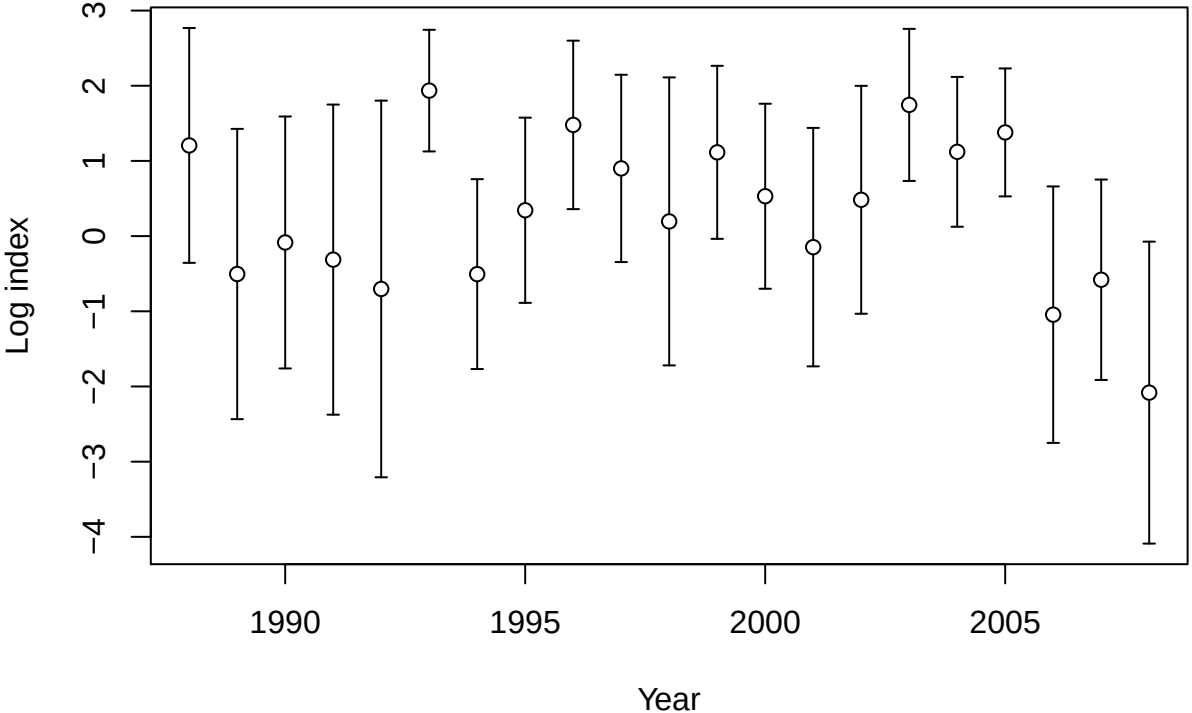

Residual
2
0
−2
1990
1995
2000
2005
2010
2015
2020
Year

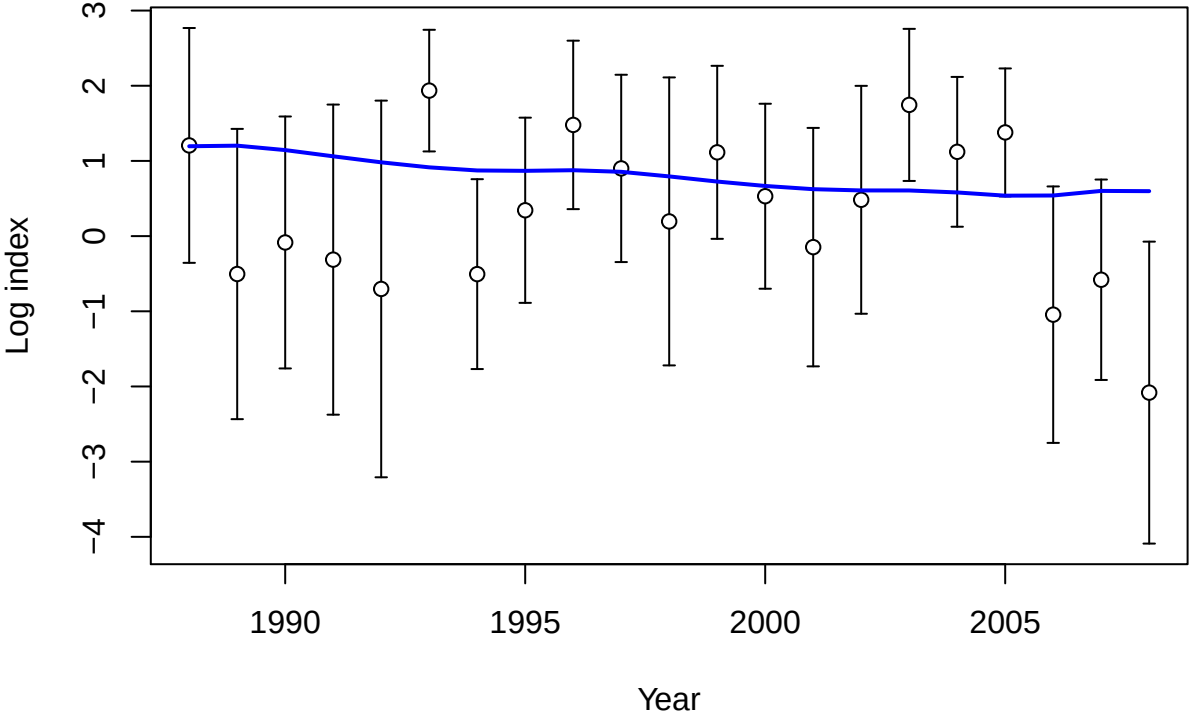

Deviation
1.5
1.0
0.5
−0.5
−1.5
1990
1995
2000
2005
2010
2015
2020
Year

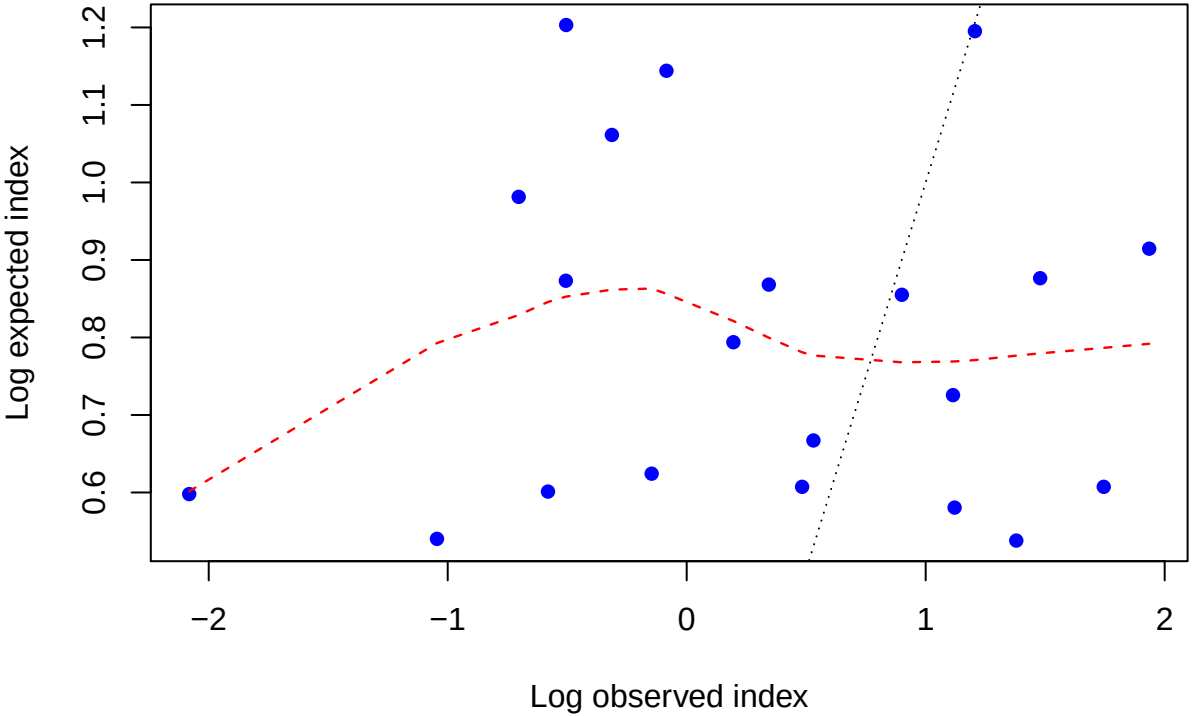

Index
0
5
10
15
1990
1995
2000
2005
Year

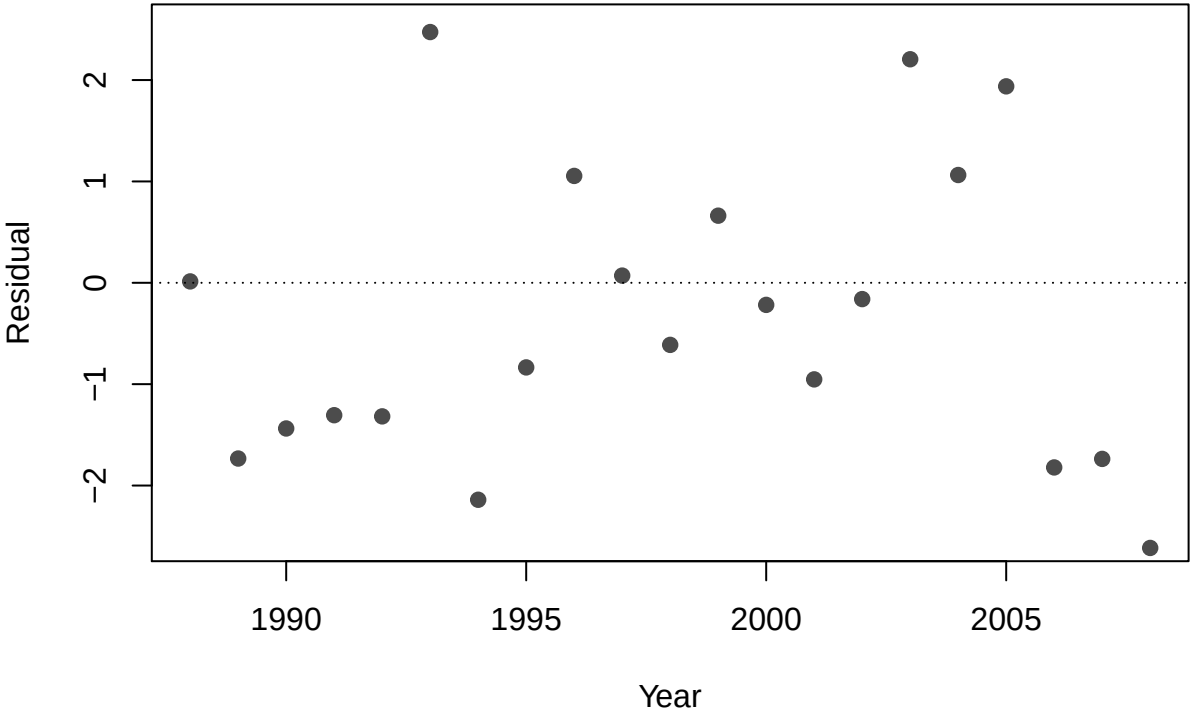

Index
0
5
10
15
1990
1995
2000
2005
Year

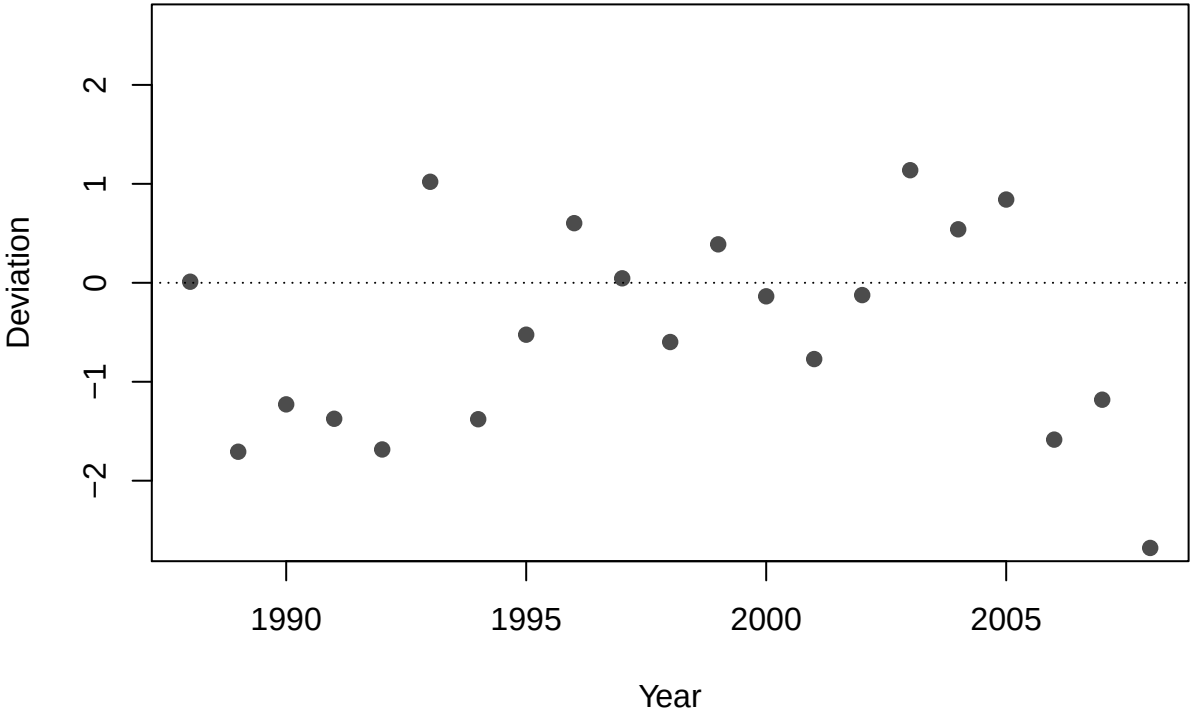

Expected index
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
1
2
3
4
5
6
7
Observed index

