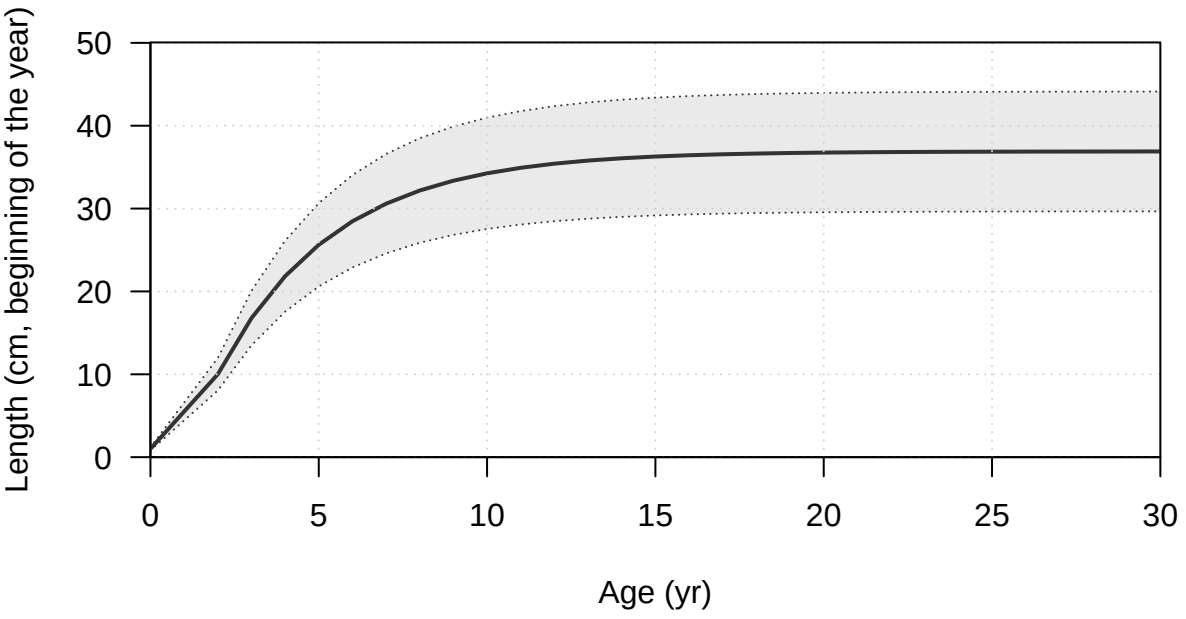
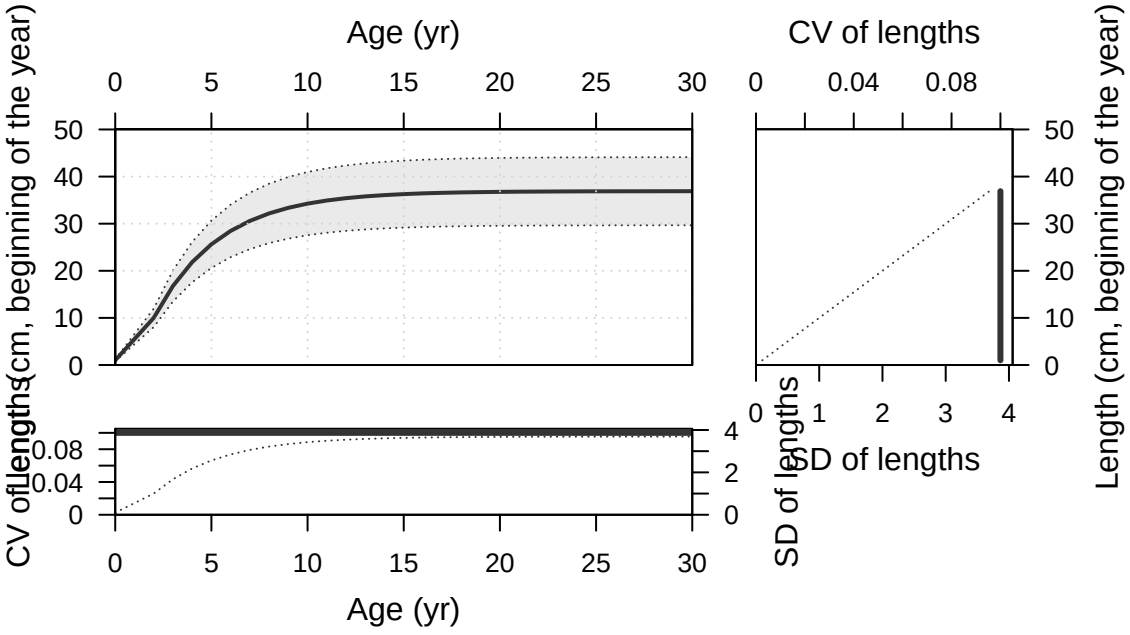
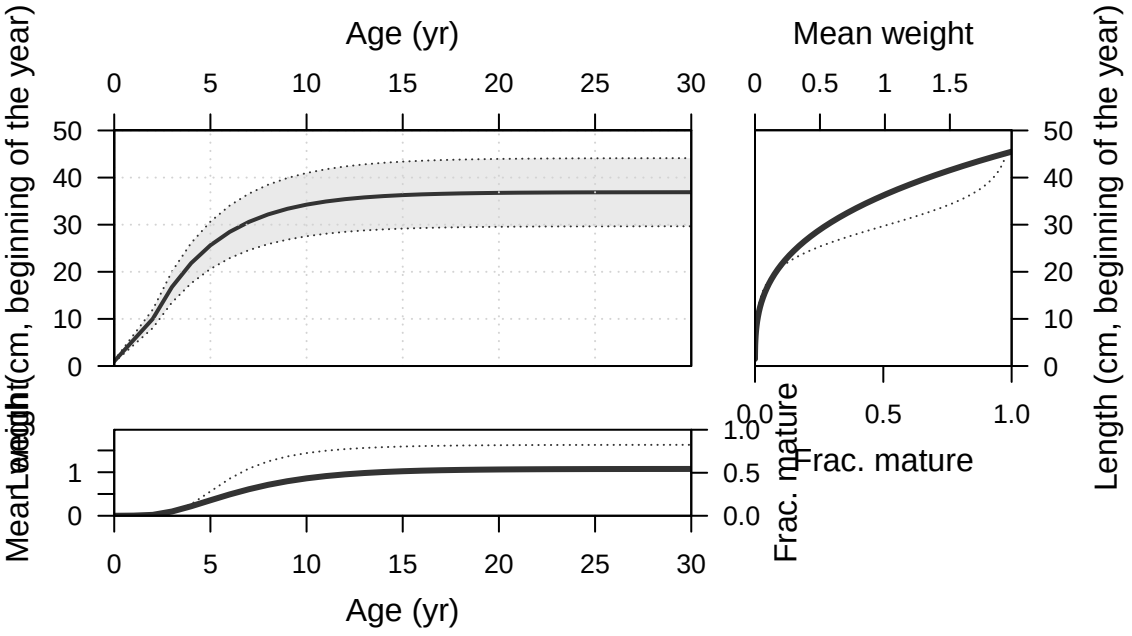
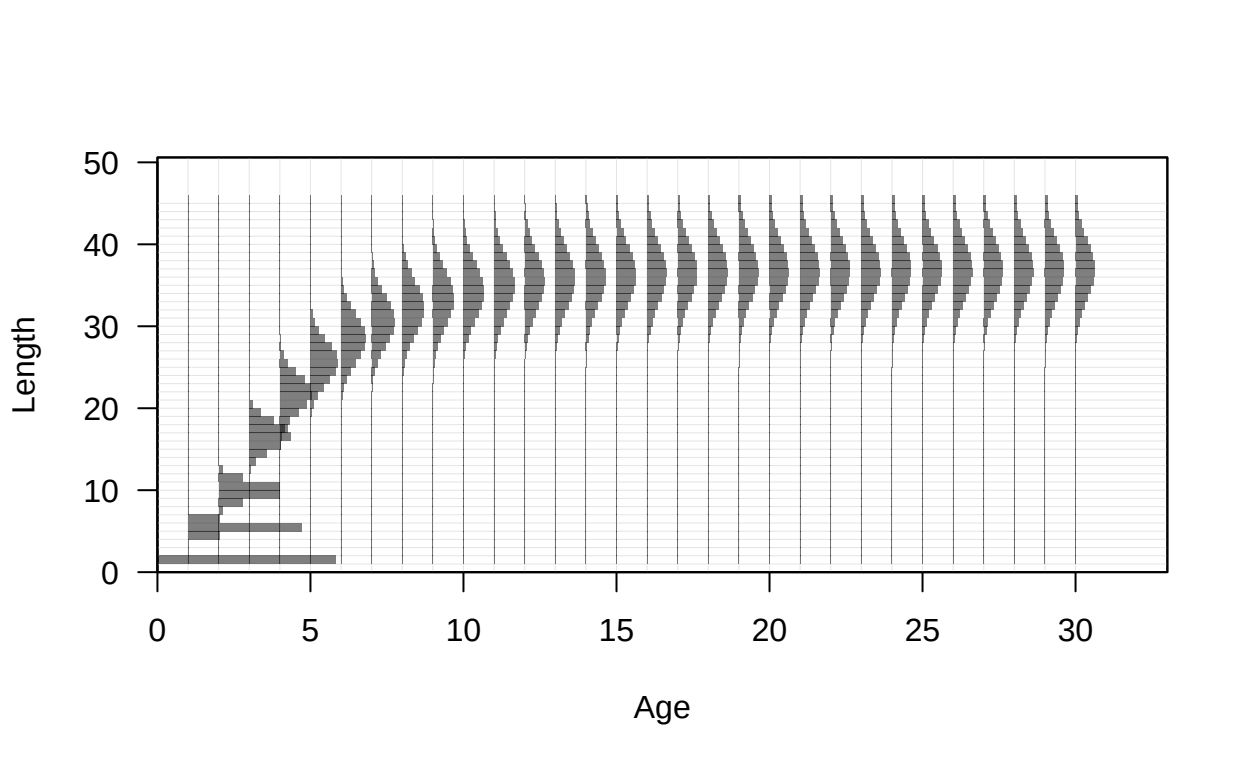
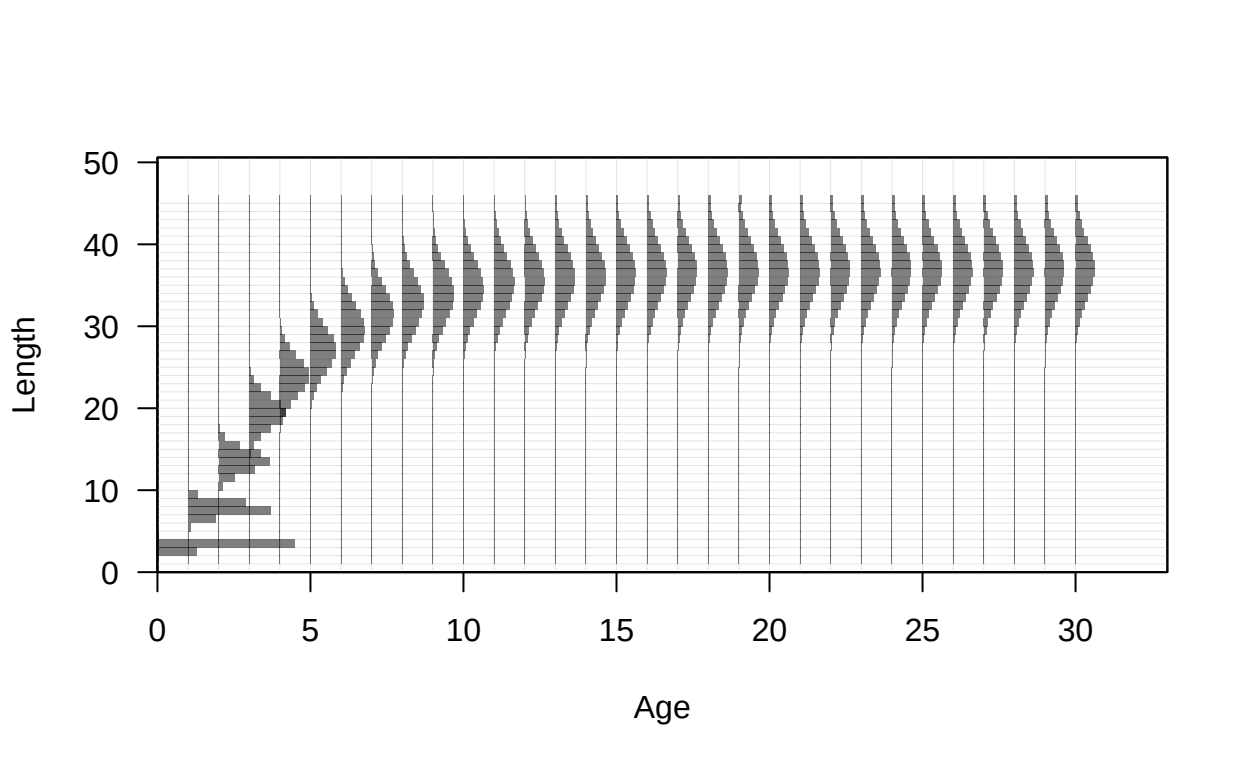
Plots created using the 'r4ss' package in R
Stock Synthesis version: 3.30.19.0
StartTime: Wed Jul 13 15:31:37 2022
Data_File: data.ss
Control_File: control.ss

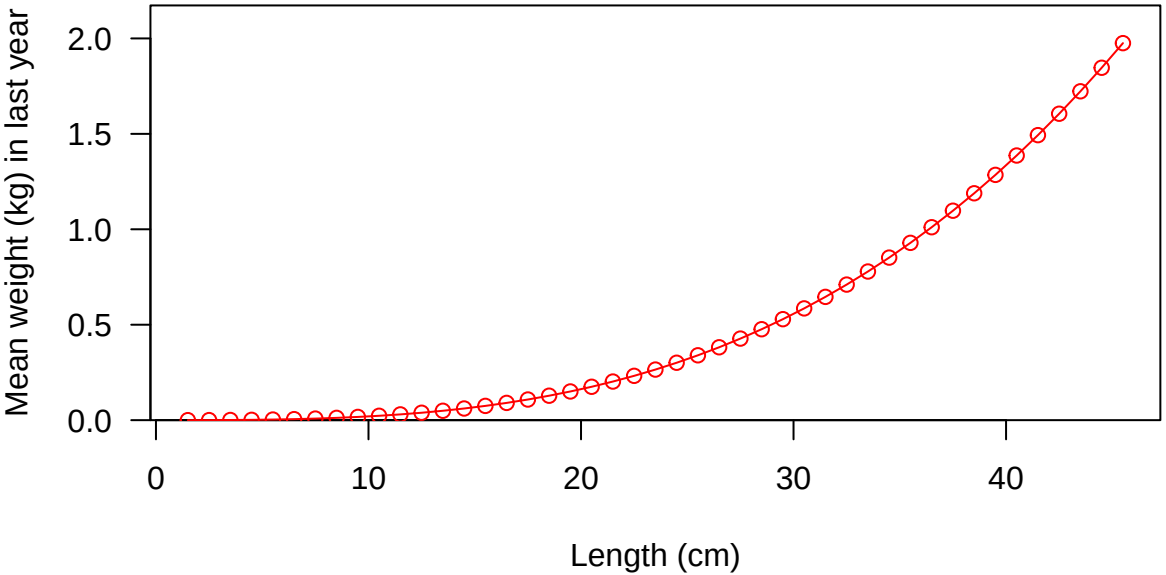

Length (cm, beginning of the year)
50
40
30
20
10
0
0
5
10
15
20
25
30
Age (yr)

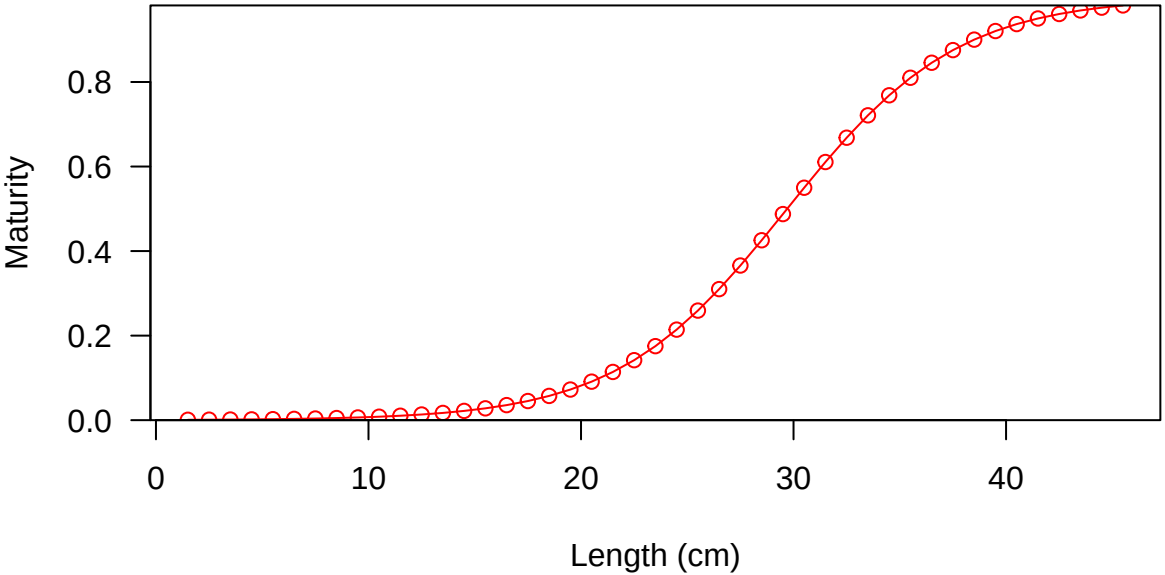

Age (yr)
0
5
10
15
20
25
30
Length (cm, beginning of the year)
50
40
30
20
10
0
CV of lengths
0.08
0.04
0
SD of lengths
4
2
0
CV of lengths
0
0.04
0.08
SD of lengths
0
1
2
3
4
Length (cm, beginning of the year)

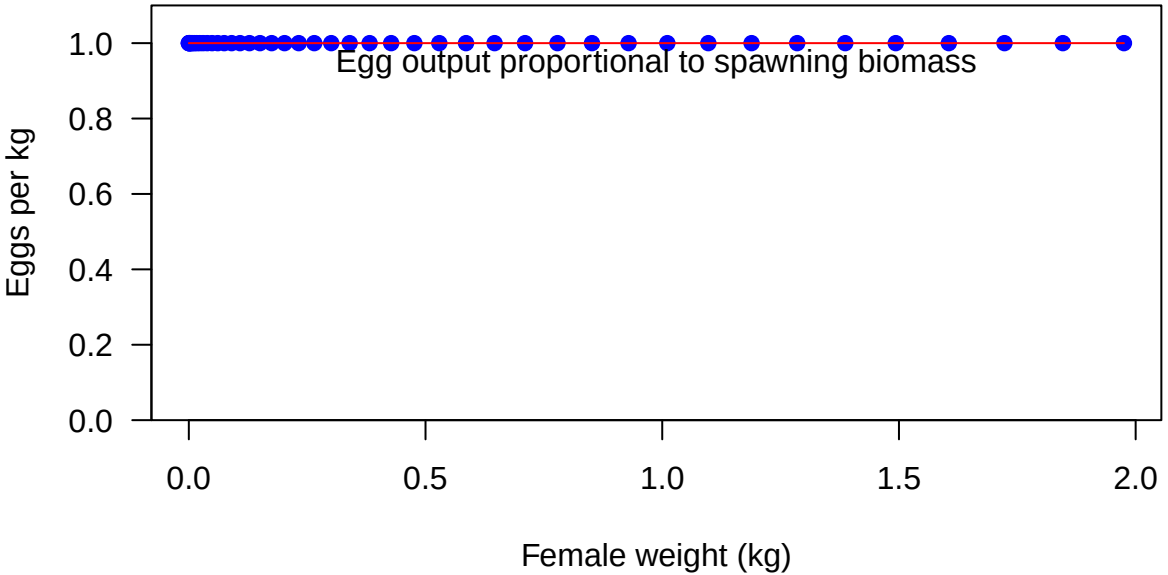

Age (yr)
Mean weight
Length (cm, beginning of the year)
Mean weight
Age (yr)
Frac. mature
Frac. mature
Length (cm, beginning of the year)

