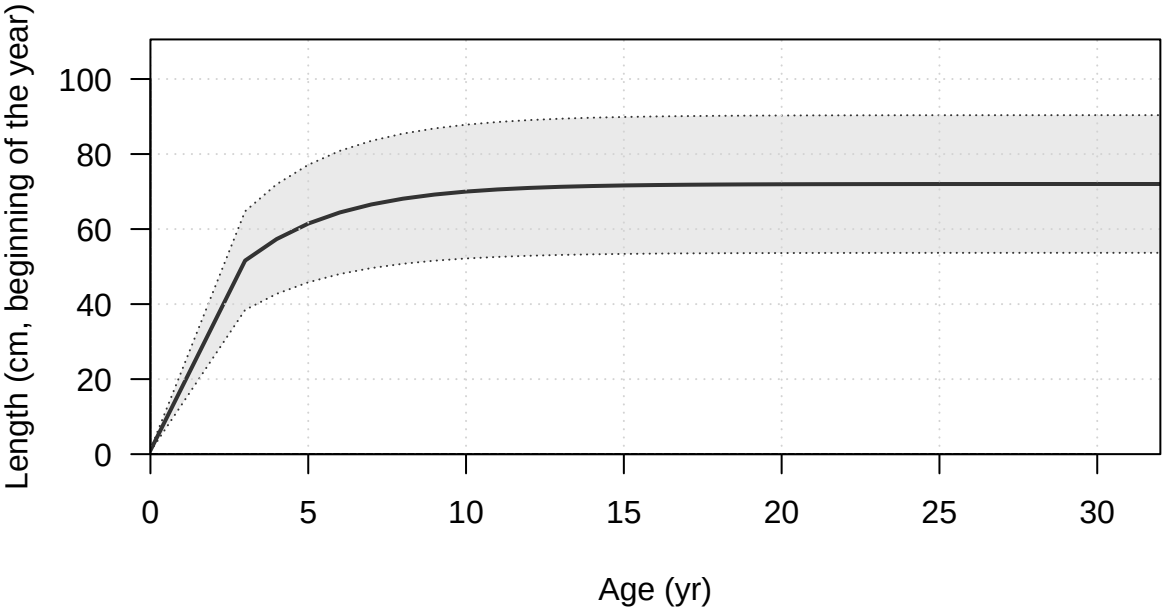
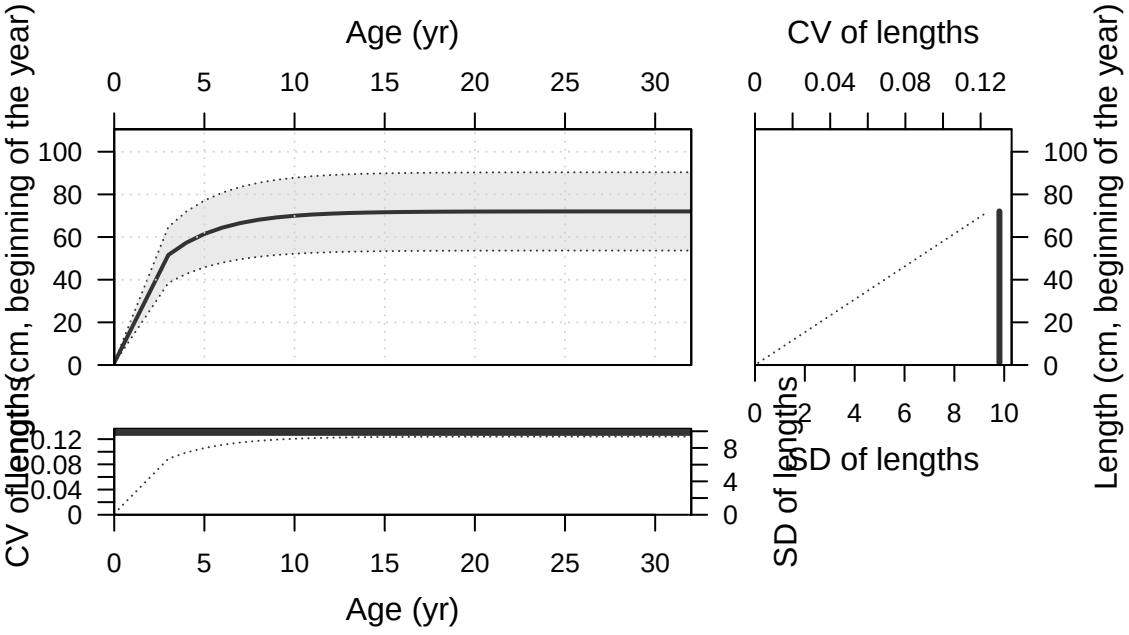
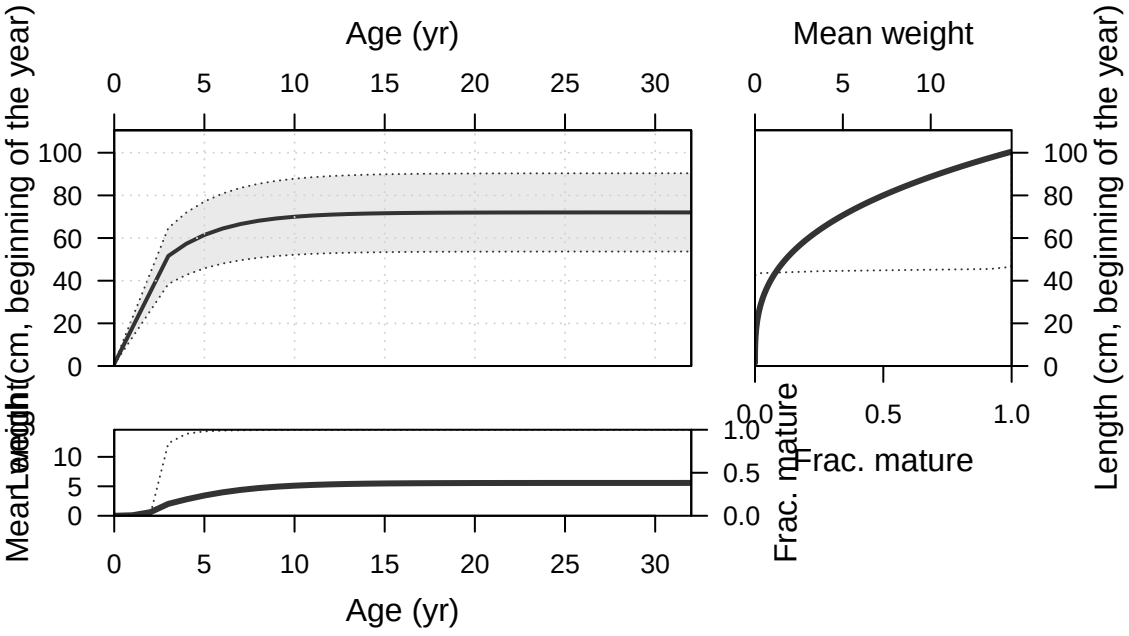
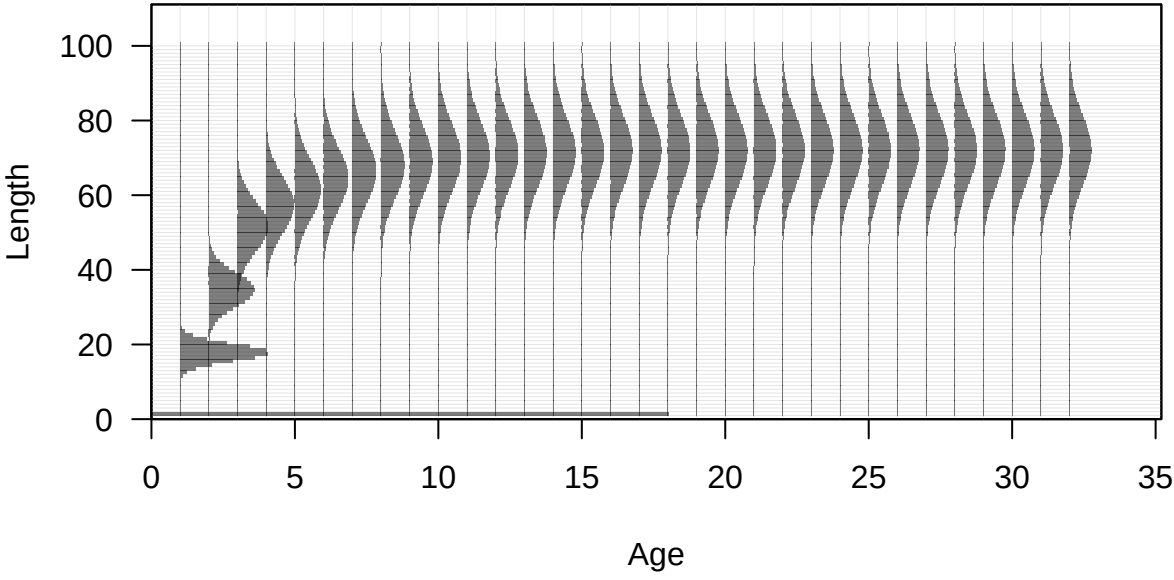
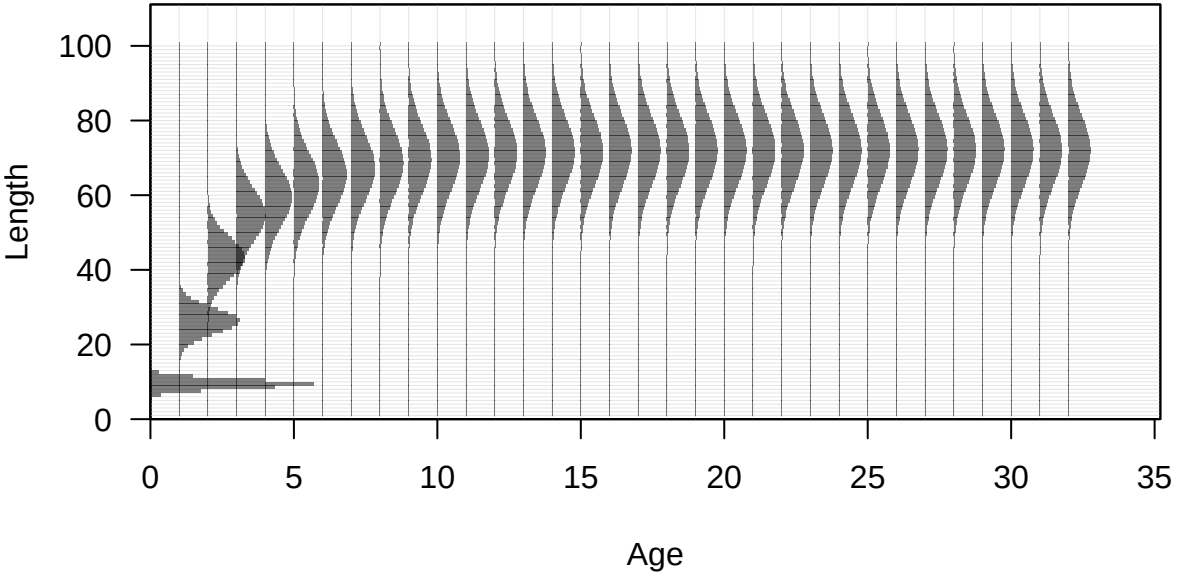
Plots created using the 'r4ss' package in R
Stock Synthesis version: 3.30.19.0
StartTime: Fri Jul 08 10:07:55 2022
Data_File: data.ss
Control_File: control.ss

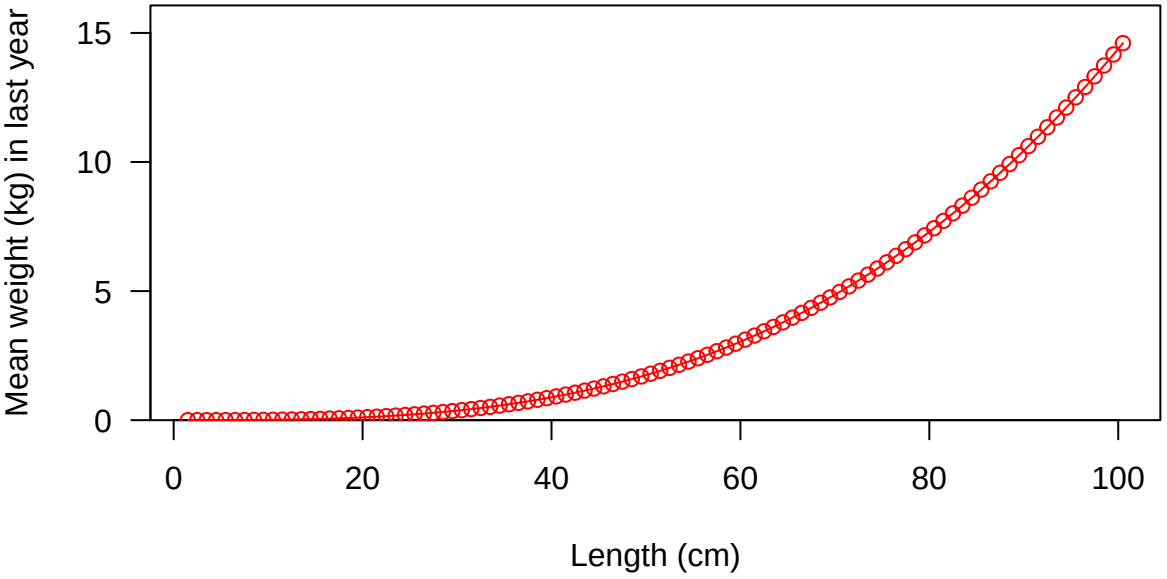

Length (cm, beginning of the year)
100
80
60
40
20
0
0
5
10
15
20
25
30
Age (yr)

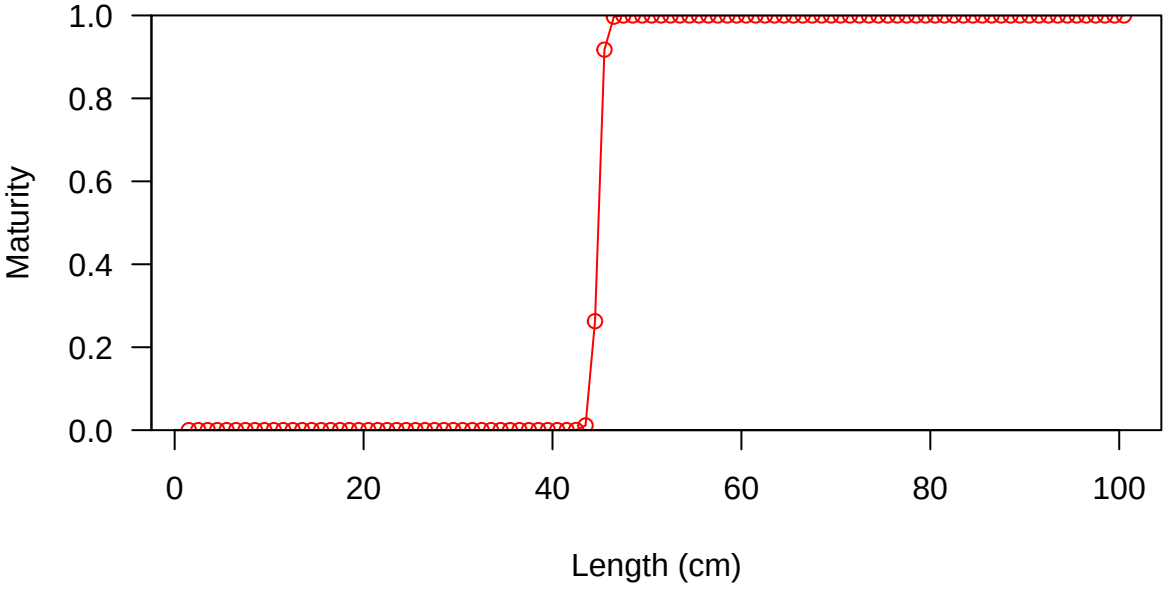

Age (yr)
0
5
10
15
20
25
30
Length (cm, beginning of the year)
0
20
40
60
80
100
CV of lengths
0
0.04
0.08
0.12
SD of lengths
0
2
4
6
8
10

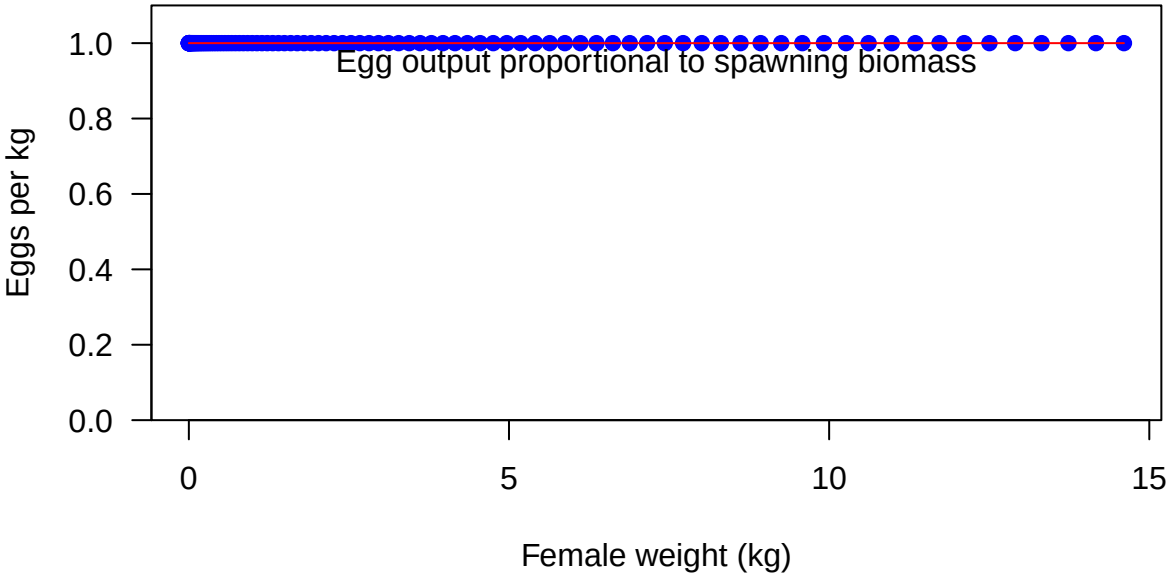

Age (yr)
0
5
10
15
20
25
30
100
80
60
40
20
0
Length (cm, beginning of the year)
Mean weight
10
5
0
1.0
0.5
0.0
Frac. mature
Age (yr)

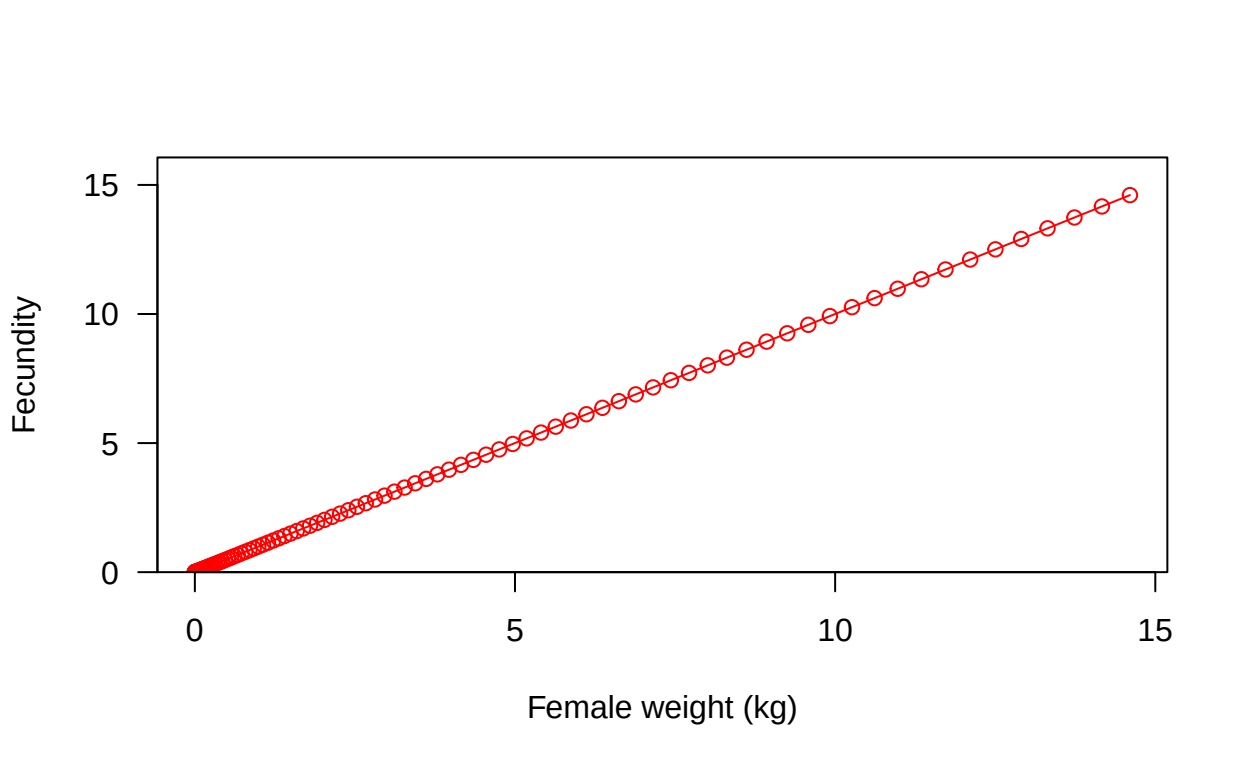

Length
100
80
60
40
20
0
0
5
10
15
20
25
30
35
Age

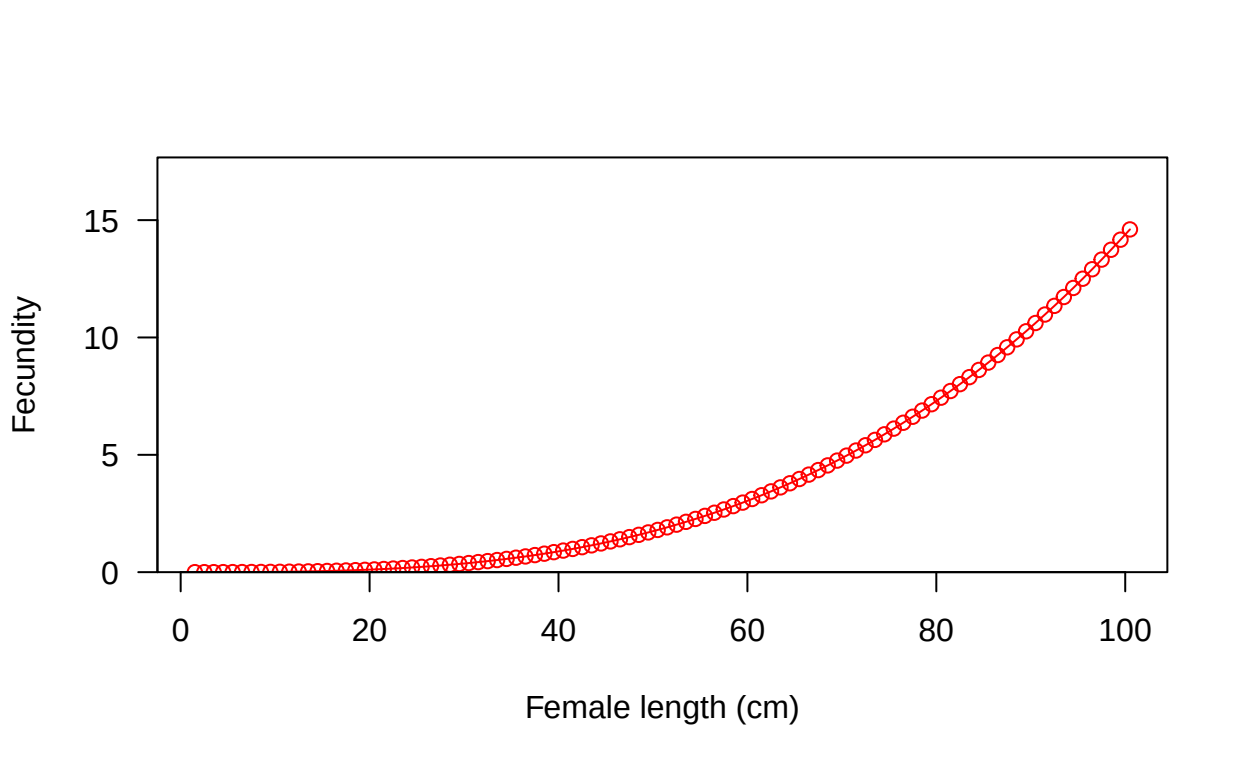

Length
100
80
60
40
20
0
0
5
10
15
20
25
30
35
Age

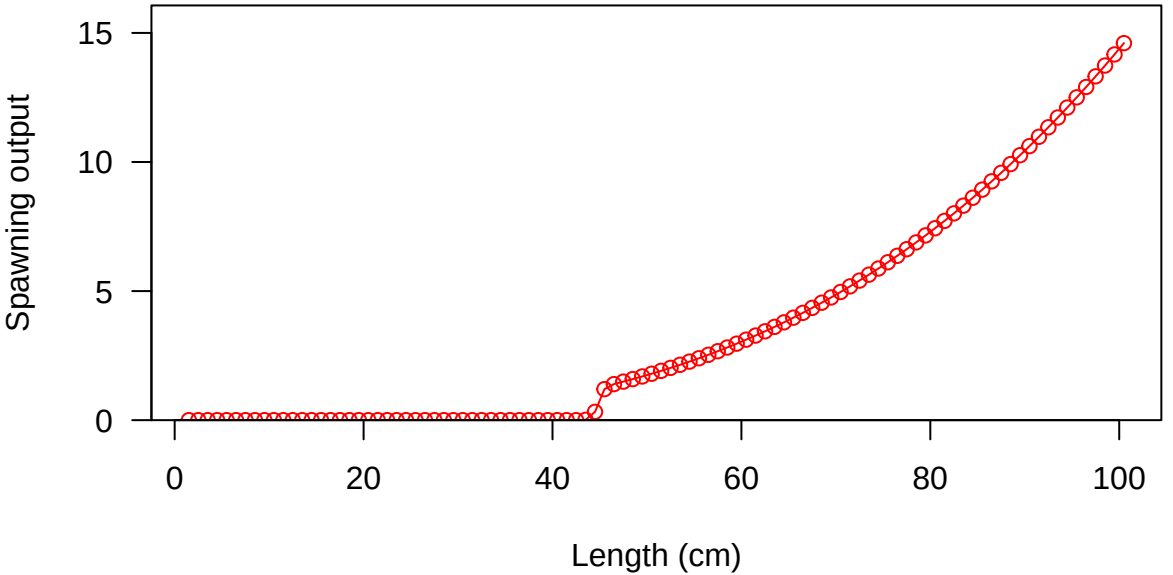

Mean weight (kg) in last year
15
10
5
0
0
20
40
60
80
100
Length (cm)