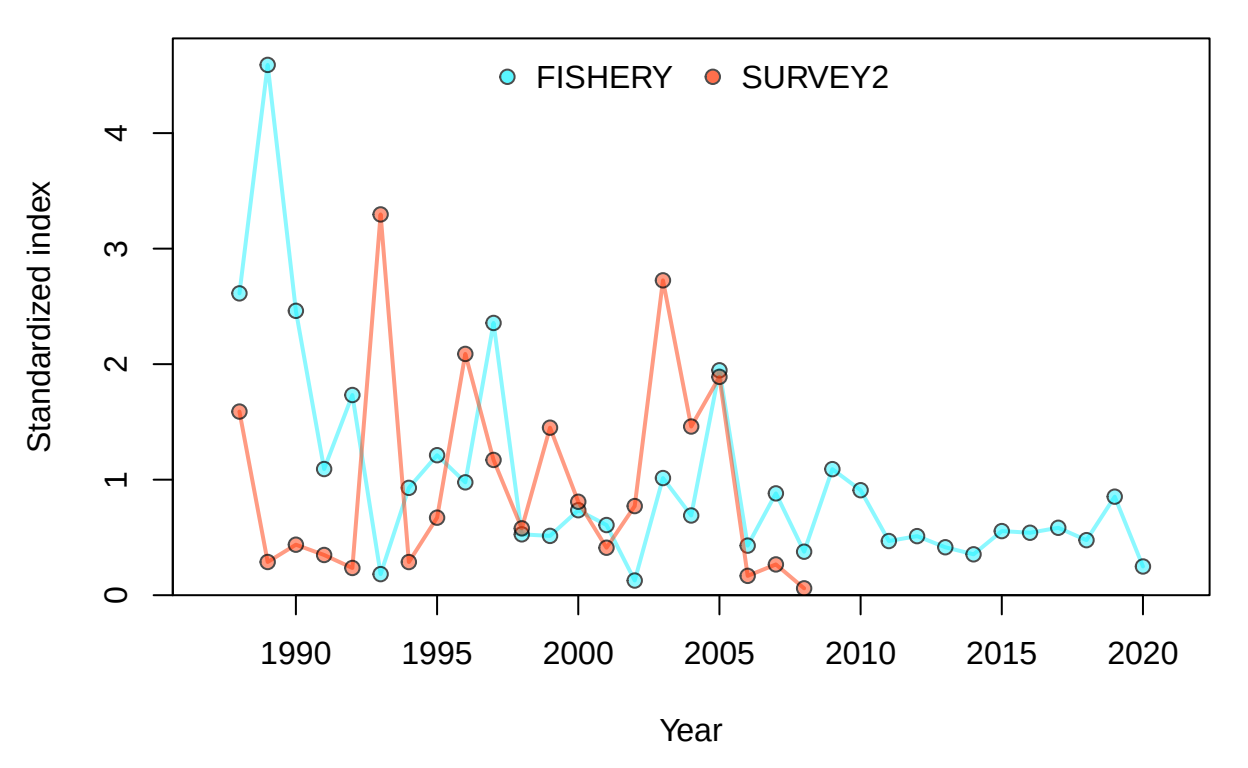

Log index
3
2
1
0
−1
−2
−3
−4
1990
1995
2000
2005
Year

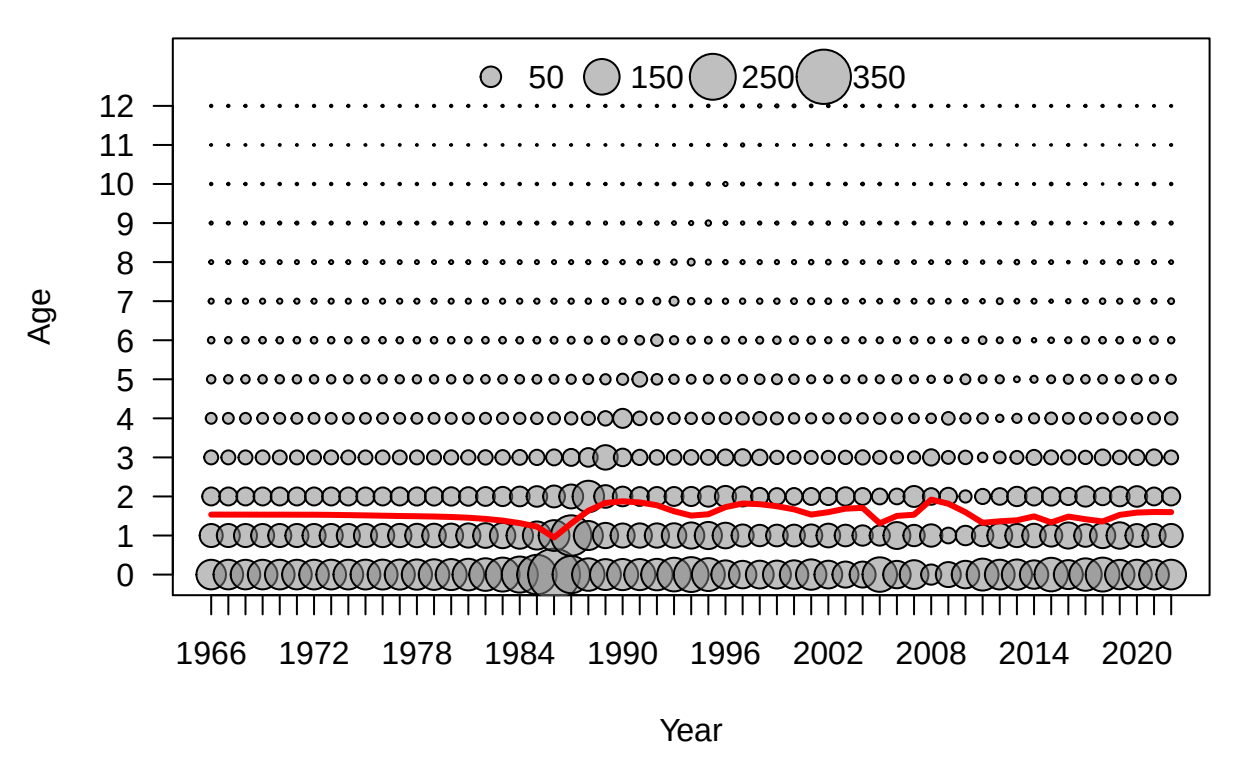

Log index
3
2
1
0
−1
−2
−3
−4
1990
1995
2000
2005
Year

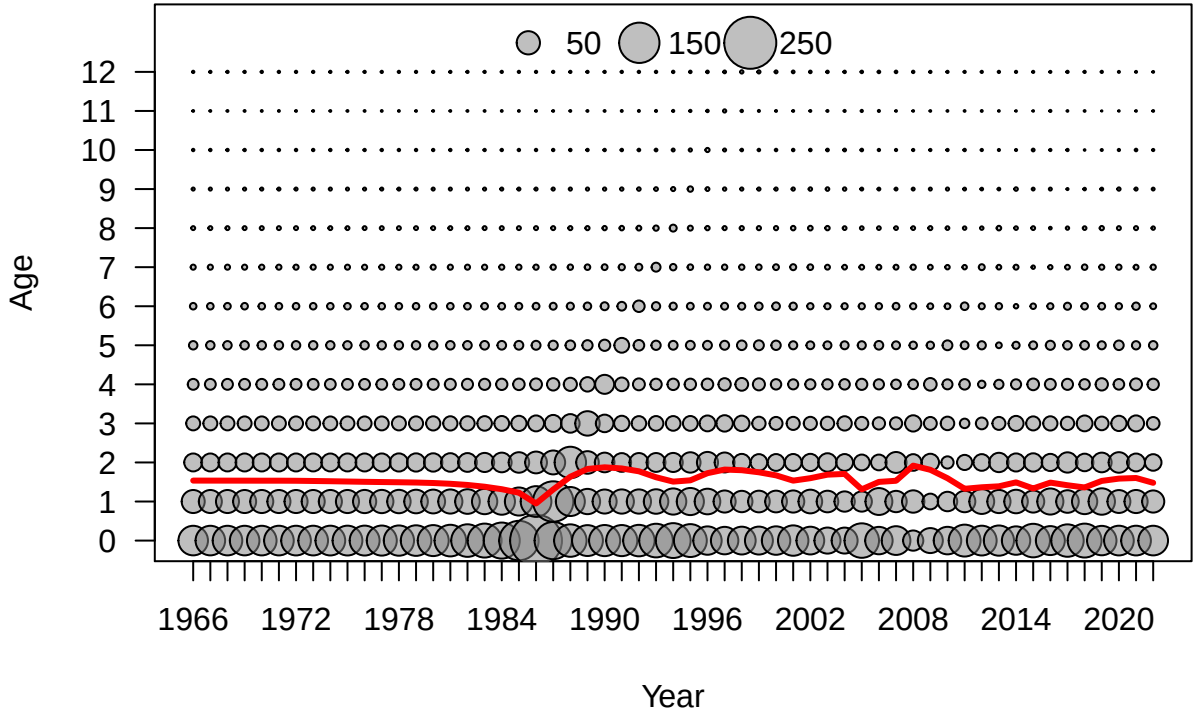

Log expected index
0.6
0.7
0.8
0.9
1.0
1.1
1.2
−2
−1
0
1
2
Log observed index