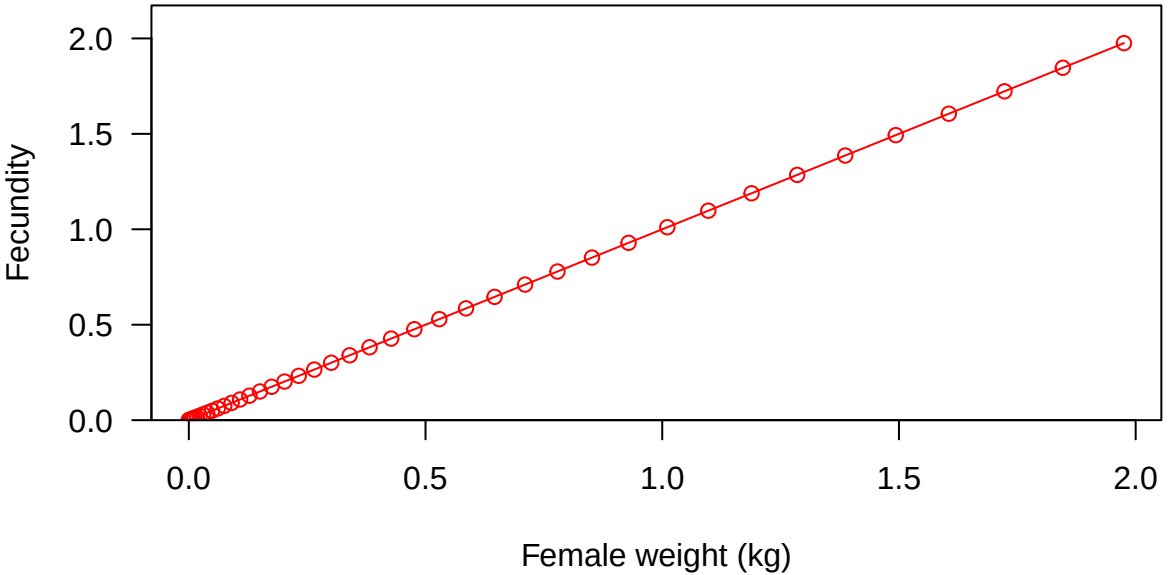

Length
Age
0
10
20
30
40
50
0
5
10
15
20
25
30

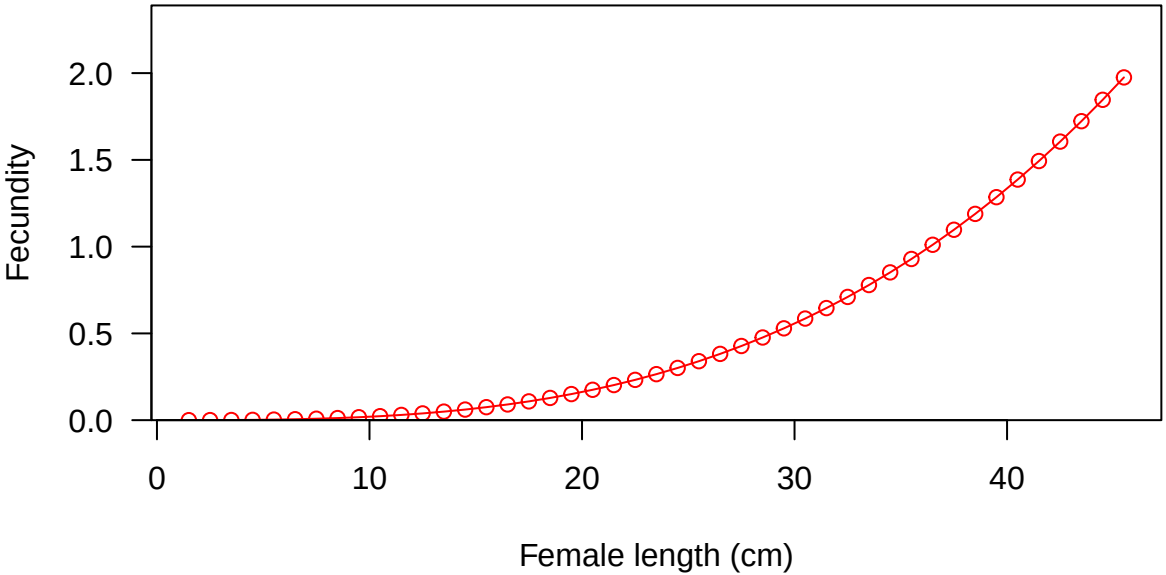

Length
Age
0
10
20
30
40
50
0
5
10
15
20
25
30

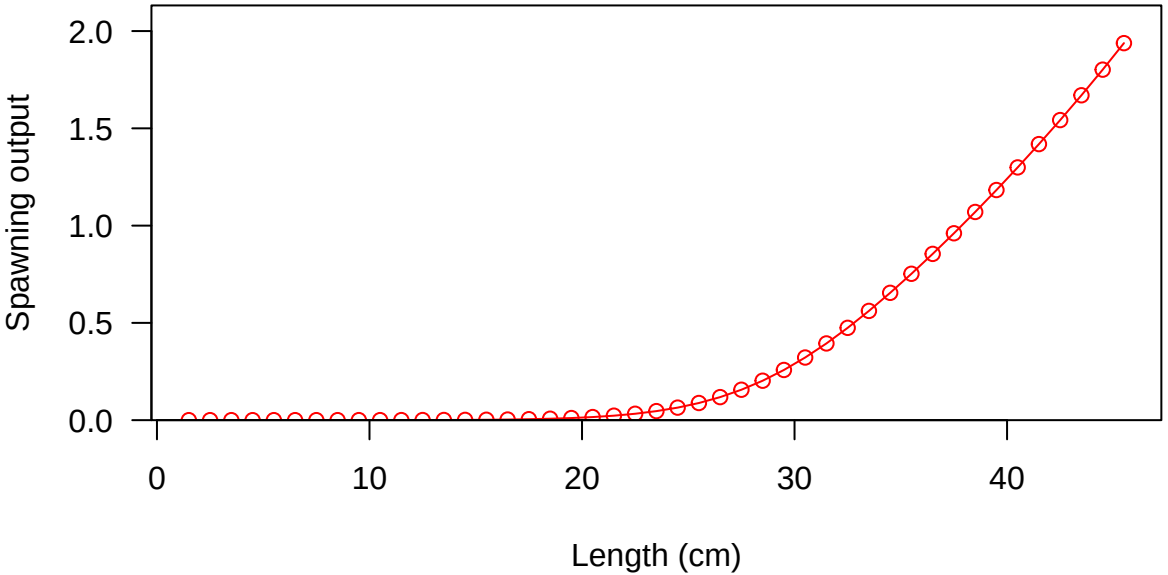

Mean weight (kg) in last year
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
Length (cm)

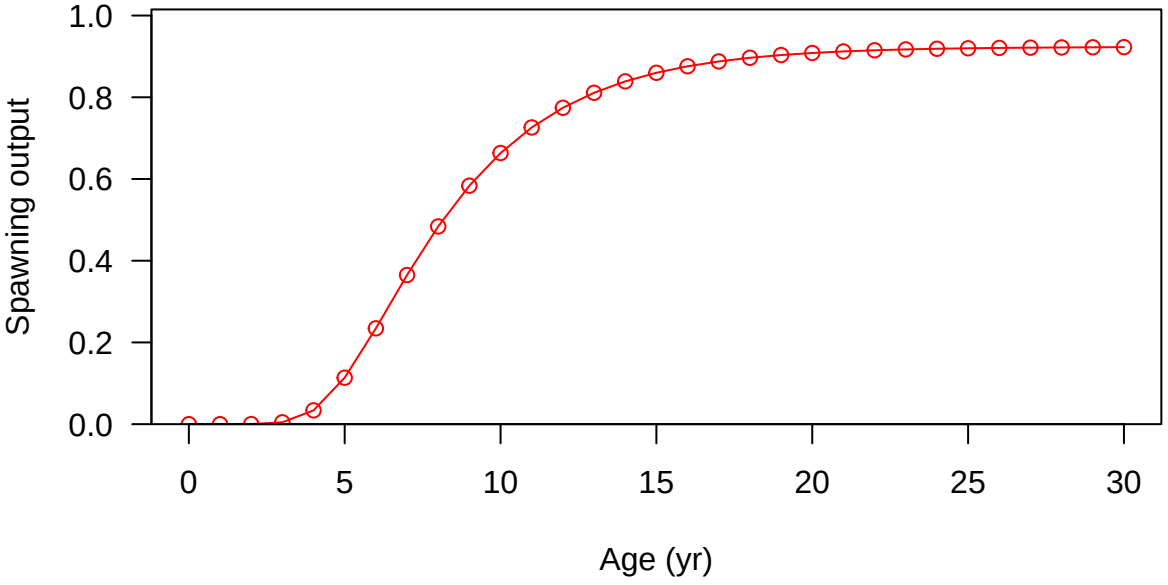

Maturity
0.0
0.2
0.4
0.6
0.8
0
10
20
30
40
Length (cm)

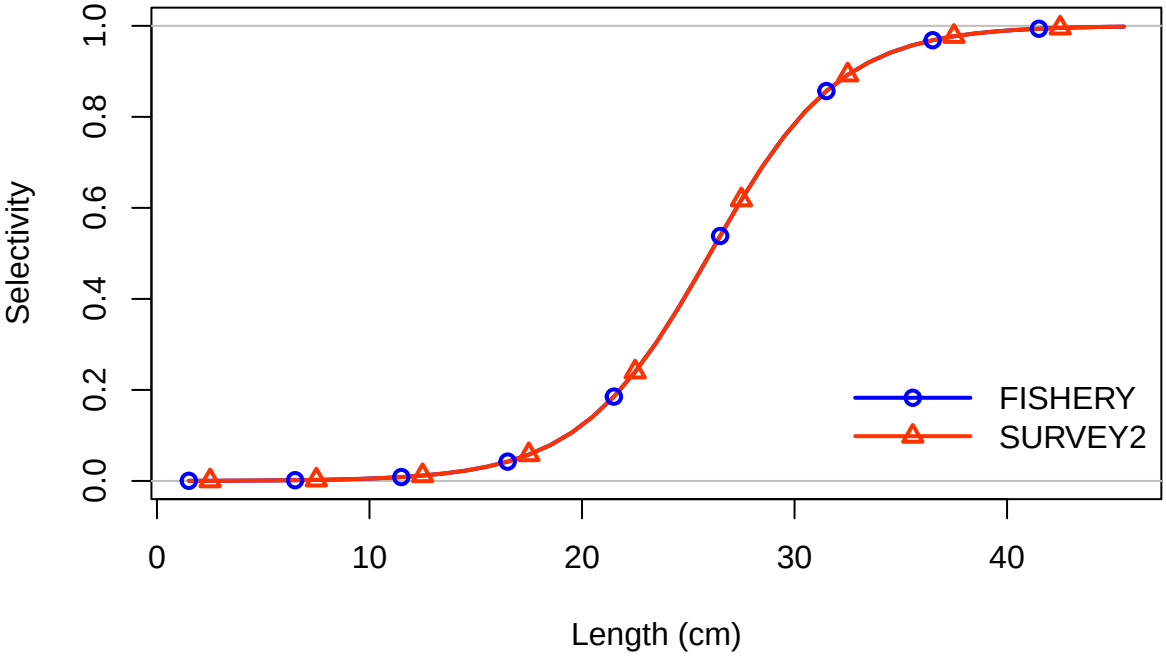

Egg output proportional to spawning biomass
Eggs per kg
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
Female weight (kg)

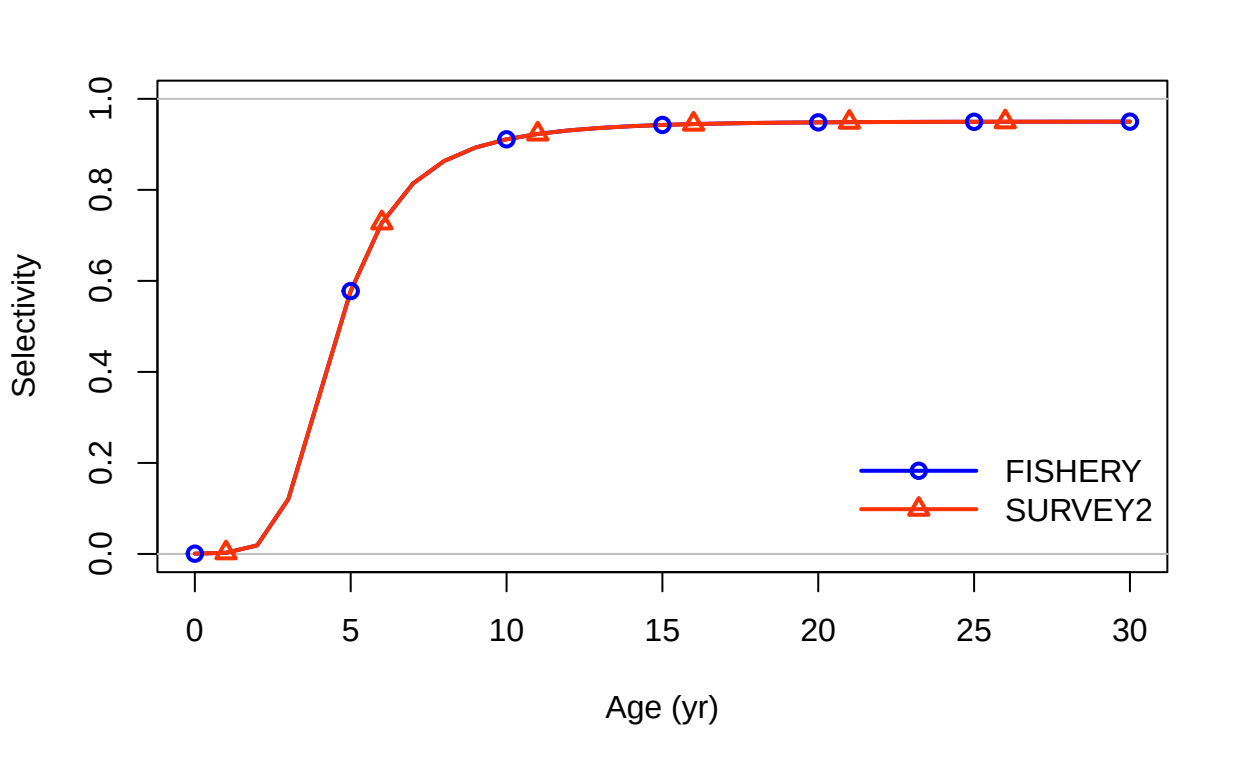

Fecundity
0.0
0.5
1.0
1.5
2.0
0.0
0.5
1.0
1.5
2.0
Female weight (kg)

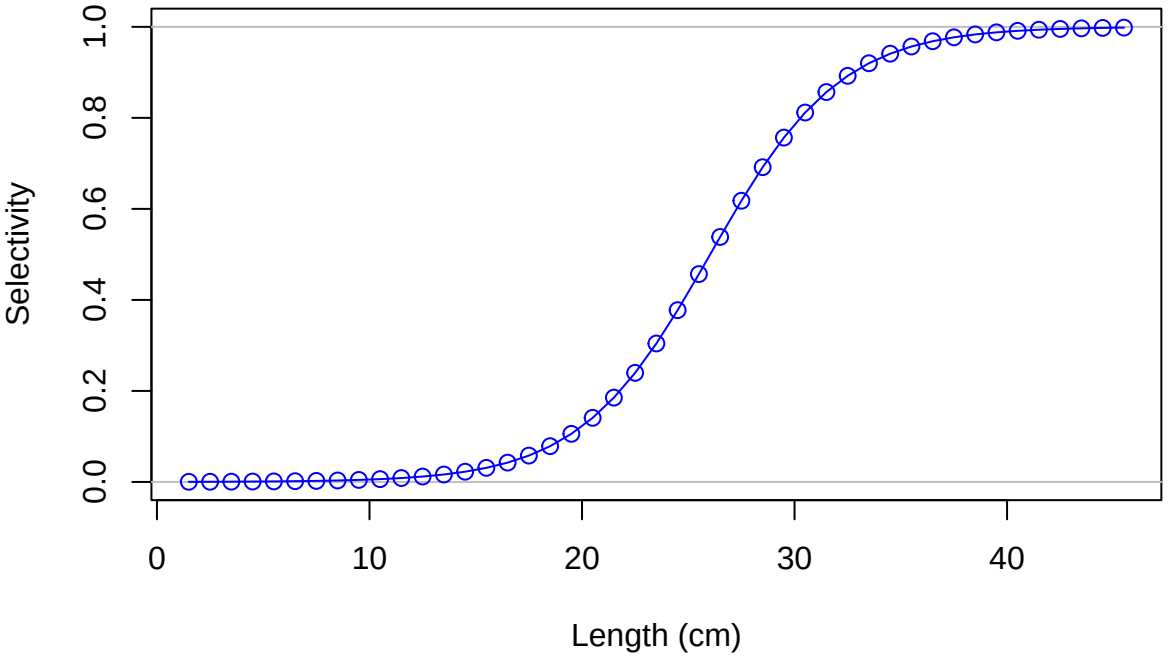

Fecundity
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
Female length (cm)

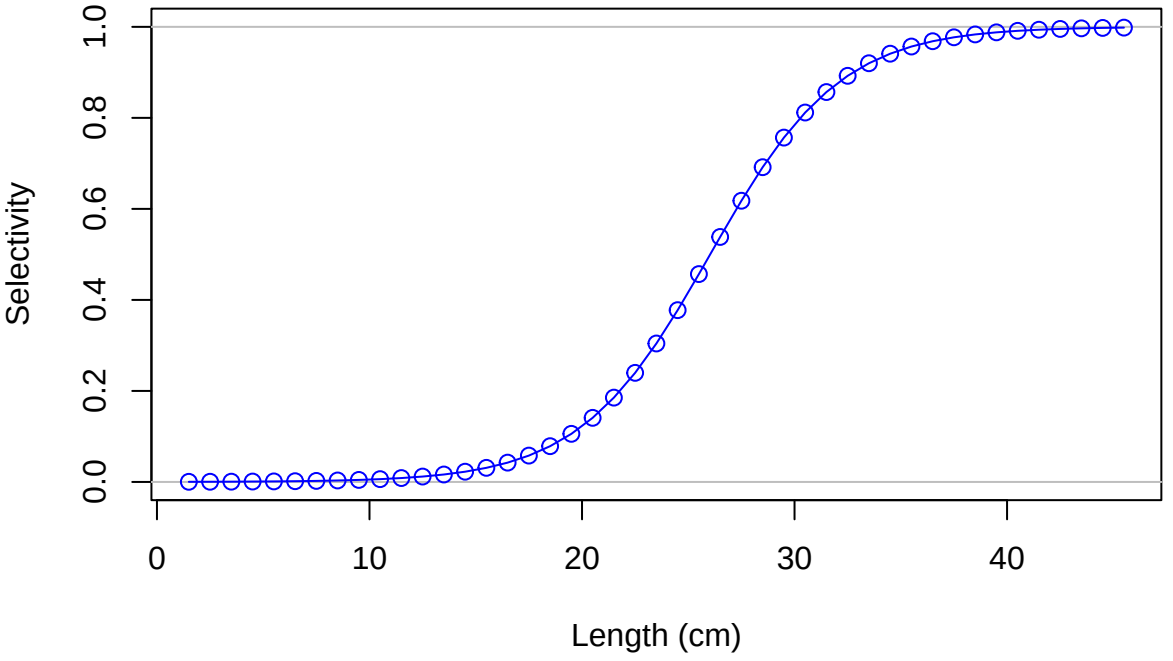

Spawning output
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
Length (cm)