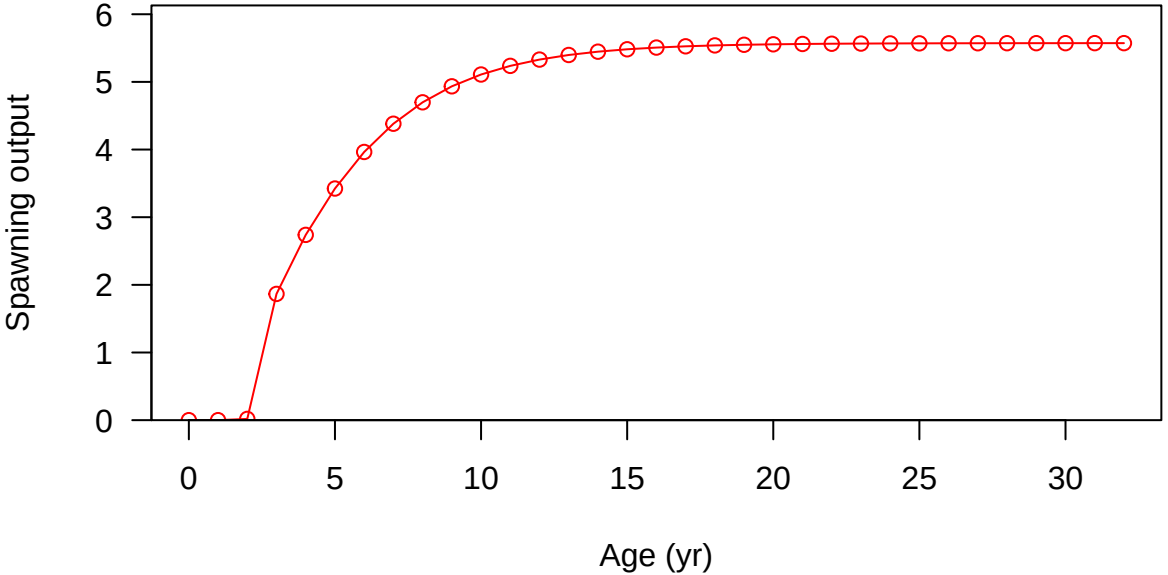

1.0
0.8
0.6
0.4
0.2
0.0
Maturity
0
20
40
60
80
100
Length (cm)

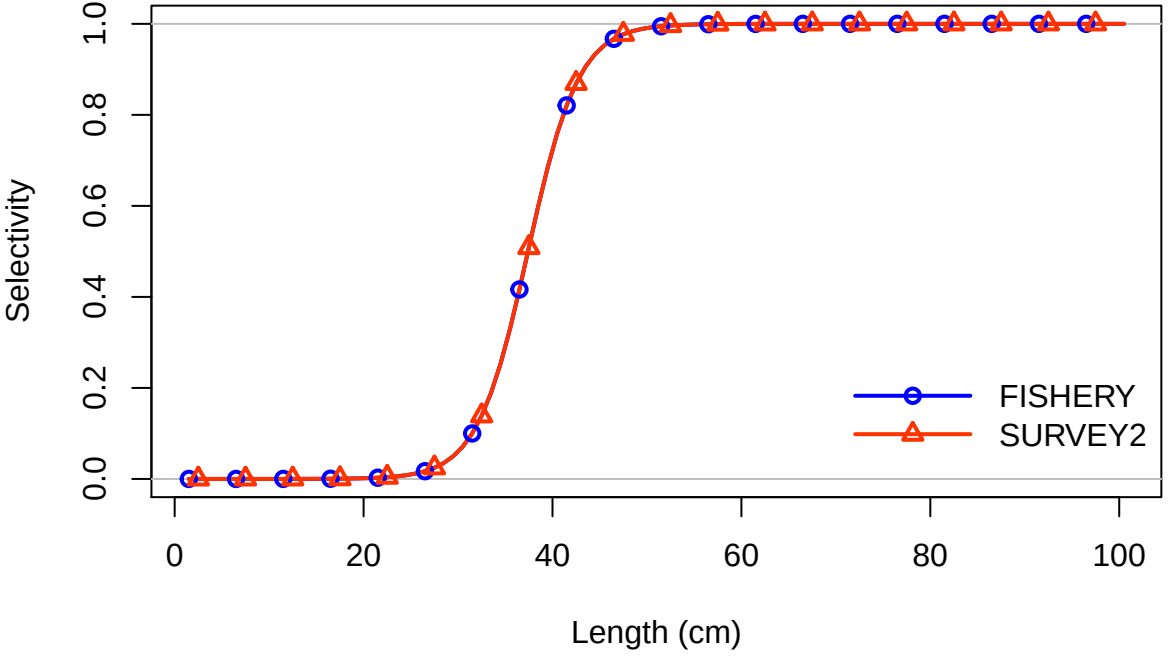

Egg output proportional to spawning biomass
Eggs per kg
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
Female weight (kg)

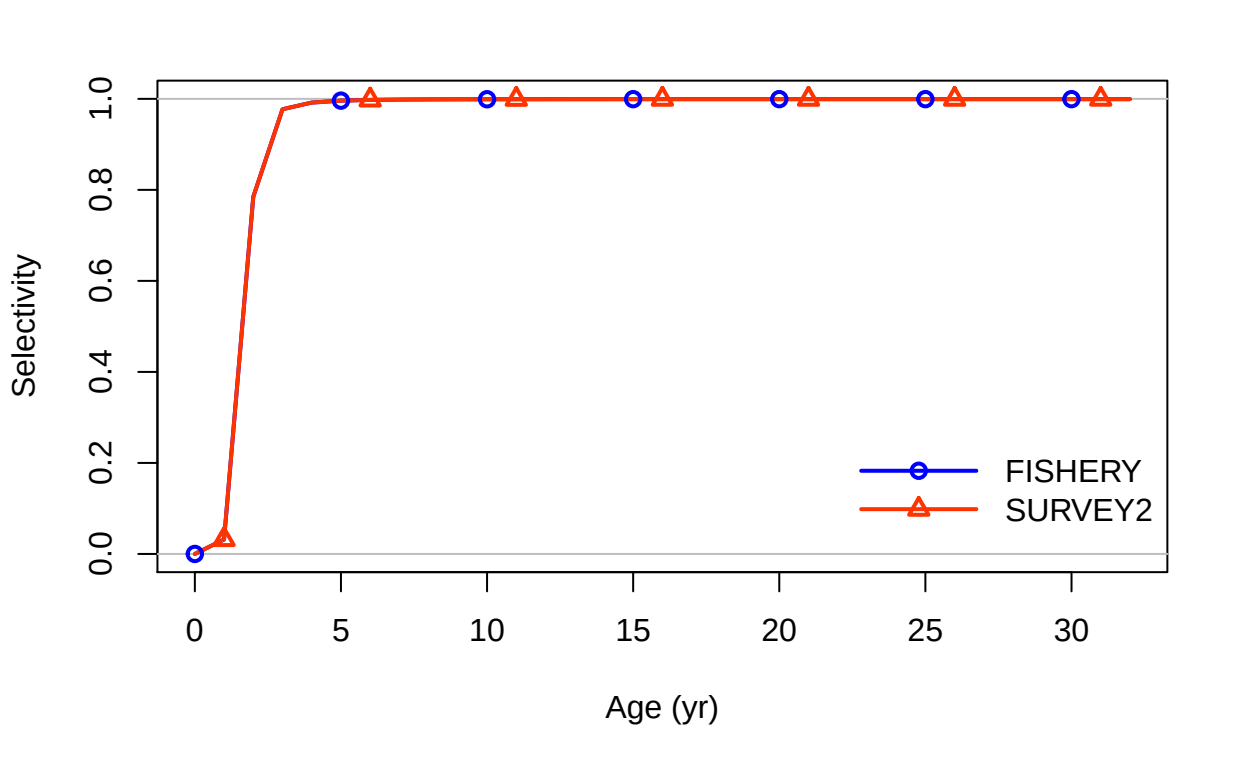

15
10
5
0
Fecundity
0
5
10
15
Female weight (kg)

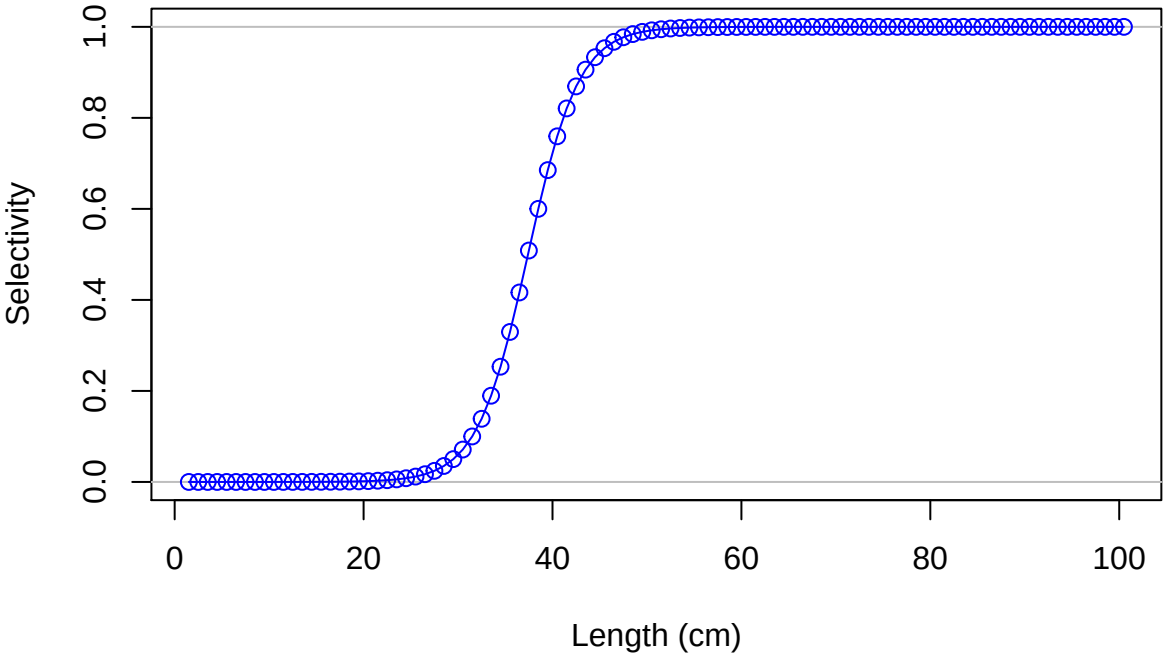

Fecundity
15
10
5
0
0
20
40
60
80
100
Female length (cm)

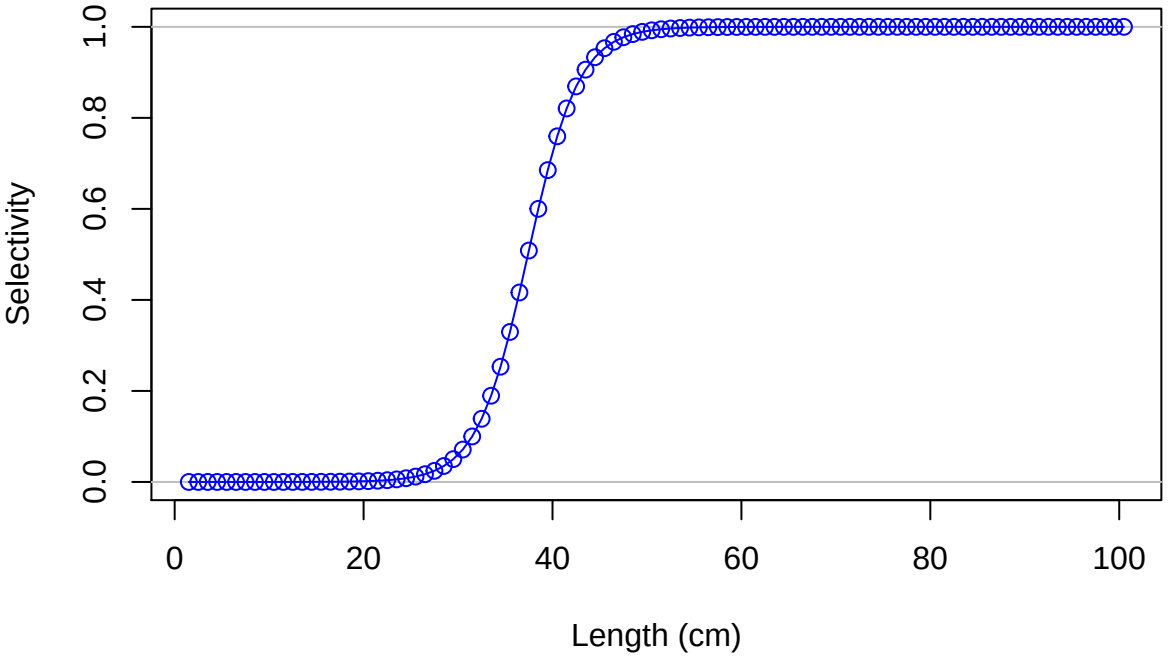

Spawning output
15
10
5
0
0
20
40
60
80
100
Length (cm)

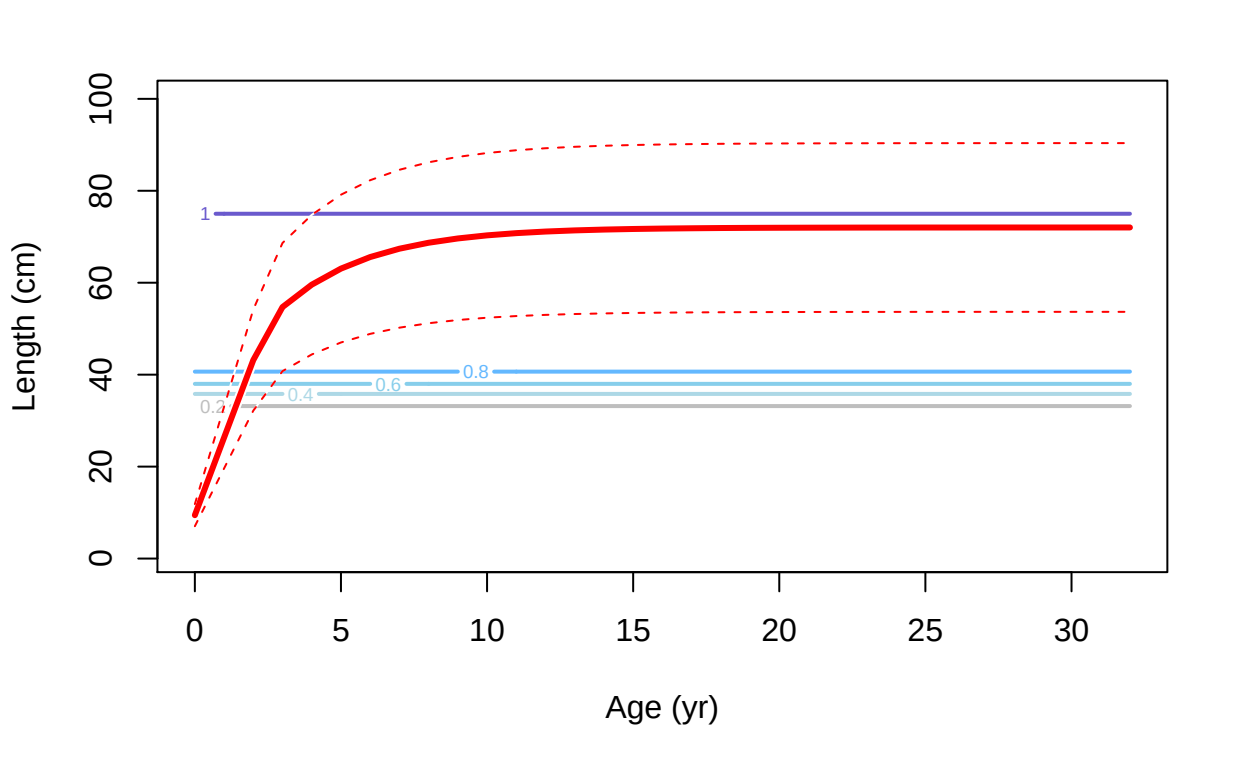

Spawning output
0
1
2
3
4
5
6
0
5
10
15
20
25
30
Age (yr)

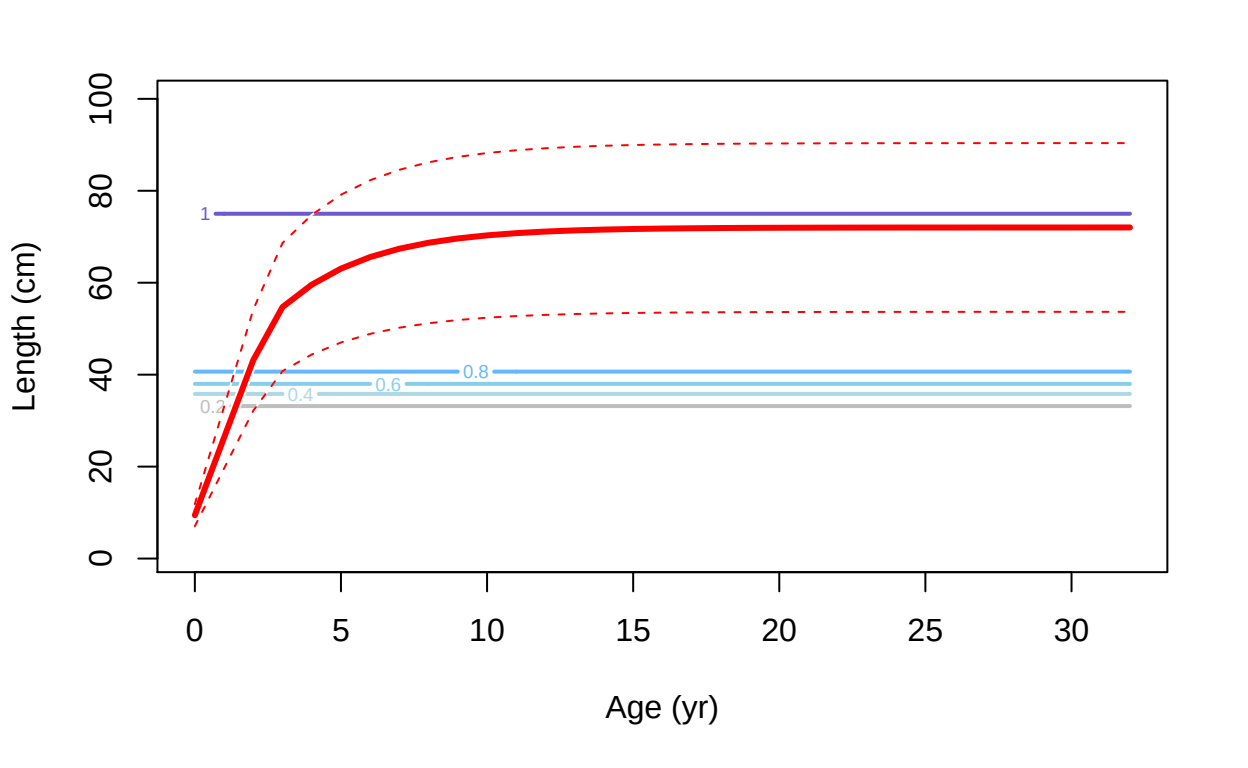

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Length (cm)
FISHERY
SURVEY2

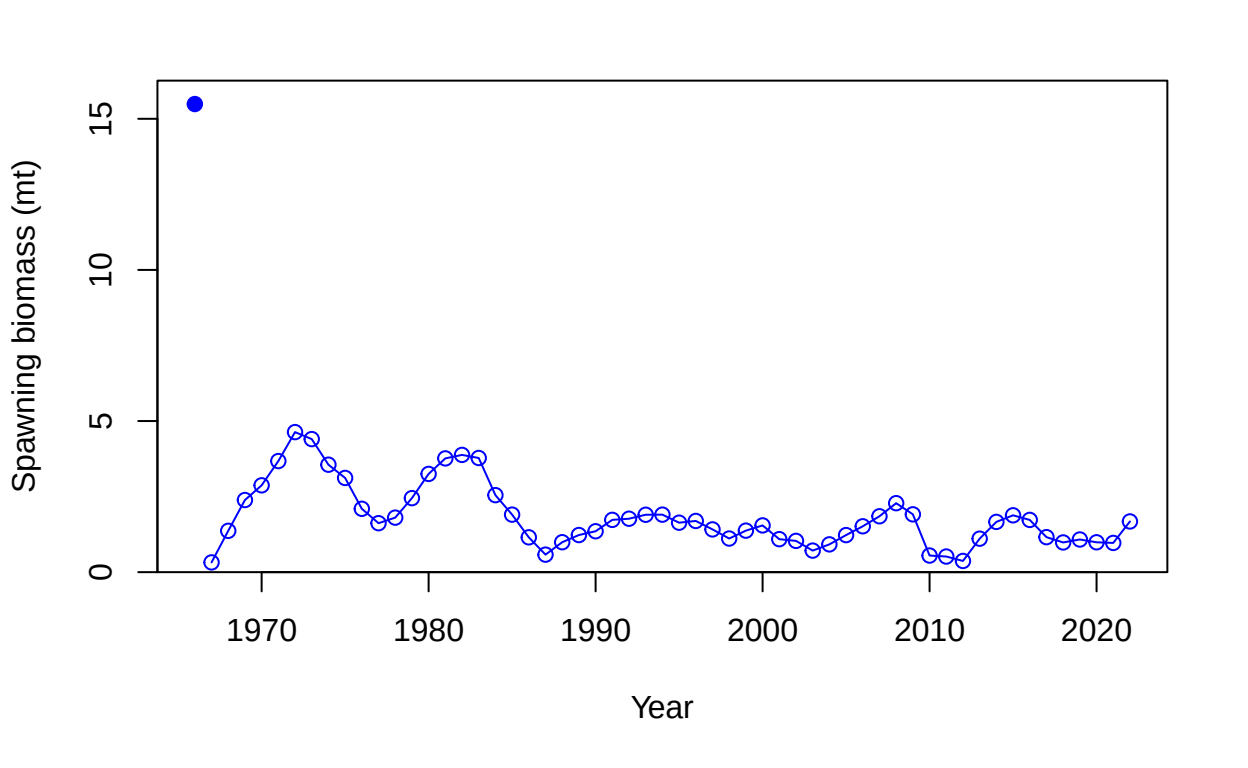

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25
30
Age (yr)
FISHERY
SURVEY2

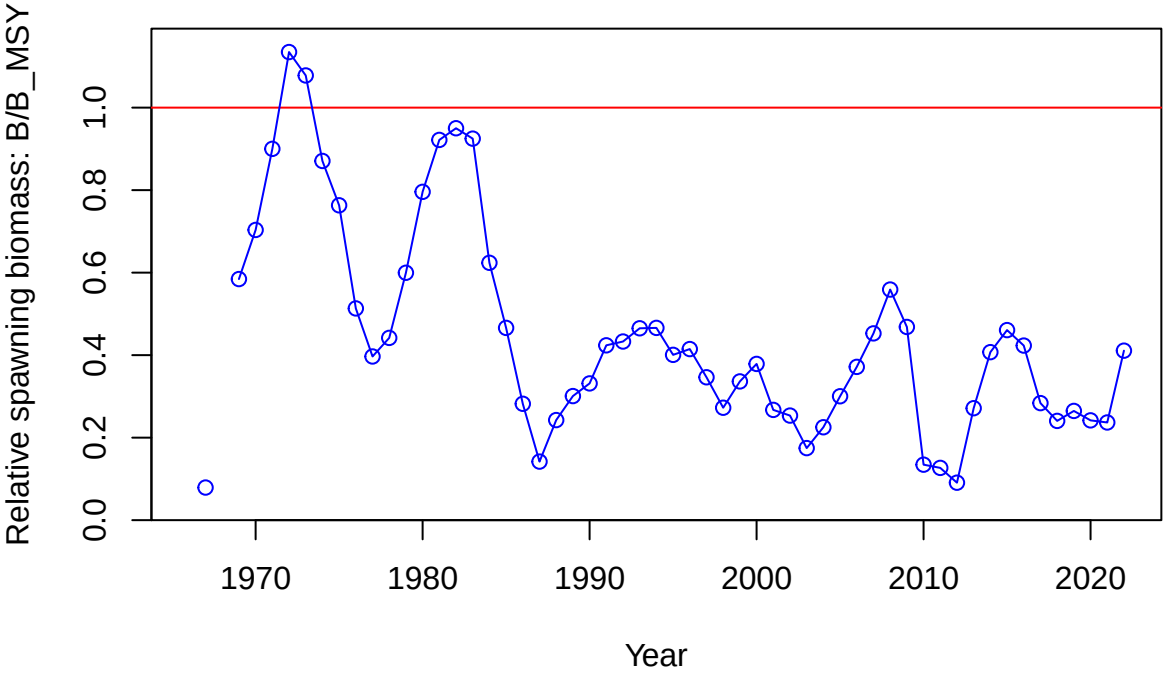

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Length (cm)

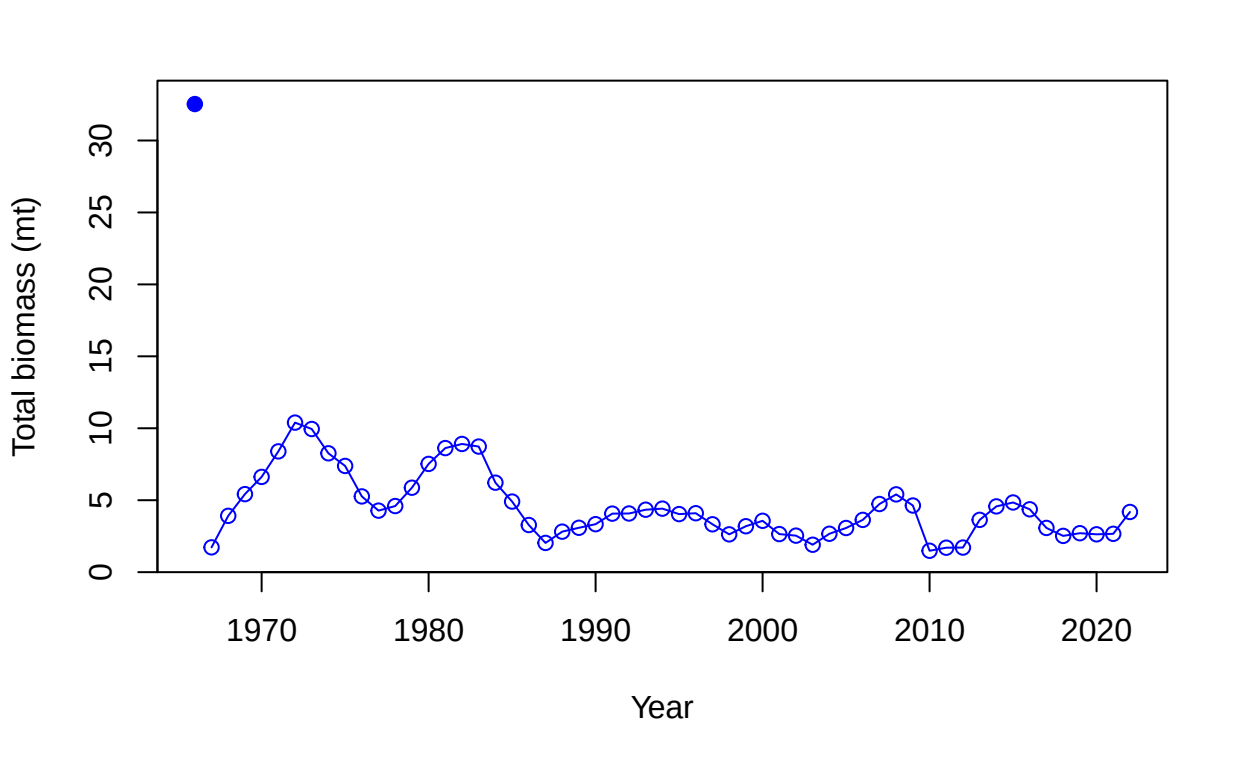

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Length (cm)