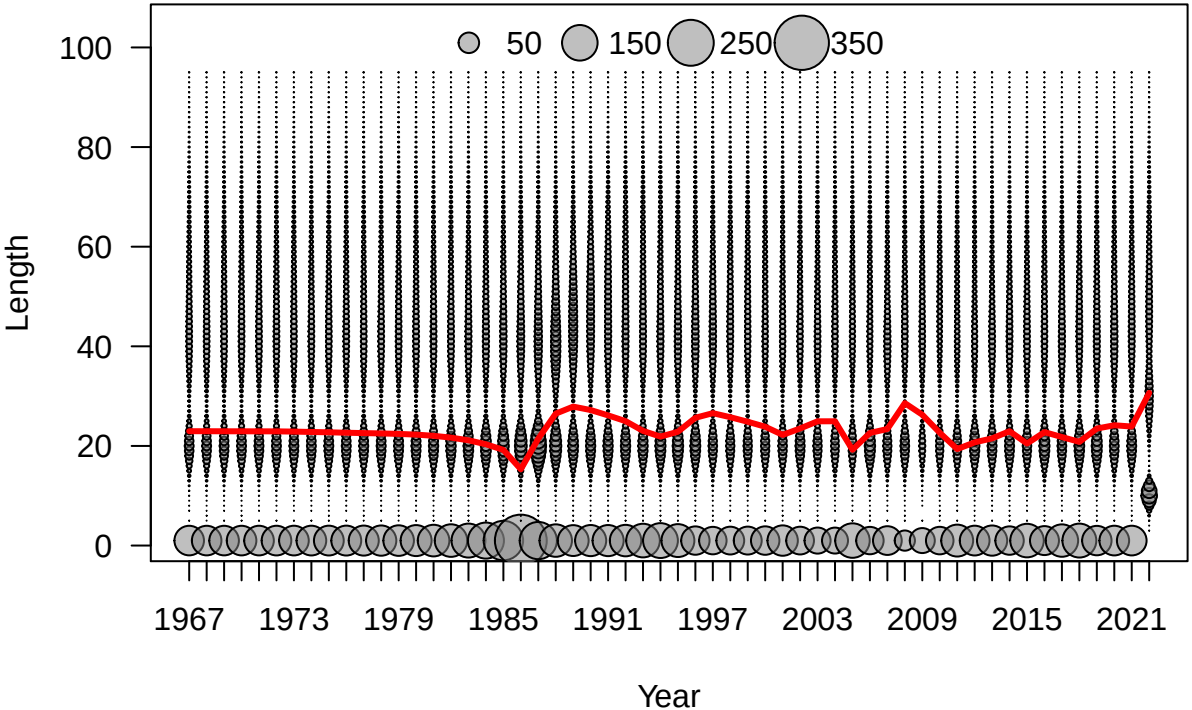

Residual
2
1
0
−1
−2
1990
1995
2000
2005
Year

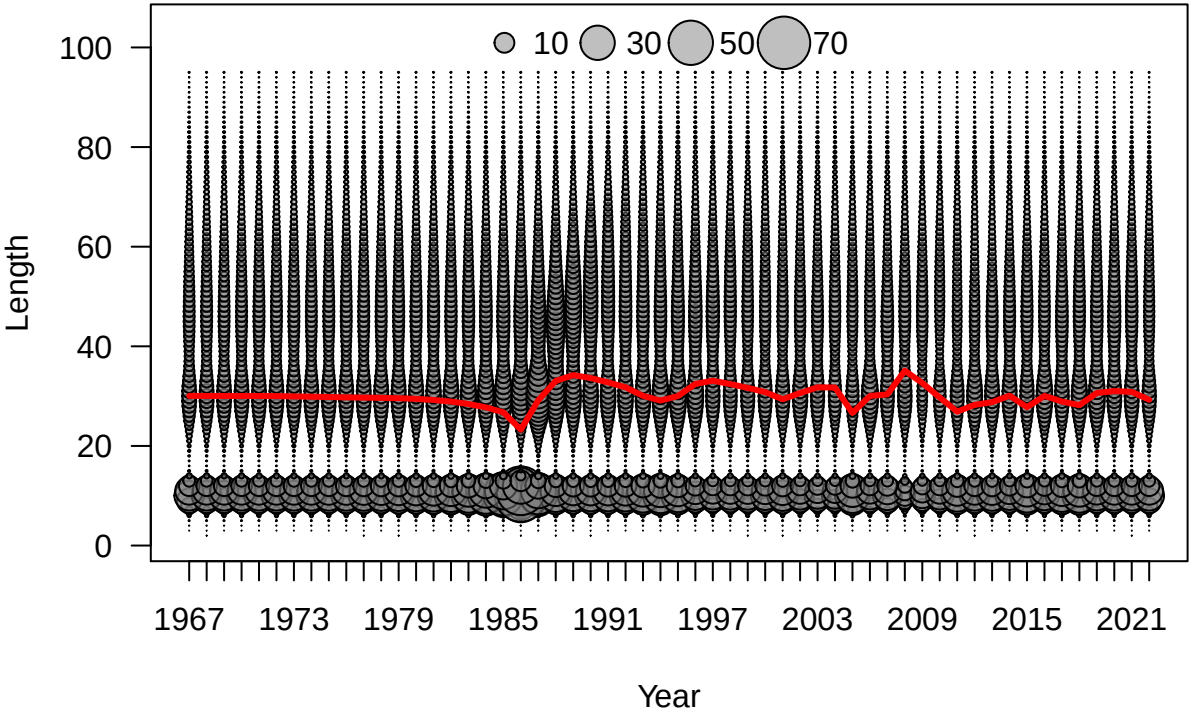

Deviation
2
1
0
−1
−2
1990
1995
2000
2005
Year

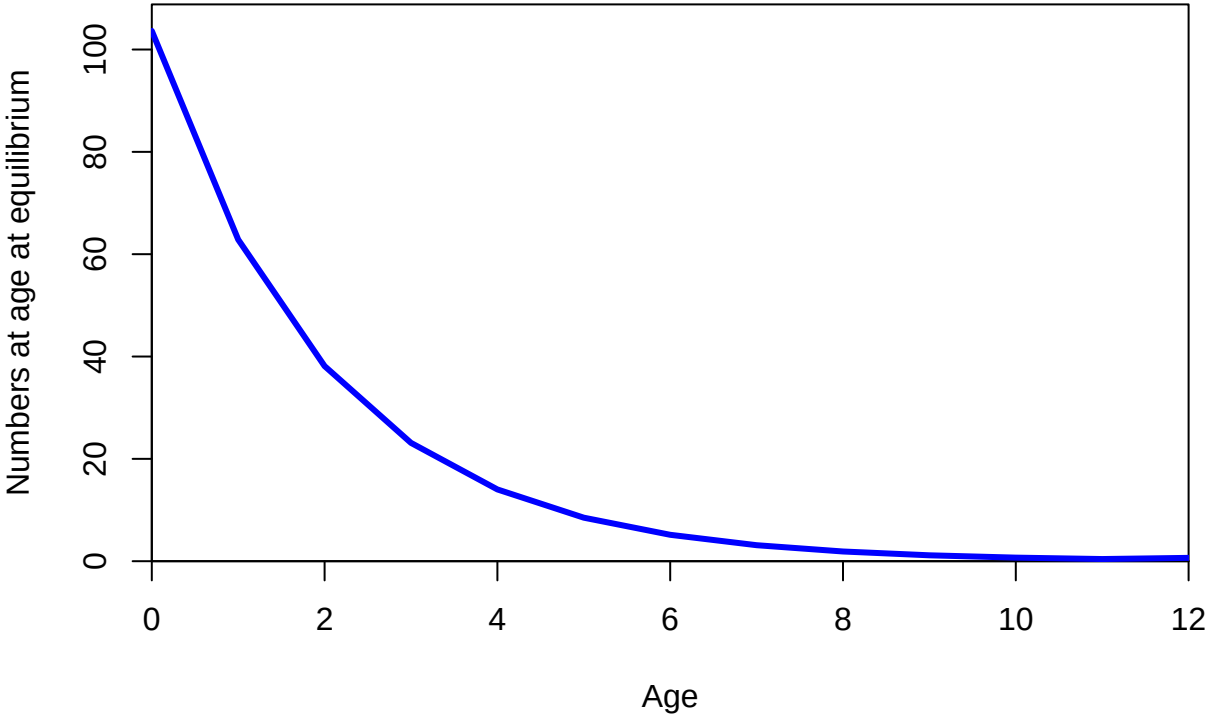

FISHERY
SURVEY2
Standardized index
0
1
2
3
4
1990
1995
2000
2005
2010
2015
2020
Year