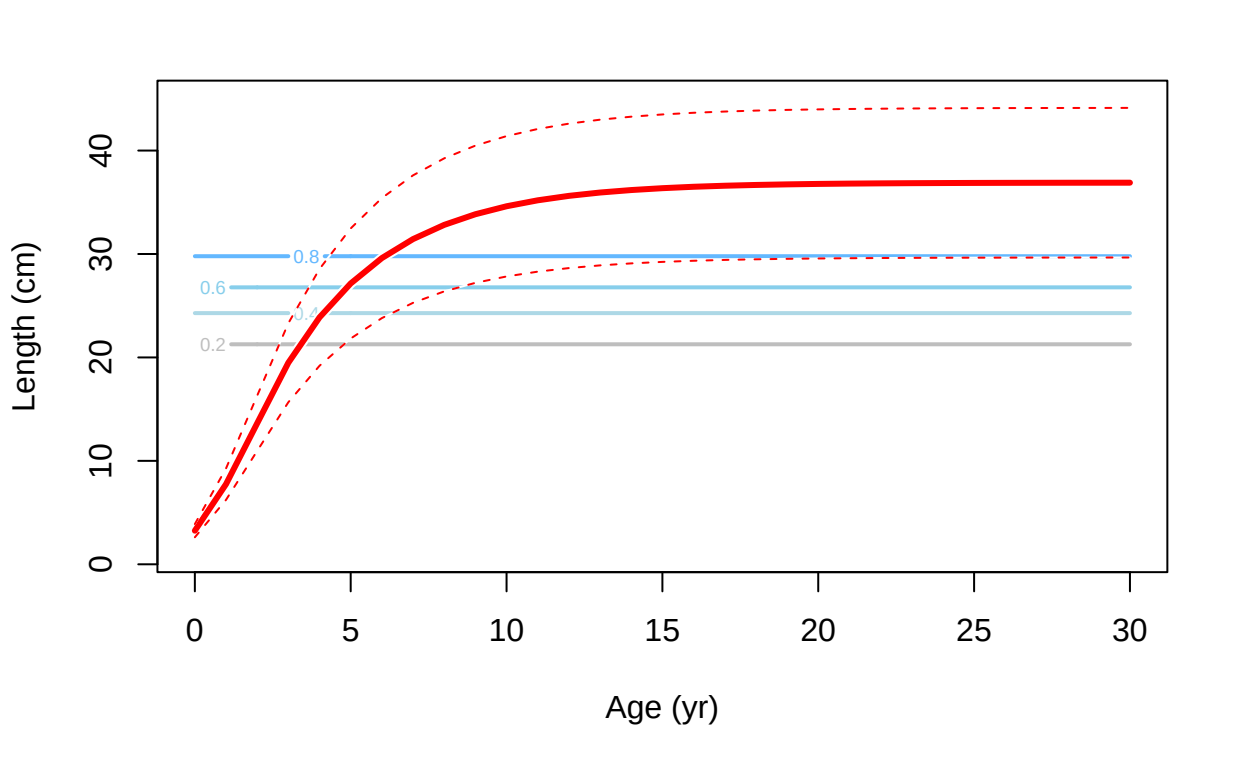

1.0
0.8
0.6
0.4
0.2
0.0
Spawning output
0
5
10
15
20
25
30
Age (yr)

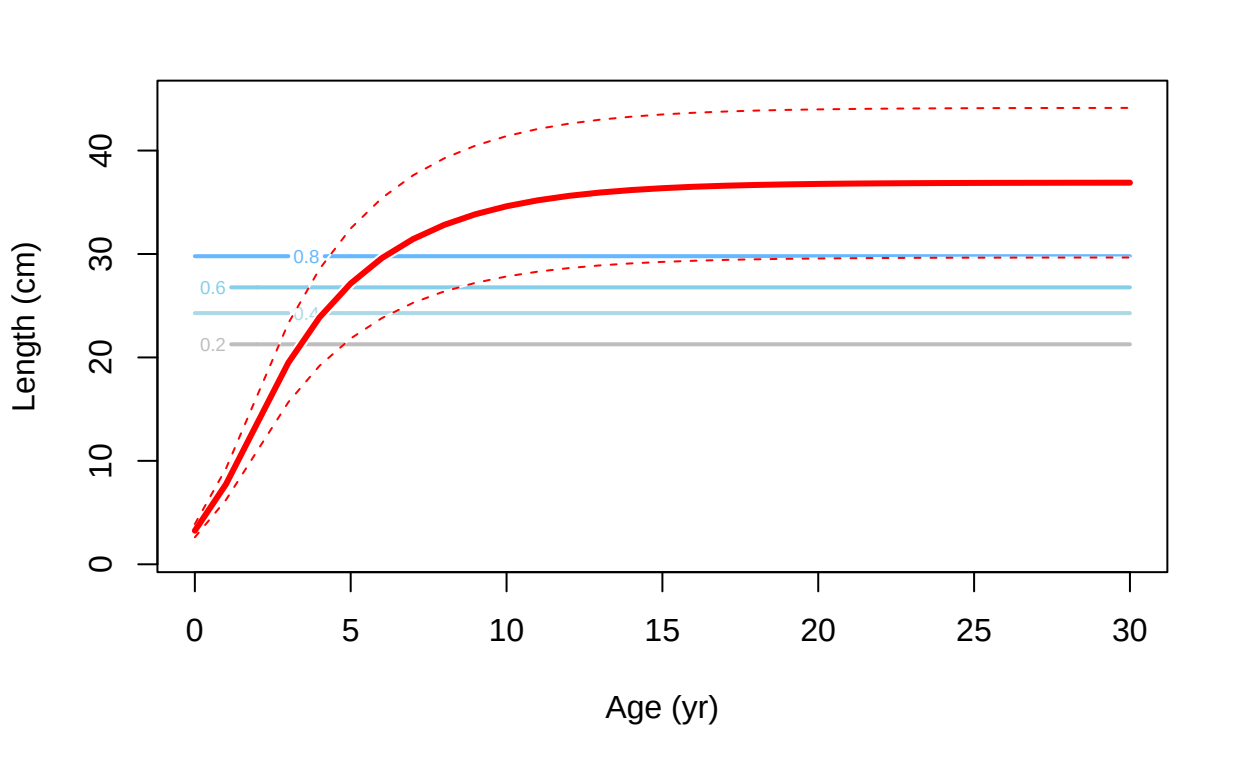

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
Length (cm)
FISHERY
SURVEY2

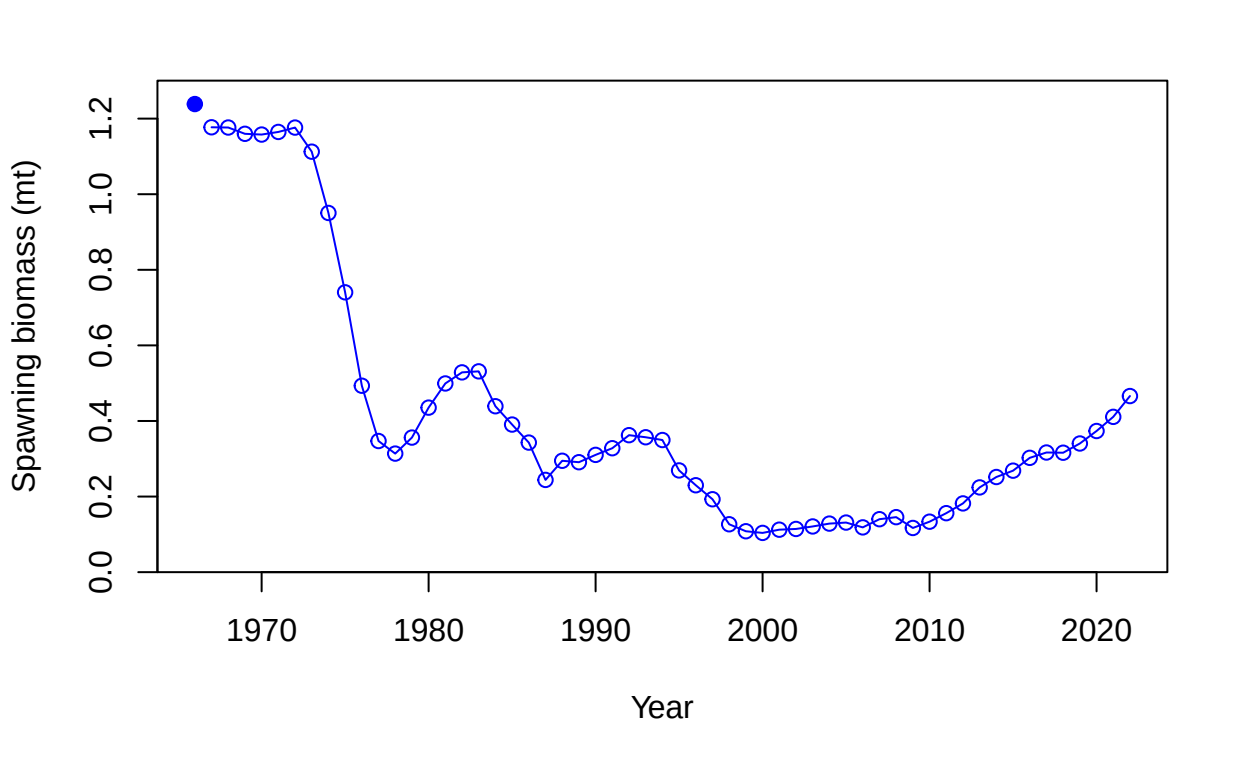

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25
30
Age (yr)
FISHERY
SURVEY2

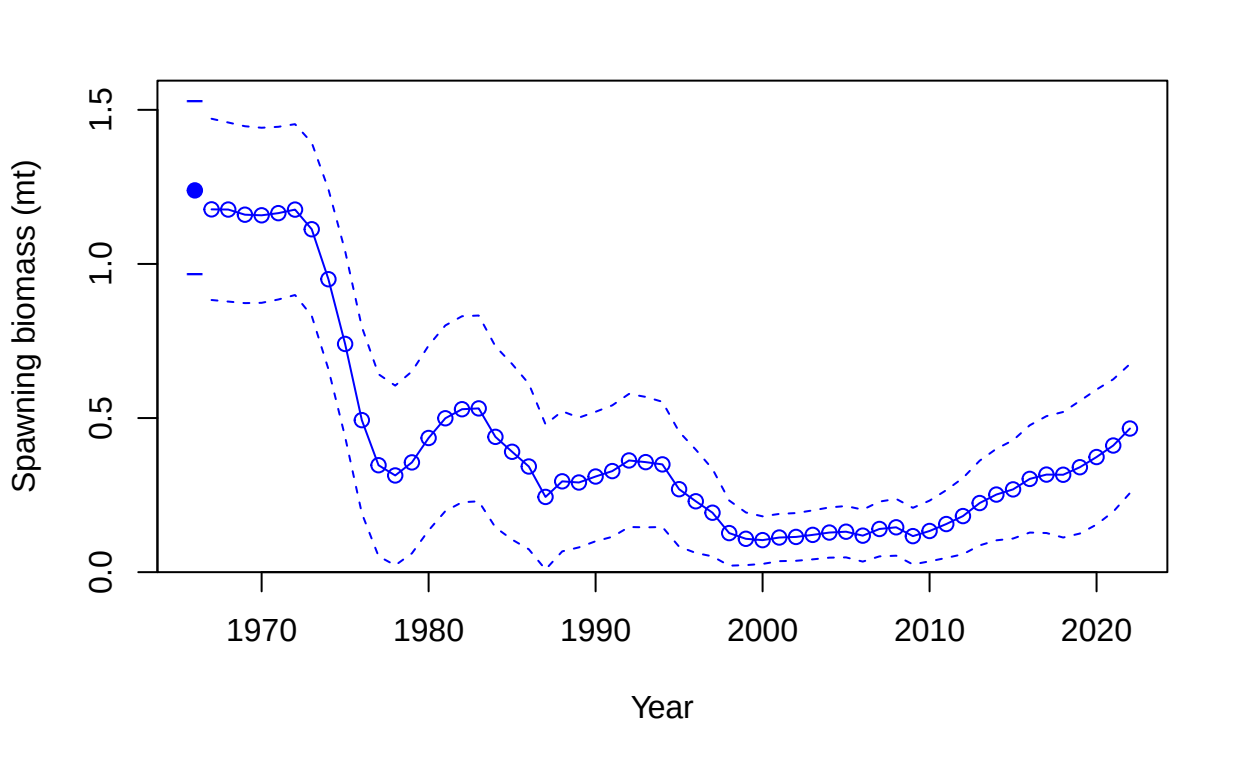

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
Length (cm)

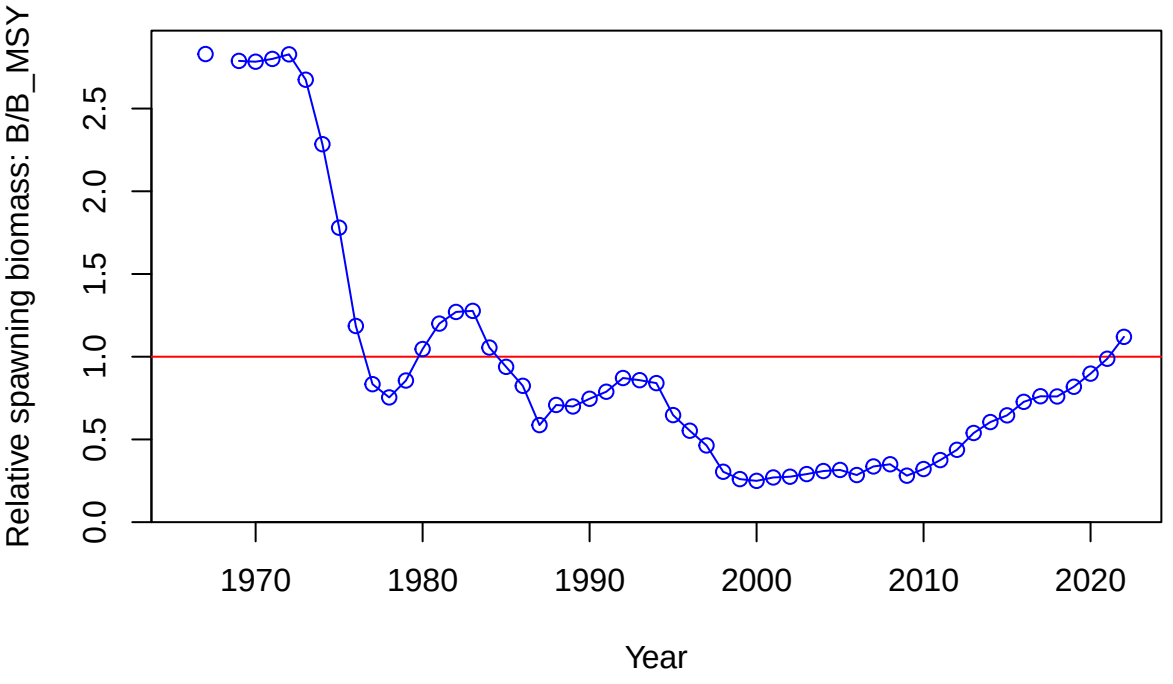

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
Length (cm)

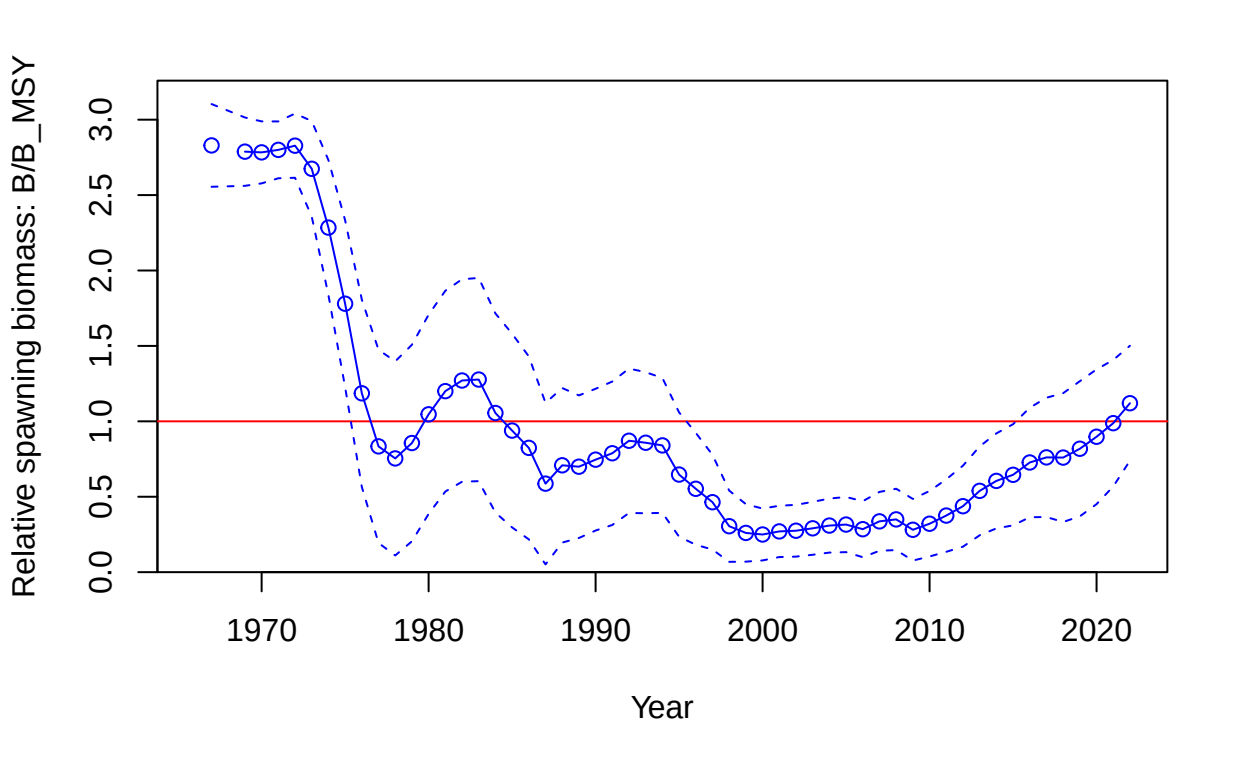

Length (cm)
0
10
20
30
40
0
5
10
15
20
25
30
Age (yr)
0.8
0.6
0.4
0.2

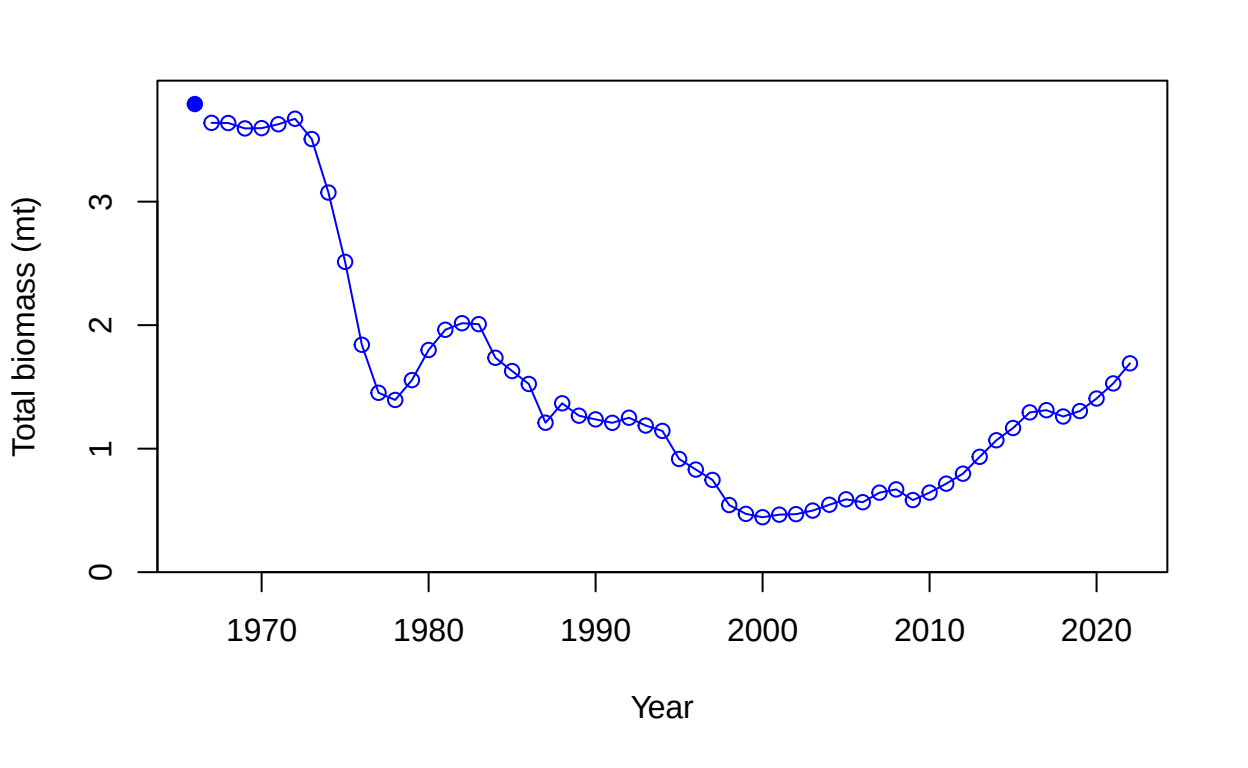

Length (cm)
0
10
20
30
40
0
5
10
15
20
25
30
Age (yr)
0.8
0.6
0.4
0.2

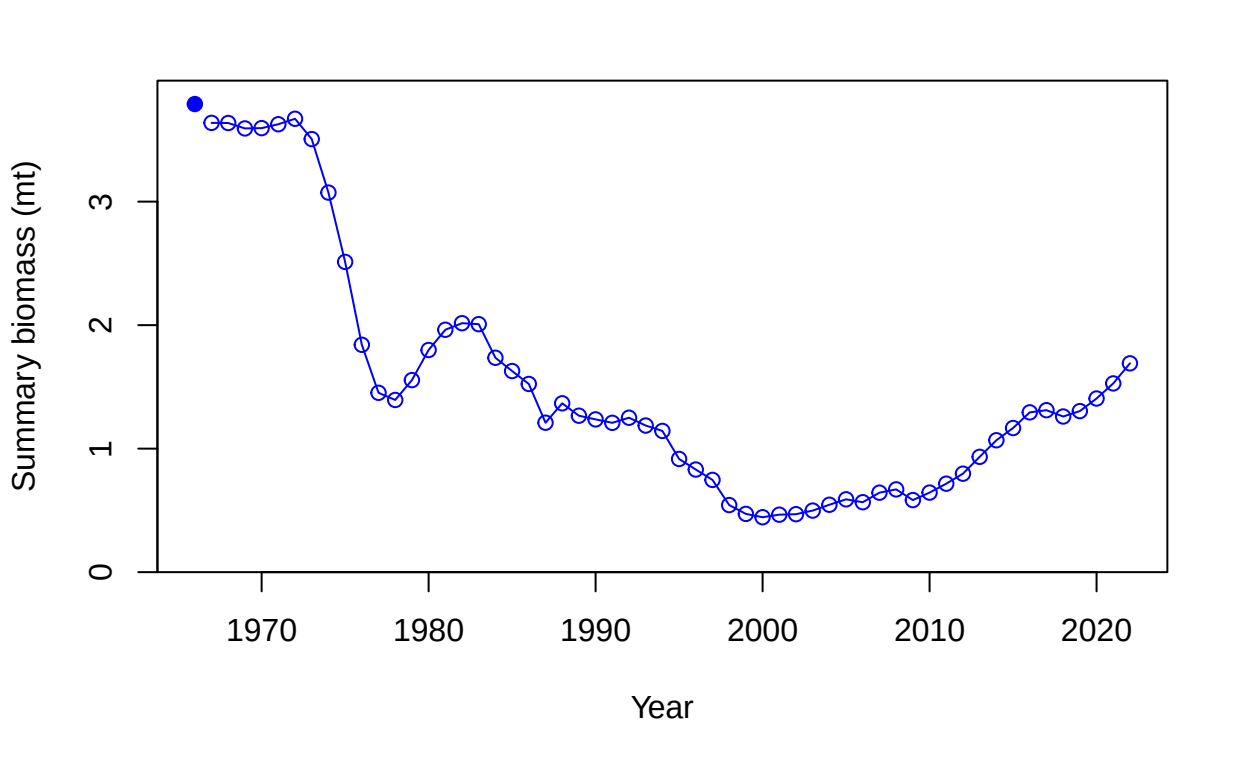

Spawning biomass (mt)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1970
1980
1990
2000
2010
2020
Year