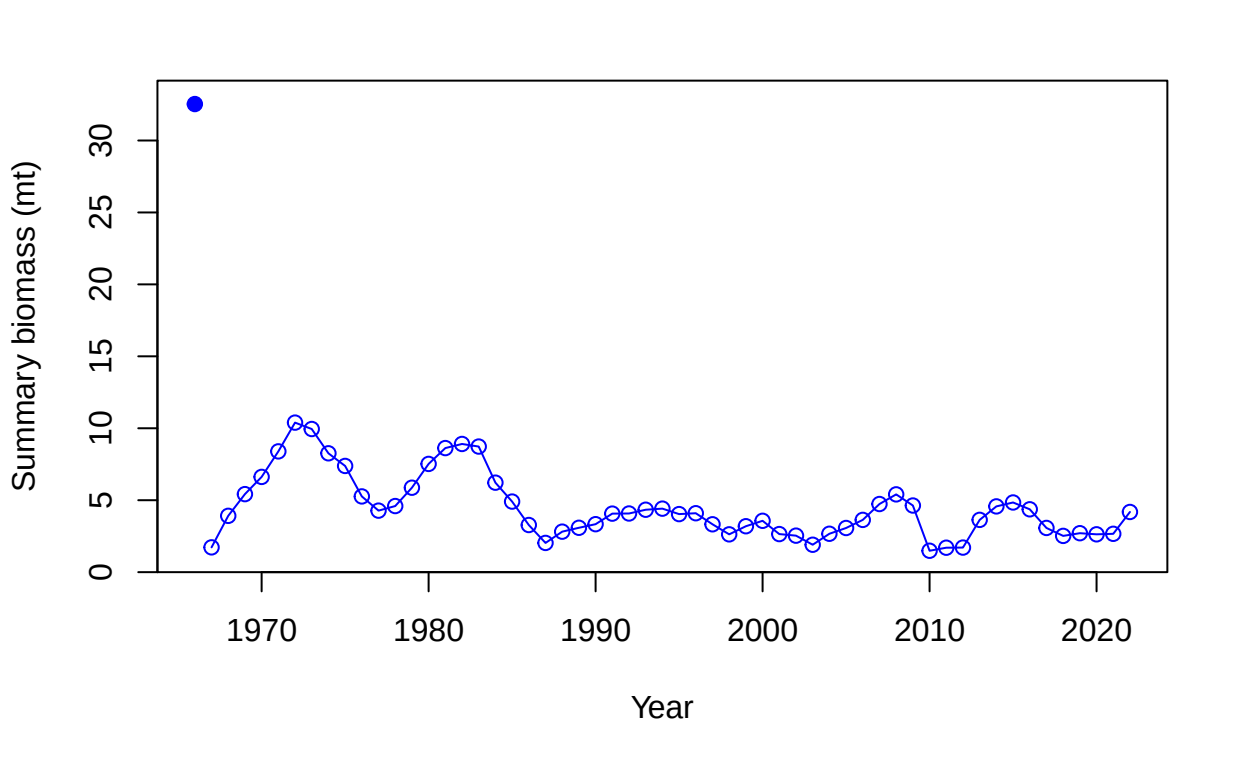

Length (cm)
0
20
40
60
80
100
0
5
10
15
20
25
30
Age (yr)
1
0.8
0.6
0.4
0.2

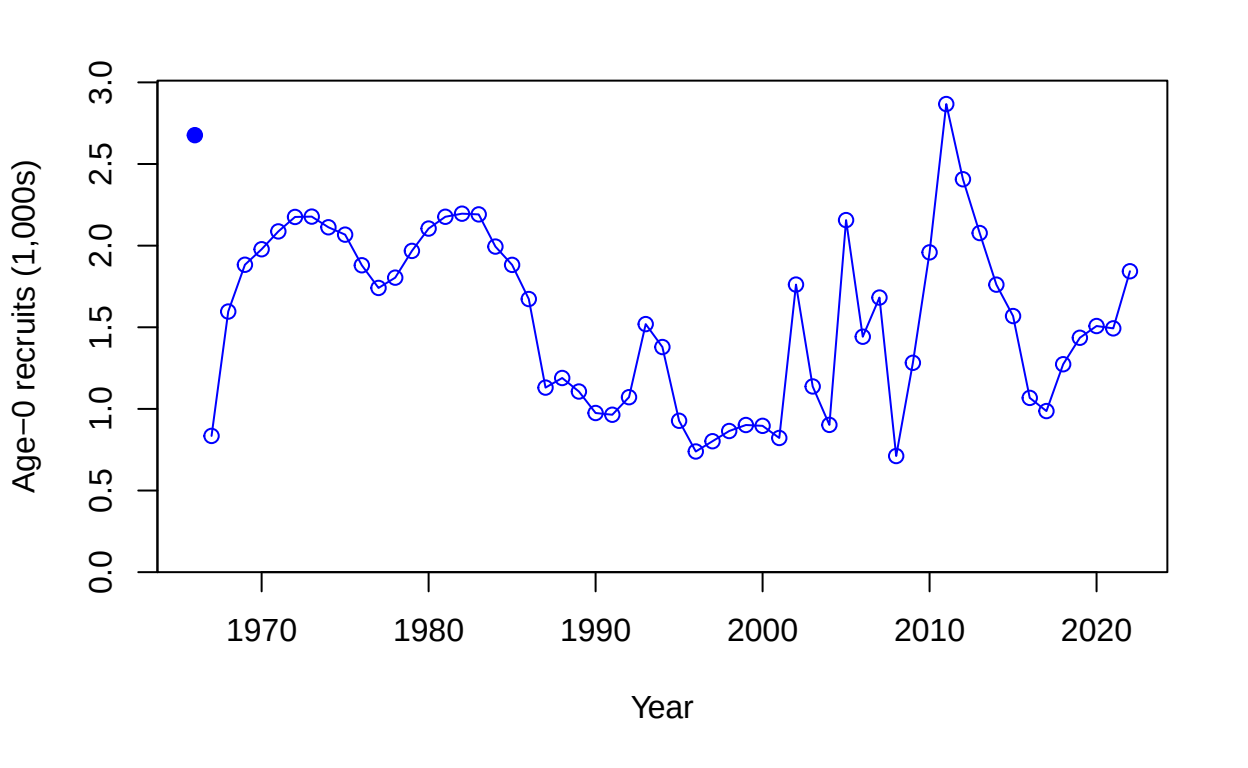

Length (cm)
0
20
40
60
80
100
0
5
10
15
20
25
30
Age (yr)
1
0.8
0.6
0.4
0.2

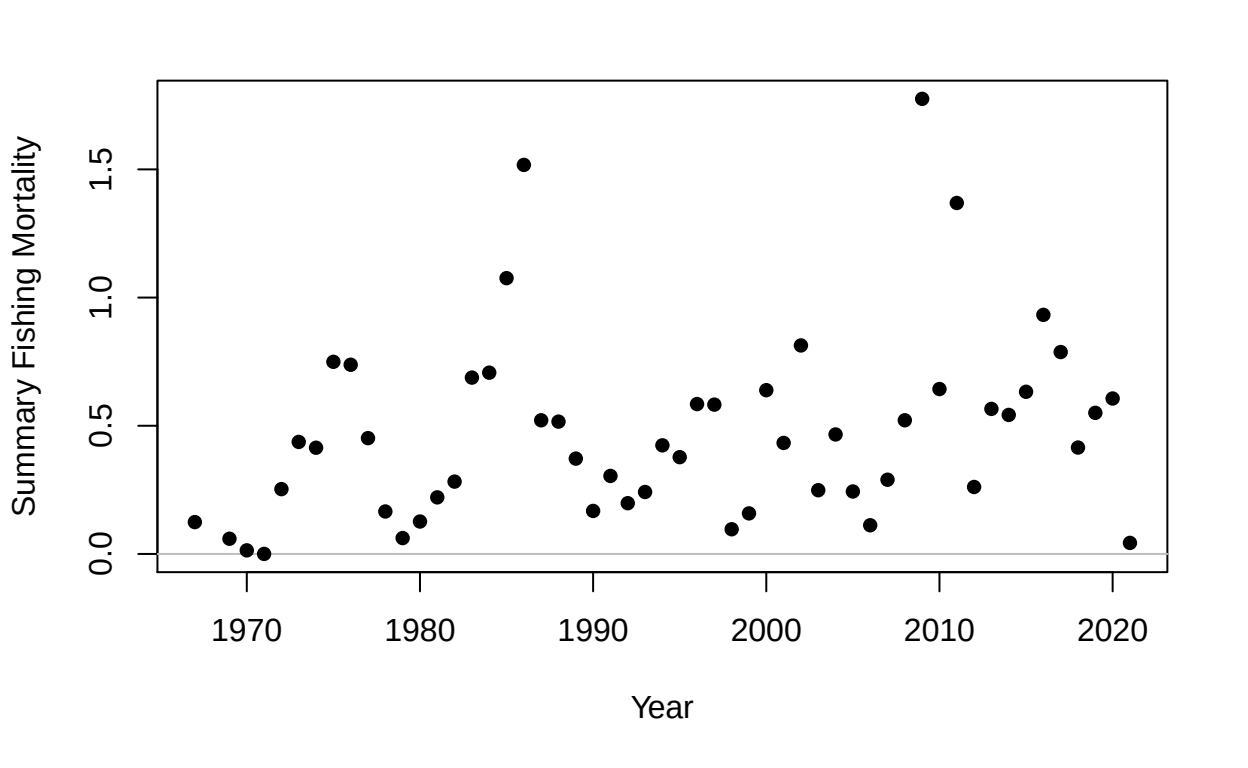

Spawning biomass (mt)
0
5
10
15
1970
1980
1990
2000
2010
2020
Year

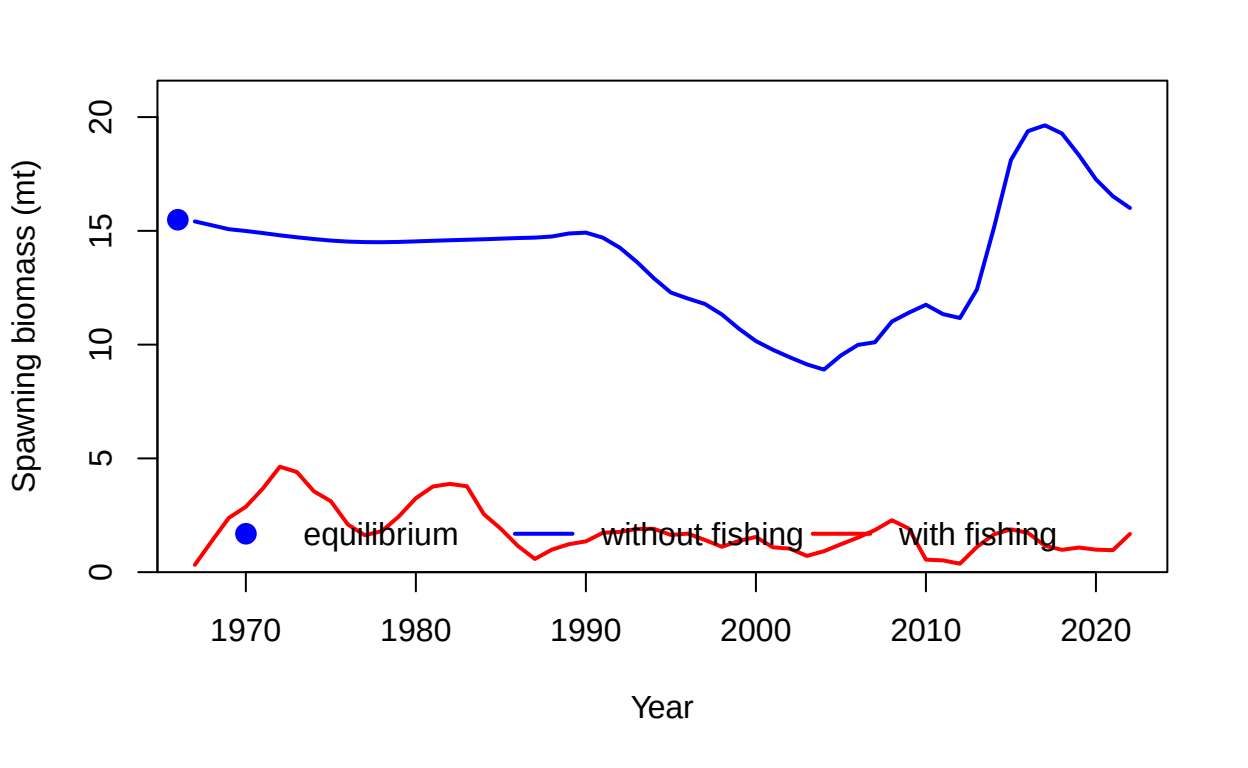

Relative spawning biomass: B/B_MSY
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

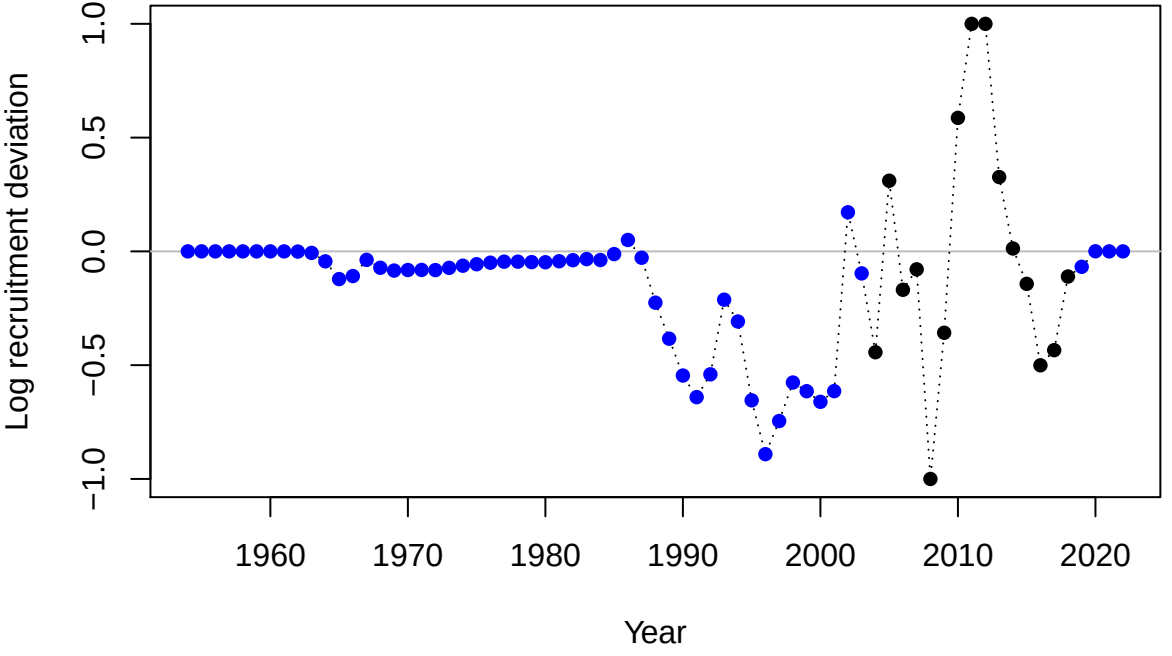

Total biomass (mt)
0
5
10
15
20
25
30
1970
1980
1990
2000
2010
2020
Year

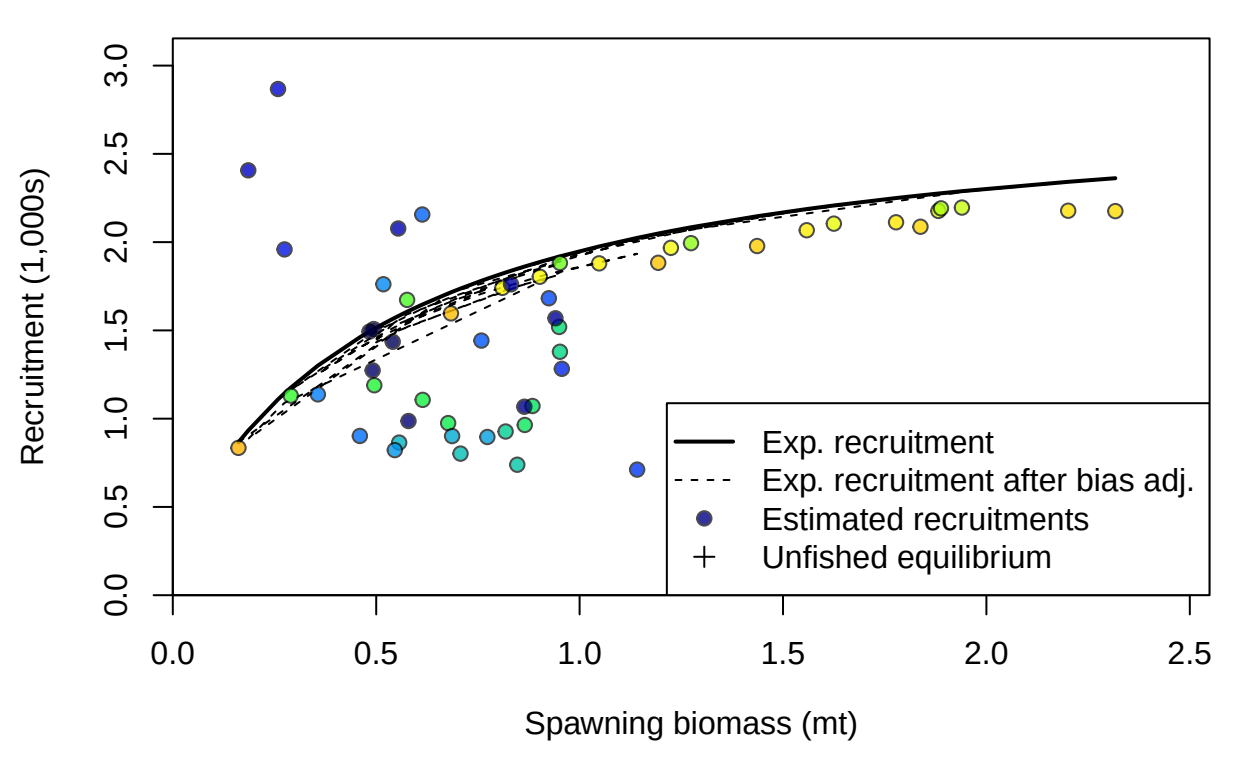

Summary biomass (mt)
0
5
10
15
20
25
30
1970
1980
1990
2000
2010
2020
Year

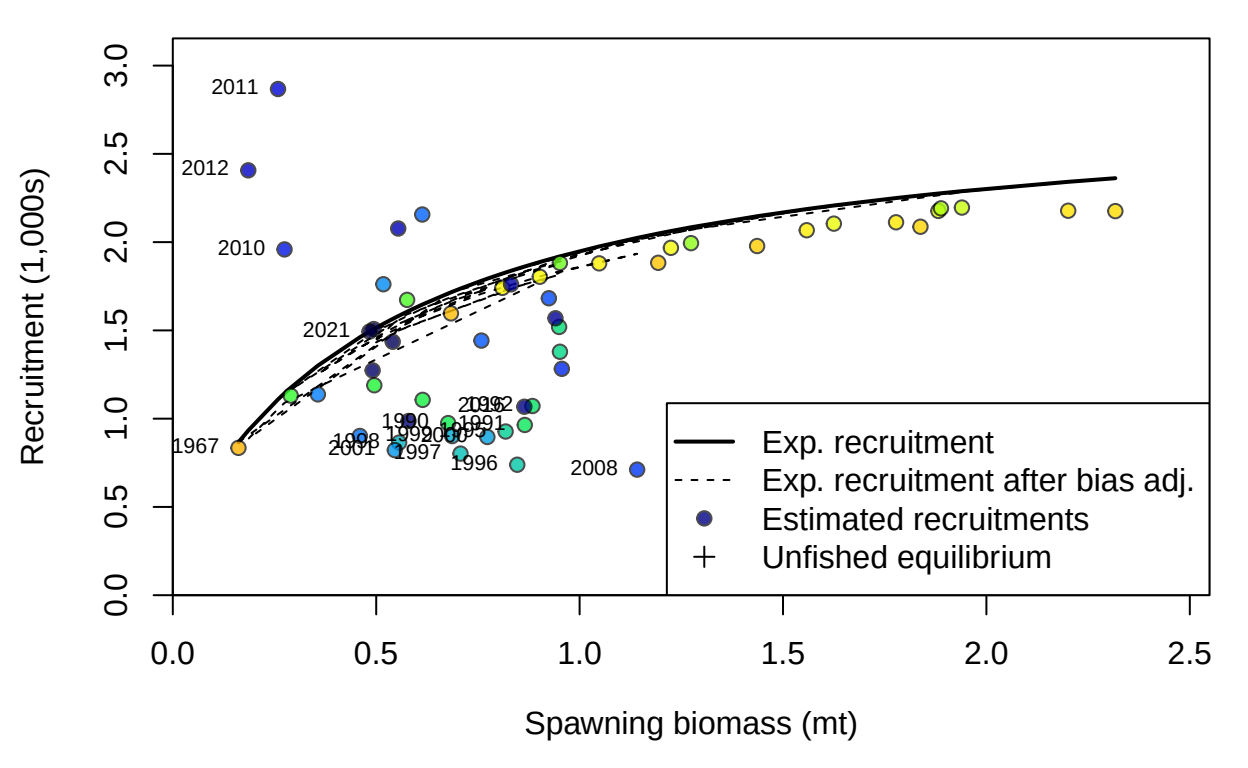

Age−0 recruits (1,000s)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

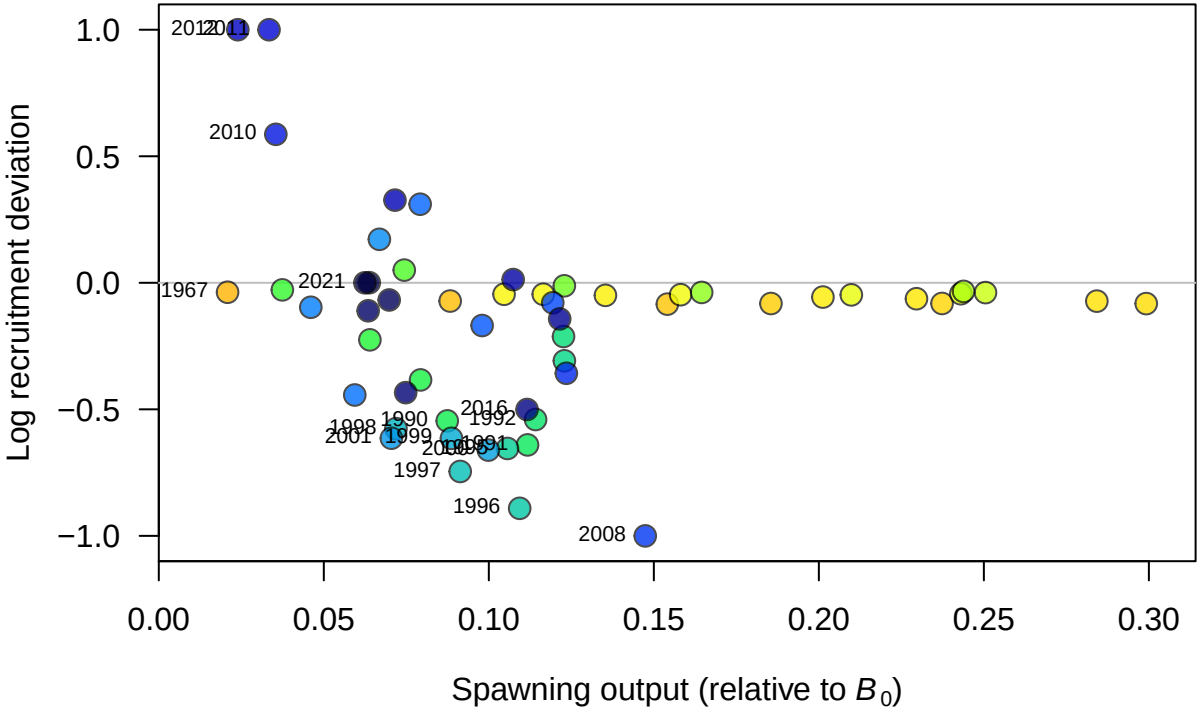

Summary Fishing Mortality
0.0
0.5
1.0
1.5
1970
1980
1990
2000
2010
2020
Year

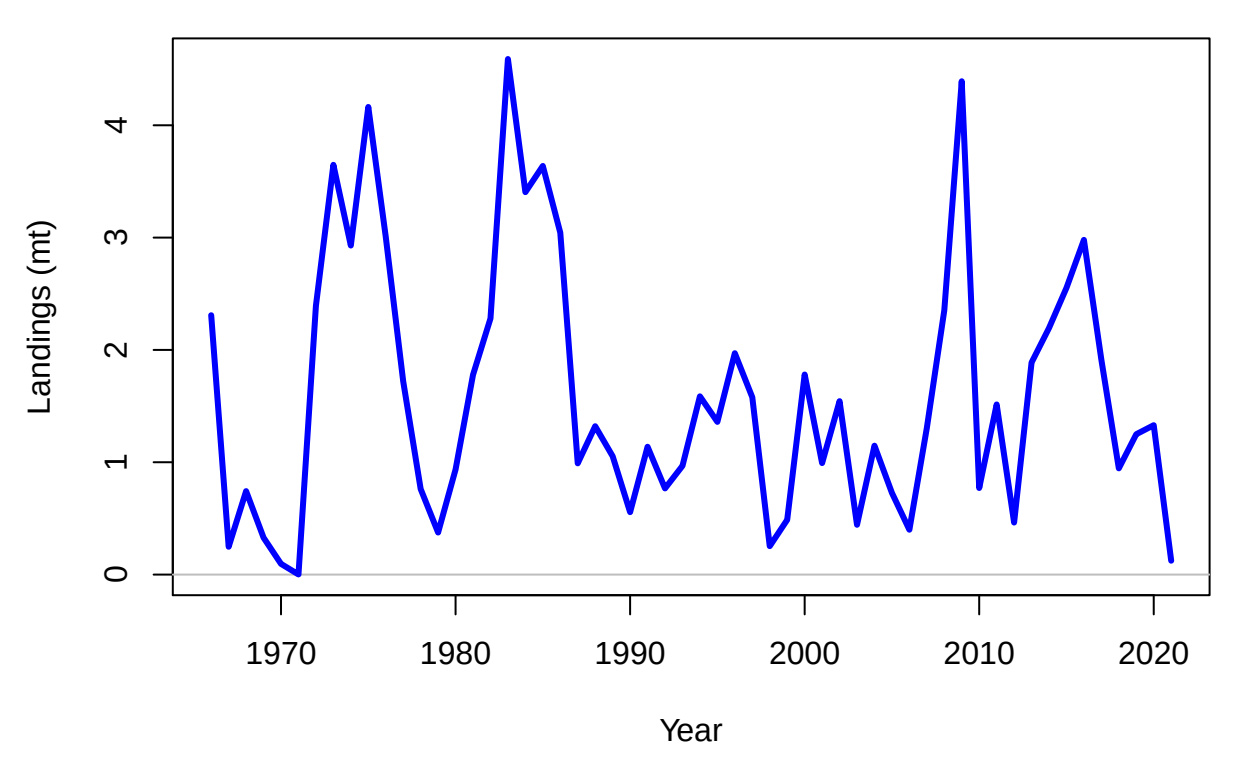

Spawning biomass (mt)
0
5
10
15
20
1970
1980
1990
2000
2010
2020
Year
equilibrium
without fishing
with fishing