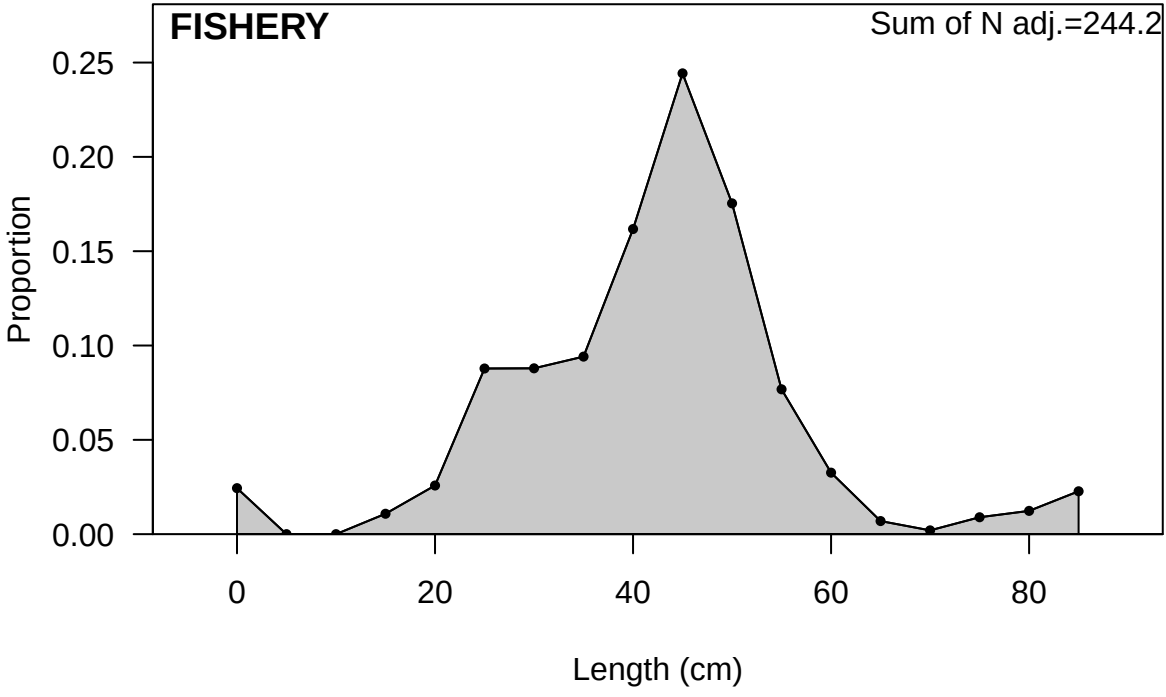

50
150
250
350
Age
12
11
10
9
8
7
6
5
4
3
2
1
0
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

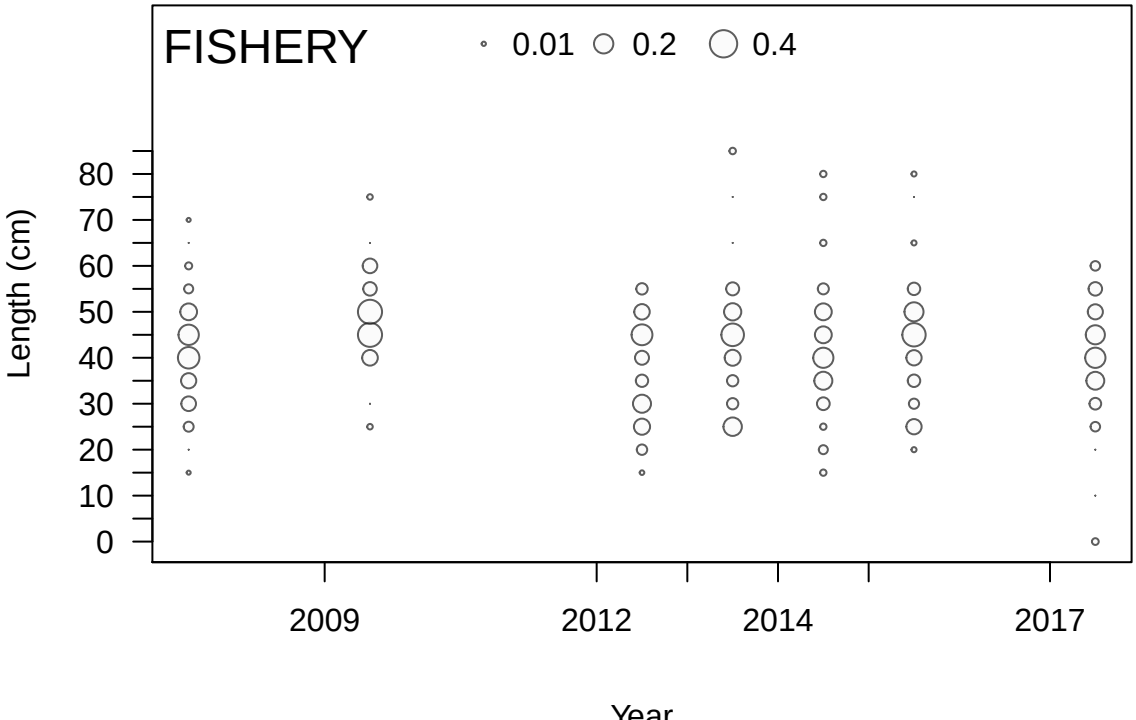

50
150
250
Age
12
11
10
9
8
7
6
5
4
3
2
1
0
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

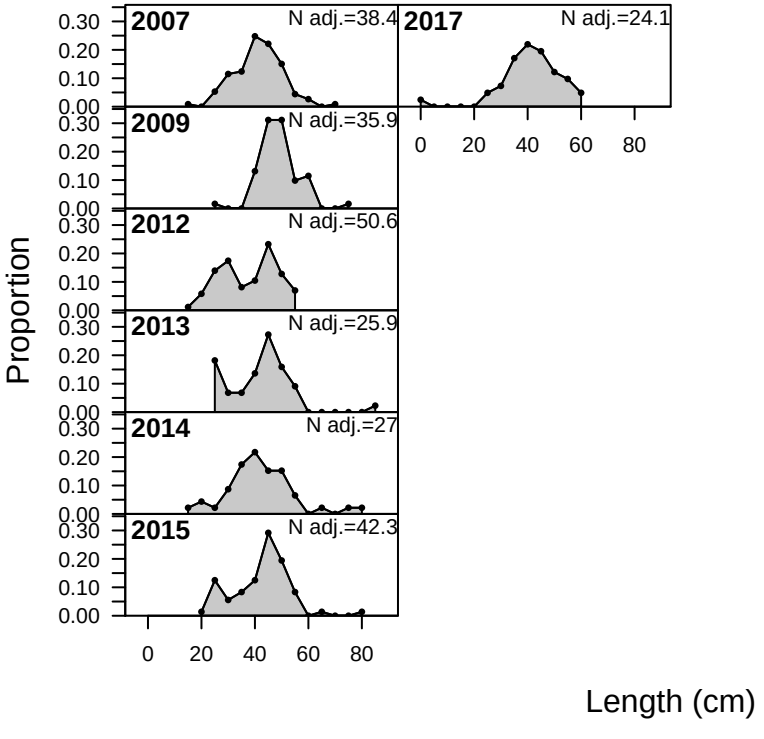

50
150
250
350
100
80
60
40
20
0
Length
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

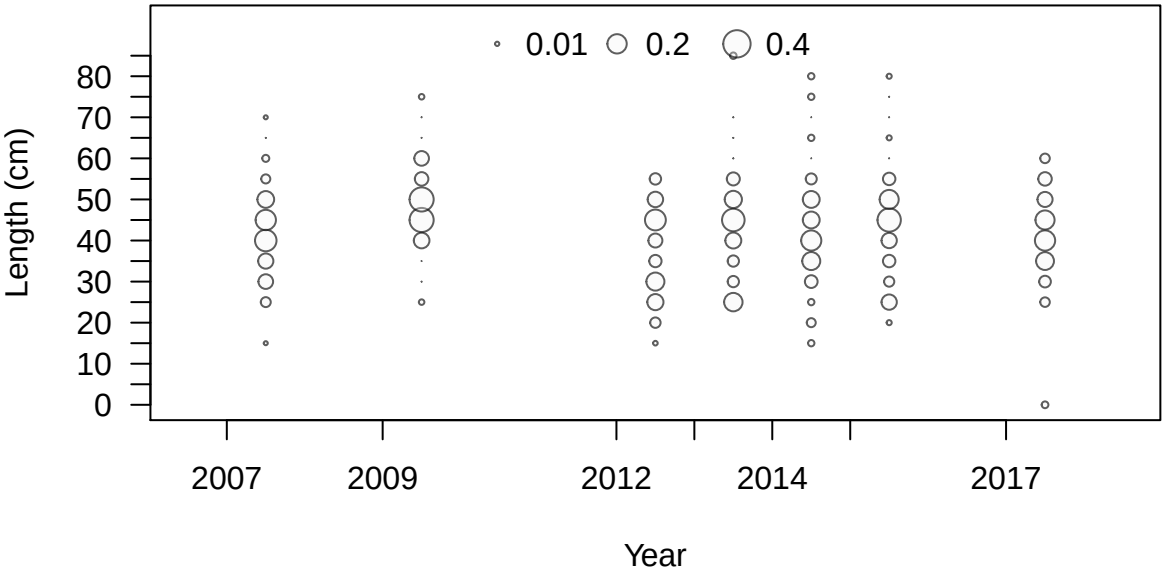

10
30
50
70
100
80
60
40
20
0
Length
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