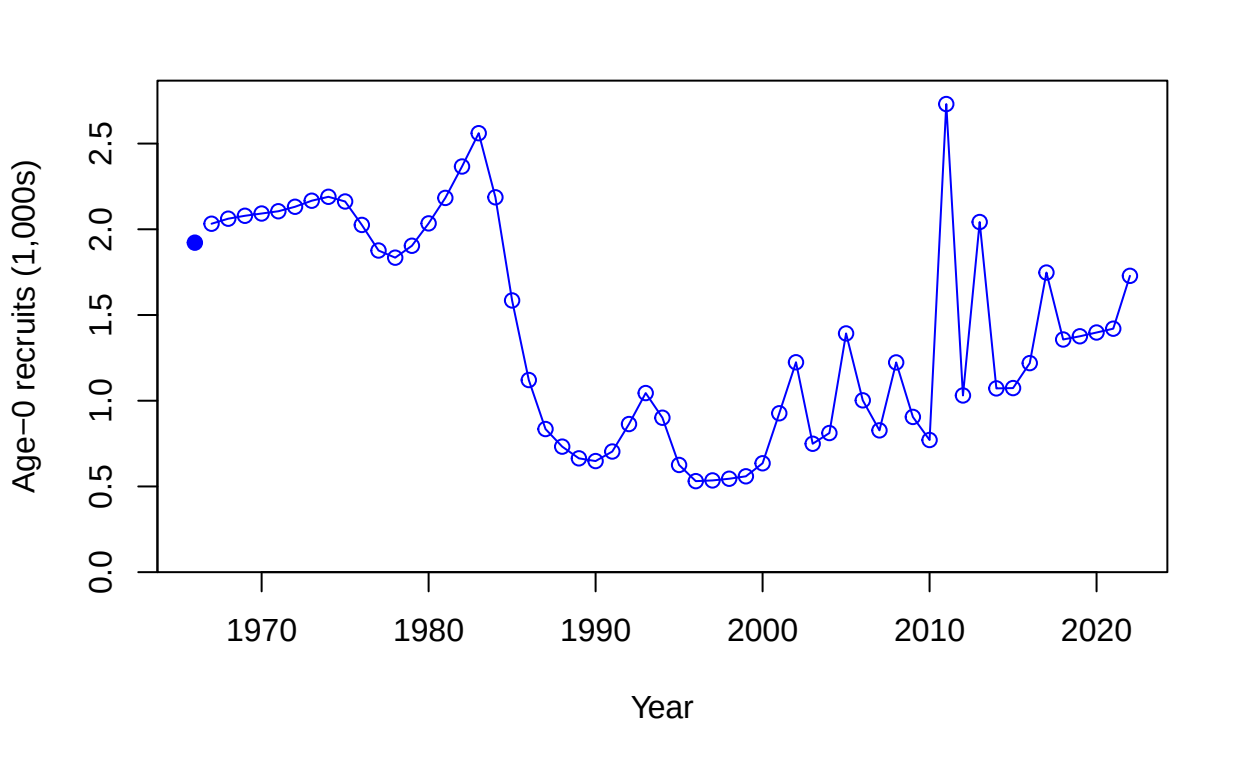

Spawning biomass (mt)
0.0
0.5
1.0
1.5
1970
1980
1990
2000
2010
2020
Year

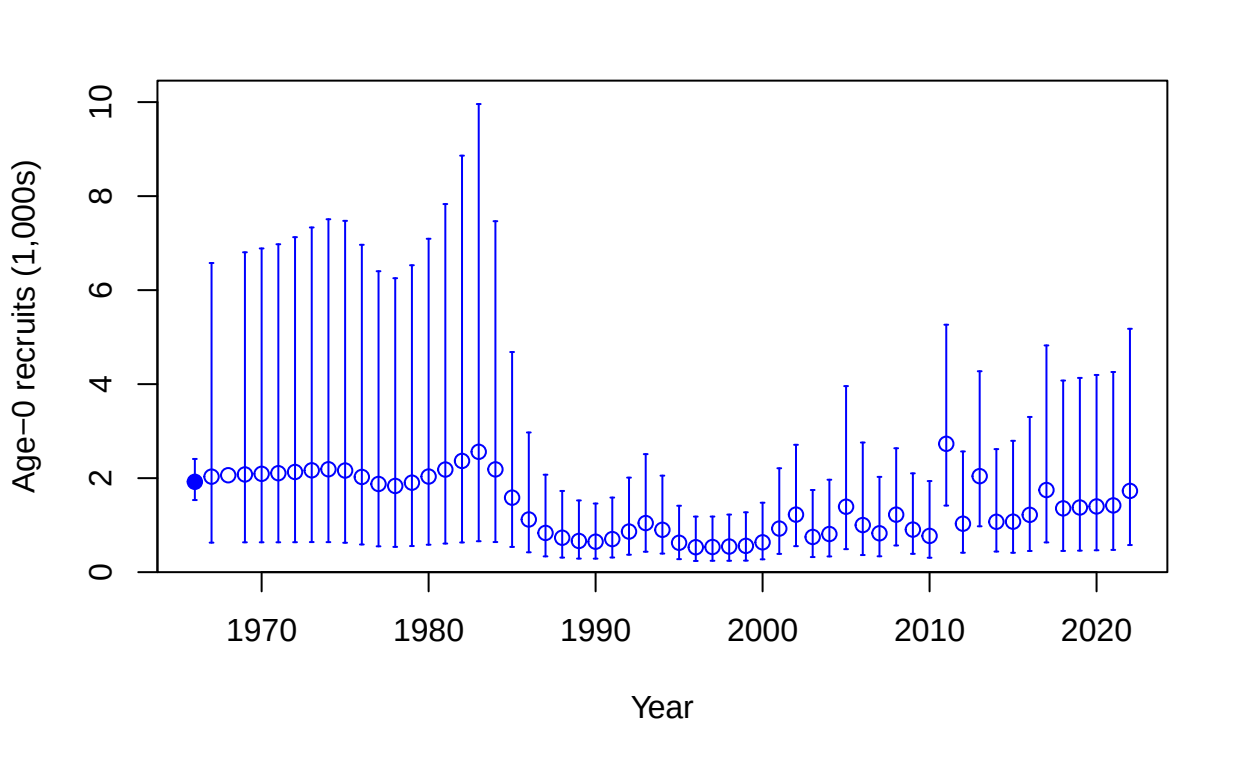

Relative spawning biomass: B/B_MSY
0.0
0.5
1.0
1.5
2.0
2.5
1970
1980
1990
2000
2010
2020
Year

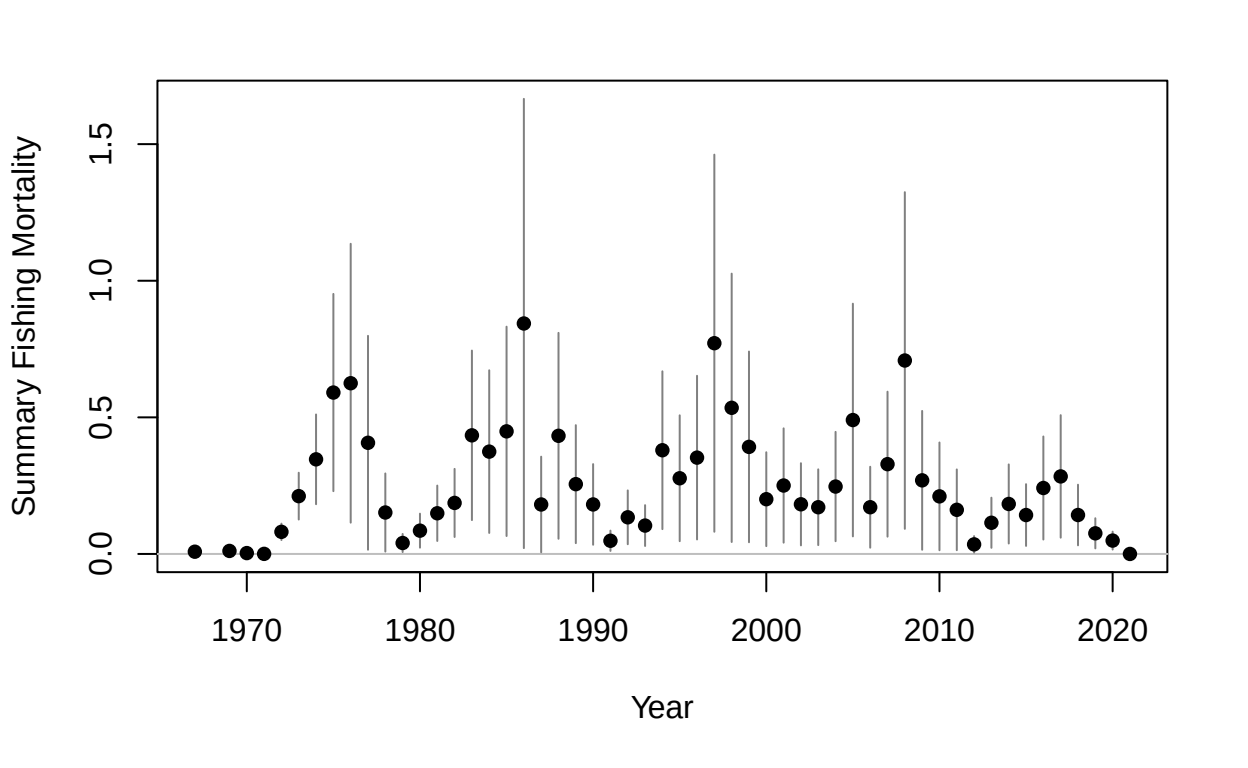

Relative spawning biomass: B/B_MSY
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

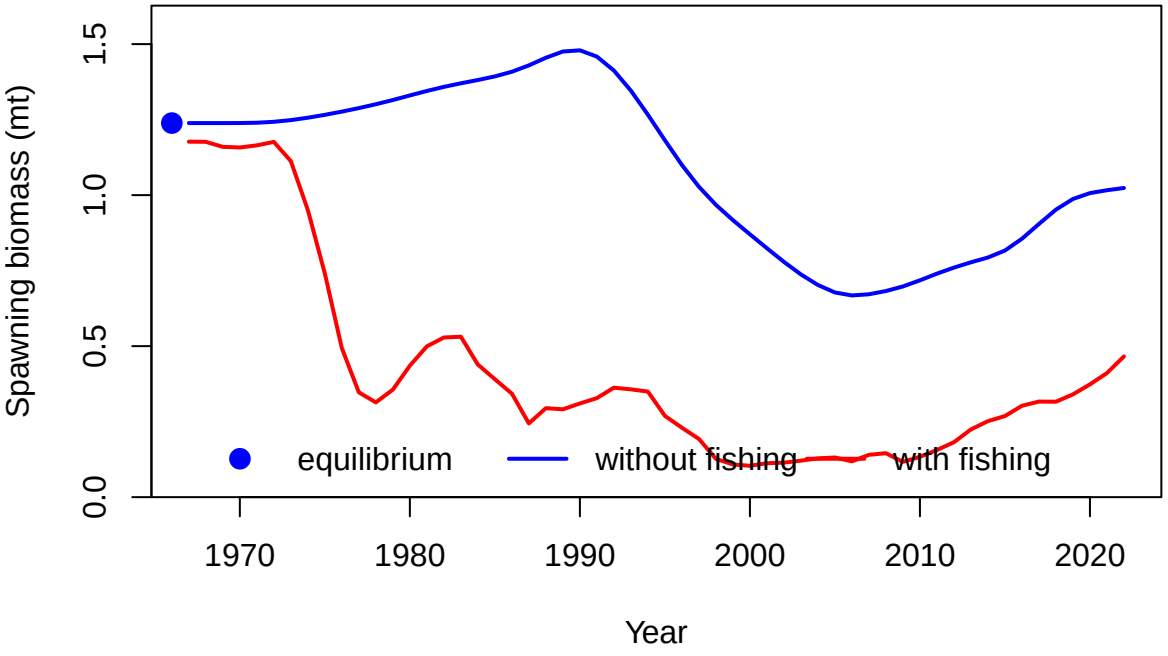

Total biomass (mt)
0
1
2
3
1970
1980
1990
2000
2010
2020
Year

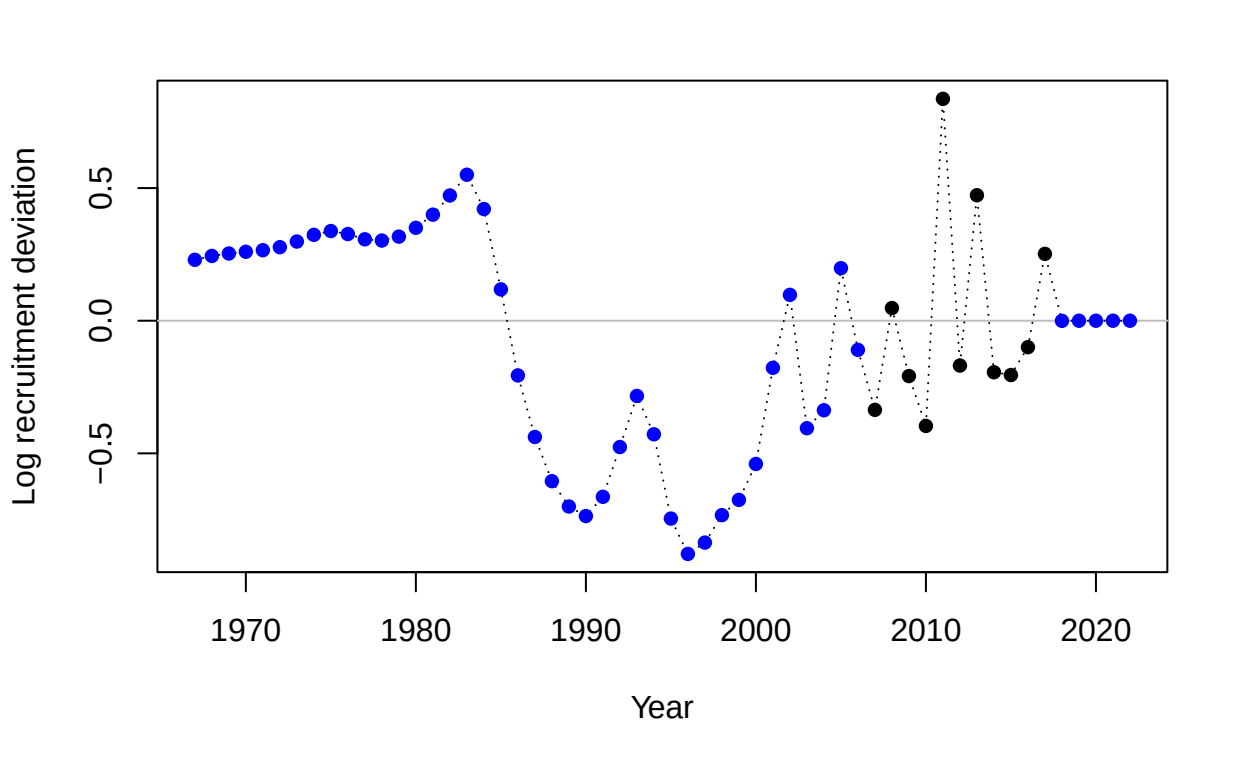

Summary biomass (mt)
0
1
2
3
1970
1980
1990
2000
2010
2020
Year

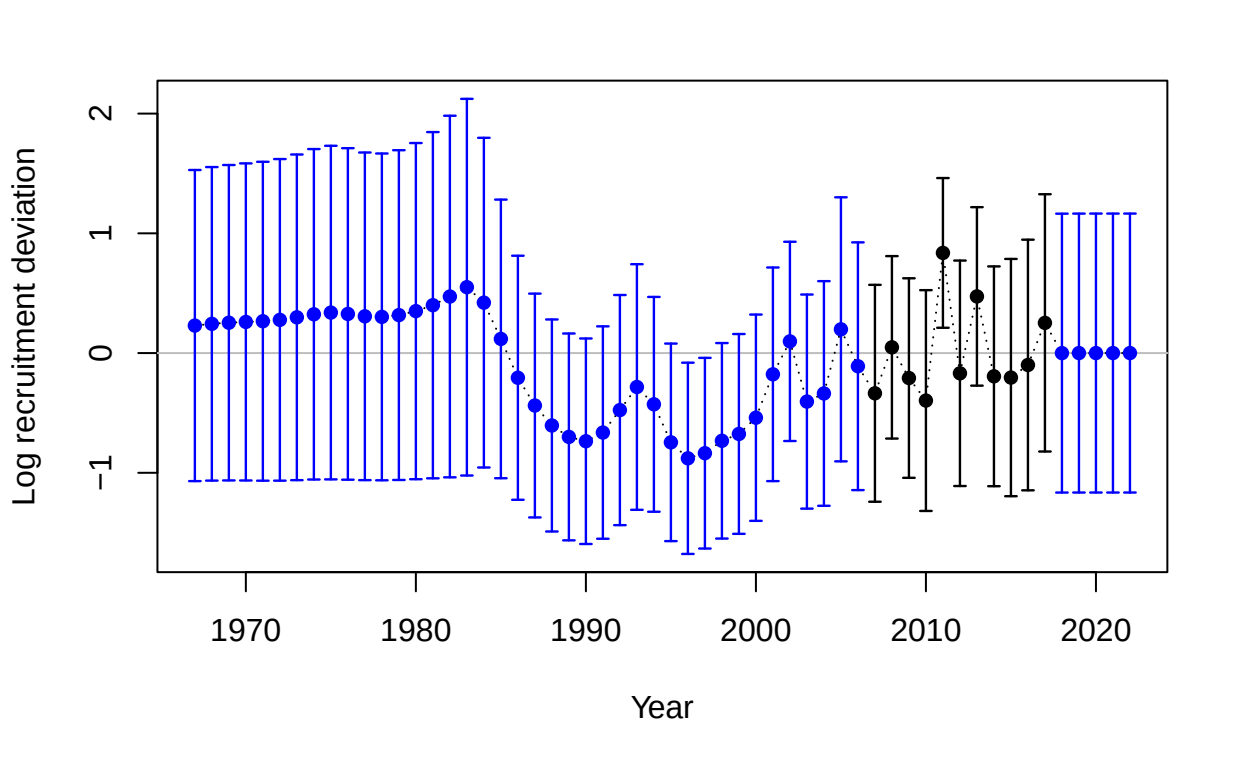

Age−0 recruits (1,000s)
0.0
0.5
1.0
1.5
2.0
2.5
1970
1980
1990
2000
2010
2020
Year