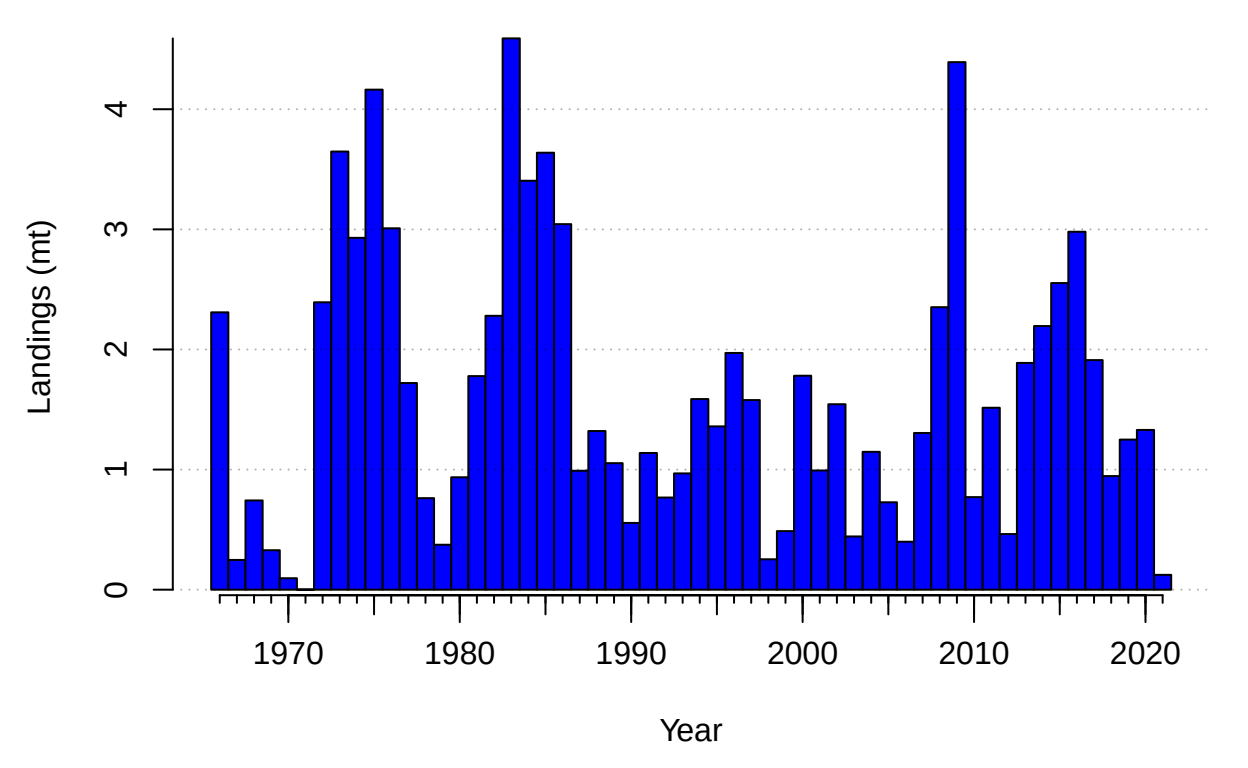

Log recruitment deviation
1.0
0.5
0.0
−0.5
−1.0
1960
1970
1980
1990
2000
2010
2020
Year

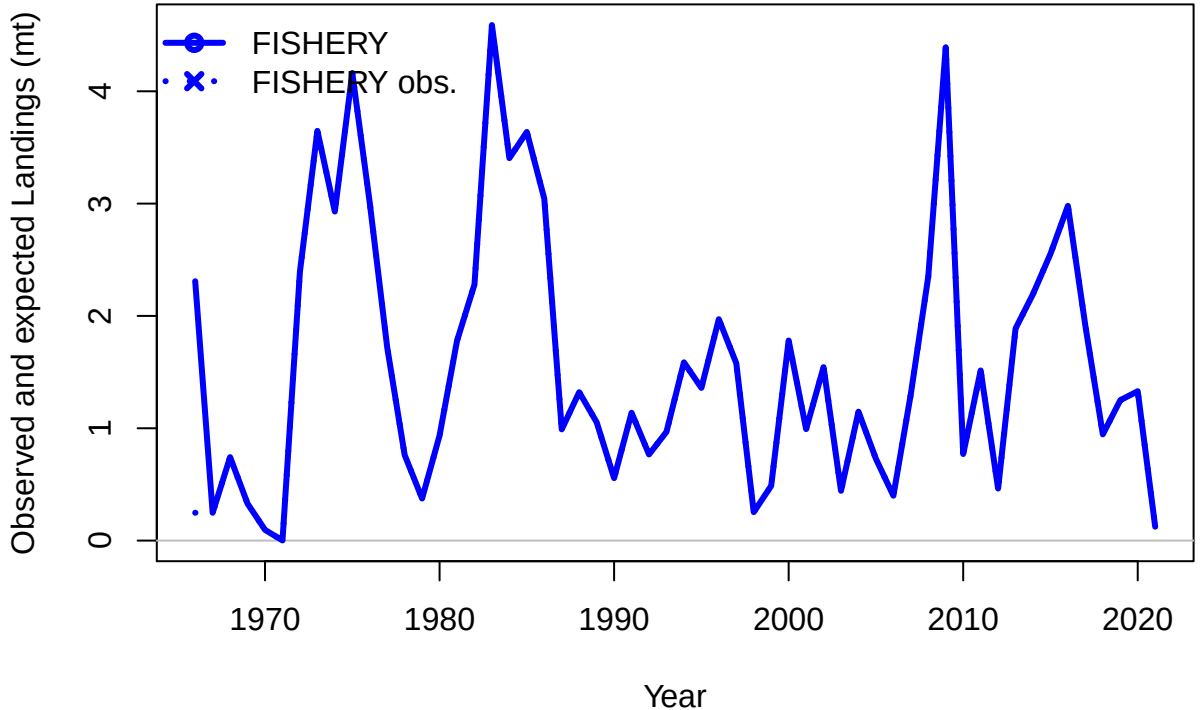

Recruitment (1,000s)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Spawning biomass (mt)
0.0
0.5
1.0
1.5
2.0
2.5
Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium

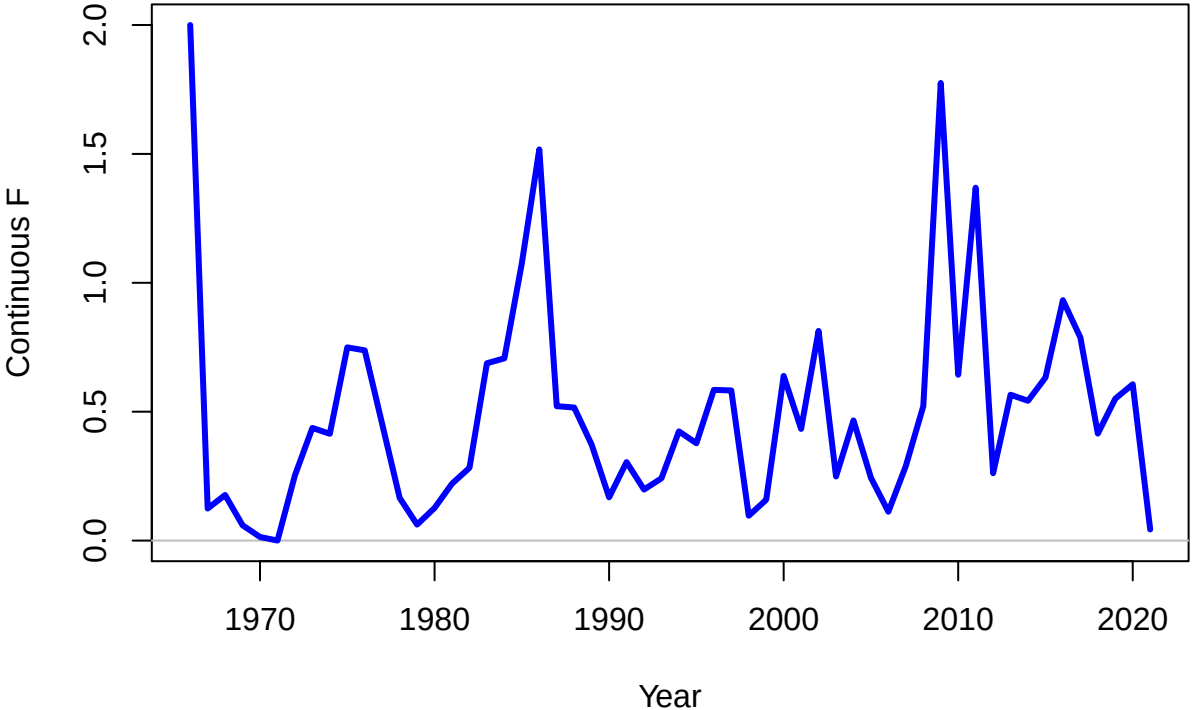

Recruitment (1,000s)
Spawning biomass (mt)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
2011
2012
2010
2021
1967
2008
1996
1997
2001
Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium

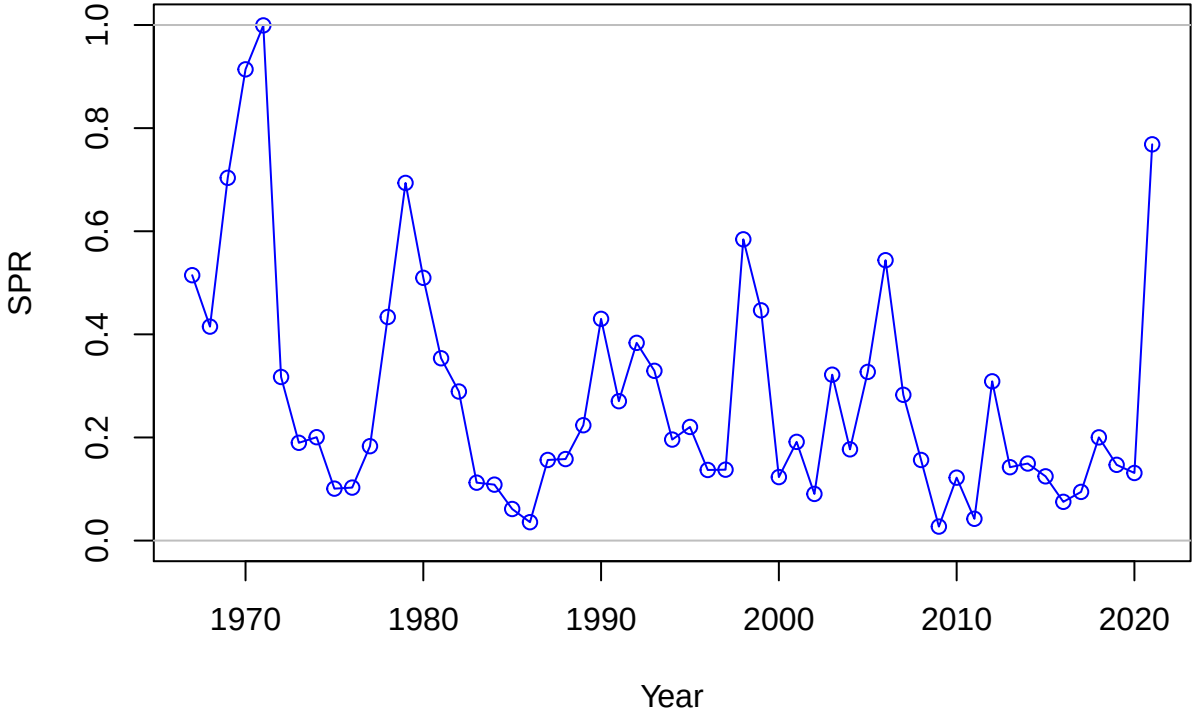

Log recruitment deviation
1.0
0.5
0.0
−0.5
−1.0
0.00
0.05
0.10
0.15
0.20
0.25
0.30
Spawning output (relative to B_0)
2012
2011
2010
1967
2021
2016
1998
1990
1992
2001
1999
1997
1996
2008

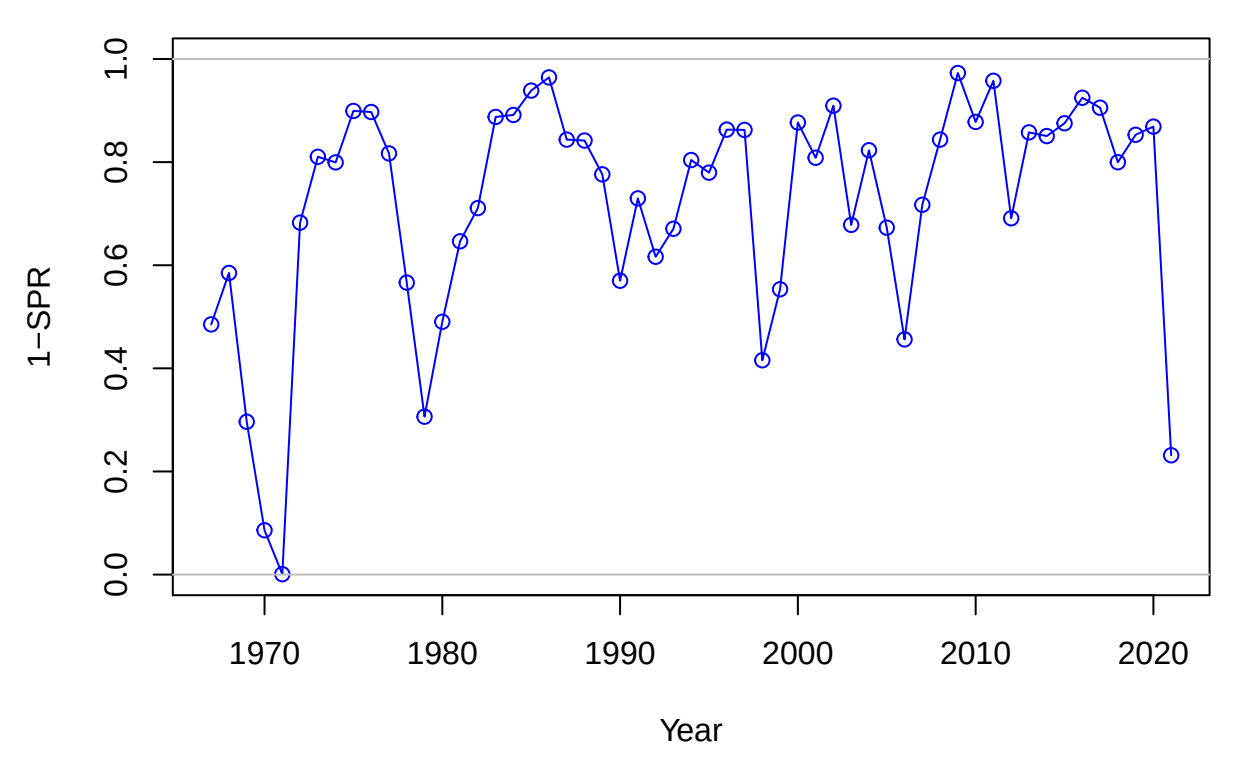

Landings (mt)
0
1
2
3
4
1970
1980
1990
2000
2010
2020
Year

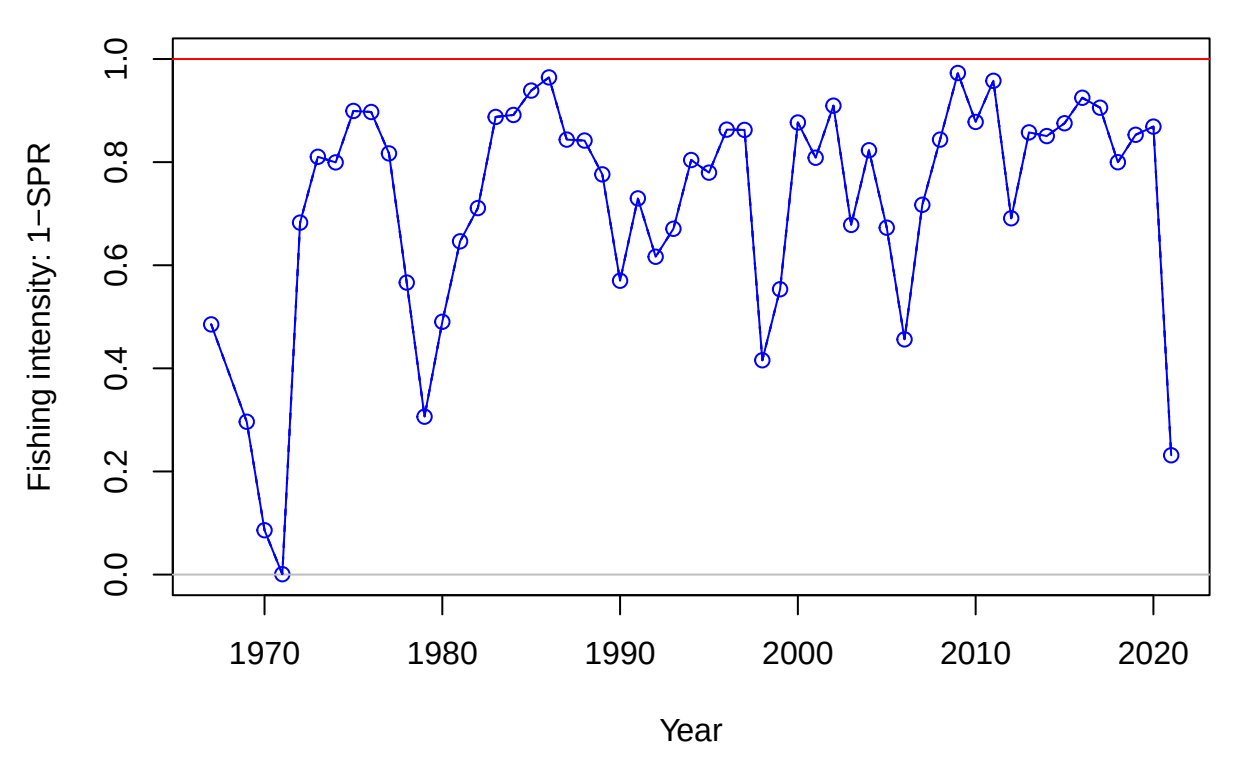

Landings (mt)
0
1
2
3
4
1970
1980
1990
2000
2010
2020
Year

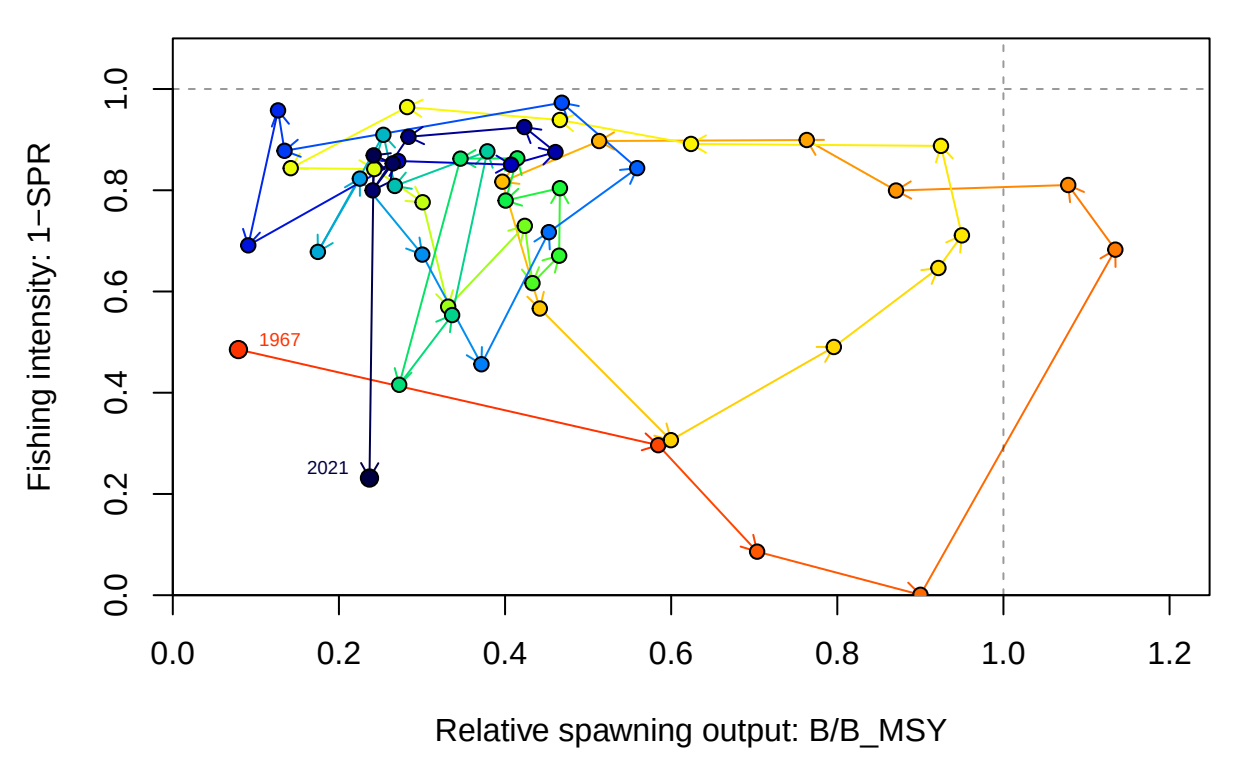

FISHERY
FISHERY obs.
Observed and expected Landings (mt)
0
1
2
3
4
1970
1980
1990
2000
2010
2020
Year