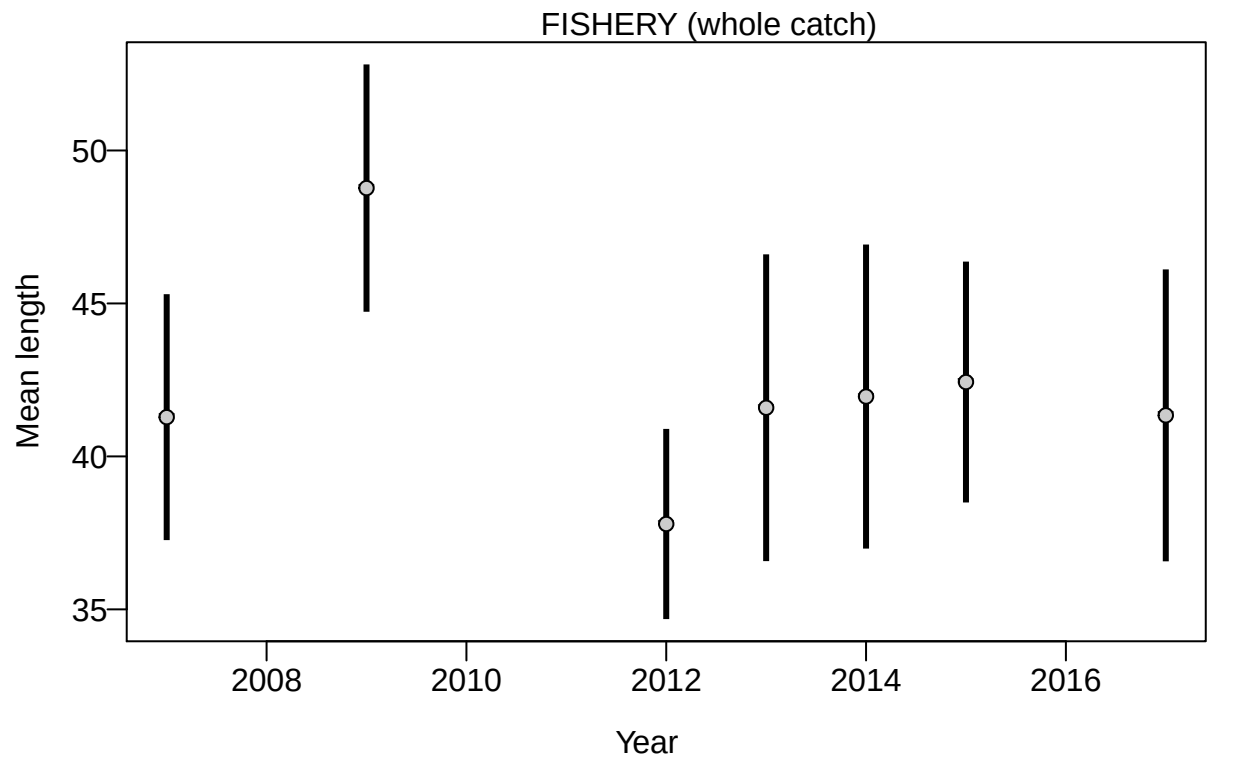

Numbers at age at equilibrium
0
20
40
60
80
100
0
2
4
6
8
10
12
Age

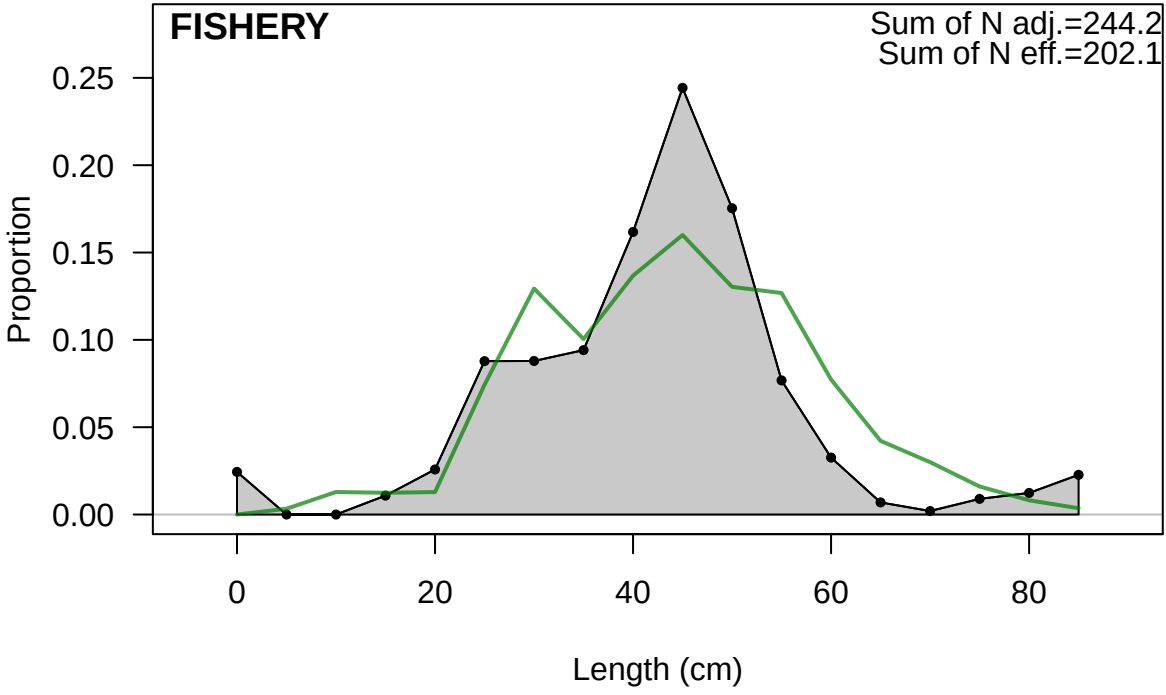

FISHERY
Sum of N adj.=244.2
Proportion
0.25
0.20
0.15
0.10
0.05
0.00
0
20
40
60
80
Length (cm)

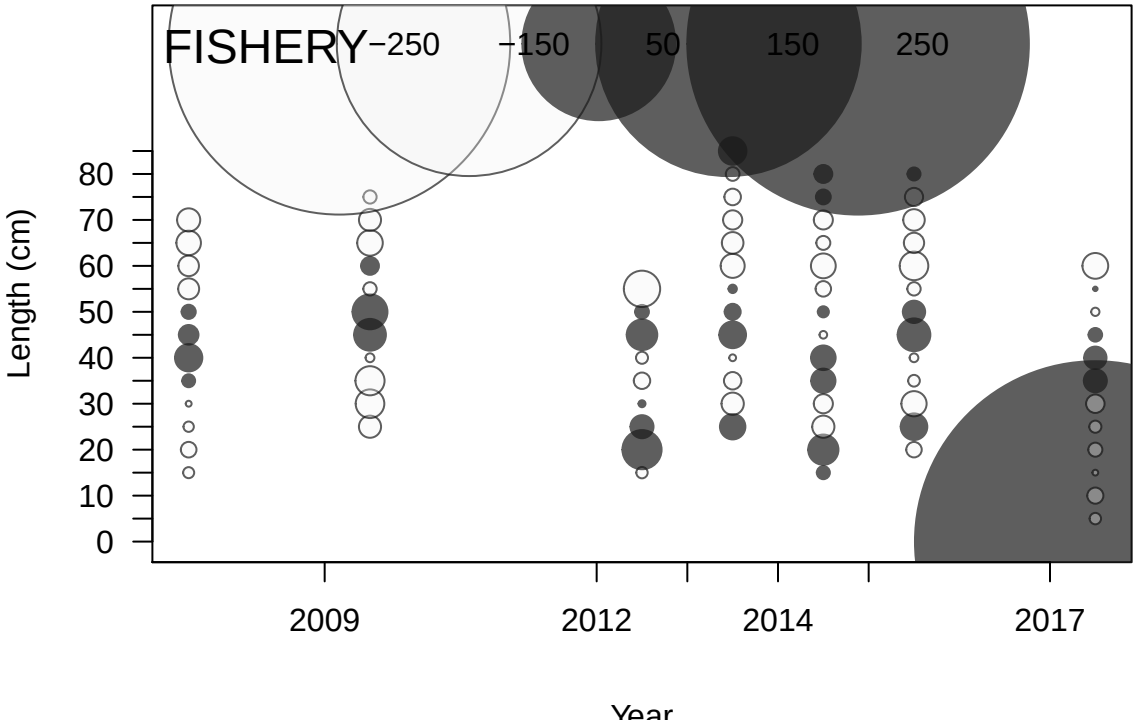

FISHERY
0.01
0.2
0.4
Length (cm)
0
10
20
30
40
50
60
70
80
2009
2012
2014
2017
Year

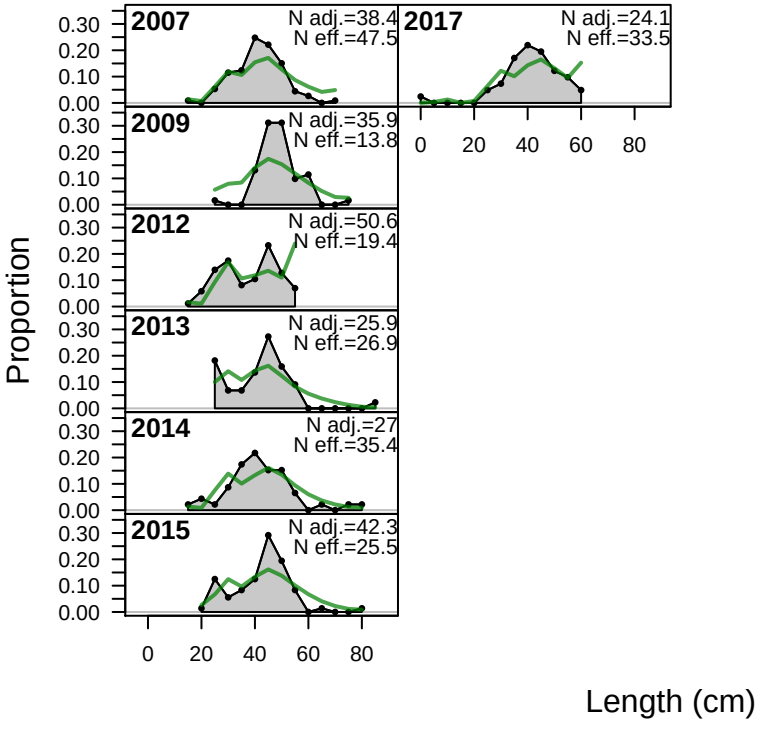

2007
N adj.=38.4
2017
N adj.=24.1
2009
N adj.=35.9
2012
N adj.=50.6
2013
N adj.=25.9
2014
N adj.=27
2015
N adj.=42.3
0.30
0.20
0.10
0.00
0
20
40
60
80
Proportion
Length (cm)