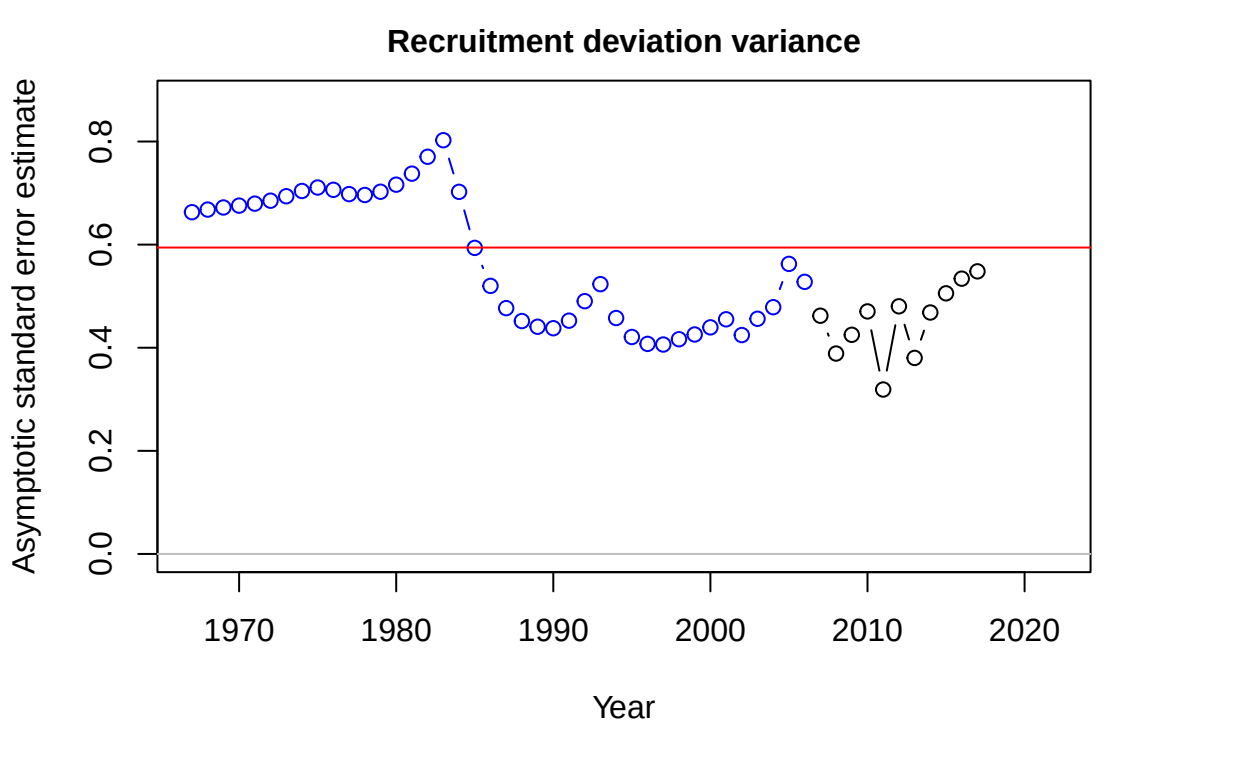

Age−0 recruits (1,000s)
0
2
4
6
8
10
1970
1980
1990
2000
2010
2020
Year

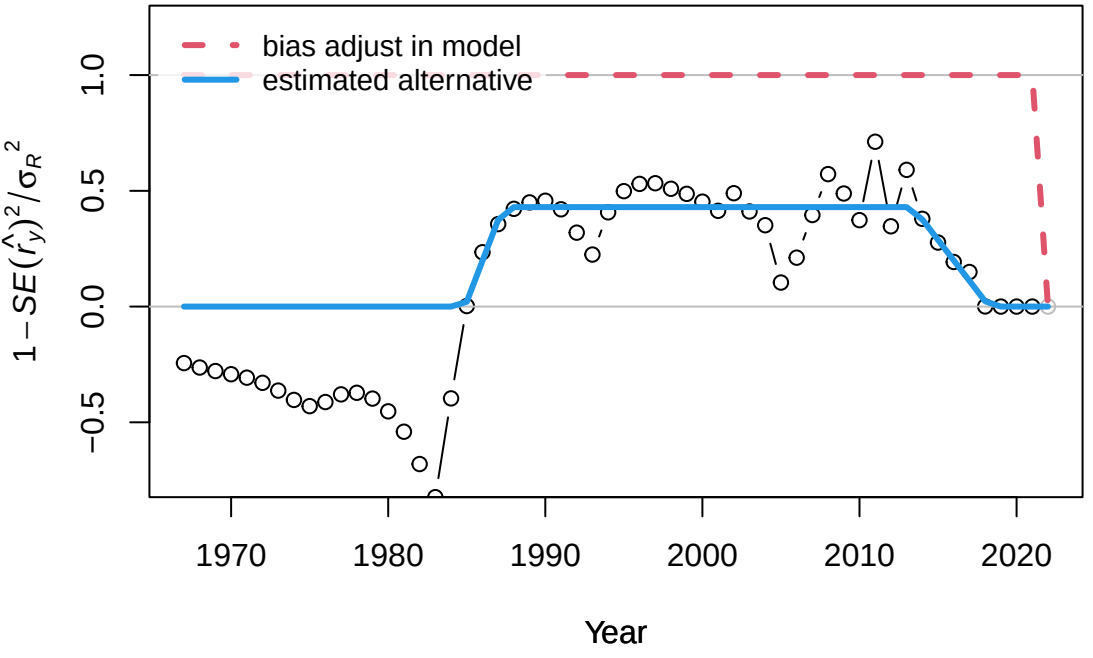

Summary Fishing Mortality
0.0
0.5
1.0
1.5
1970
1980
1990
2000
2010
2020
Year

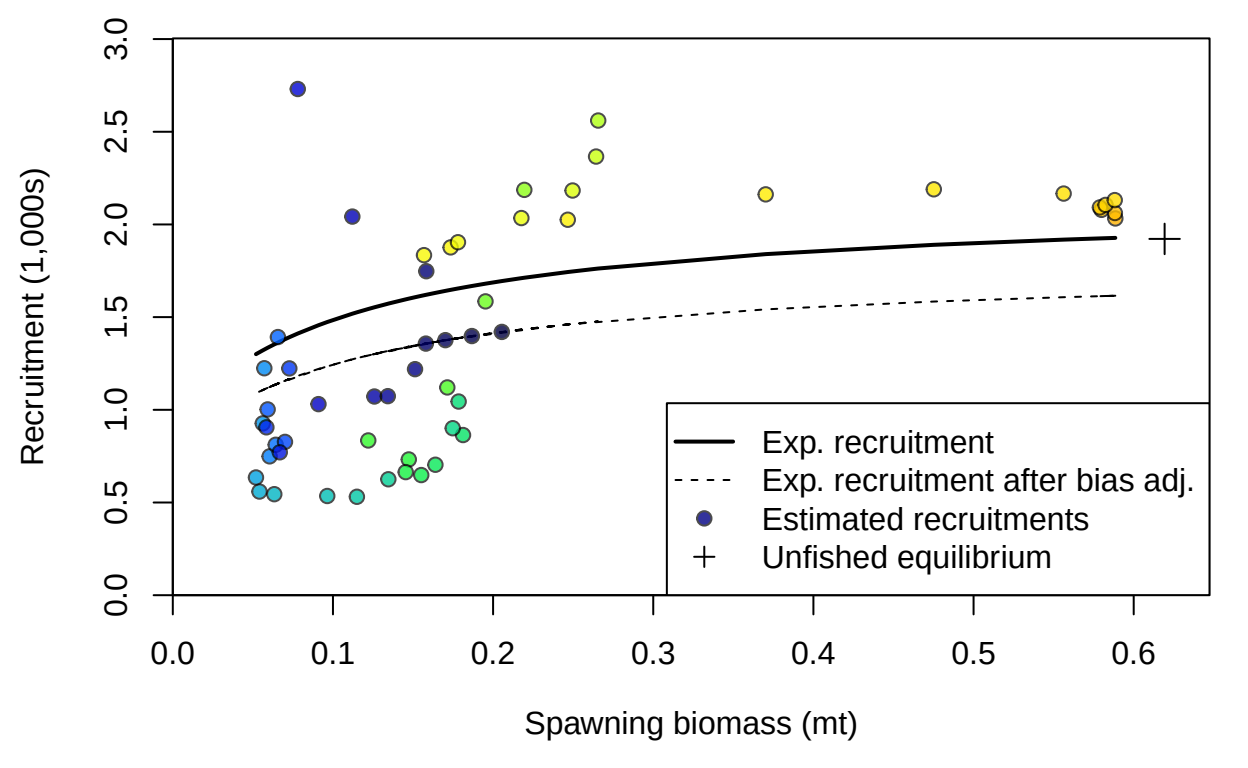

Spawning biomass (mt)
0.0
0.5
1.0
1.5
1970
1980
1990
2000
2010
2020
Year
equilibrium
without fishing
with fishing

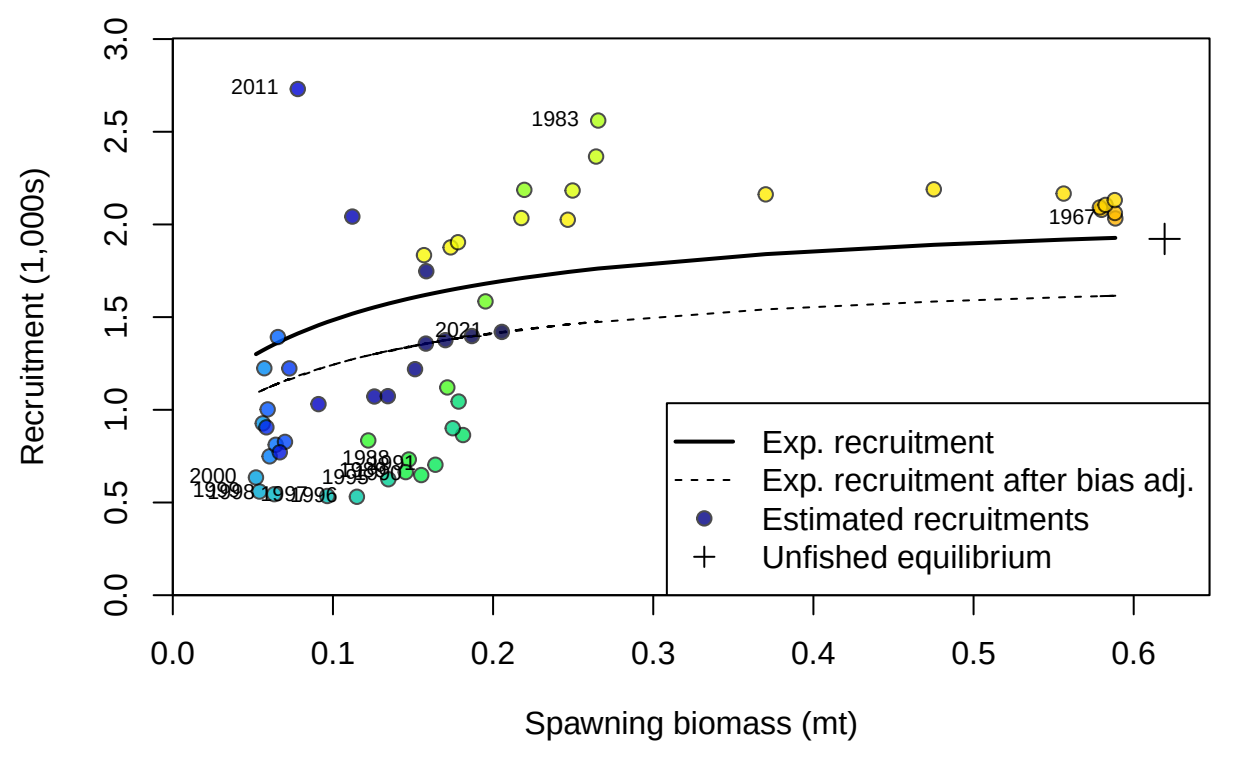

Log recruitment deviation
0.5
0.0
−0.5
1970
1980
1990
2000
2010
2020
Year

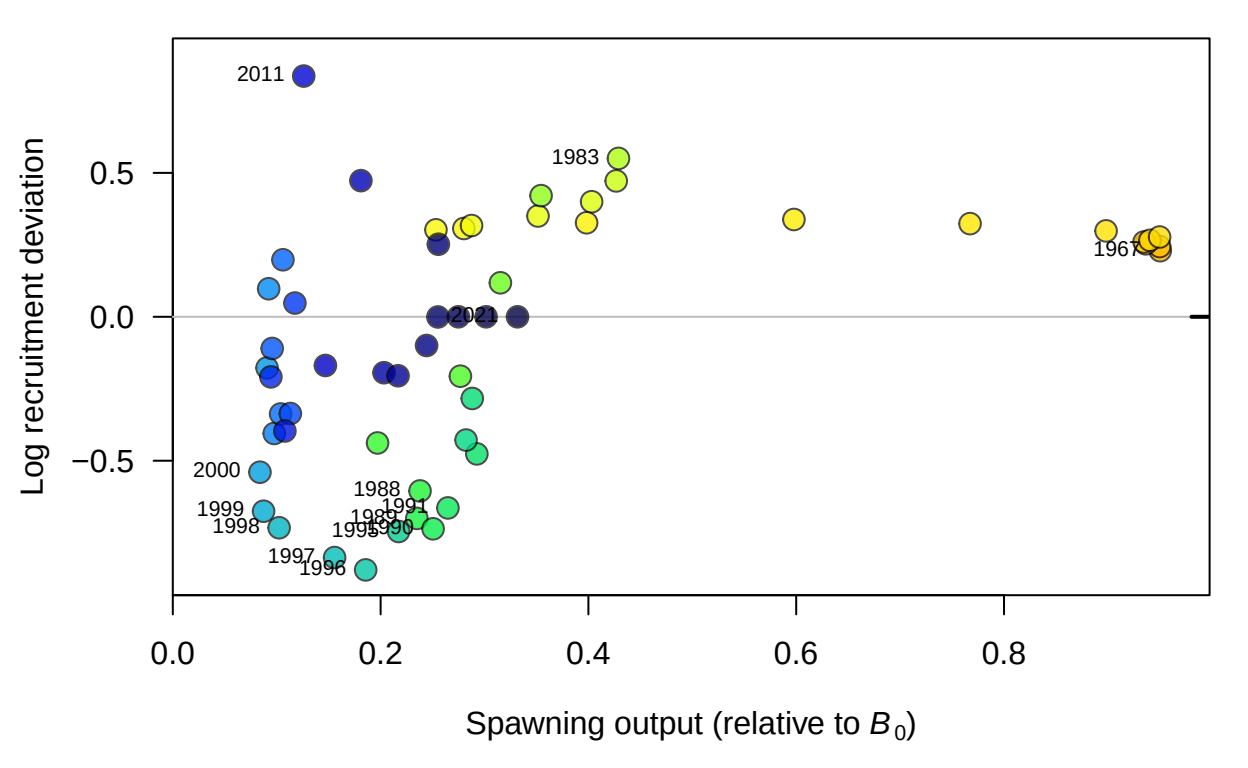

Log recruitment deviation
2
1
0
−1
1970
1980
1990
2000
2010
2020
Year

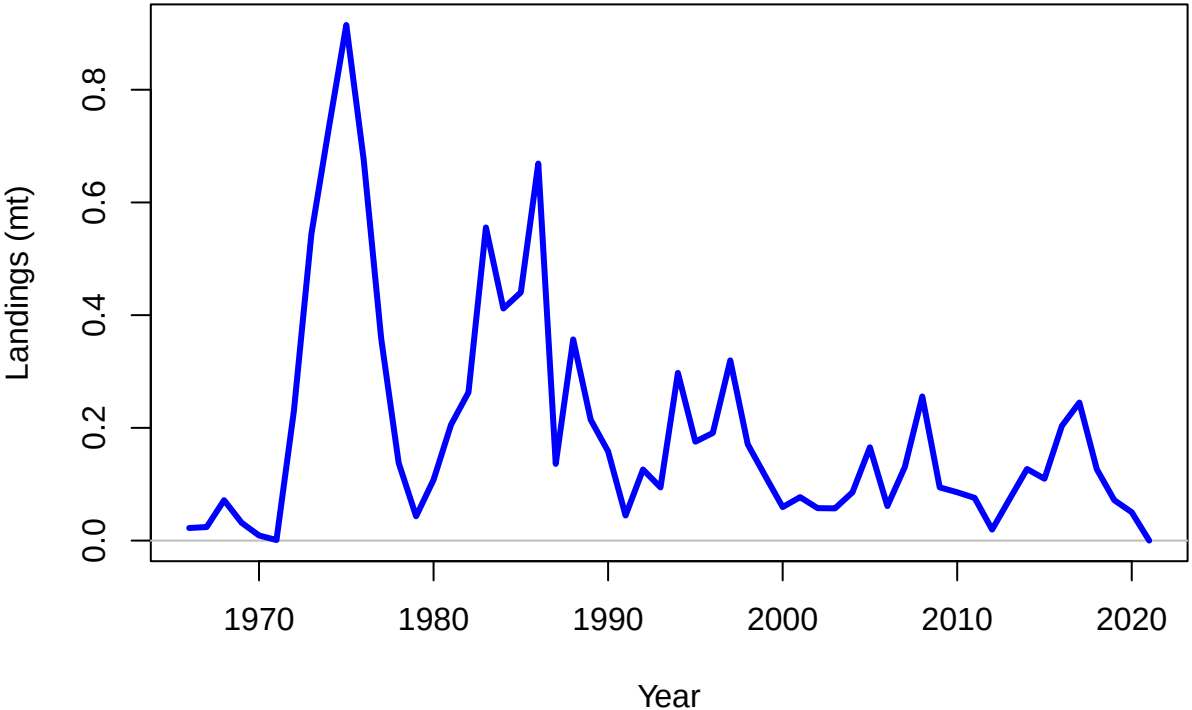

Recruitment deviation variance
Asymptotic standard error estimate
0.0
0.2
0.4
0.6
0.8
1970
1980
1990
2000
2010
2020
Year

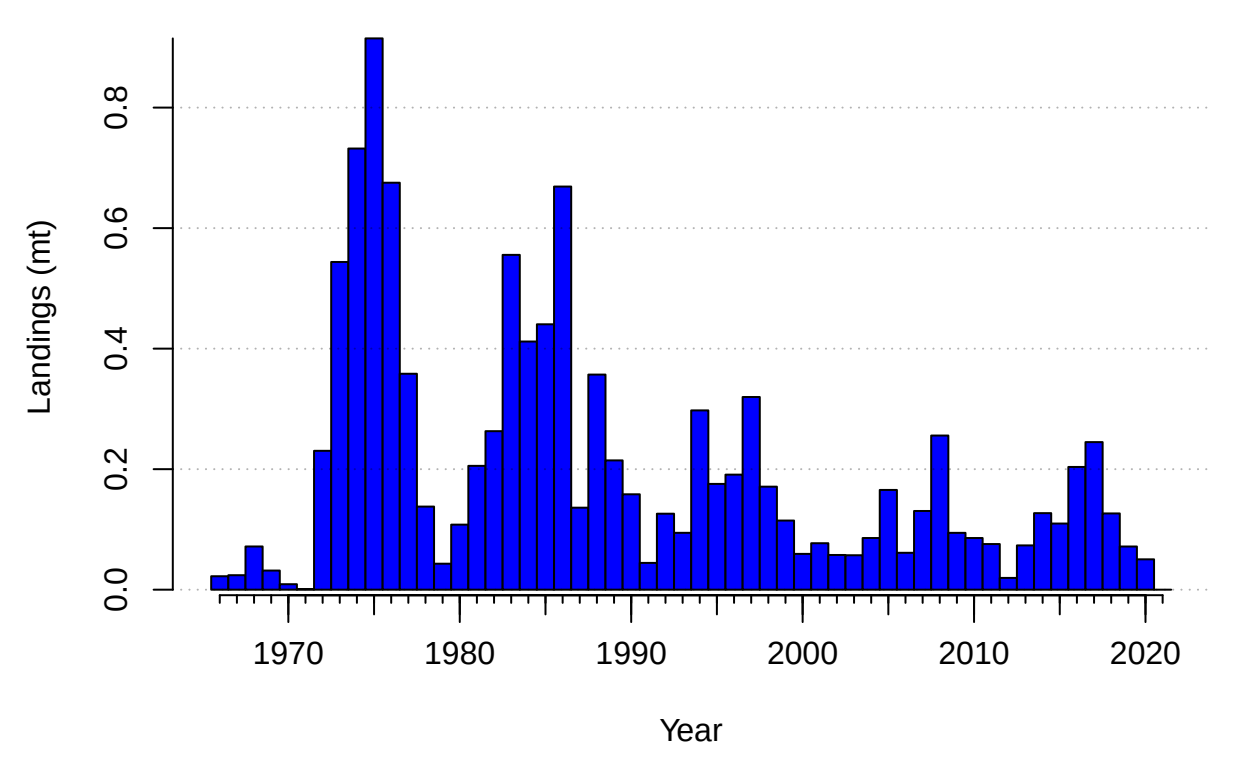

bias adjust in model
estimated alternative
1.0
0.5
0.0
−0.5
$1-SE(\hat{r}_y)^2/\sigma_R{}^2$
1970
1980
1990
2000
2010
2020
Year