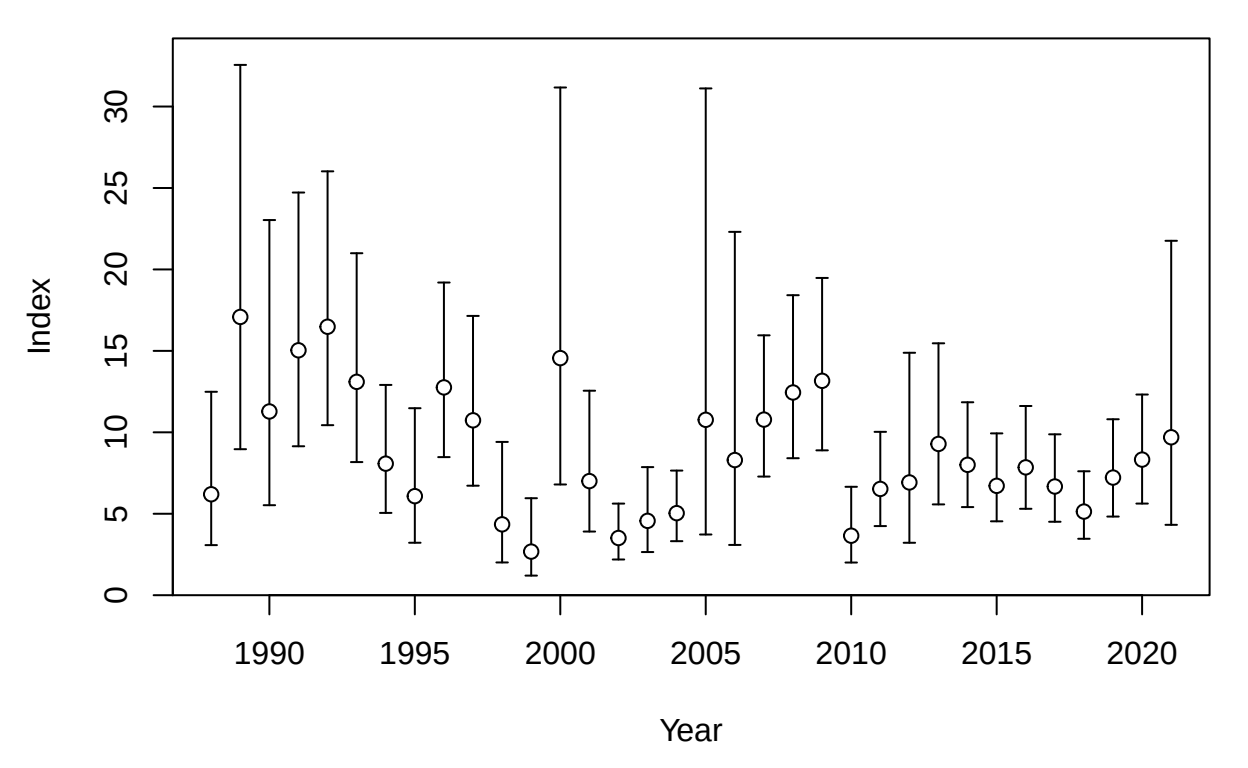

Continuous F
0.0
0.5
1.0
1.5
2.0
1970
1980
1990
2000
2010
2020
Year

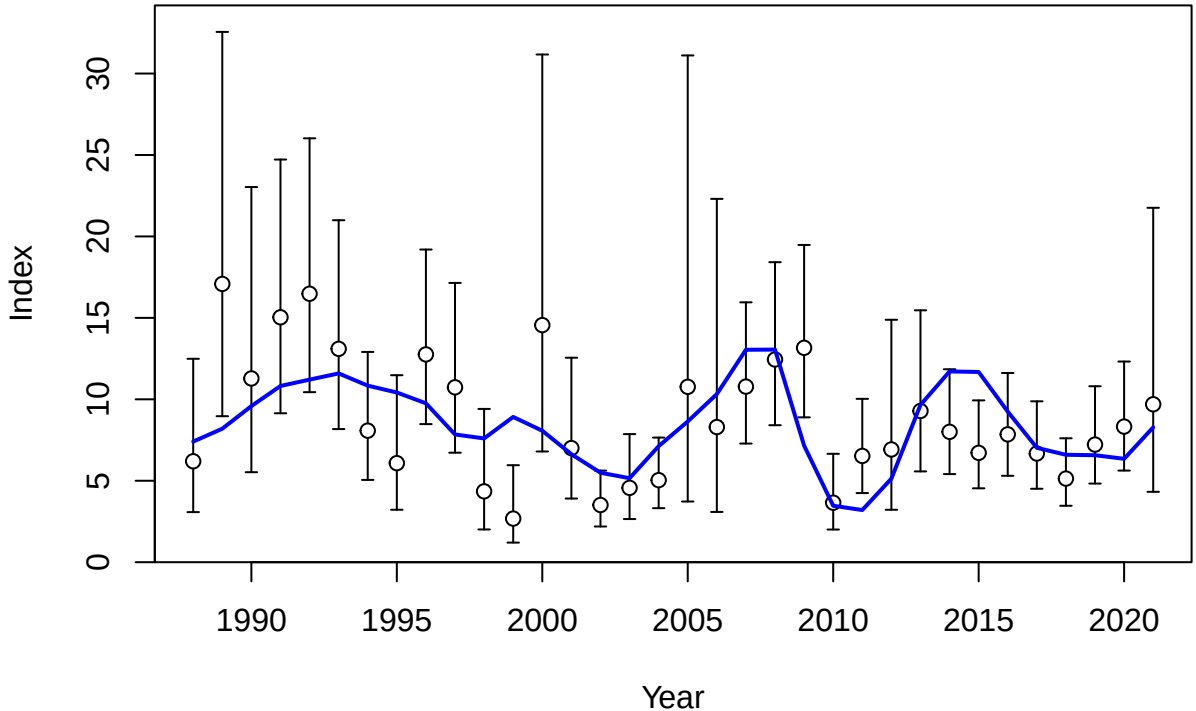

SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

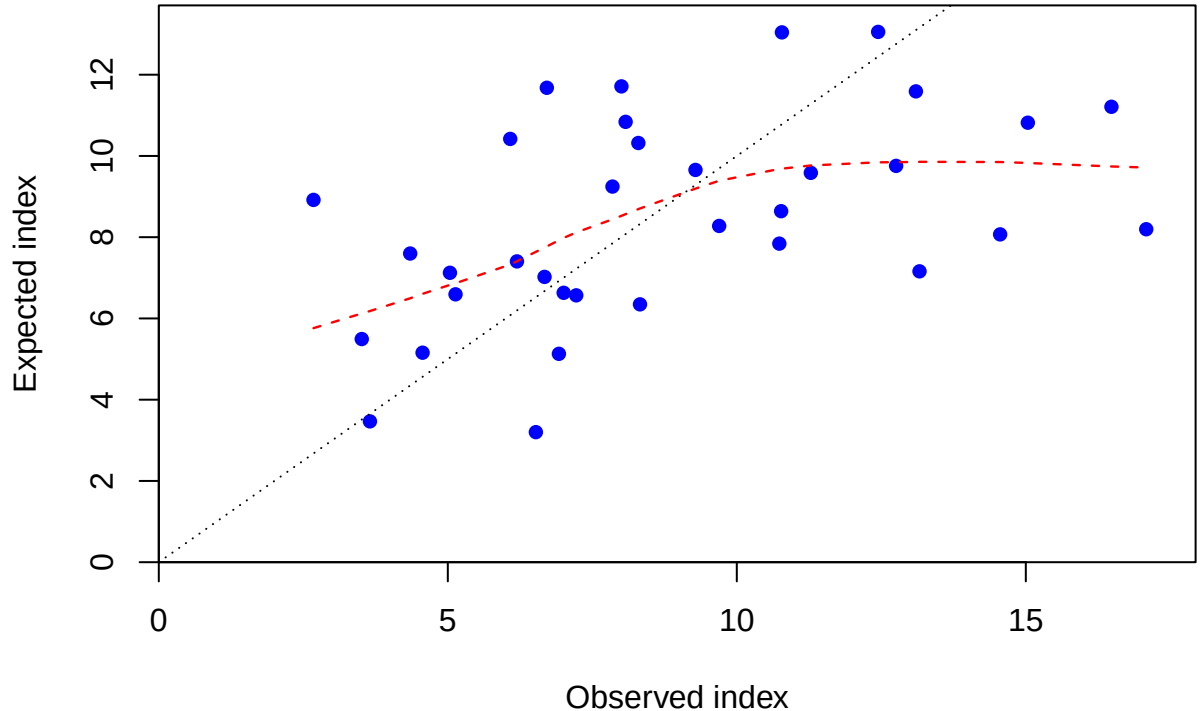

1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

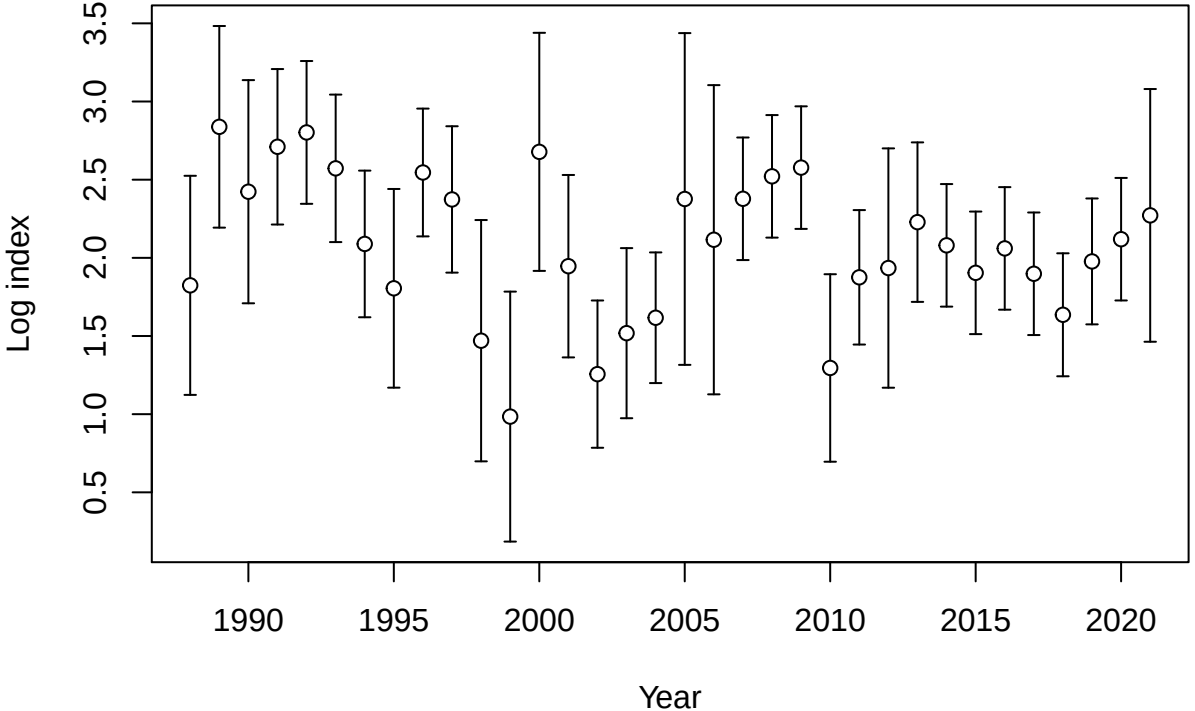

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

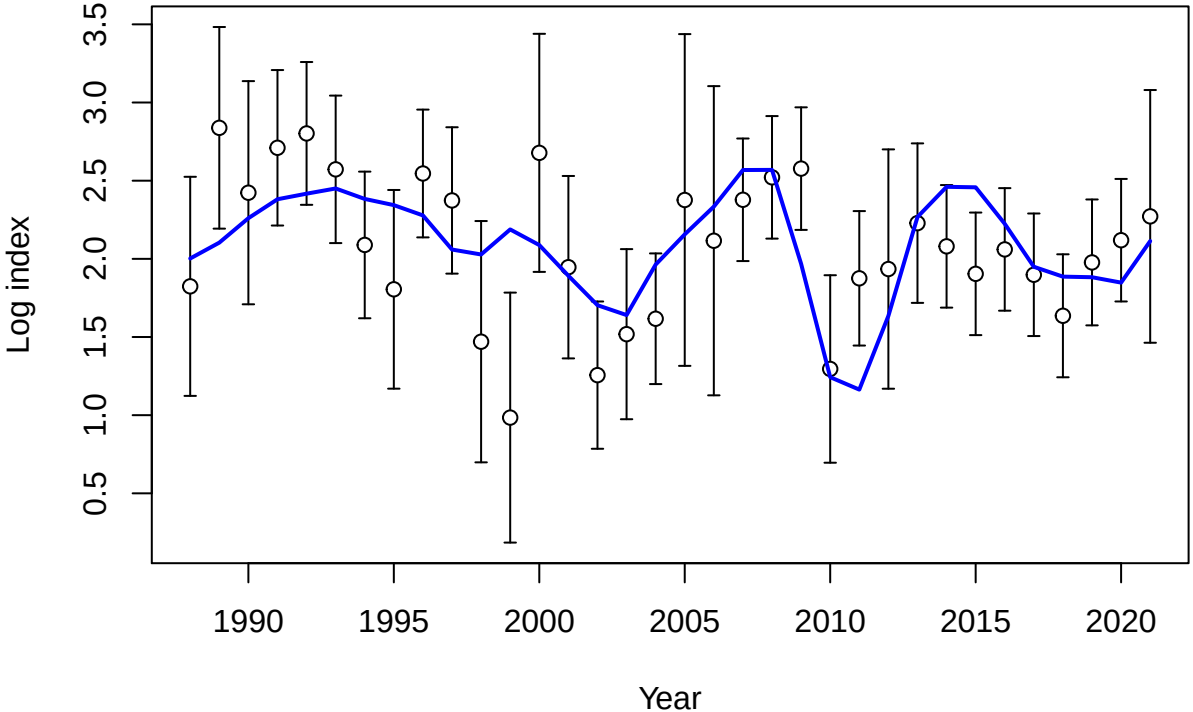

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1967
2021
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Relative spawning output: B/B_MSY

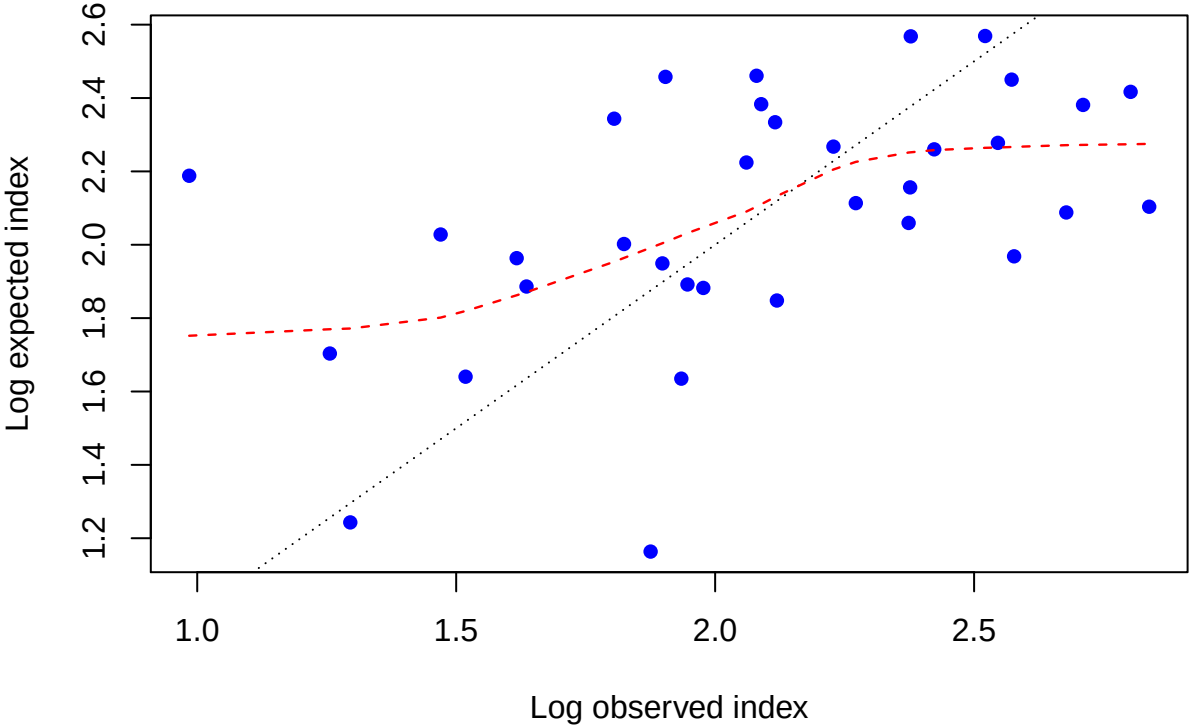

Index
0
5
10
15
20
25
30
1990
1995
2000
2005
2010
2015
2020
Year

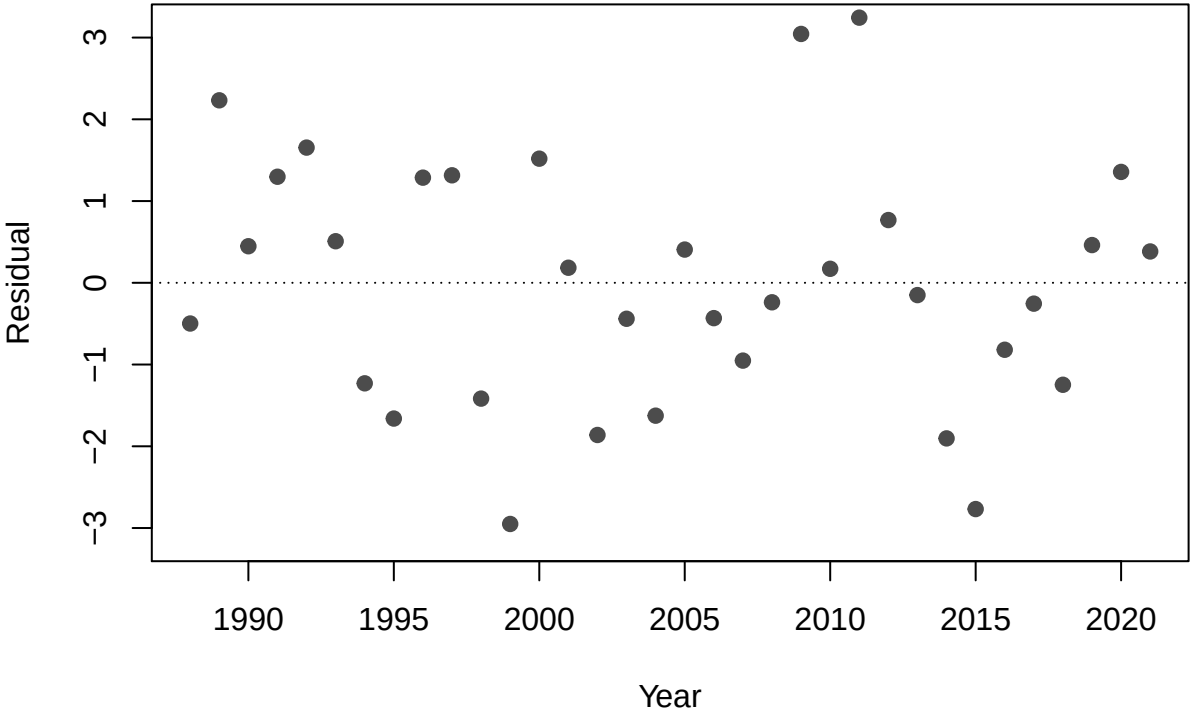

Index
0
5
10
15
20
25
30
1990
1995
2000
2005
2010
2015
2020
Year

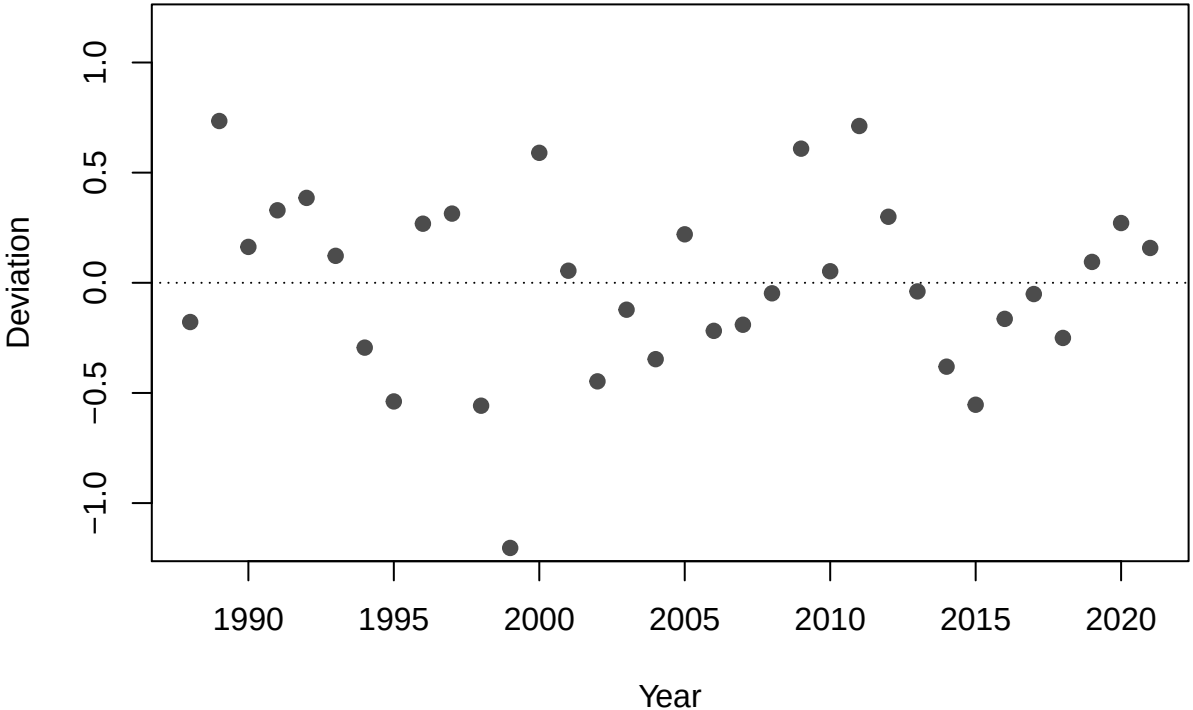

Expected index
0
2
4
6
8
10
12
0
5
10
15
Observed index

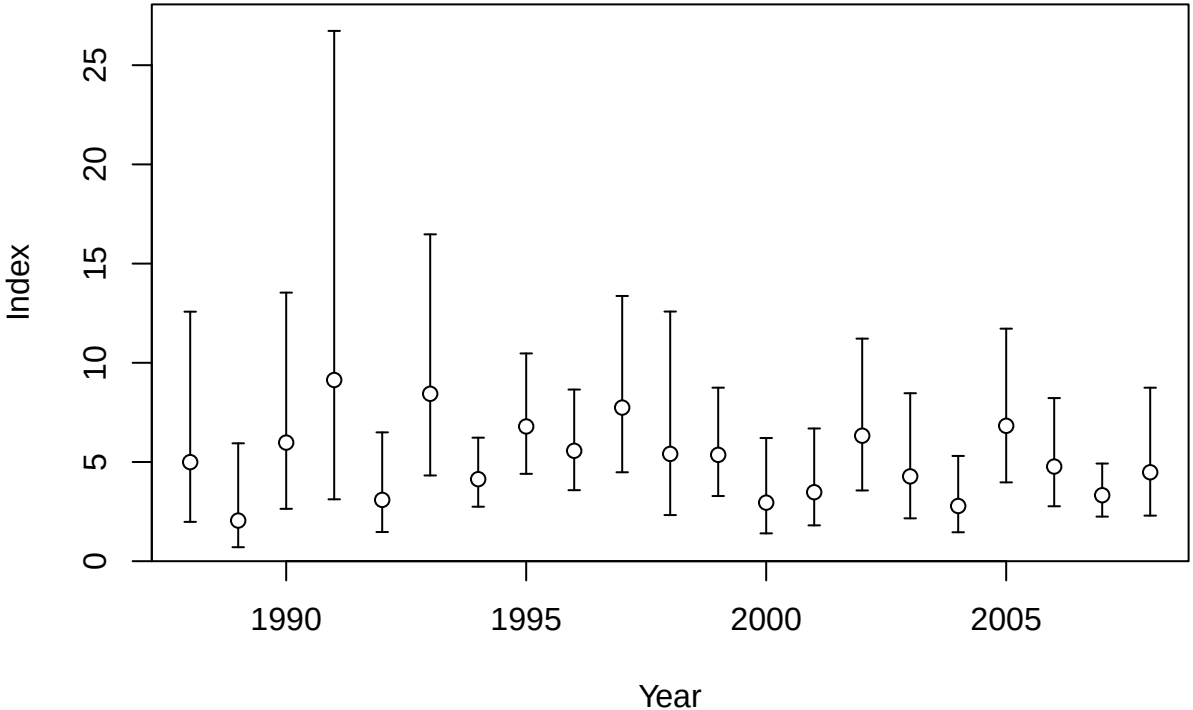

Log index
0.5
1.0
1.5
2.0
2.5
3.0
3.5
1990
1995
2000
2005
2010
2015
2020
Year

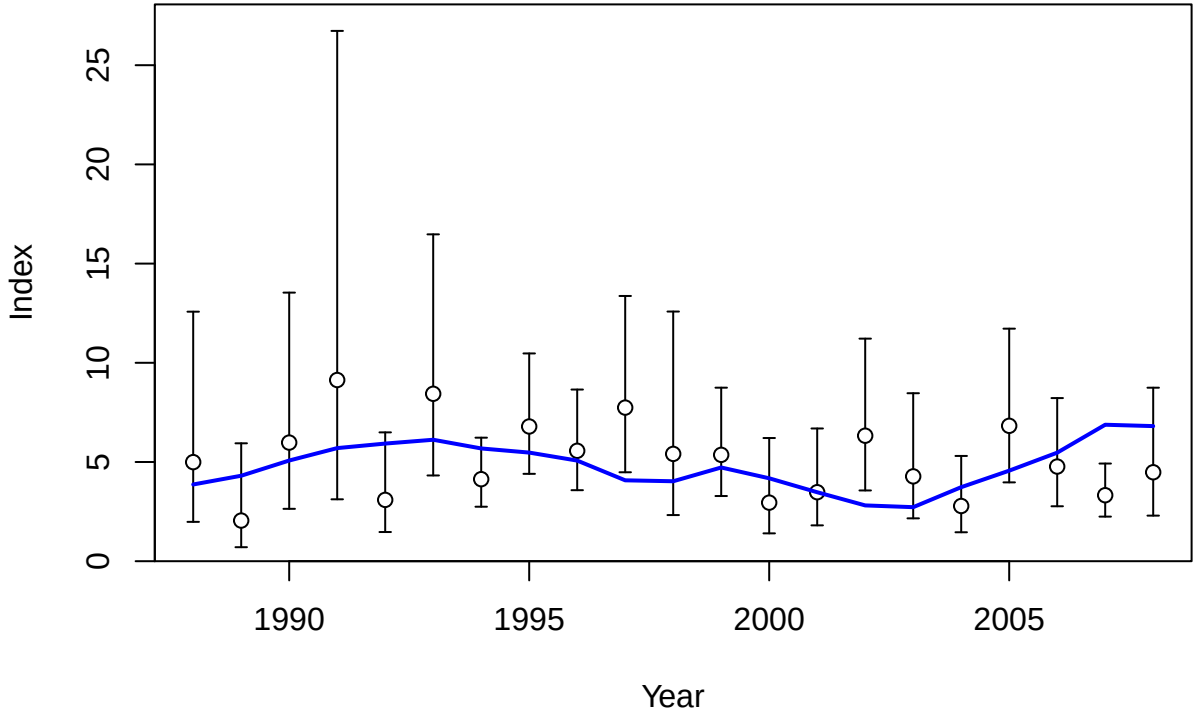

Log index
0.5
1.0
1.5
2.0
2.5
3.0
3.5
1990
1995
2000
2005
2010
2015
2020
Year

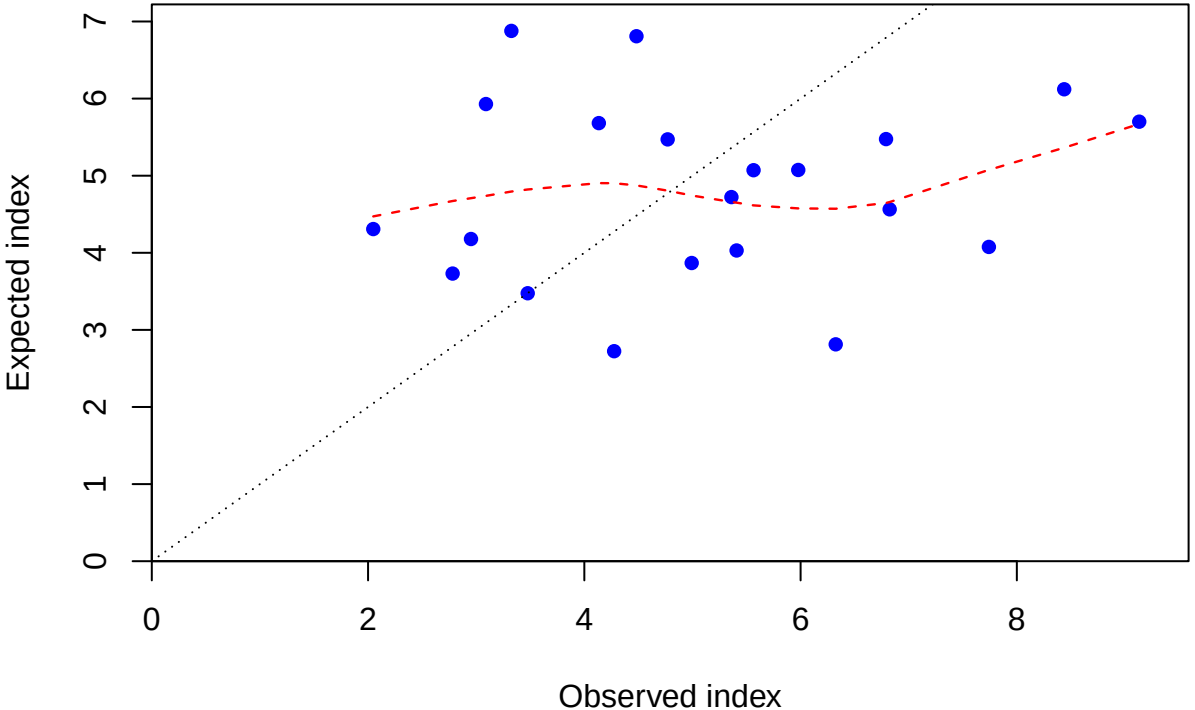

Log expected index
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
1.0
1.5
2.0
2.5
Log observed index