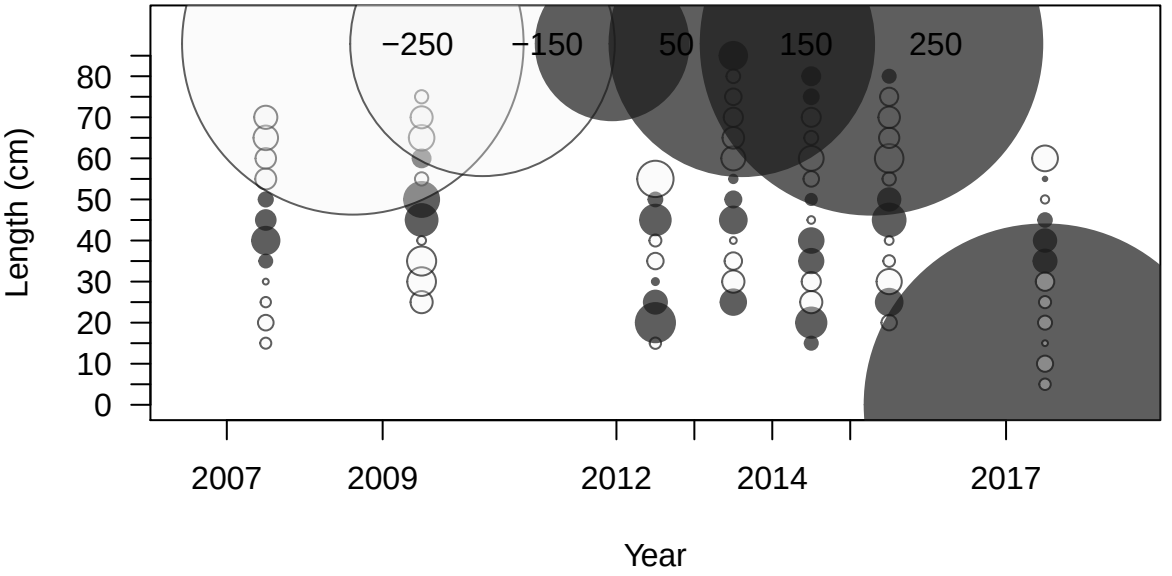

0.01
0.2
0.4
Length (cm)
0
10
20
30
40
50
60
70
80
2007
2009
2012
2014
2017
Year

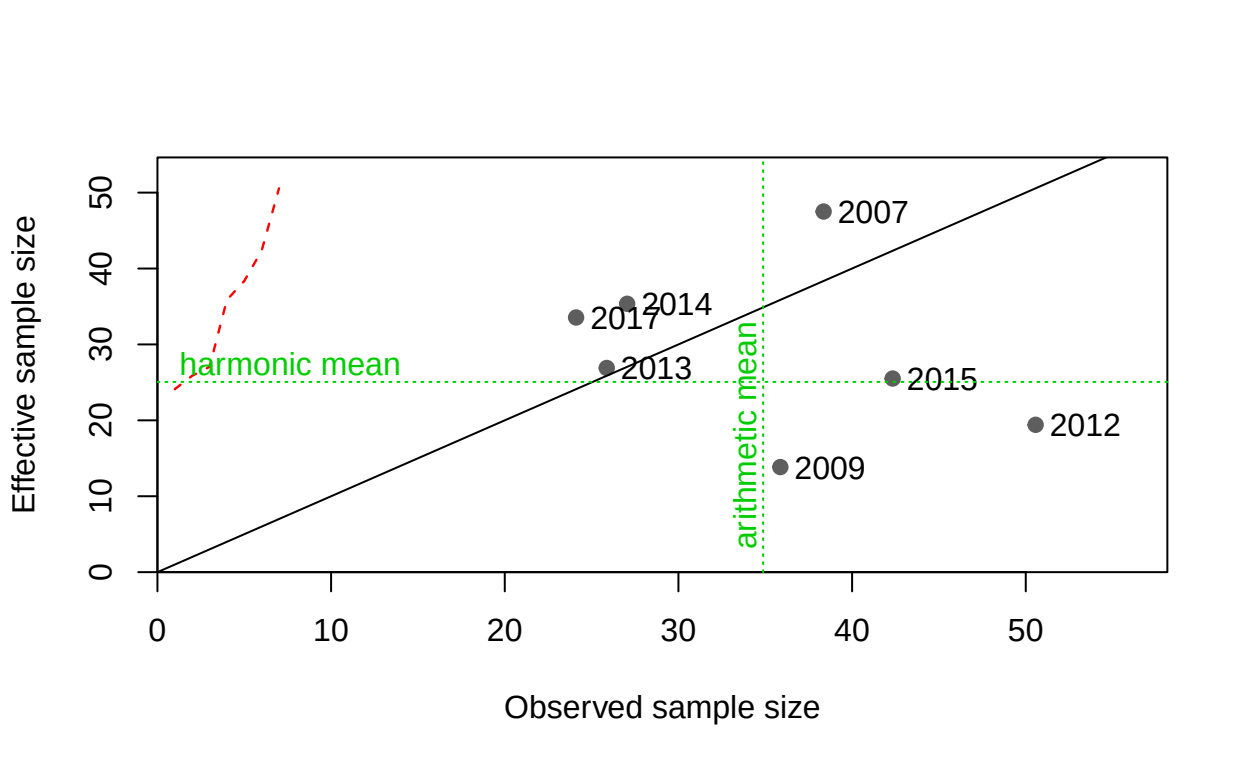

FISHERY (whole catch)
Mean length
50
45
40
35
2008
2010
2012
2014
2016
Year

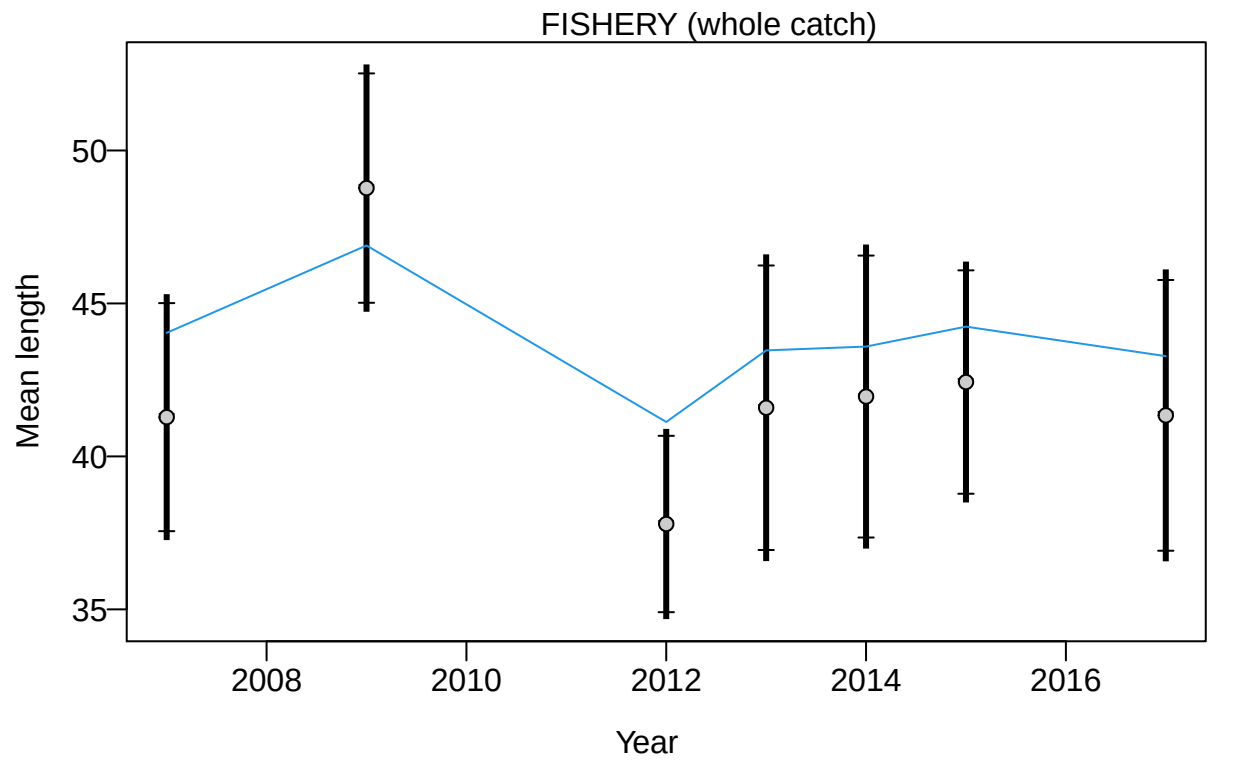

FISHERY
Sum of N adj.=244.2
Sum of N eff.=202.1
Proportion
0.25
0.20
0.15
0.10
0.05
0.00
0
20
40
60
80
Length (cm)