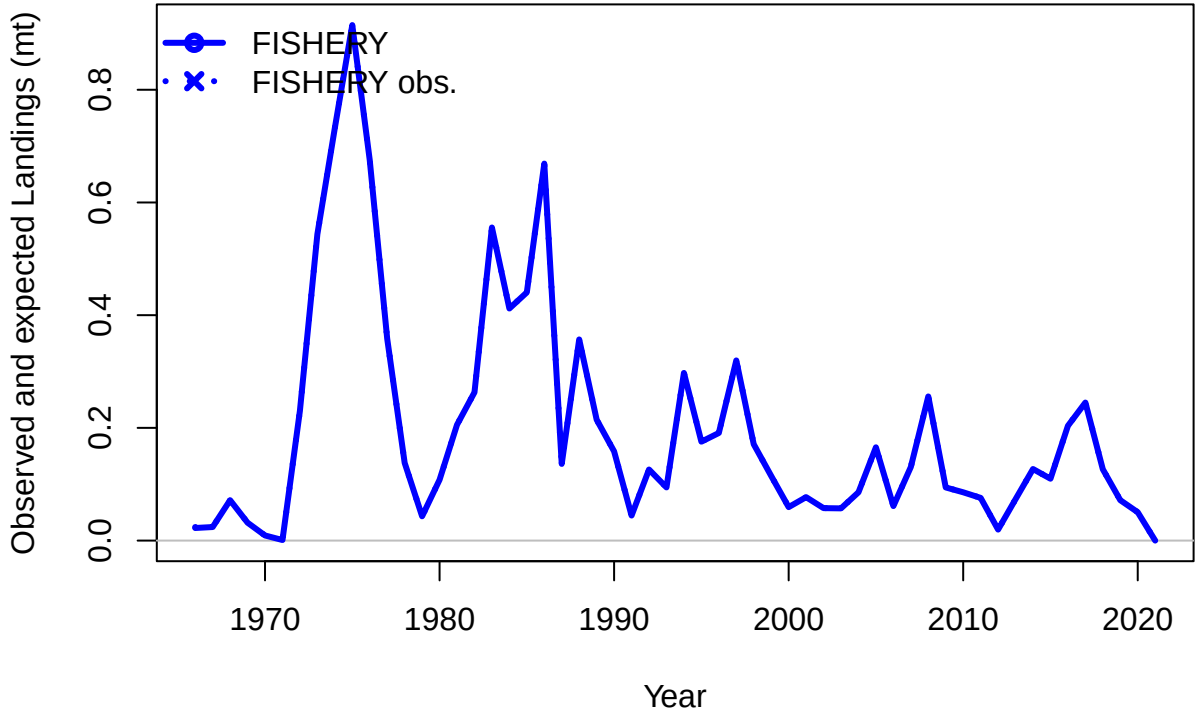

Recruitment (1,000s)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Spawning biomass (mt)
Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium

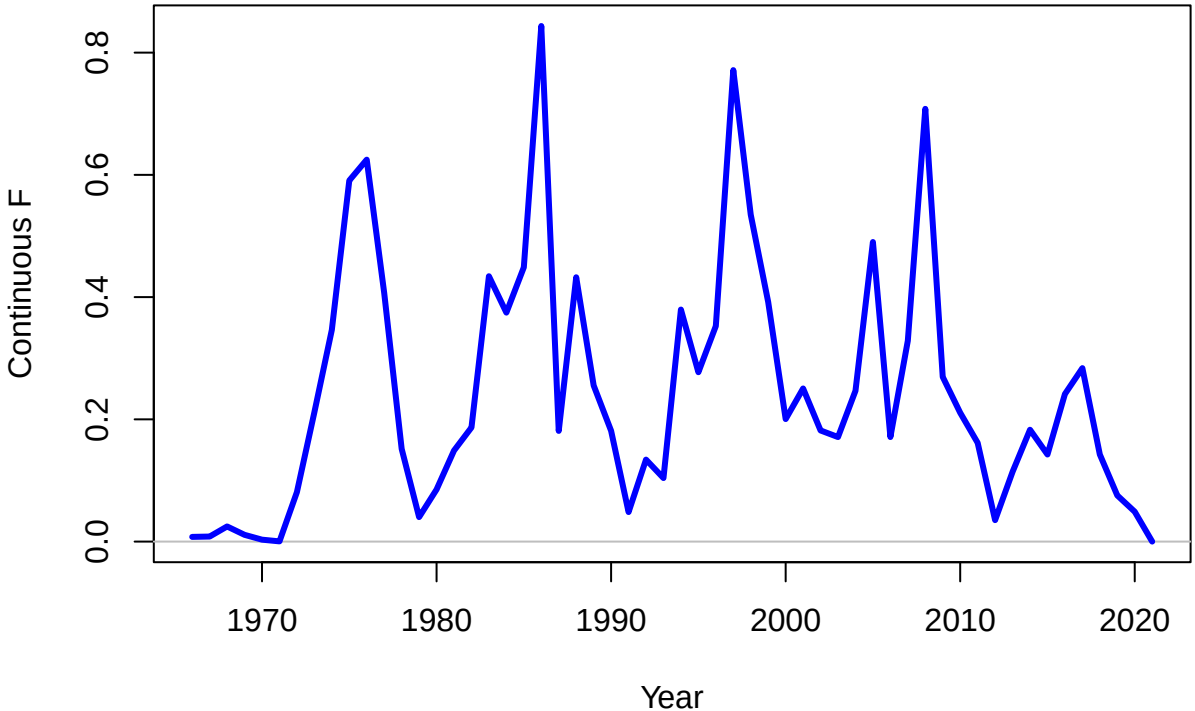

Recruitment (1,000s)
Spawning biomass (mt)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0.1
0.2
0.3
0.4
0.5
0.6
2011
1983
1967
2021
2000
Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium

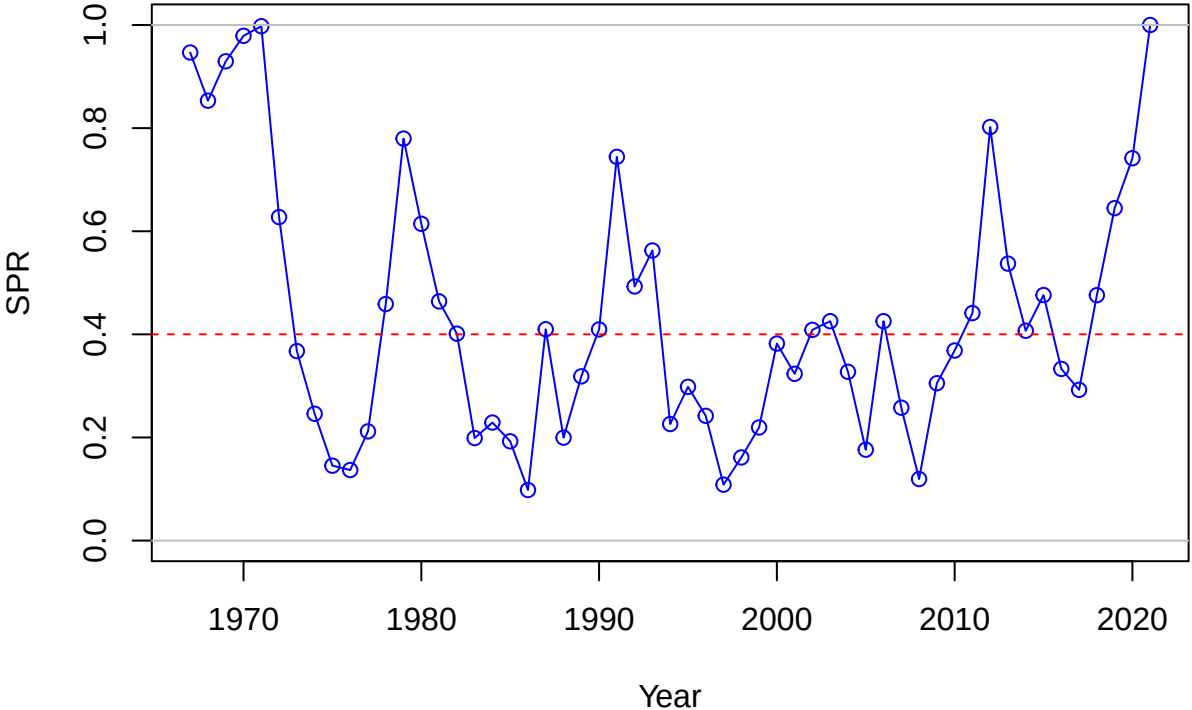

Log recruitment deviation
0.5
0.0
−0.5
0.0
0.2
0.4
0.6
0.8
Spawning output (relative to B_0)
2011
1983
1967
2021
2000
1999
1998
1997
1996
1988
1991
1989
1990
1995

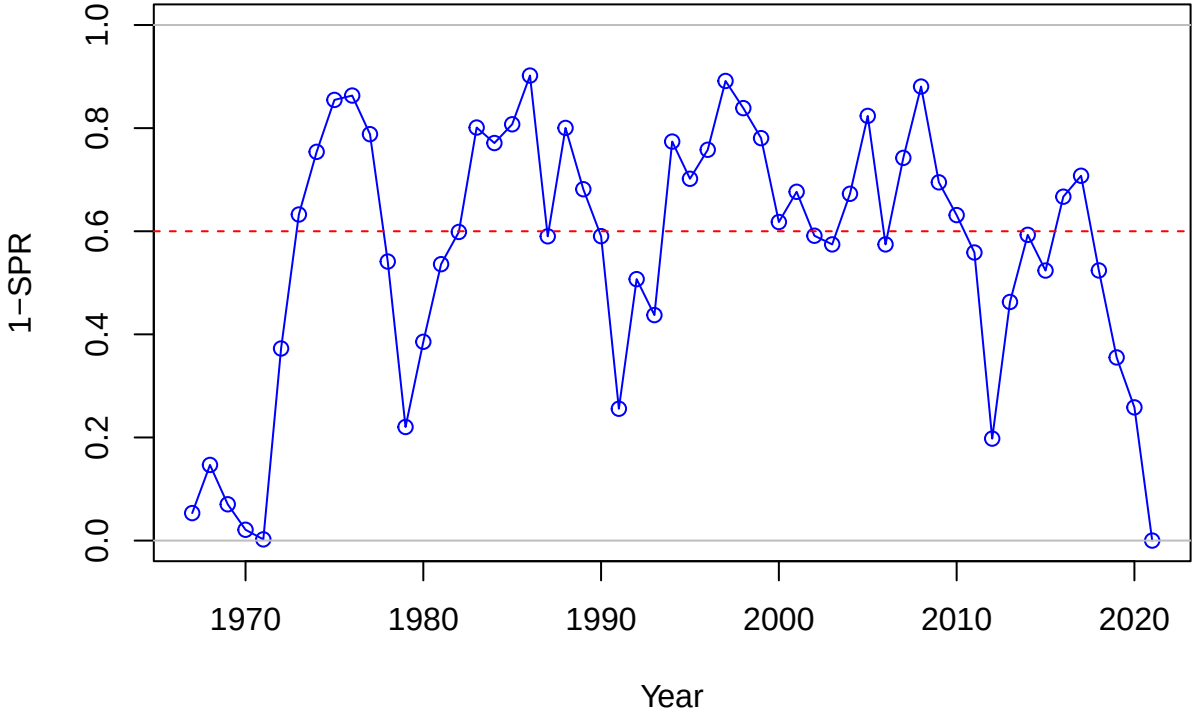

Landings (mt)
0.0
0.2
0.4
0.6
0.8
1970
1980
1990
2000
2010
2020
Year

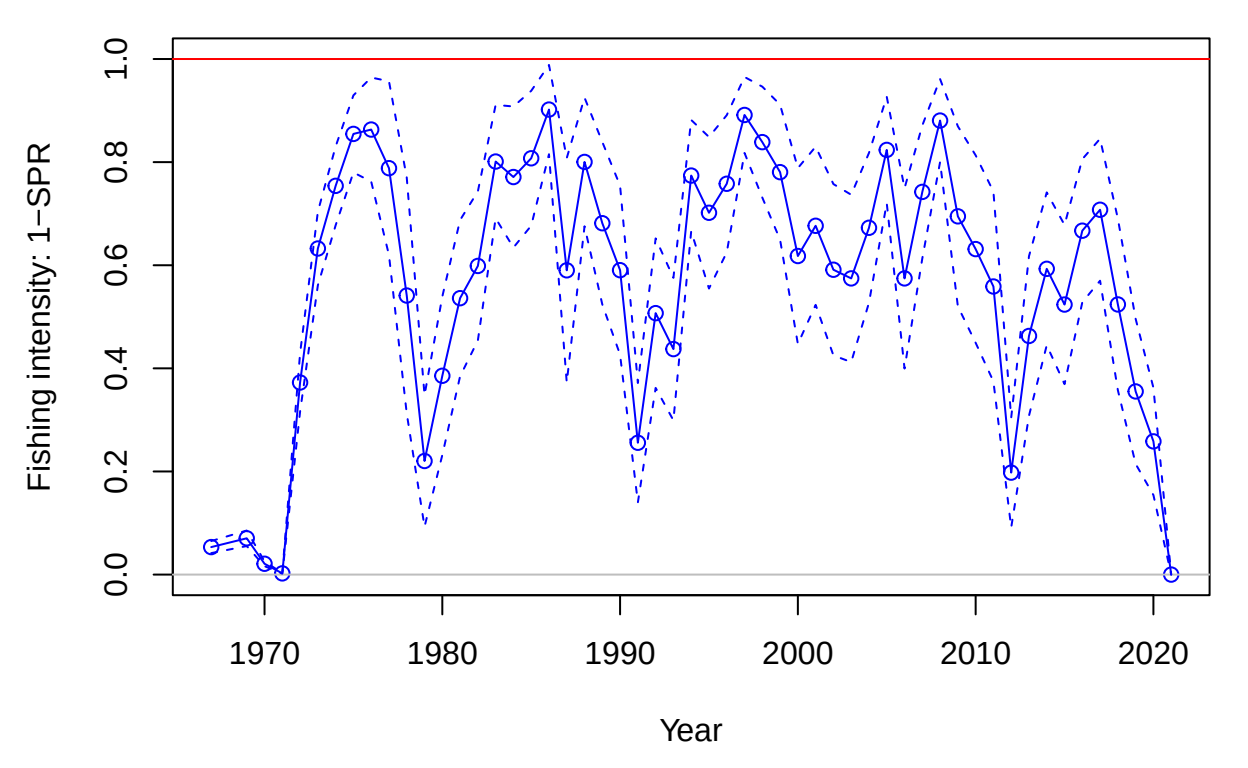

Landings (mt)
0.0
0.2
0.4
0.6
0.8
1970
1980
1990
2000
2010
2020
Year

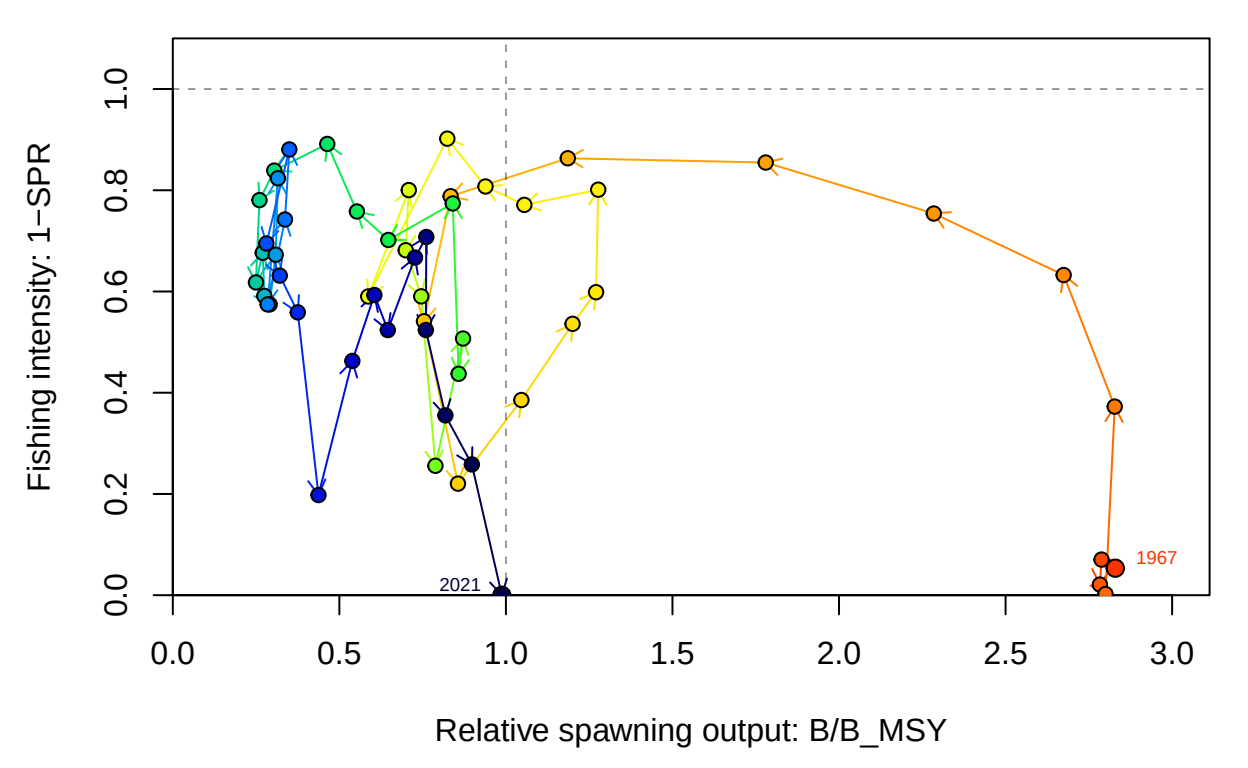

FISHERY
FISHERY obs.
Observed and expected Landings (mt)
0.0
0.2
0.4
0.6
0.8
1970
1980
1990
2000
2010
2020
Year