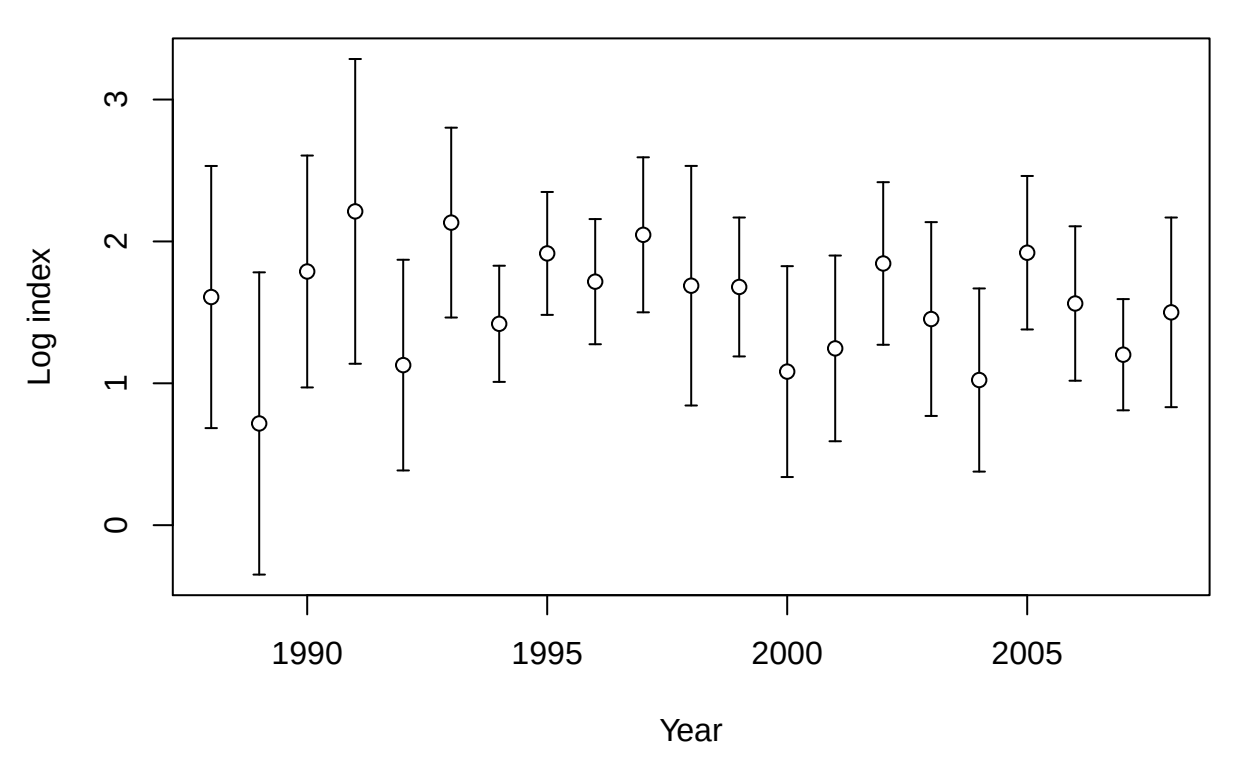

Residual
3
2
1
0
−1
−2
−3
1990
1995
2000
2005
2010
2015
2020
Year

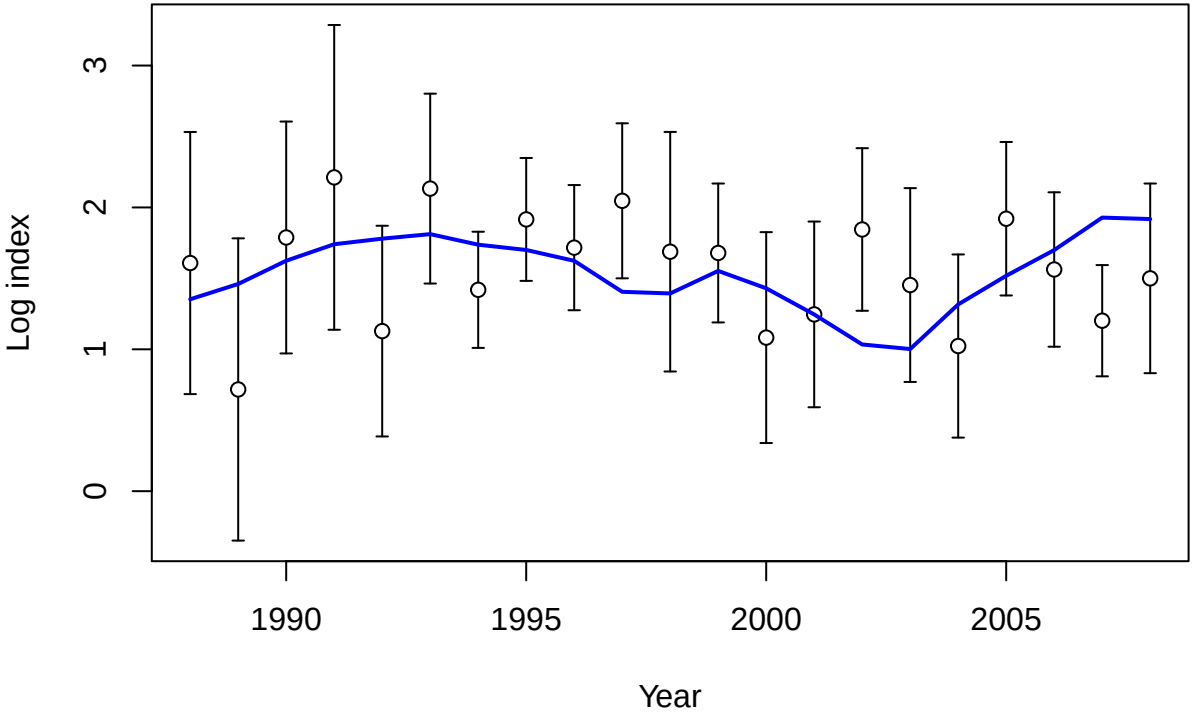

Deviation
1.0
0.5
0.0
−0.5
−1.0
1990
1995
2000
2005
2010
2015
2020
Year

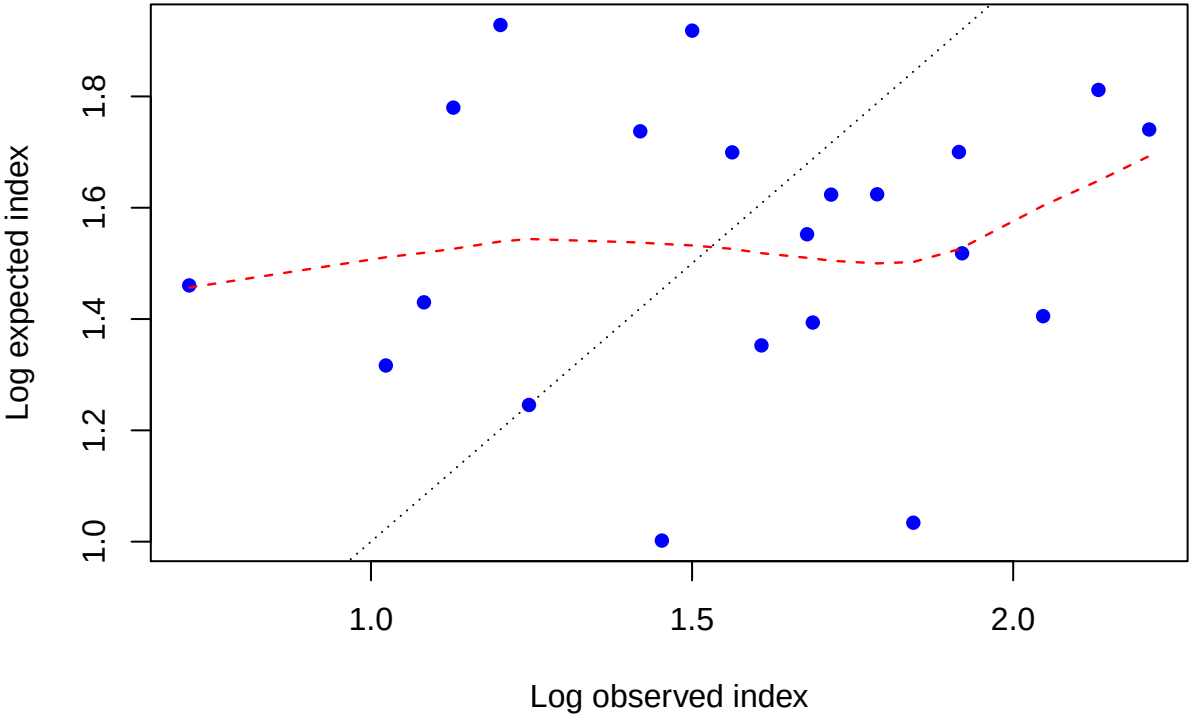

Index
0
5
10
15
20
25
1990
1995
2000
2005
Year

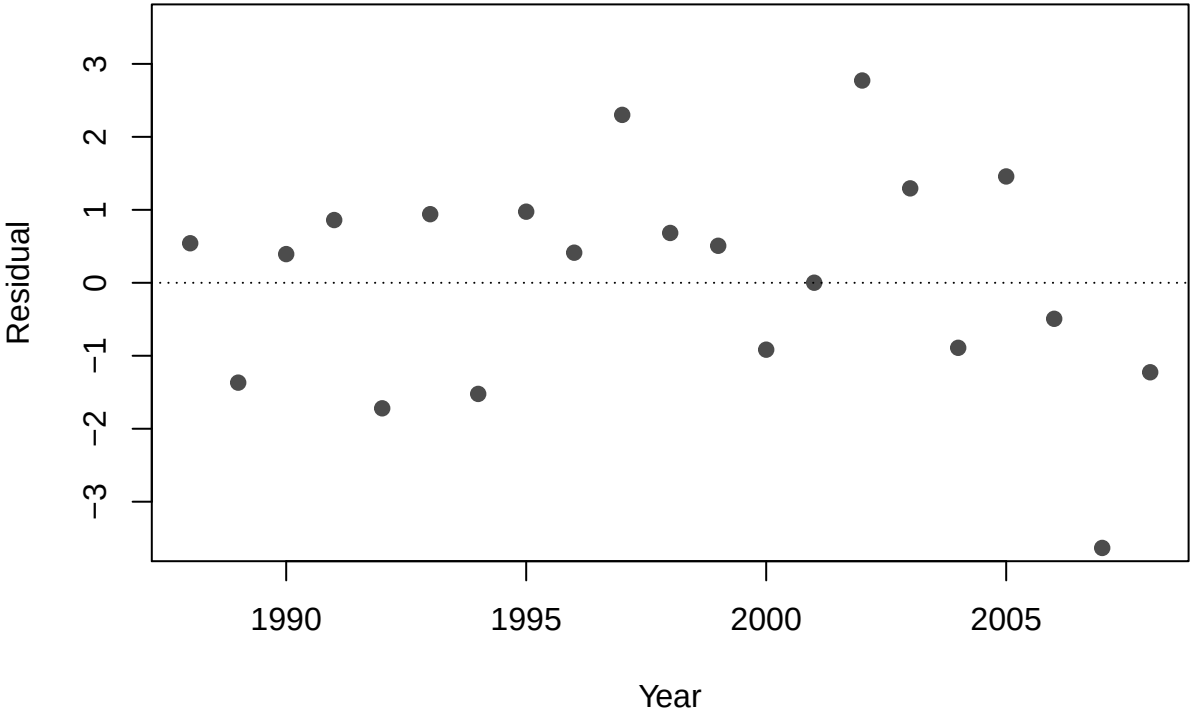

Index
0
5
10
15
20
25
1990
1995
2000
2005
Year

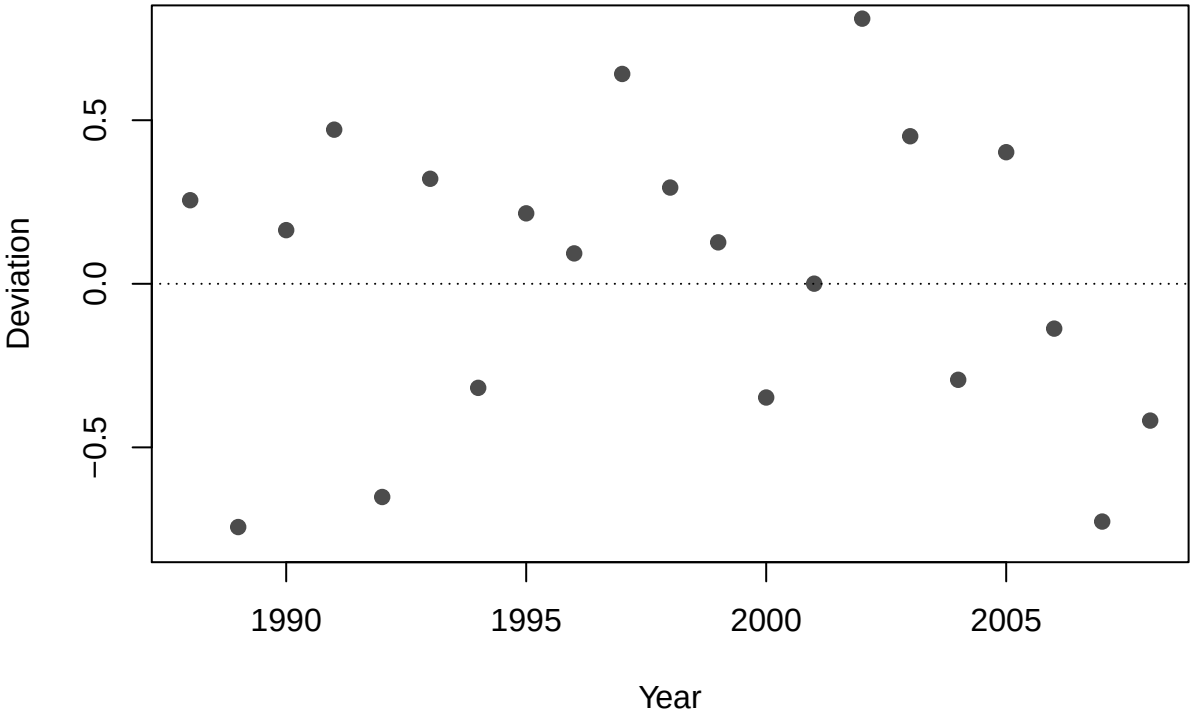

Expected index
0
1
2
3
4
5
6
7
0
2
4
6
8
Observed index

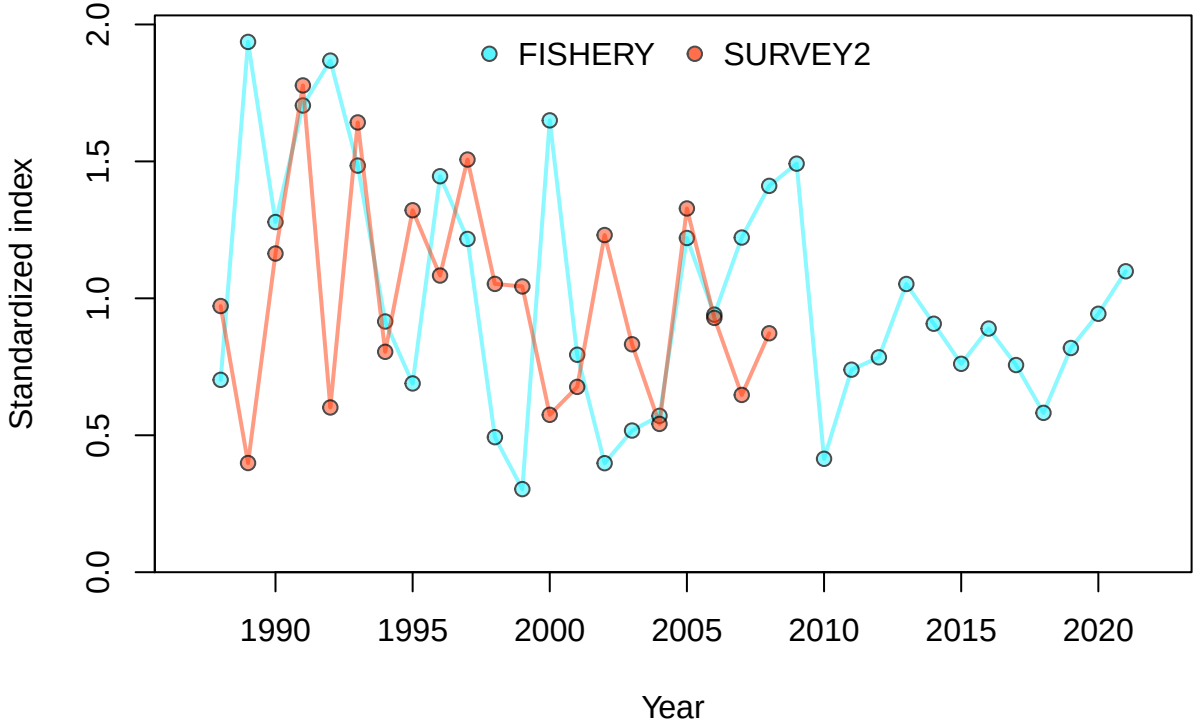

Log index
0
1
2
3
1990
1995
2000
2005
Year

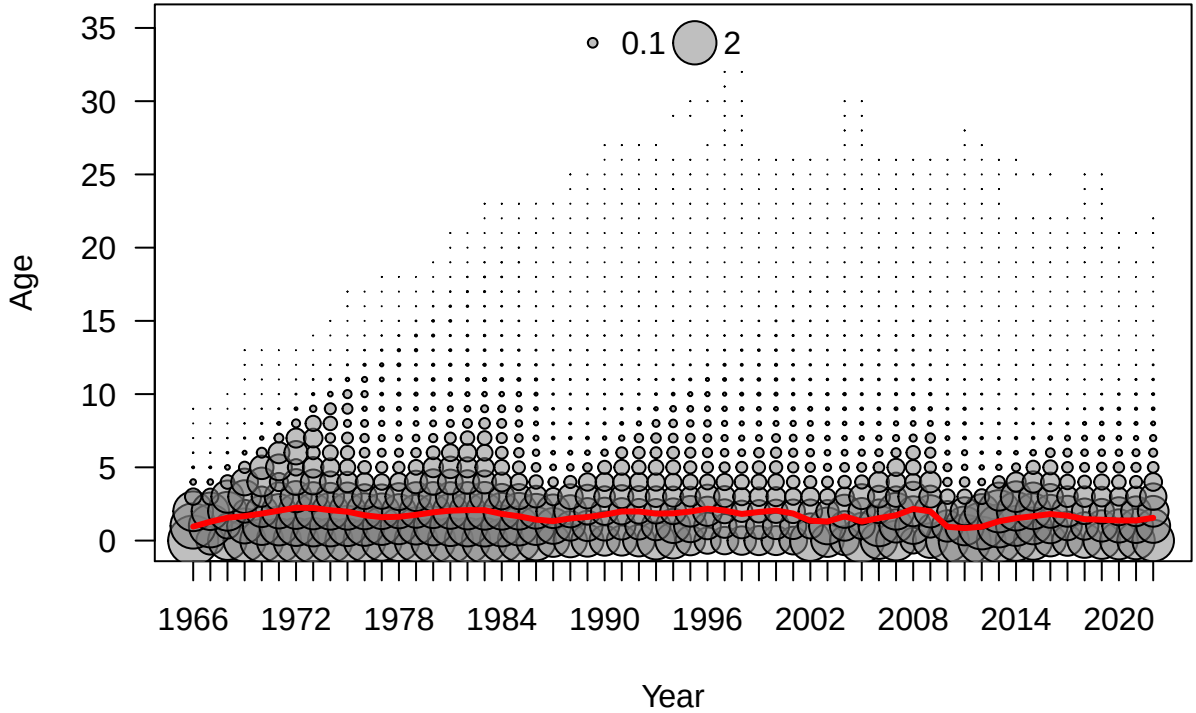

Log index
0
1
2
3
1990
1995
2000
2005
Year

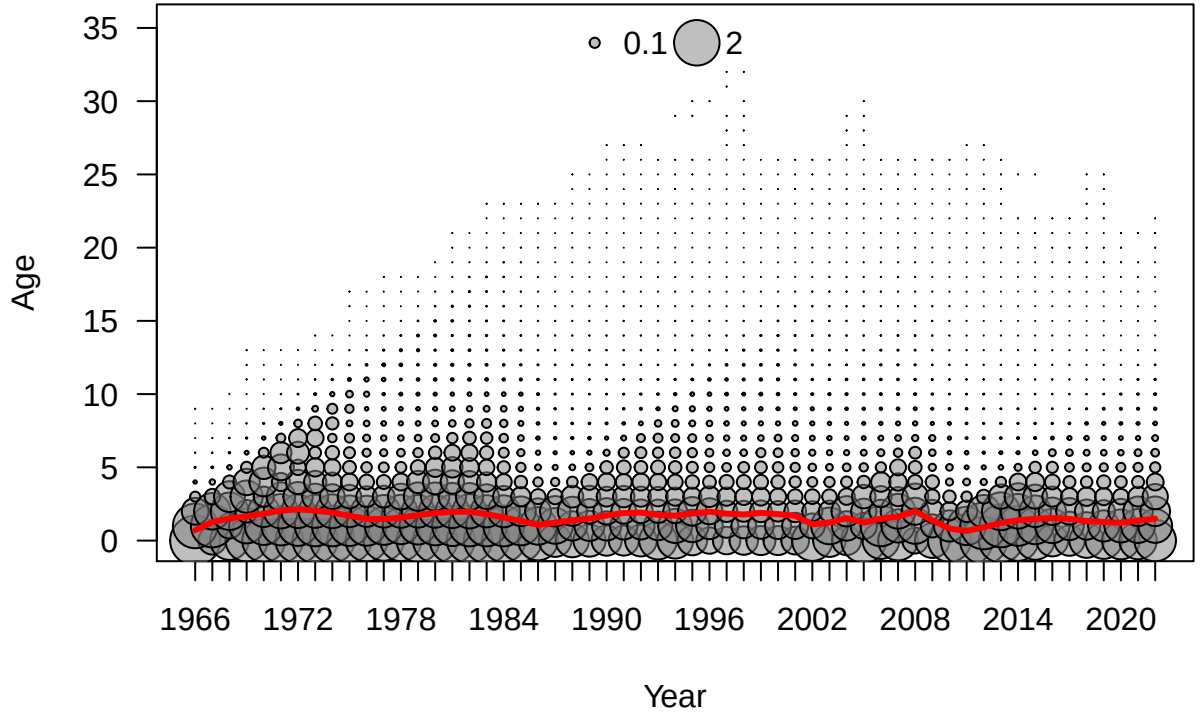

Log expected index
1.0
1.2
1.4
1.6
1.8
1.0
1.5
2.0
Log observed index

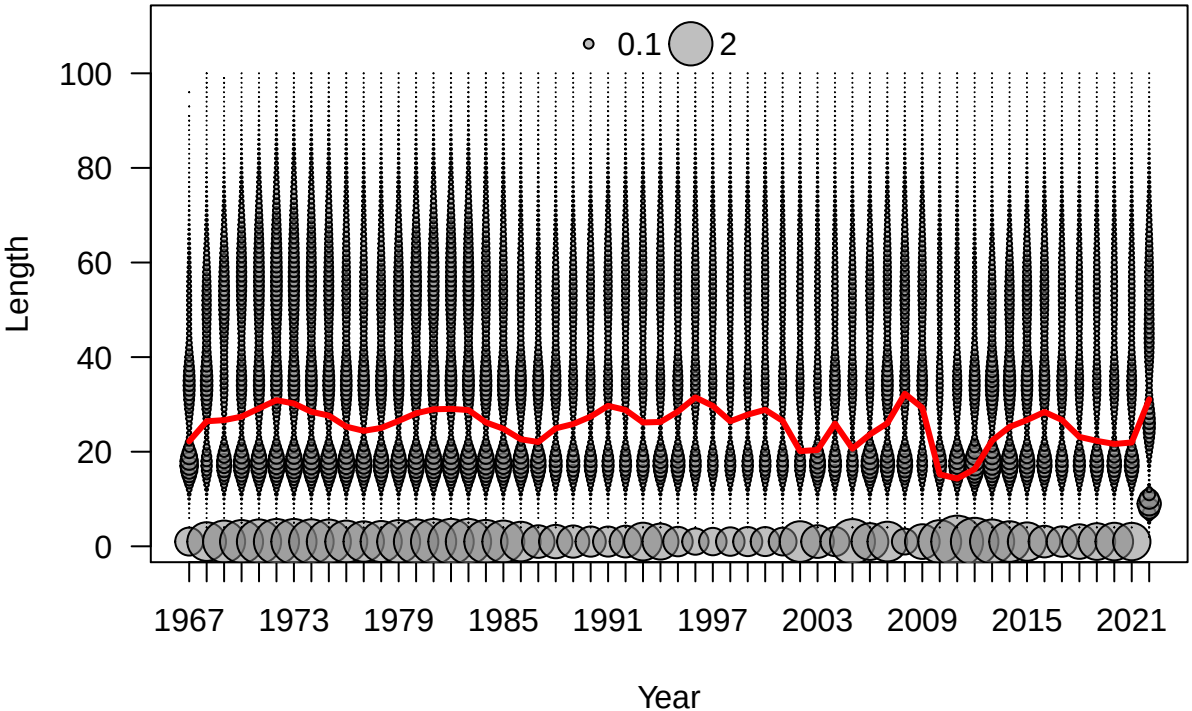

Residual
3
2
1
0
−1
−2
−3
1990
1995
2000
2005
Year

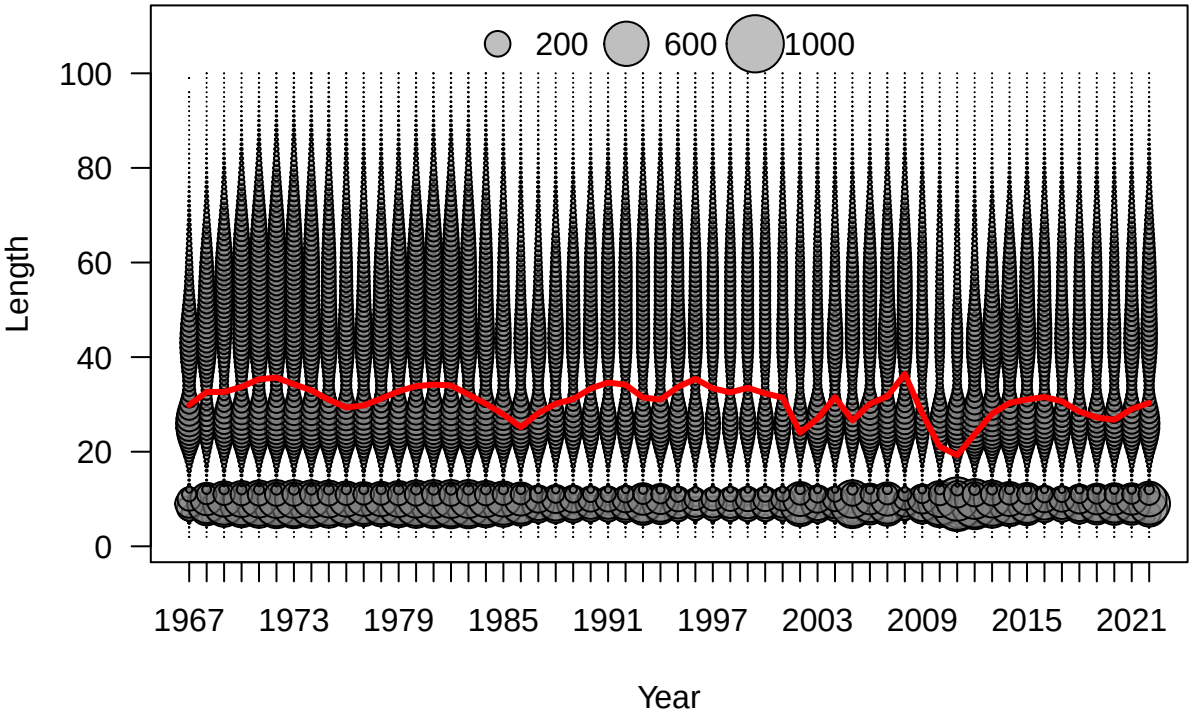

Deviation
0.5
0.0
−0.5
1990
1995
2000
2005
Year

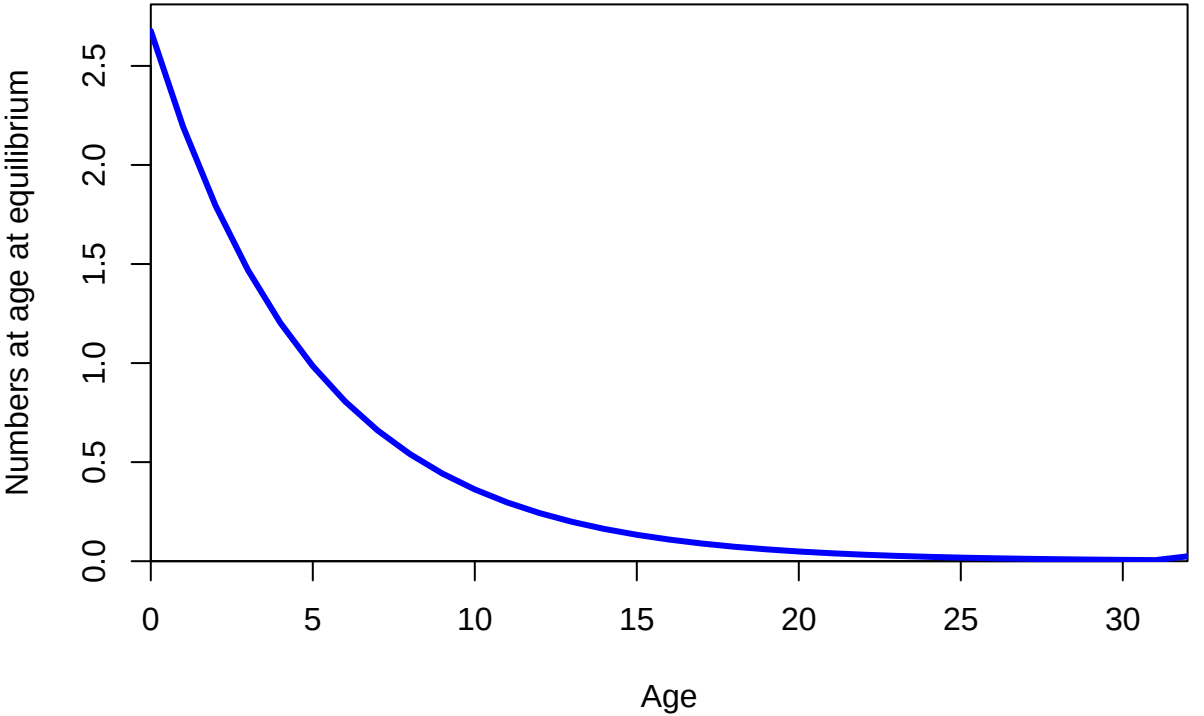

FISHERY
SURVEY2
Standardized index
0.0
0.5
1.0
1.5
2.0
1990
1995
2000
2005
2010
2015
2020
Year