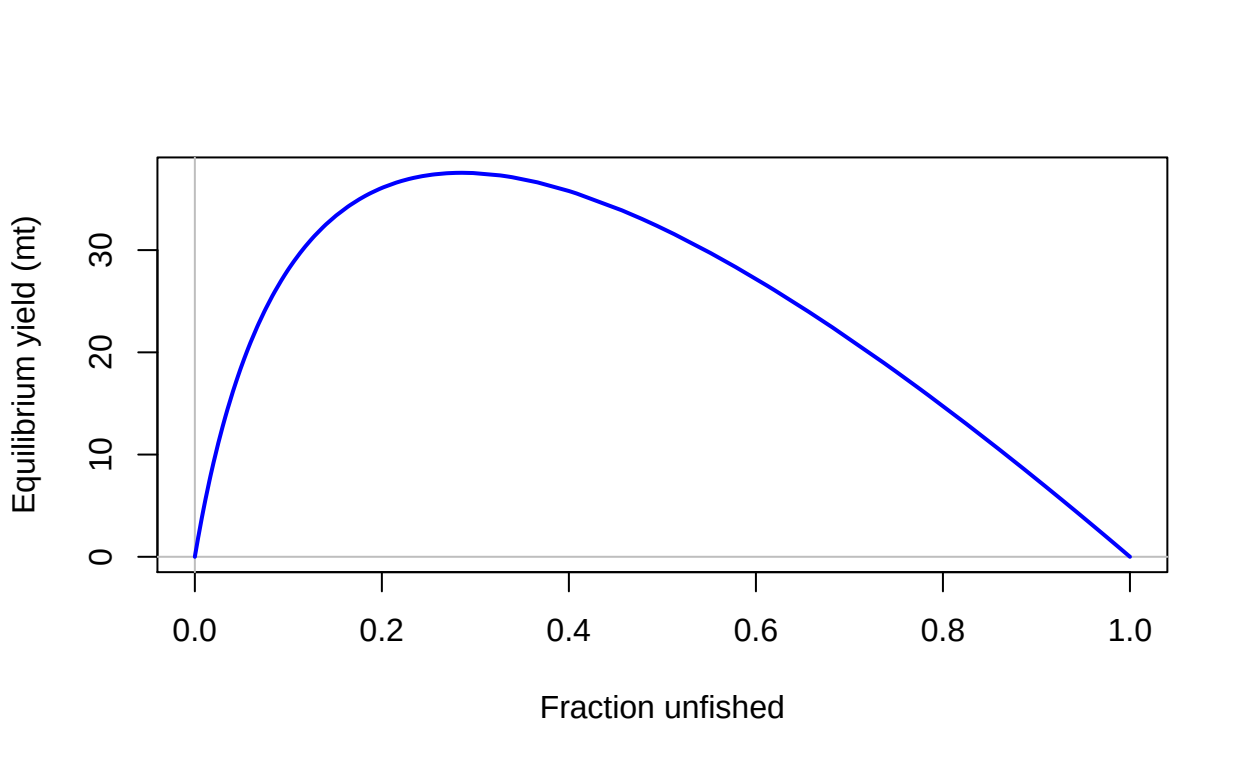

FISHERY
−250
−150
50
150
250
Length (cm)
0
10
20
30
40
50
60
70
80
2009
2012
2014
2017
Year

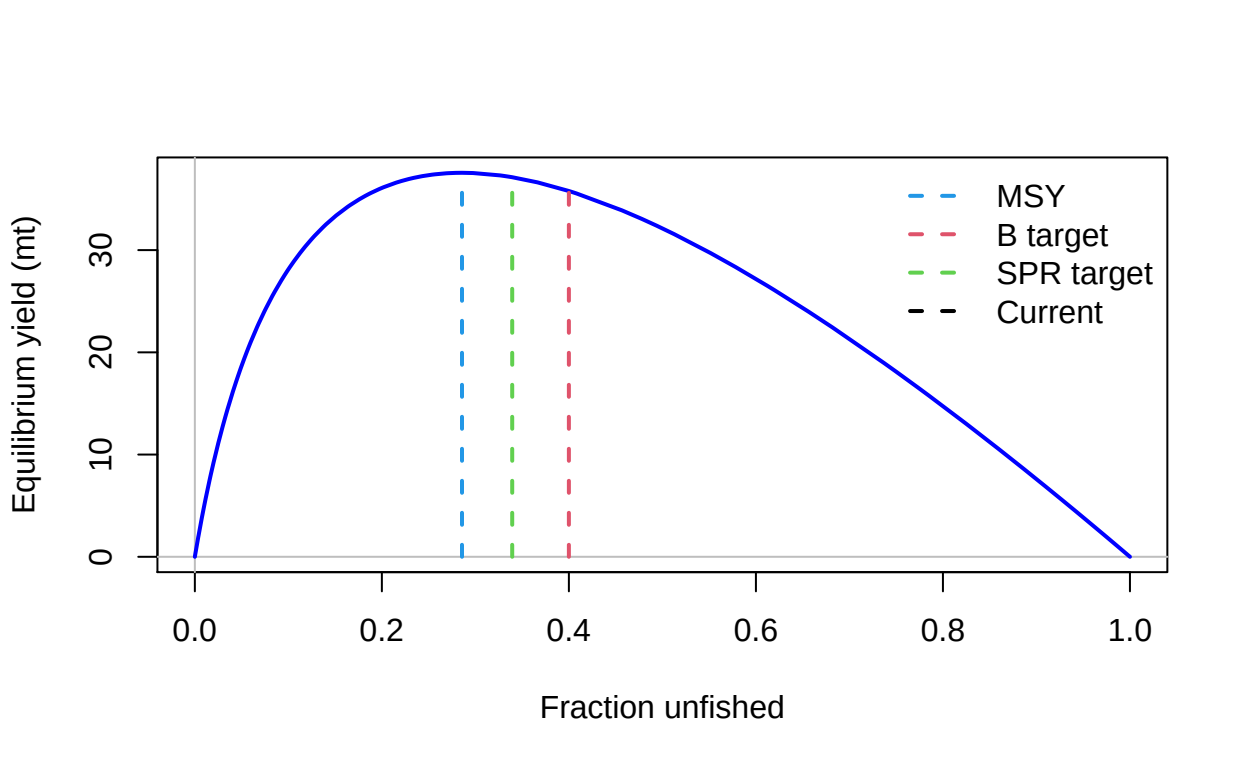

2007
N adj.=38.4
N eff.=47.5
2017
N adj.=24.1
N eff.=33.5
2009
N adj.=35.9
N eff.=13.8
2012
N adj.=50.6
N eff.=19.4
2013
N adj.=25.9
N eff.=26.9
2014
N adj.=27
N eff.=35.4
2015
N adj.=42.3
N eff.=25.5
Proportion
0.00
0.10
0.20
0.30
0
20
40
60
80
Length (cm)

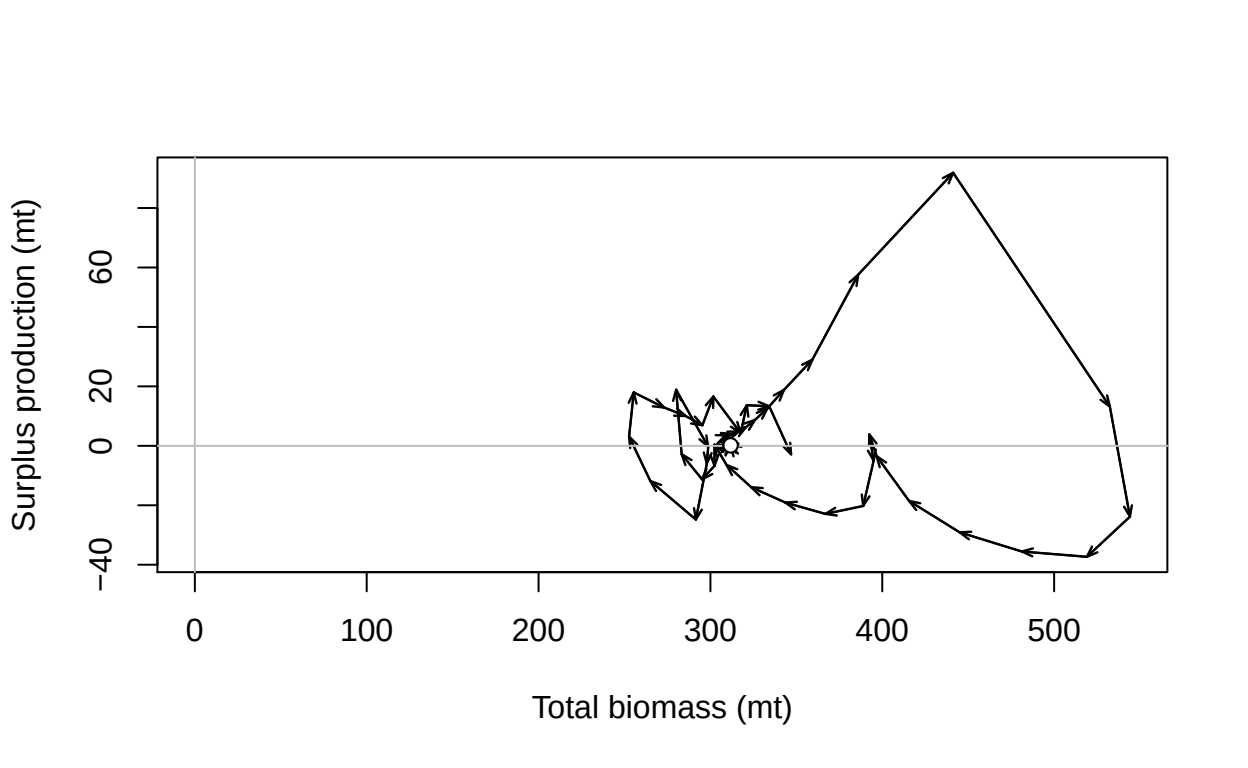

−250
−150
50
150
250
Length (cm)
0
10
20
30
40
50
60
70
80
2007
2009
2012
2014
2017
Year