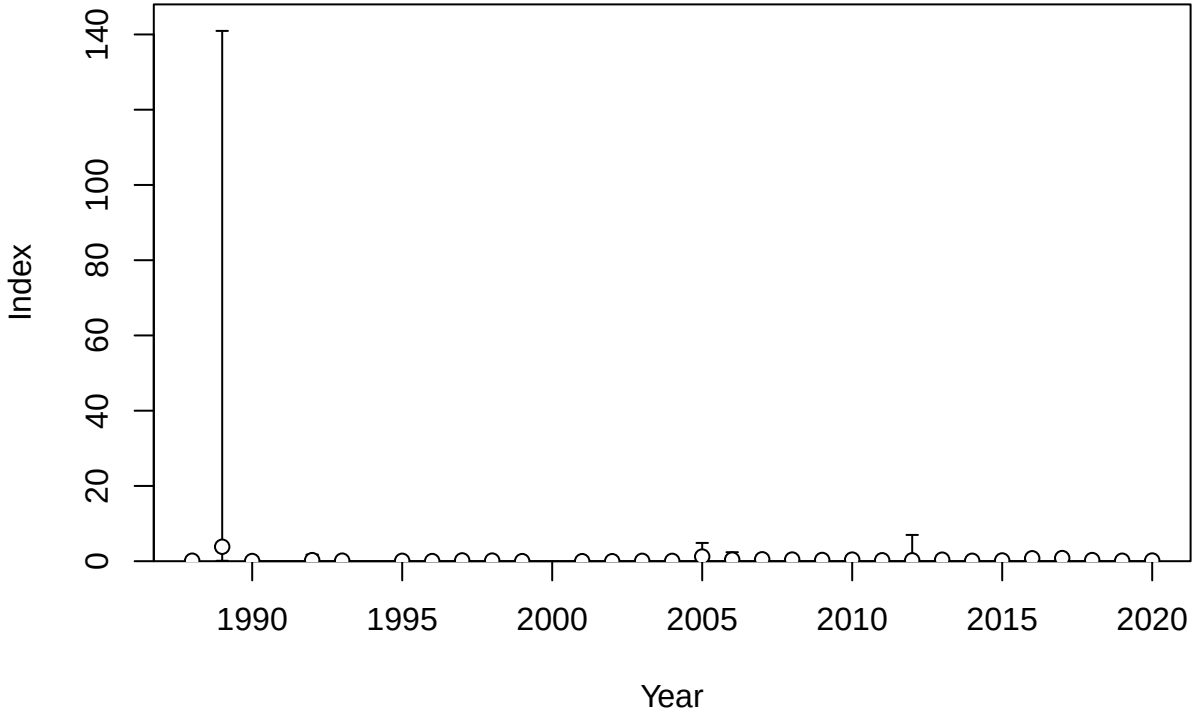

Continuous F
0.0
0.2
0.4
0.6
0.8
1970
1980
1990
2000
2010
2020
Year

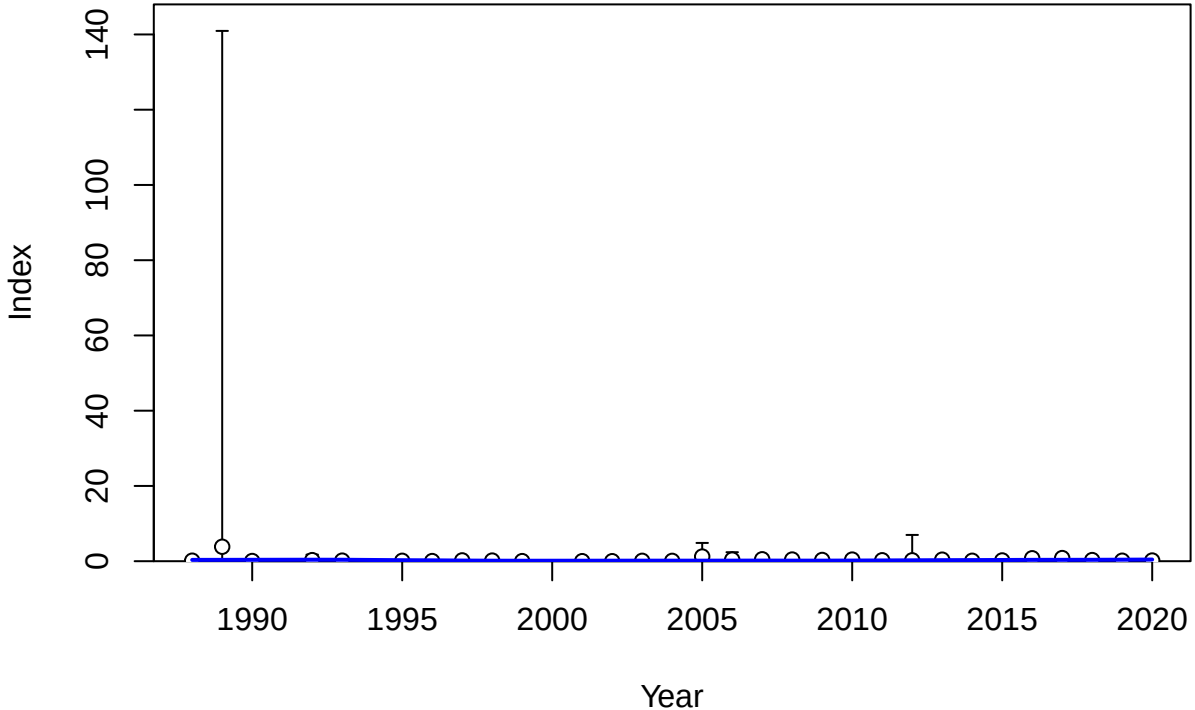

SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

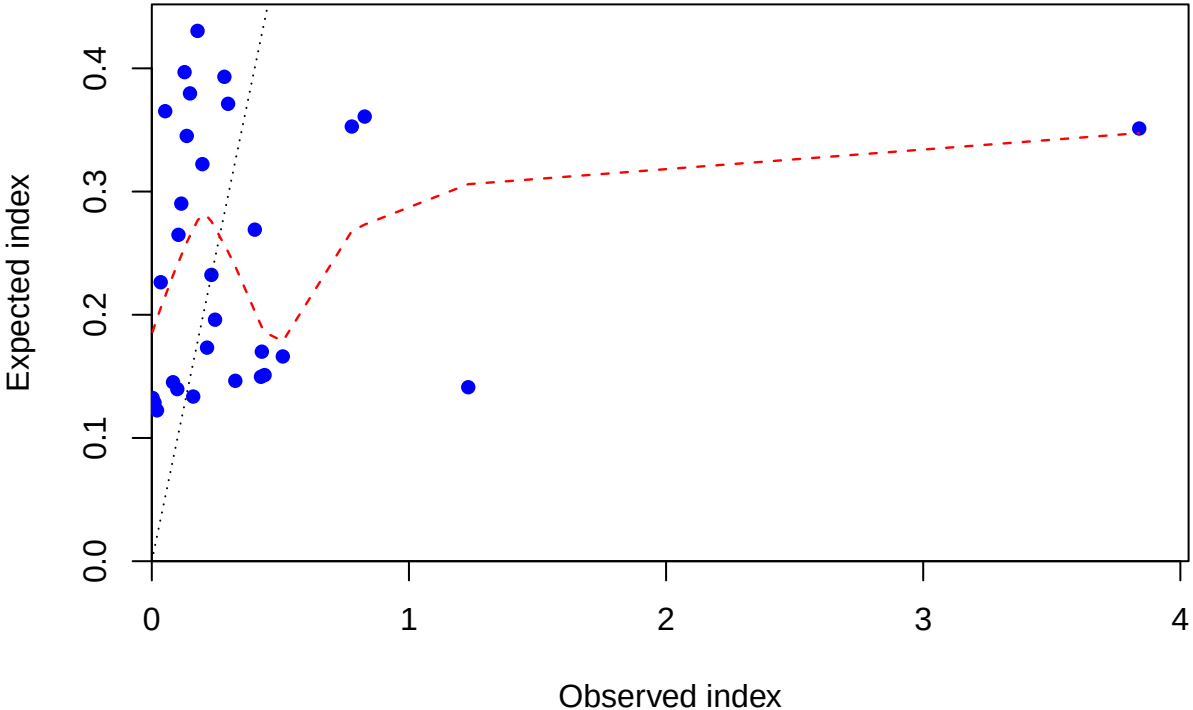

1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

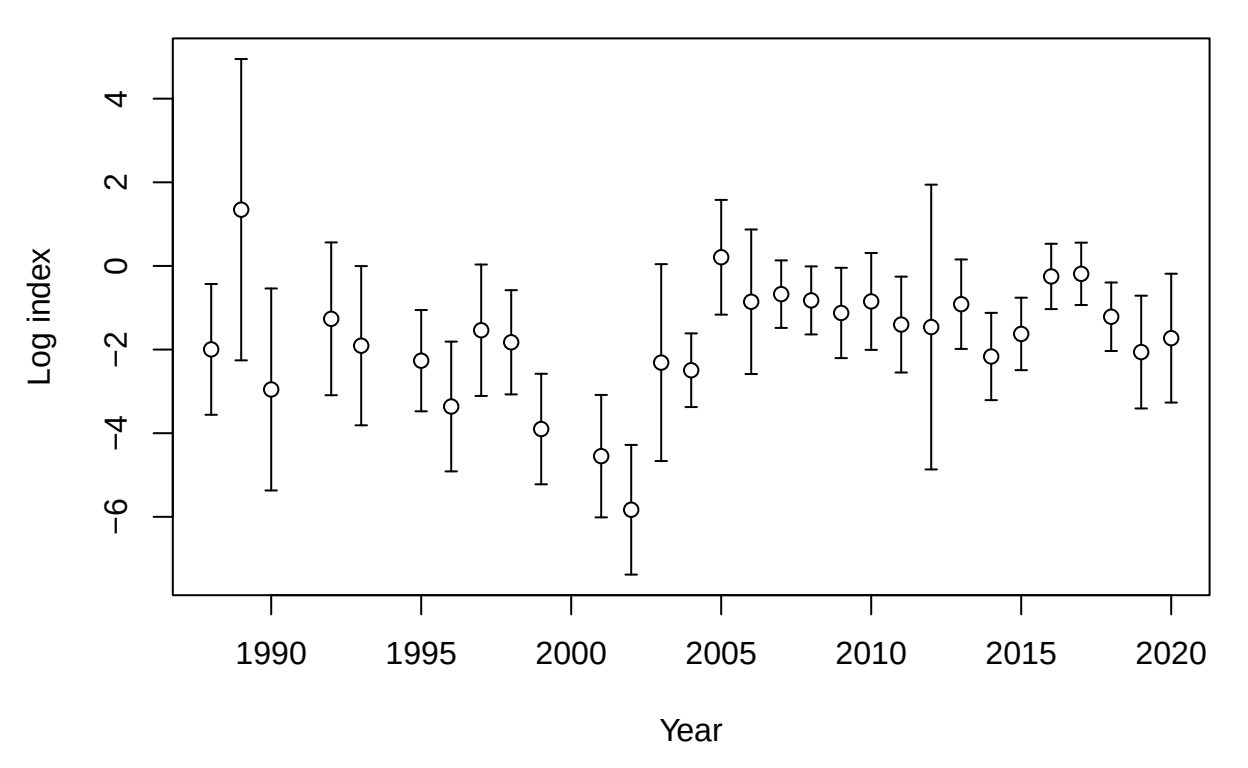

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

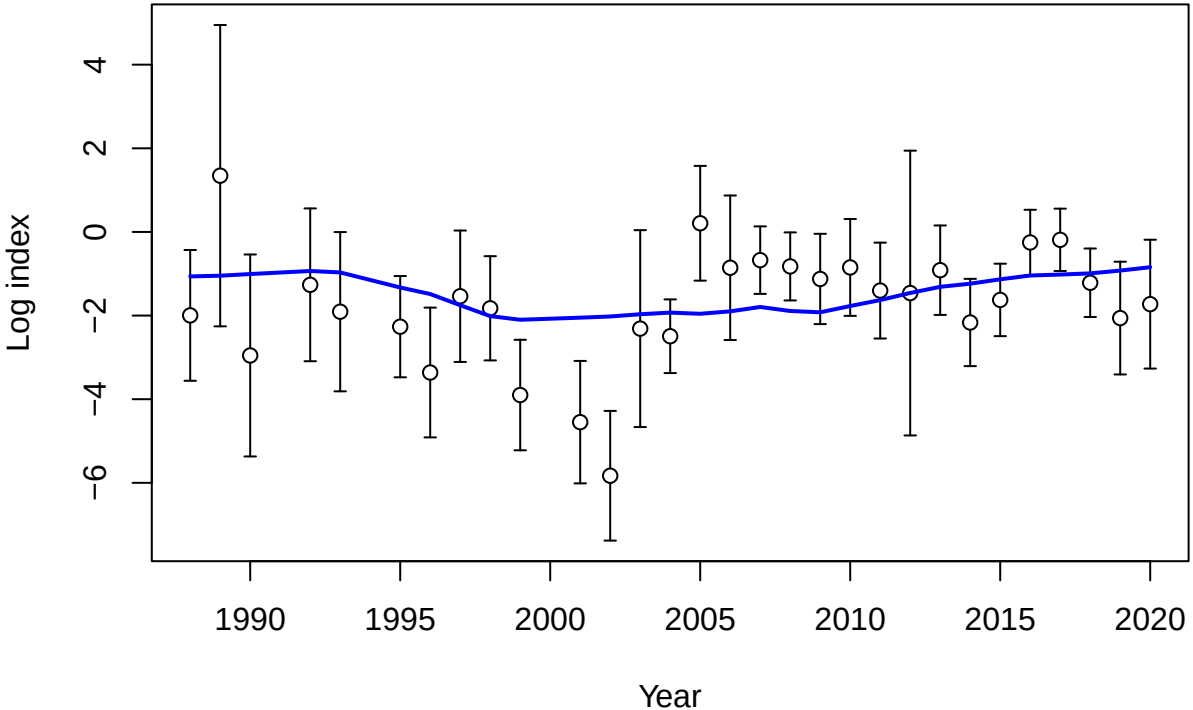

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Relative spawning output: B/B_MSY
2021
1967