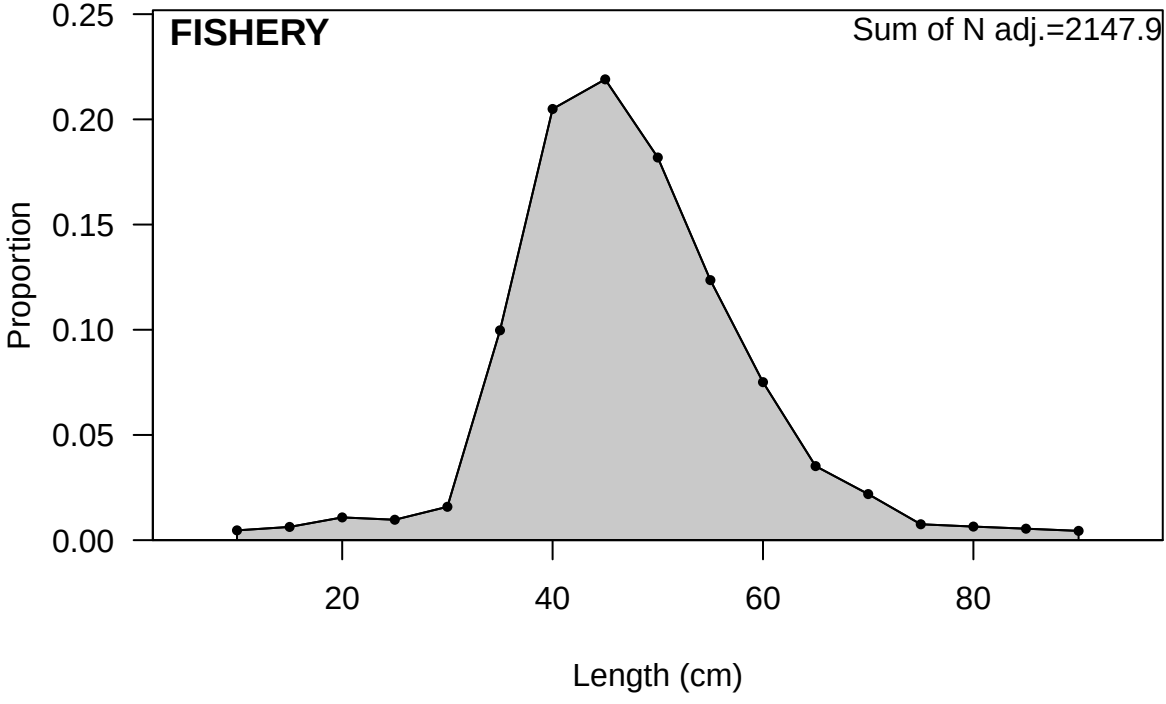

0.1
2
Age
Year
0
5
10
15
20
25
30
35
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020

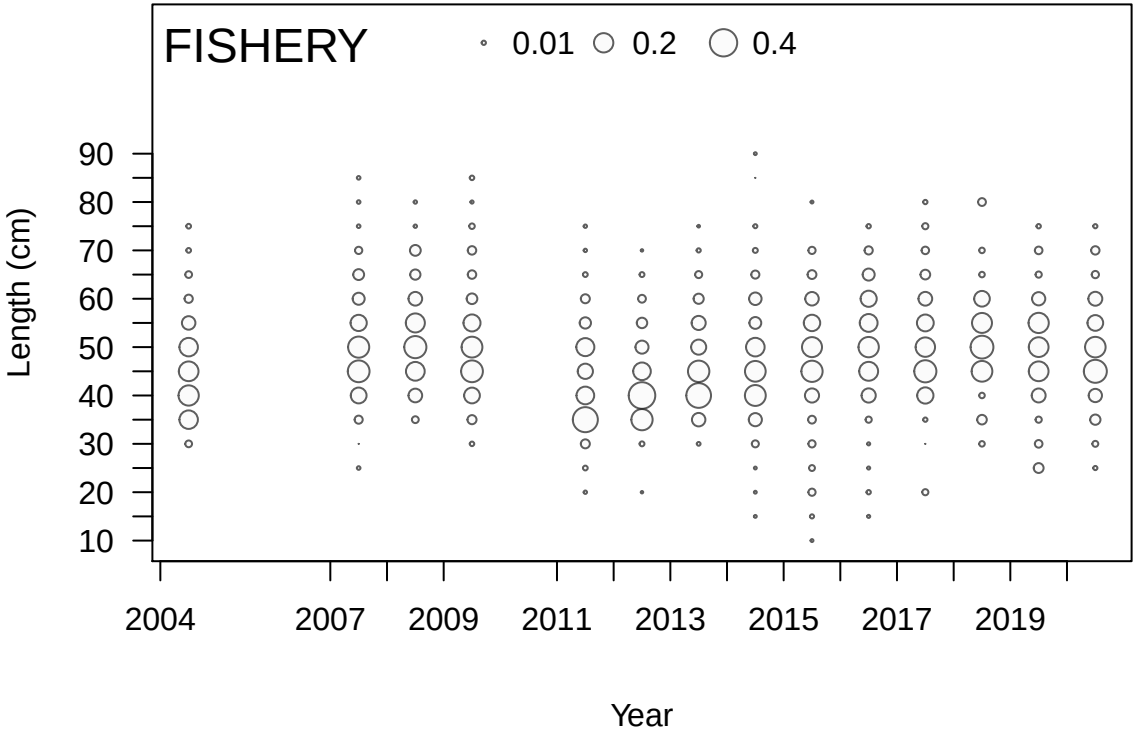

0.1
2
35
30
25
20
15
10
5
0
Age
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

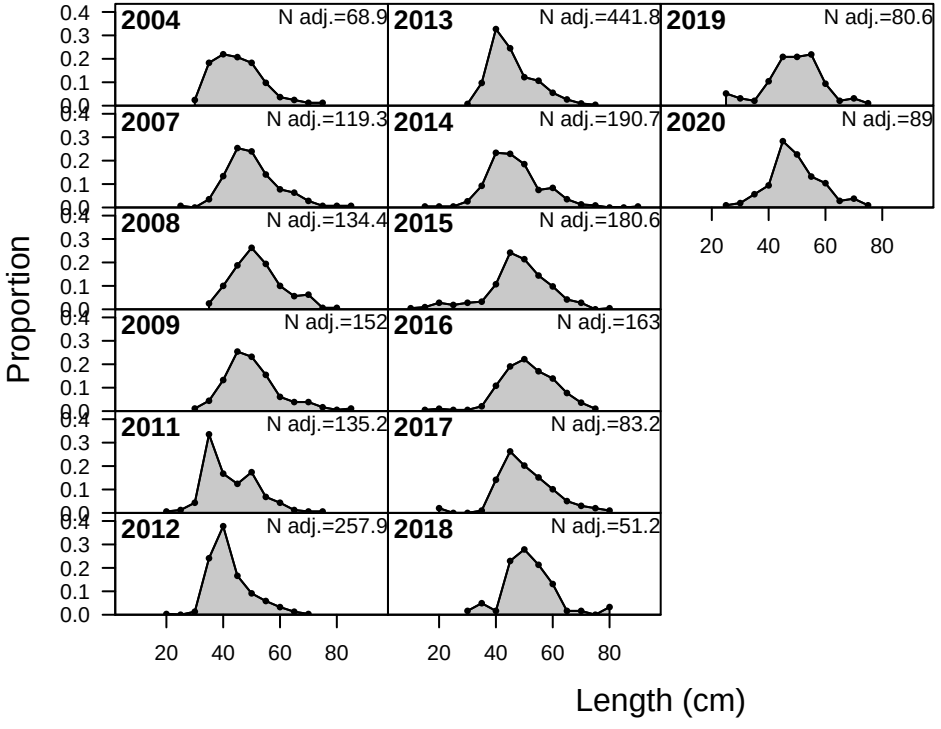

0.1
2
100
80
60
40
20
0
Length
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

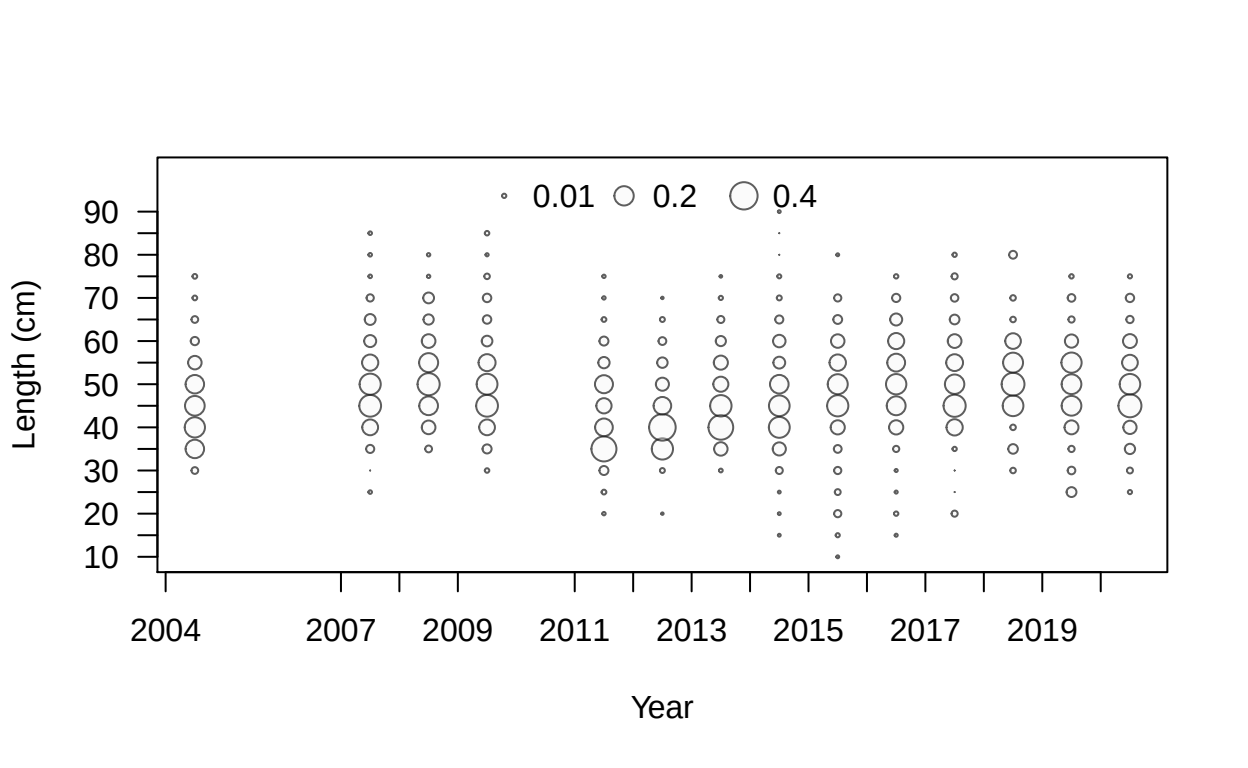

200
600
1000
100
80
60
40
20
0
Length
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

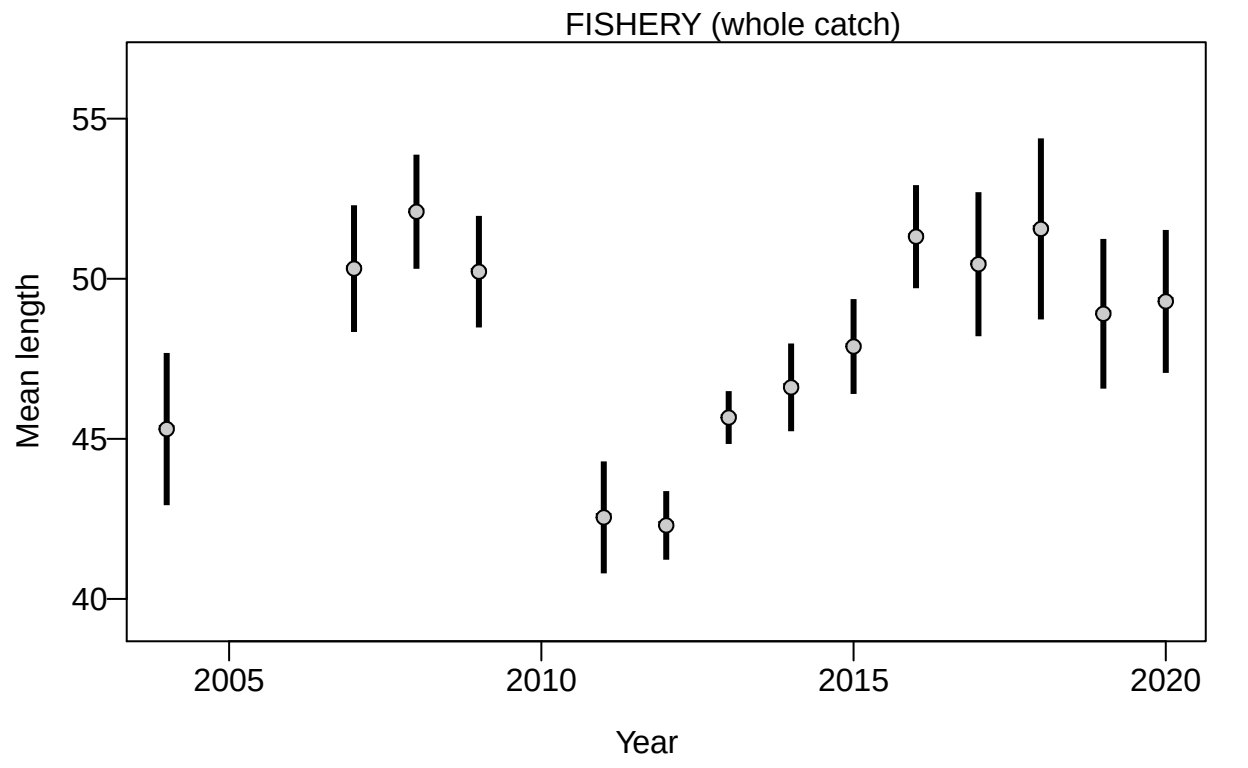

Numbers at age at equilibrium
0.0
0.5
1.0
1.5
2.0
2.5
0
5
10
15
20
25
30
Age

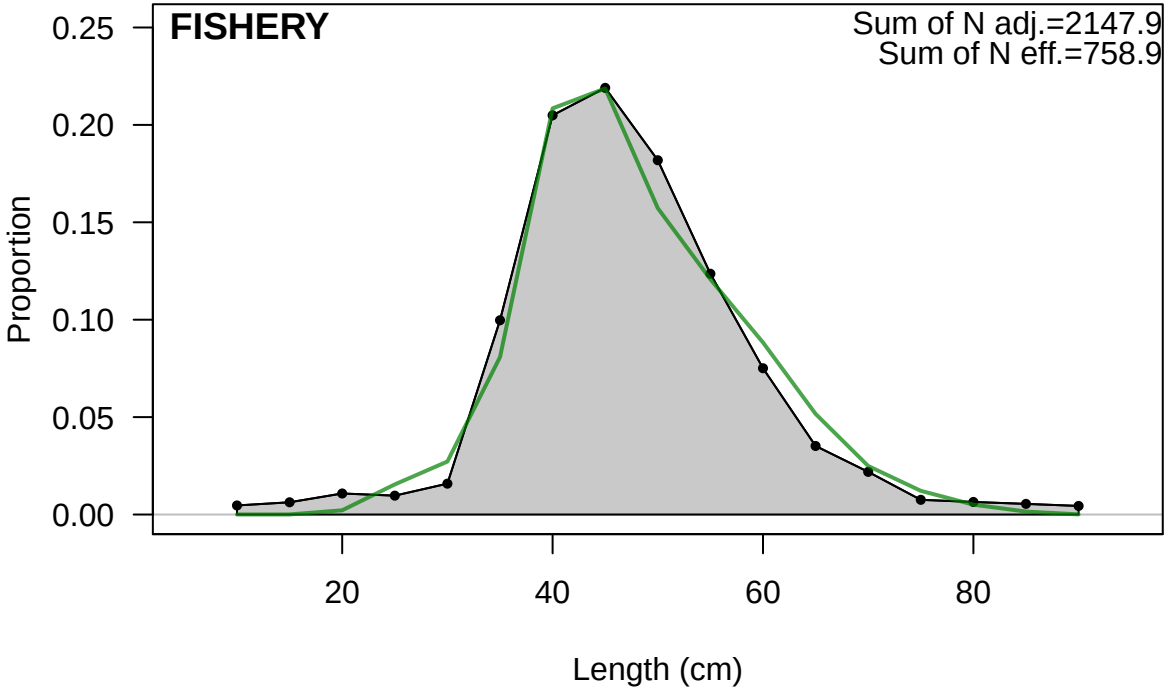

FISHERY
Sum of N adj.=2147.9
Proportion
0.25
0.20
0.15
0.10
0.05
0.00
20
40
60
80
Length (cm)

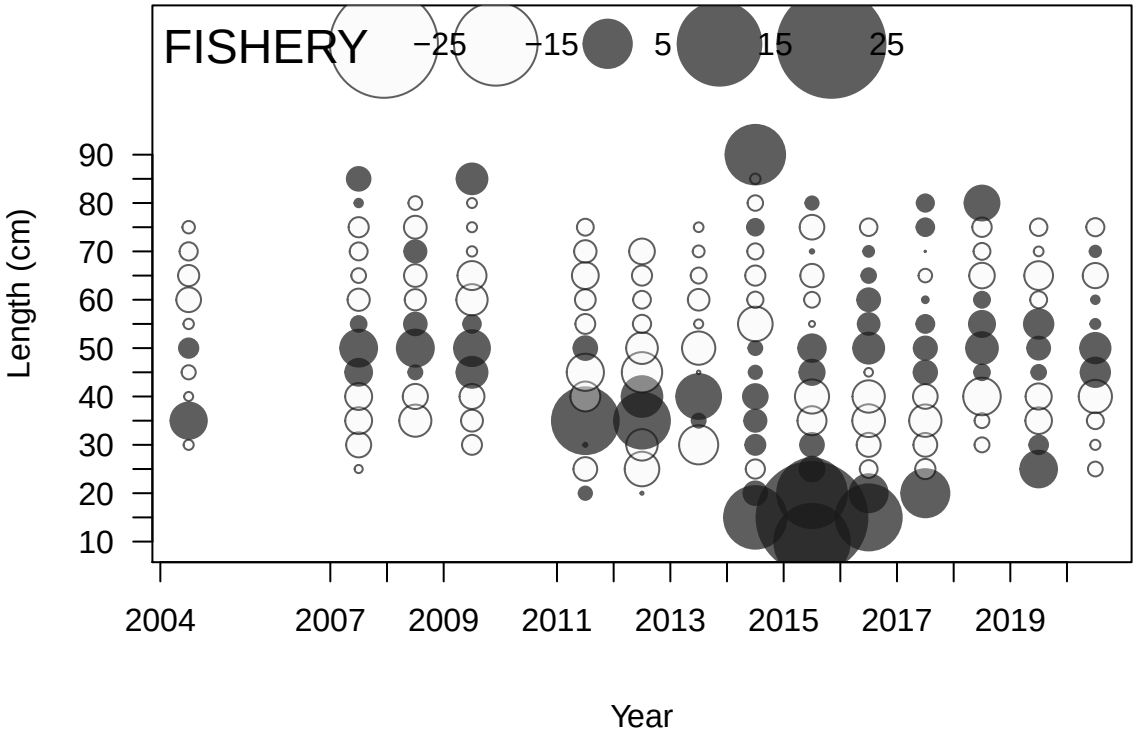

FISHERY
0.01
0.2
0.4
Length (cm)
90
80
70
60
50
40
30
20
10
2004
2007
2009
2011
2013
2015
2017
2019
Year

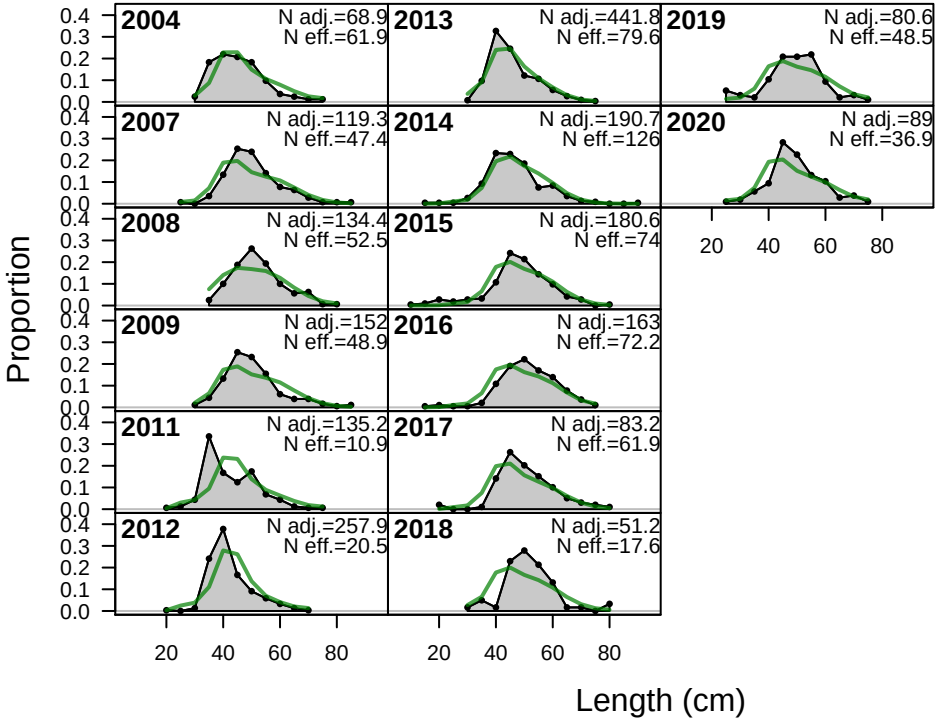

2004
N adj.=68.9
2013
N adj.=441.8
2019
N adj.=80.6
2007
N adj.=119.3
2014
N adj.=190.7
2020
N adj.=89
2008
N adj.=134.4
2015
N adj.=180.6
2009
N adj.=152
2016
N adj.=163
2011
N adj.=135.2
2017
N adj.=83.2
2012
N adj.=257.9
2018
N adj.=51.2
Proportion
Length (cm)

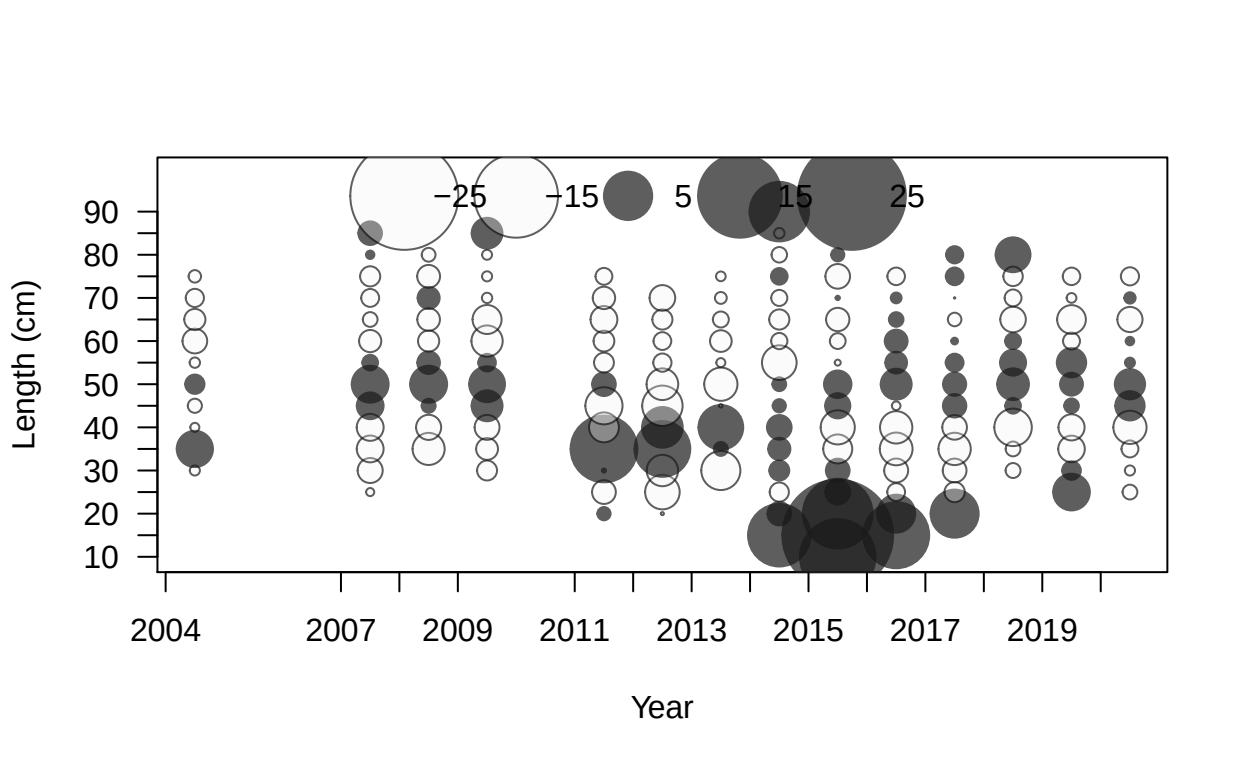

0.01
0.2
0.4
Length (cm)
90
80
70
60
50
40
30
20
10
2004
2007
2009
2011
2013
2015
2017
2019
Year