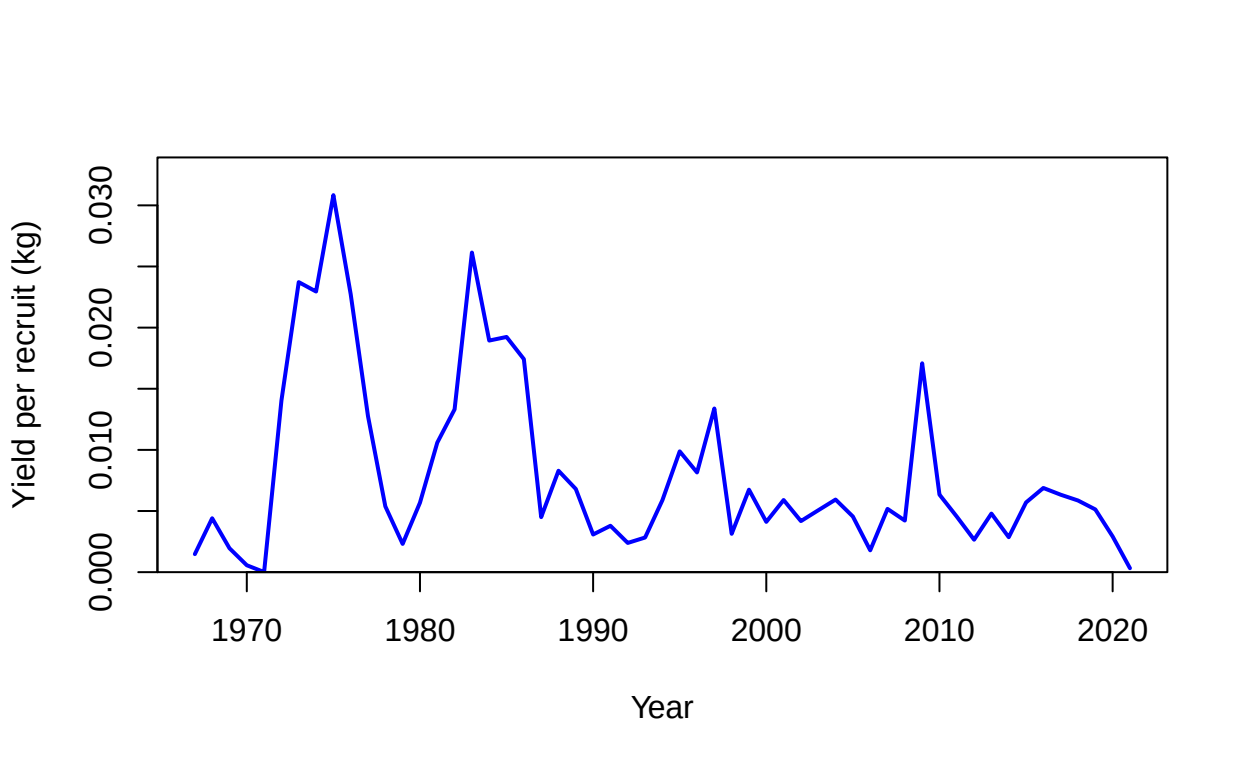

Effective sample size
0
10
20
30
40
50
Observed sample size
0
10
20
30
40
50
2007
2014
2017
2013
2015
2012
2009
harmonic mean
arithmetic mean

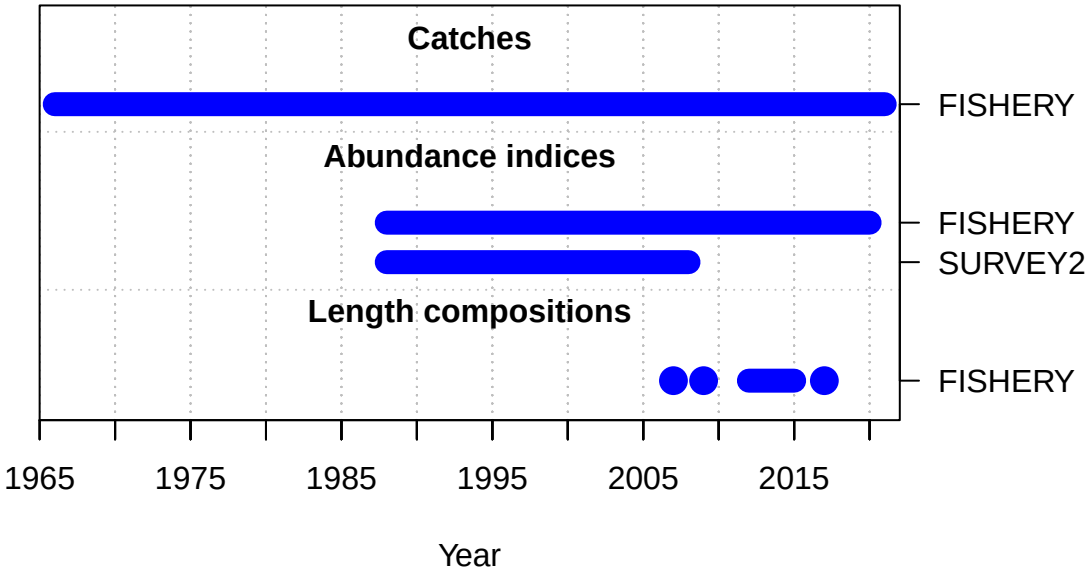

FISHERY (whole catch)
Mean length
50
45
40
35
2008
2010
2012
2014
2016
Year

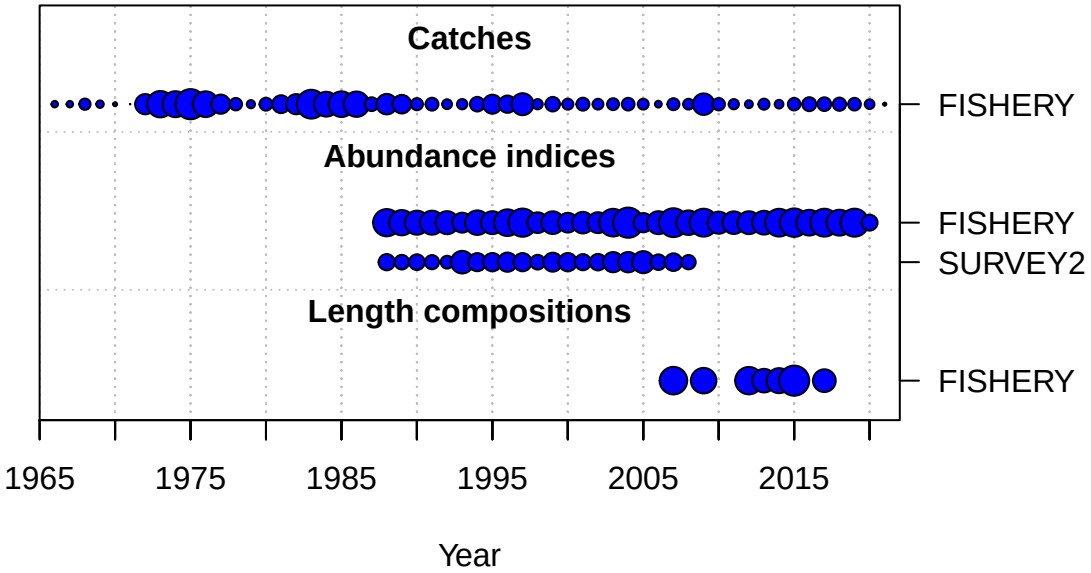

Equilibrium yield (mt)
0
10
20
30
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished

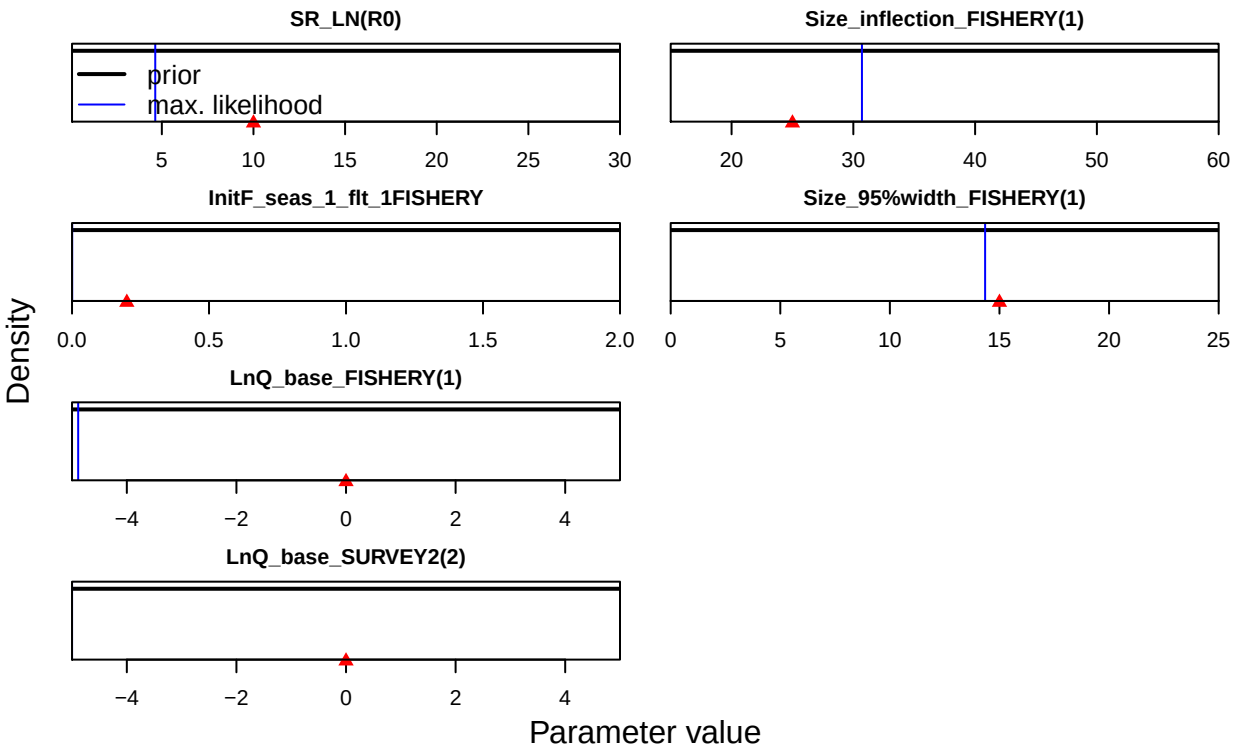

Equilibrium yield (mt)
0
10
20
30
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished
MSY
B target
SPR target
Current


Surplus production (mt)
−40
0
20
60
0
100
200
300
400
500
Total biomass (mt)


Yield per recruit (kg)
0.000
0.010
0.020
0.030
1970
1980
1990
2000
2010
2020
Year


Catches
FISHERY
Abundance indices
FISHERY
SURVEY2
Length compositions
FISHERY
1965
1975
1985
1995
2005
2015
Year


Catches
FISHERY
Abundance indices
FISHERY
SURVEY2
Length compositions
FISHERY
1965
1975
1985
1995
2005
2015
Year


SR_LN(R0)
prior
max. likelihood
5
10
15
20
25
30
Size_inflection_FISHERY(1)
20
30
40
50
60
InitF_seas_1_flt_1FISHERY
0.0
0.5
1.0
1.5
2.0
Size_95%width_FISHERY(1)
0
5
10
15
20
25
LnQ_base_FISHERY(1)
−4
−2
0
2
4
LnQ_base_SURVEY2(2)
−4
−2
0
2
4
Density
Parameter value