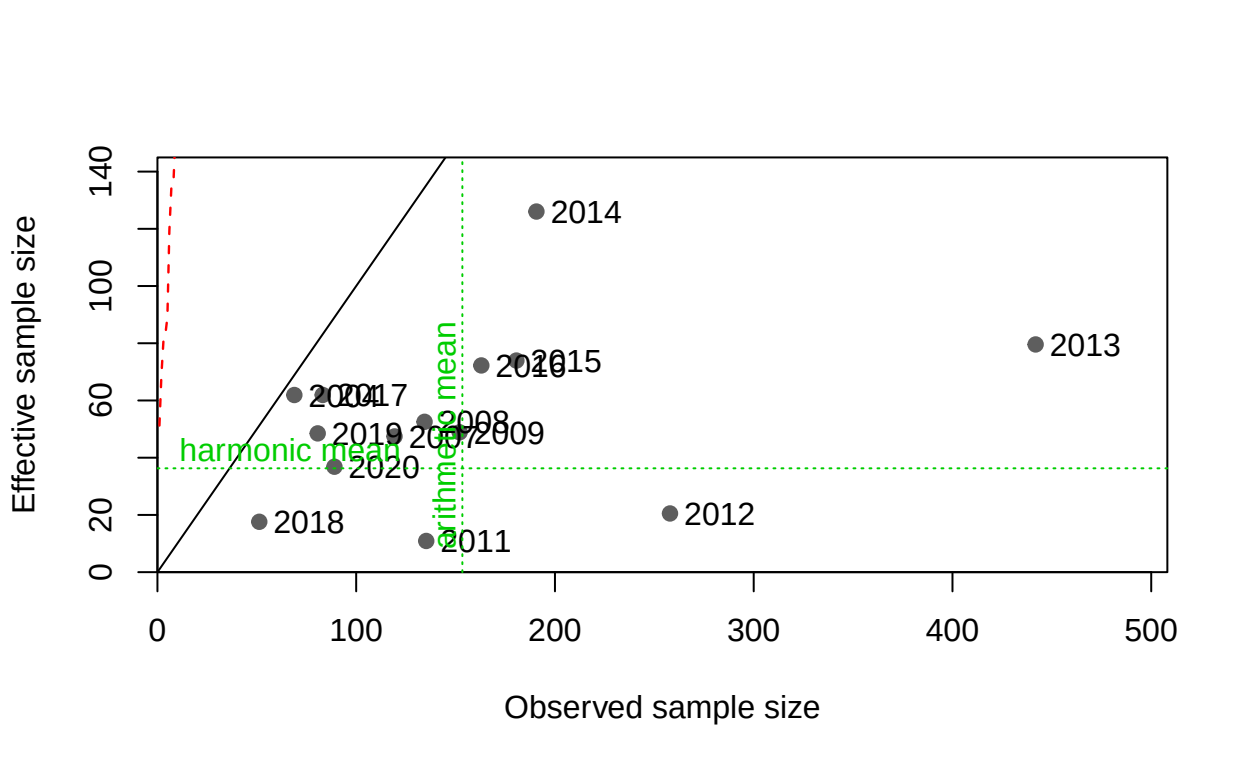

FISHERY (whole catch)
55
50
45
40
Mean length
2005
2010
2015
2020
Year

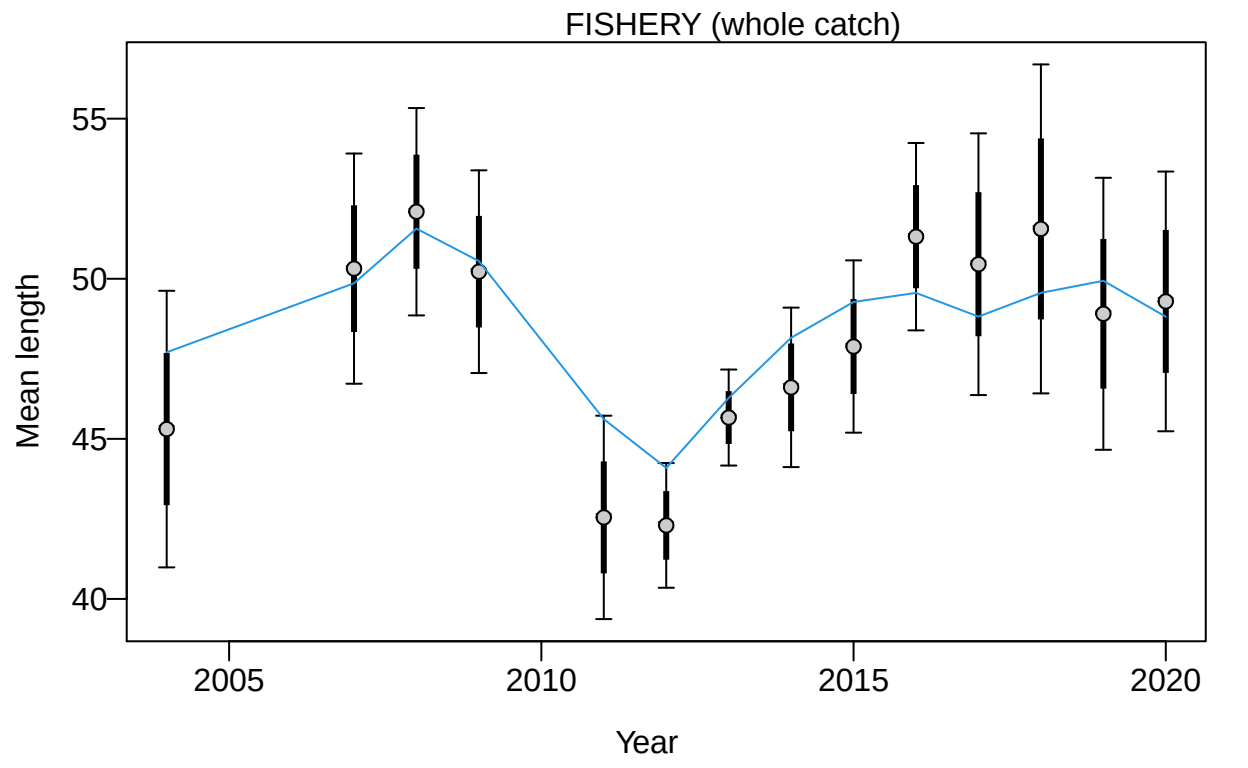

FISHERY
Sum of N adj.=2147.9
Sum of N eff.=758.9
Proportion
0.25
0.20
0.15
0.10
0.05
0.00
20
40
60
80
Length (cm)

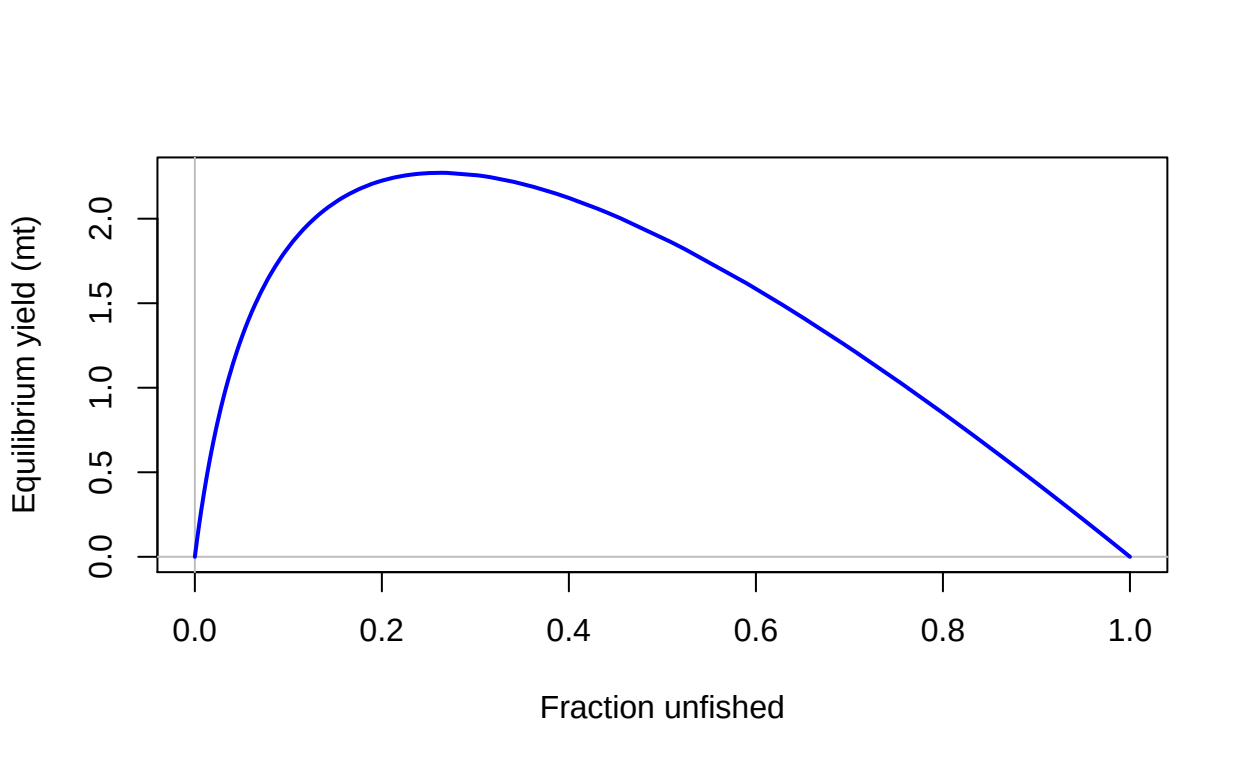

FISHERY
−25
−15
5
15
25
Length (cm)
90
80
70
60
50
40
30
20
10
2004
2007
2009
2011
2013
2015
2017
2019
Year

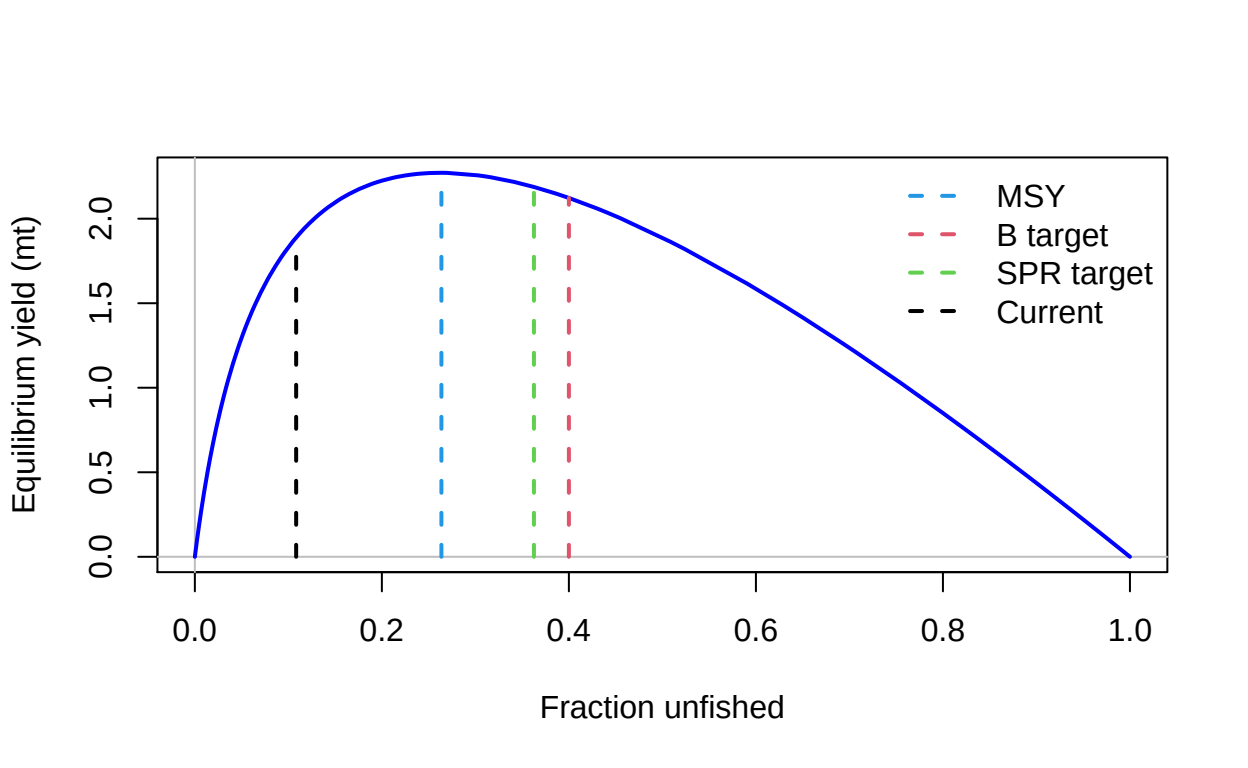

2004
N adj.=68.9
N eff.=61.9
2013
N adj.=441.8
N eff.=79.6
2019
N adj.=80.6
N eff.=48.5
2007
N adj.=119.3
N eff.=47.4
2014
N adj.=190.7
N eff.=126
2020
N adj.=89
N eff.=36.9
2008
N adj.=134.4
N eff.=52.5
2015
N adj.=180.6
N eff.=74
2009
N adj.=152
N eff.=48.9
2016
N adj.=163
N eff.=72.2
2011
N adj.=135.2
N eff.=10.9
2017
N adj.=83.2
N eff.=61.9
2012
N adj.=257.9
N eff.=20.5
2018
N adj.=51.2
N eff.=17.6
Proportion
0.0
0.1
0.2
0.3
0.4
20
40
60
80
Length (cm)

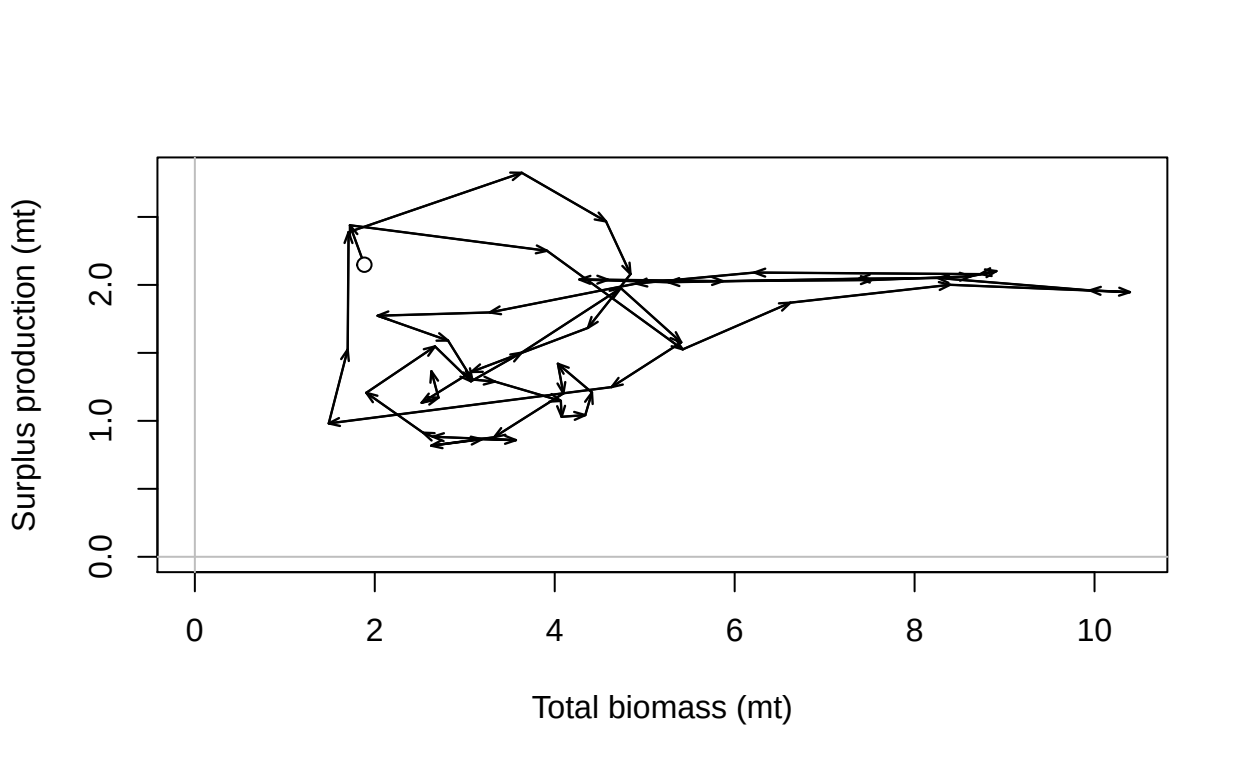

−25
−15
5
15
25
90
80
70
60
50
40
30
20
10
Length (cm)
2004
2007
2009
2011
2013
2015
2017
2019
Year

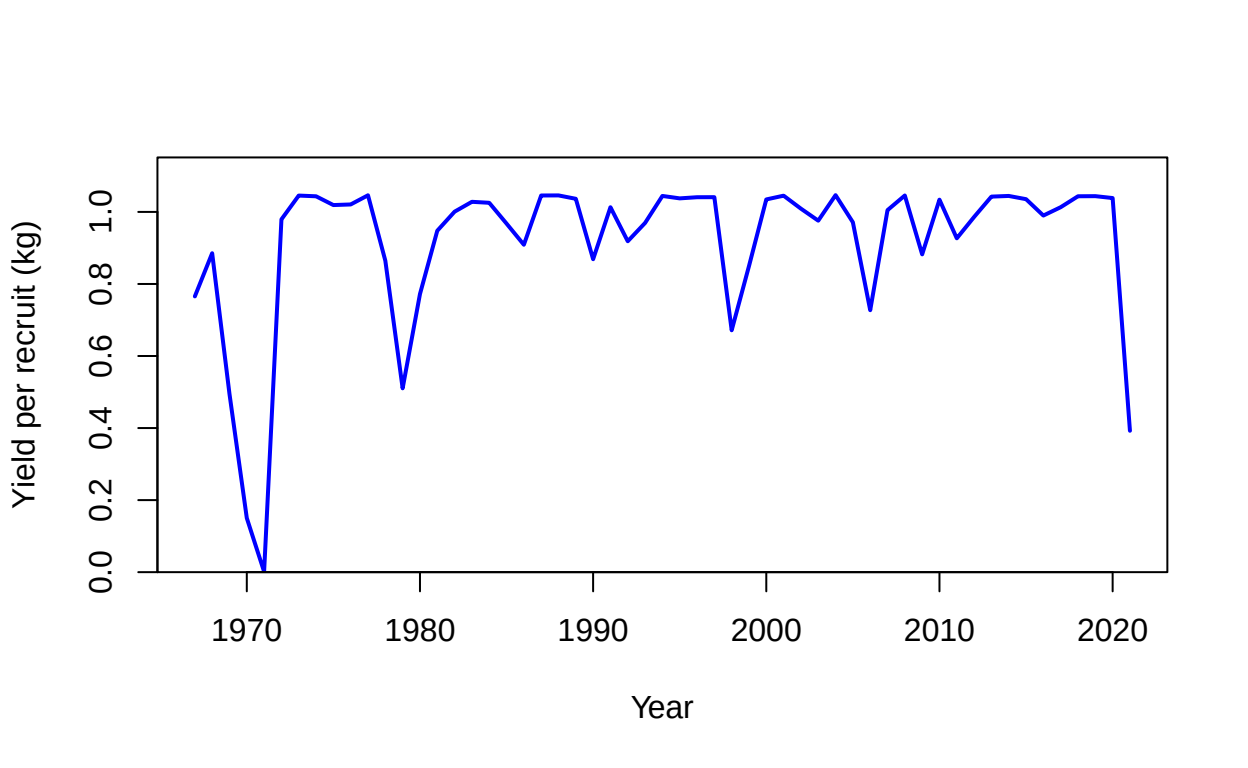

Effective sample size
0
20
60
100
140
0
100
200
300
400
500
Observed sample size
harmonic mean
arithmetic mean
2014
2013
2015
2016
2004
2017
2008
2019
2007
2009
2020
2018
2012
2011

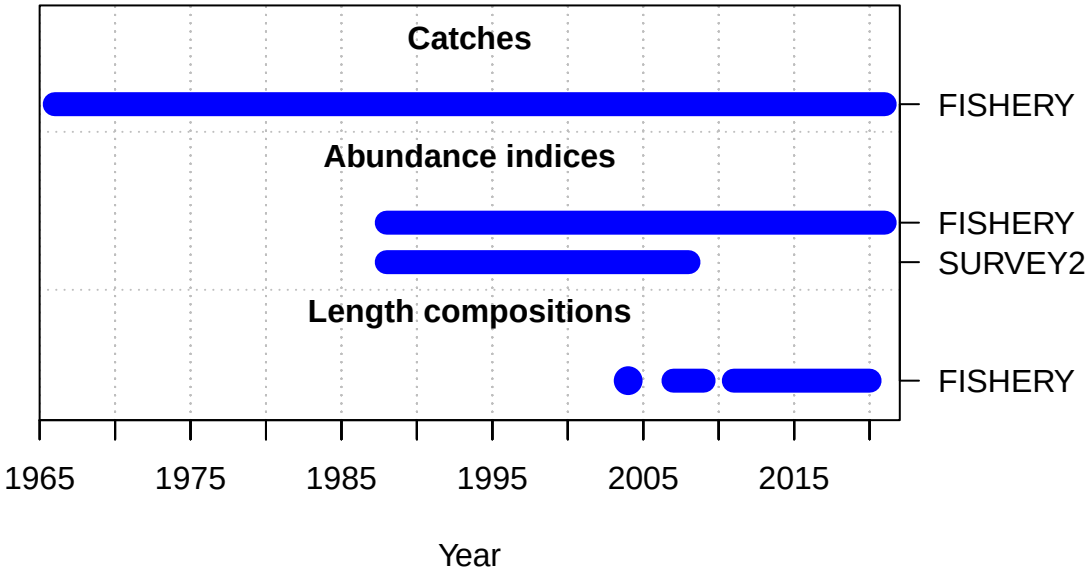

FISHERY (whole catch)
Mean length
55
50
45
40
2005
2010
2015
2020
Year

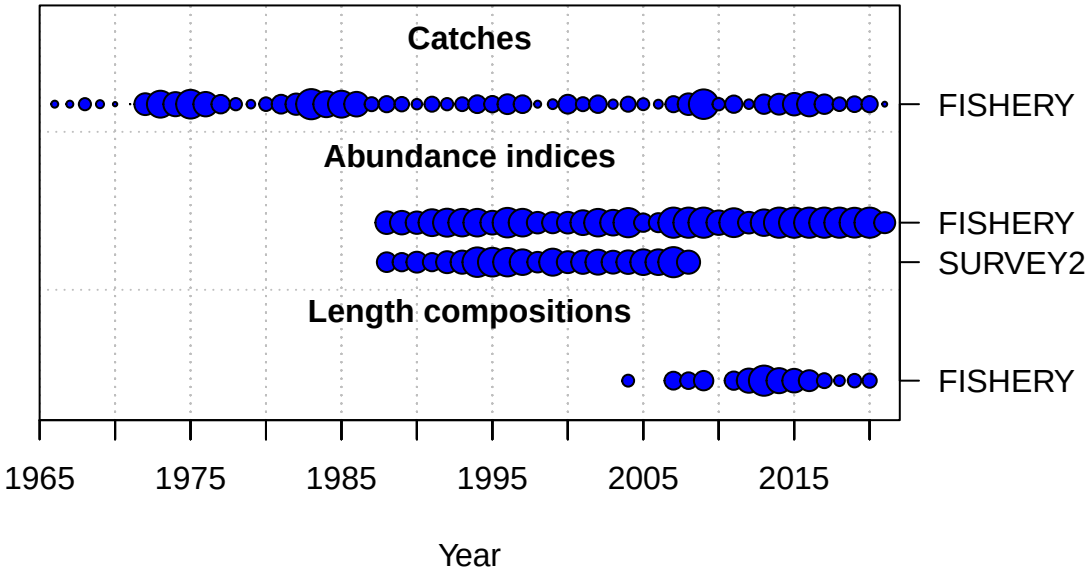

Equilibrium yield (mt)
0.0
0.5
1.0
1.5
2.0
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished

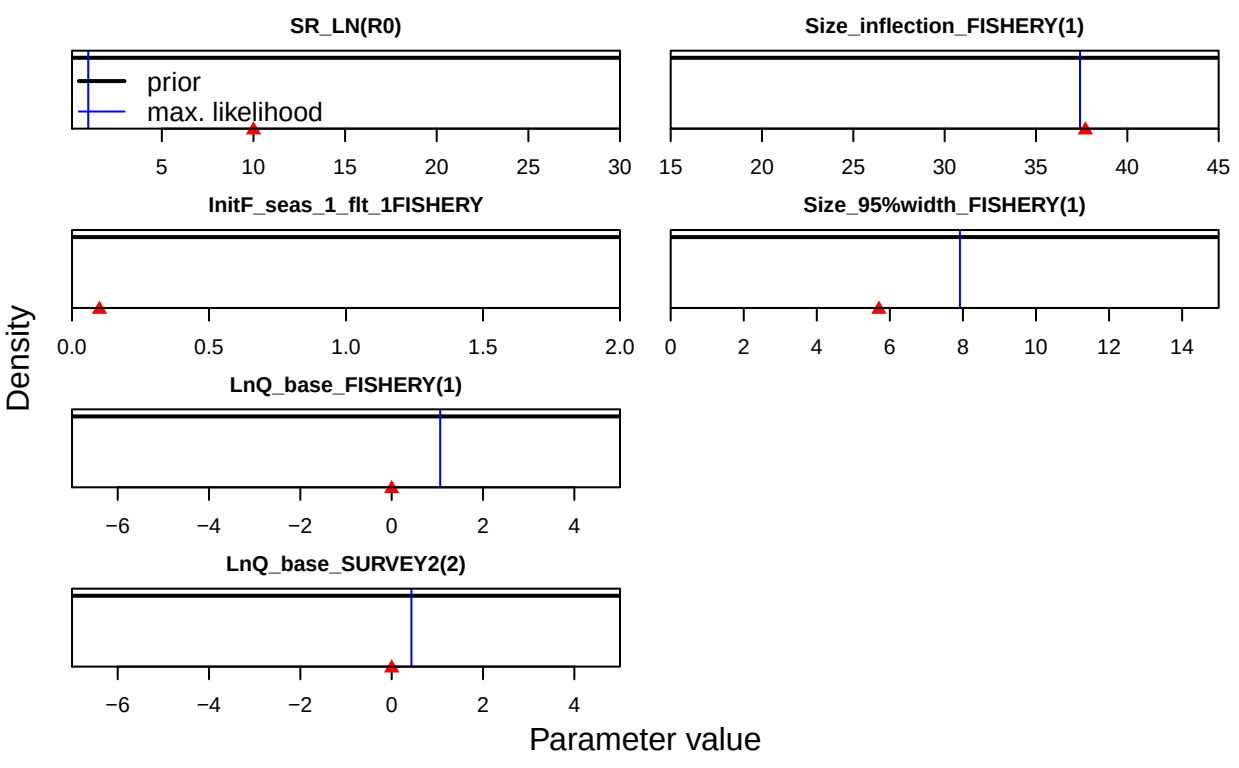

Equilibrium yield (mt)
0.0
0.5
1.0
1.5
2.0
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished
MSY
B target
SPR target
Current


Surplus production (mt)
0.0
1.0
2.0
0
2
4
6
8
10
Total biomass (mt)


Yield per recruit (kg)
0.0
0.2
0.4
0.6
0.8
1.0
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)
15
20
25
30
35
40
45
InitF_seas_1_flt_1FISHERY
0.0
0.5
1.0
1.5
2.0
Size_95%width_FISHERY(1)
0
2
4
6
8
10
12
14
LnQ_base_FISHERY(1)
−6
−4
−2
0
2
4
LnQ_base_SURVEY2(2)
−6
−4
−2
0
2
4
Density
Parameter value