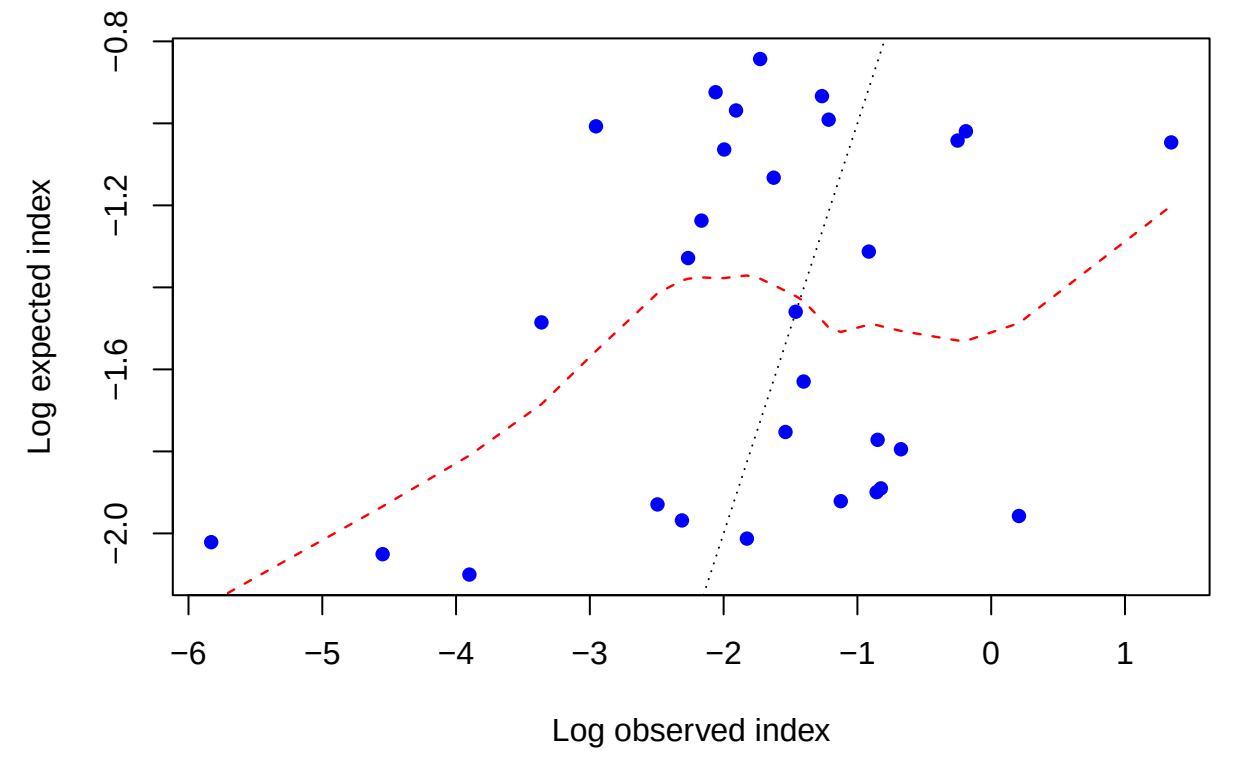

Index
0
20
40
60
80
100
140
1990
1995
2000
2005
2010
2015
2020
Year

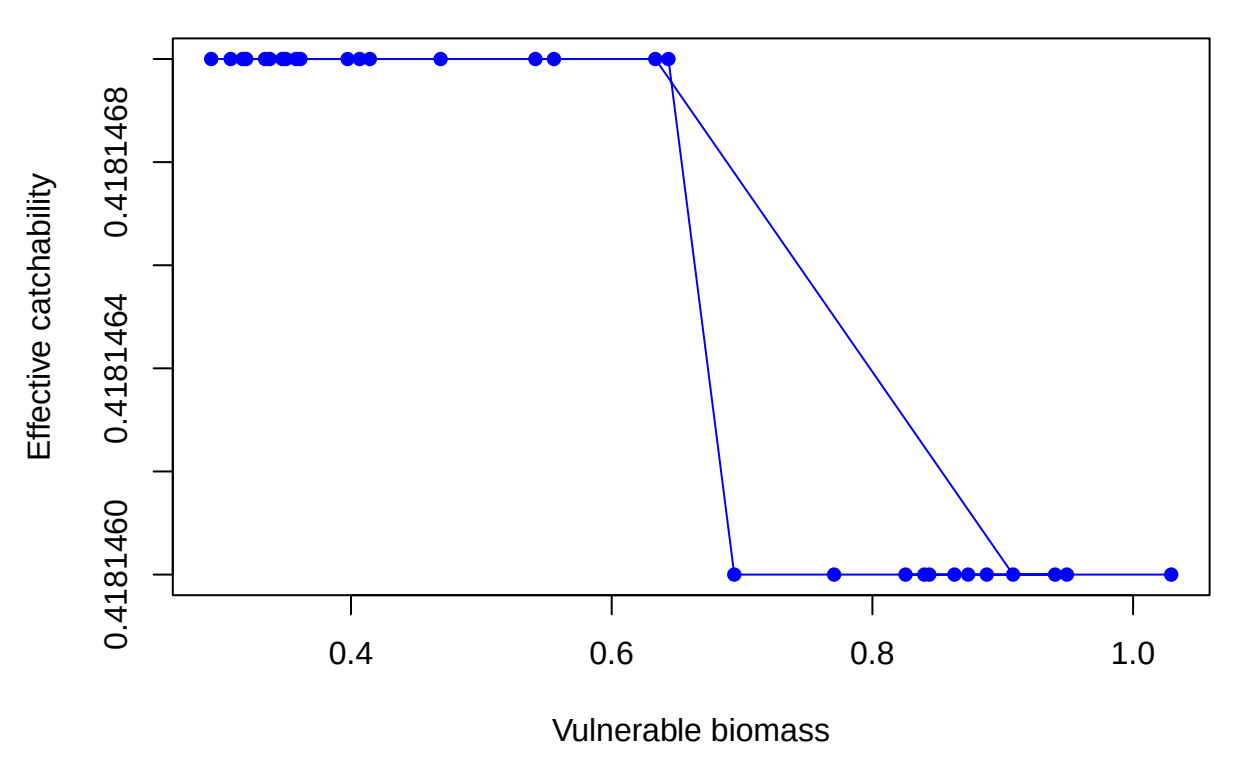

Index
0
20
40
60
80
100
140
1990
1995
2000
2005
2010
2015
2020
Year

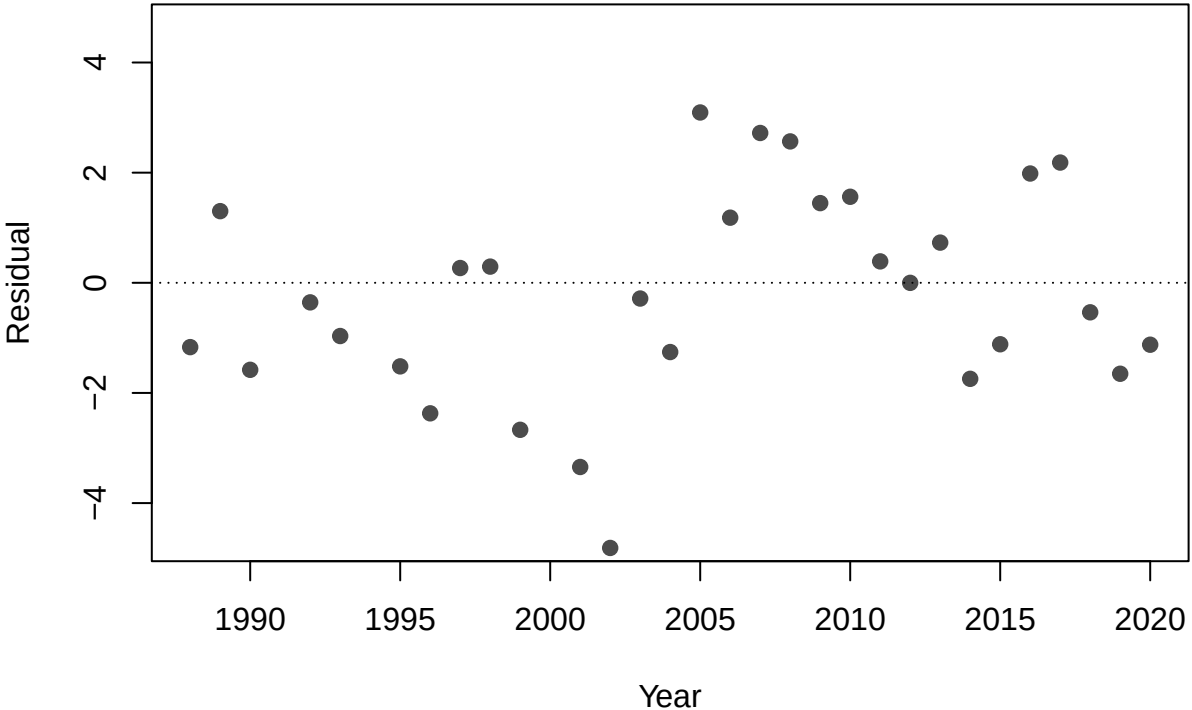

Expected index
0.0
0.1
0.2
0.3
0.4
0
1
2
3
4
Observed index

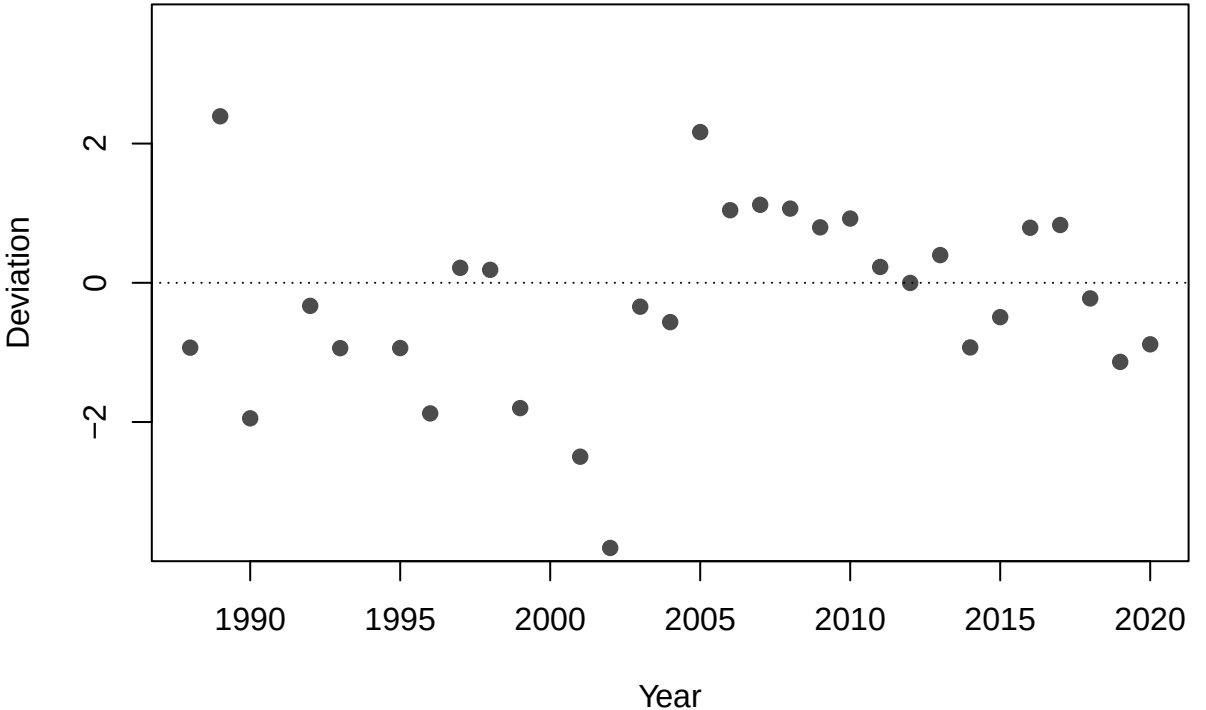

Log index
4
2
0
−2
−4
−6
1990
1995
2000
2005
2010
2015
2020
Year

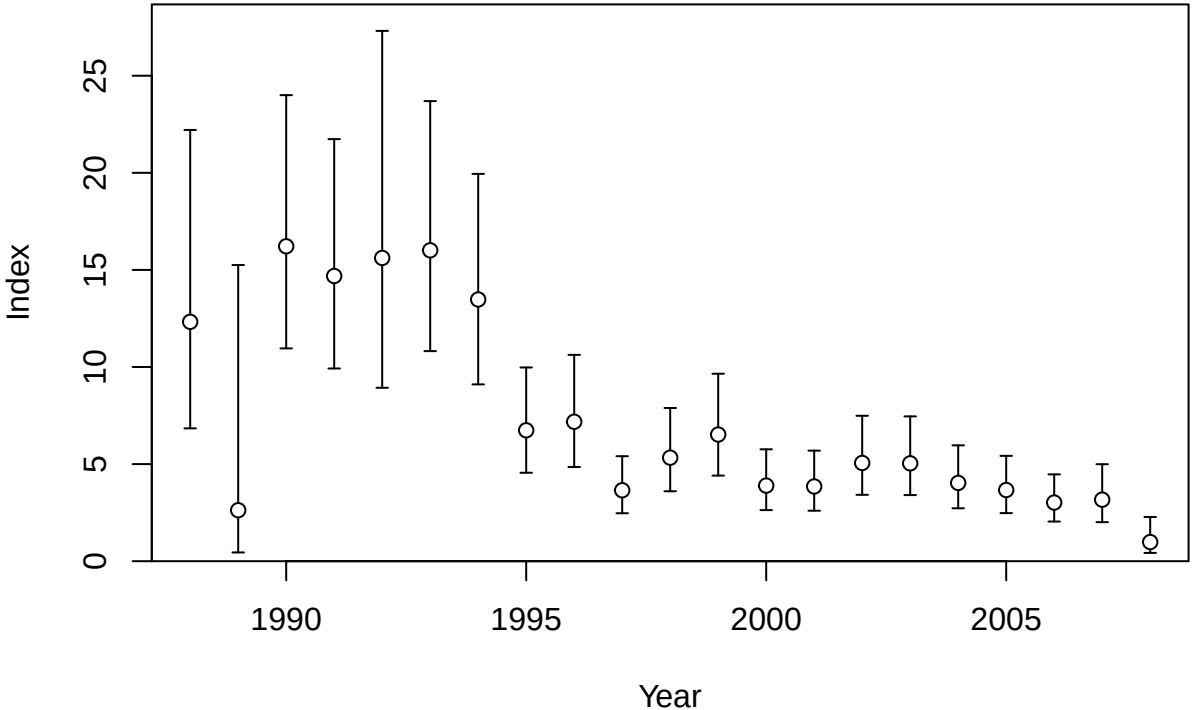

Log index
4
2
0
−2
−4
−6
1990
1995
2000
2005
2010
2015
2020
Year

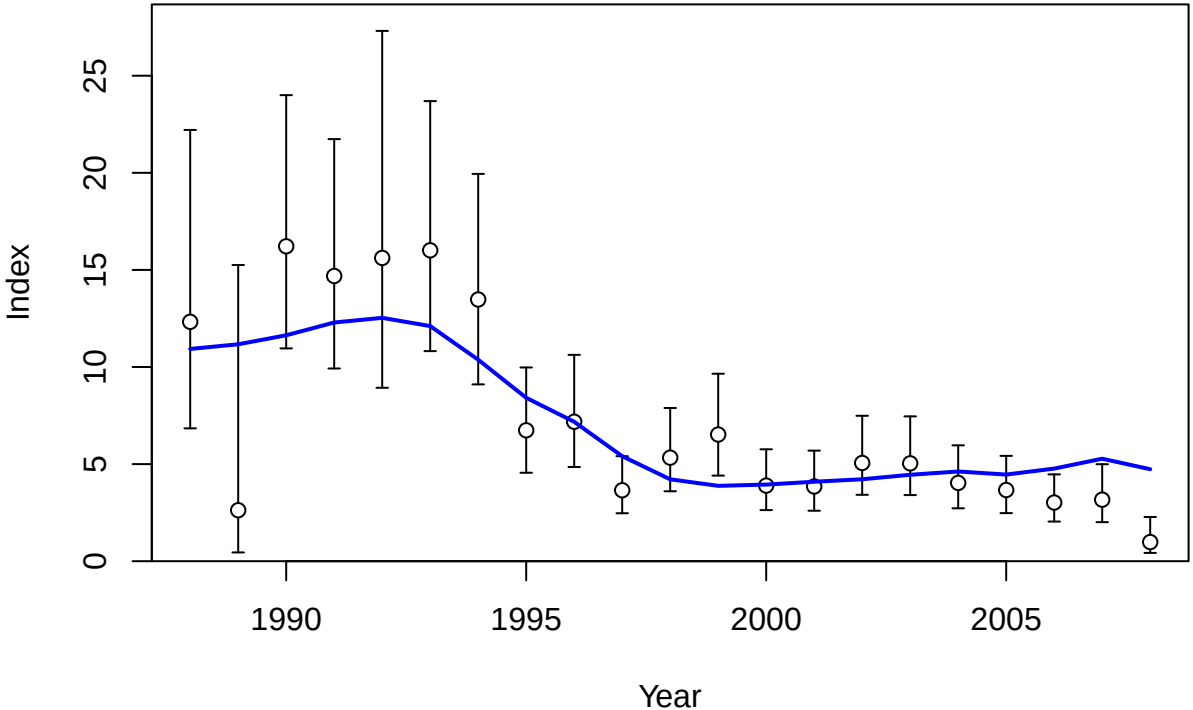

Log expected index
−0.8
−1.2
−1.6
−2.0
−6
−5
−4
−3
−2
−1
0
1
Log observed index

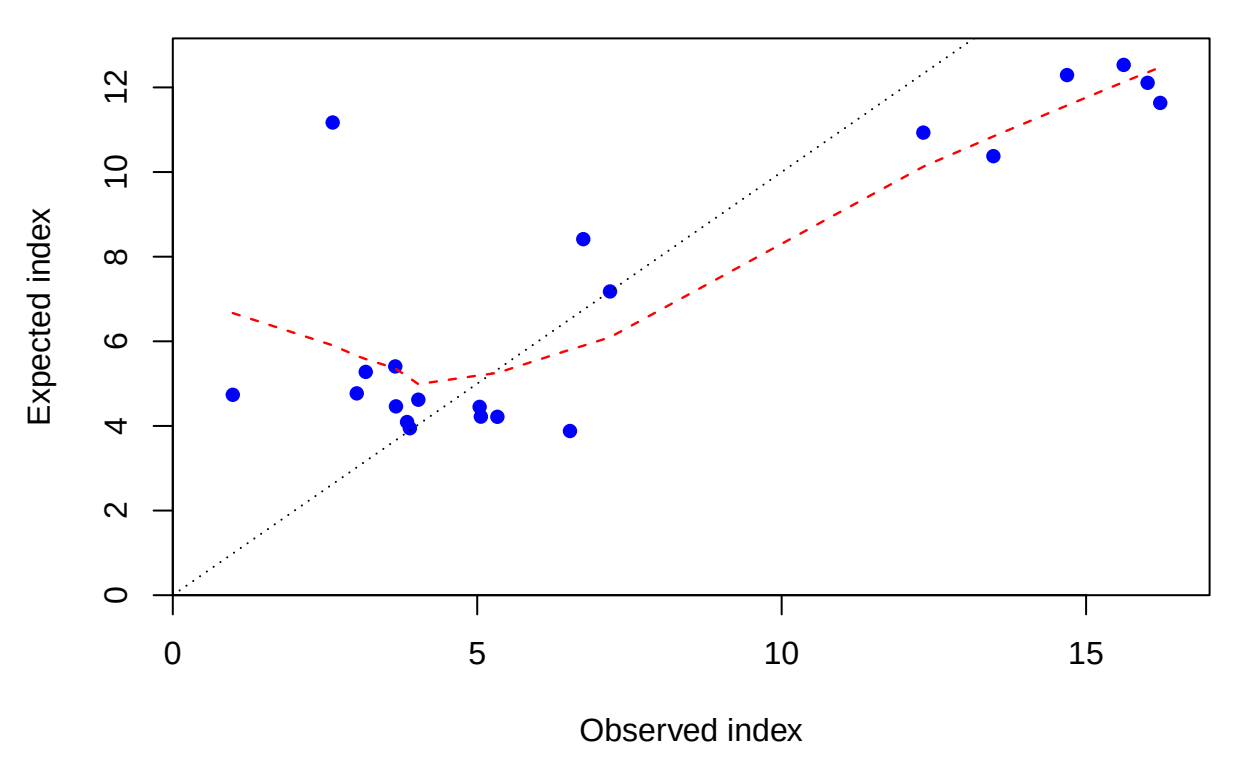

Effective catchability
0.4181460
0.4181464
0.4181468
0.4
0.6
0.8
1.0
Vulnerable biomass

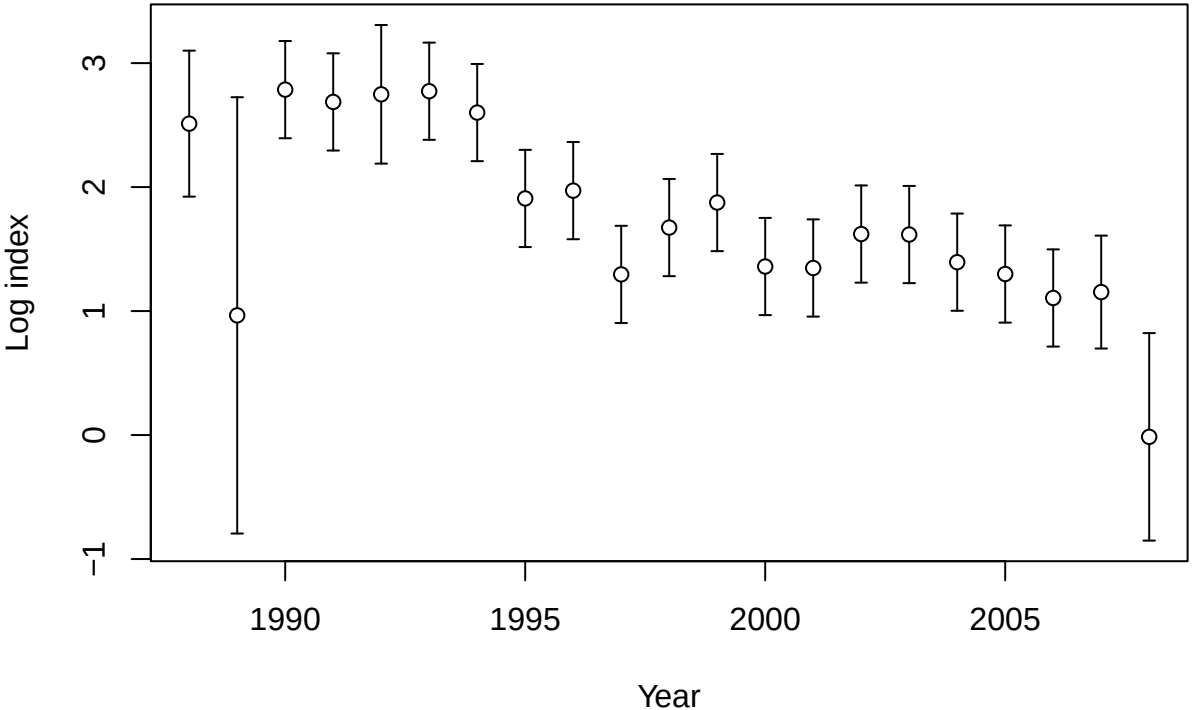

Residual
4
2
0
−2
−4
1990
1995
2000
2005
2010
2015
2020
Year

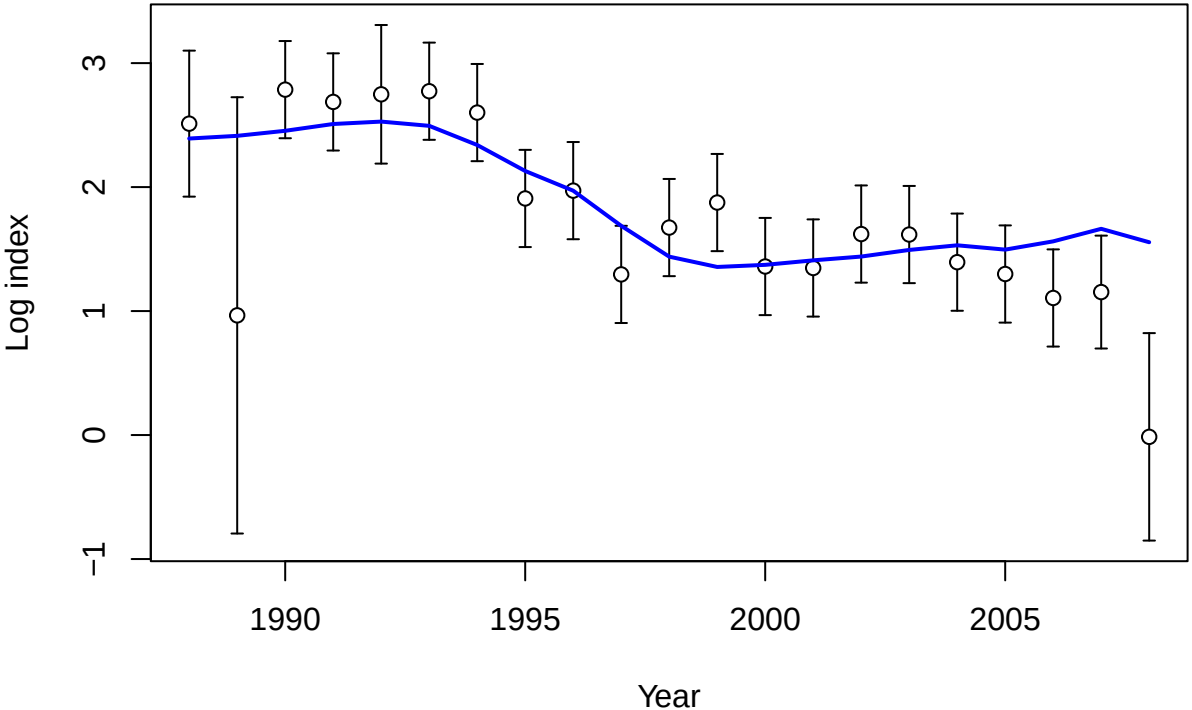

Deviation
2
0
−2
1990
1995
2000
2005
2010
2015
2020
Year

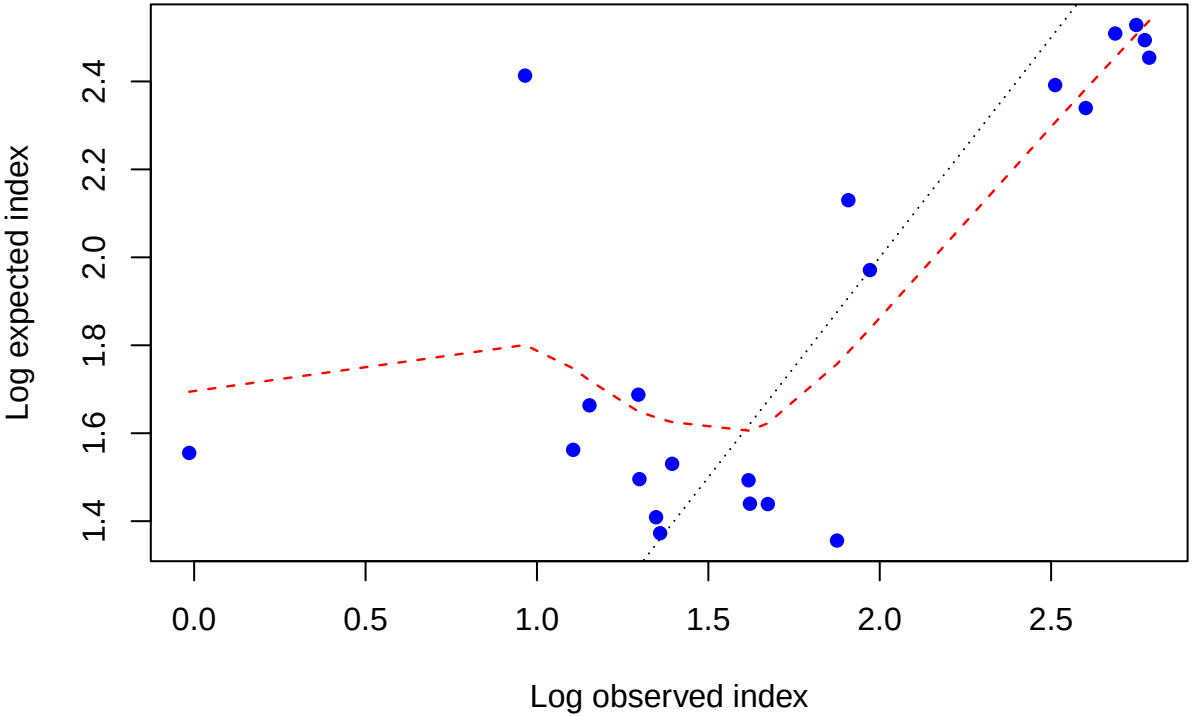

Index
0
5
10
15
20
25
1990
1995
2000
2005
Year

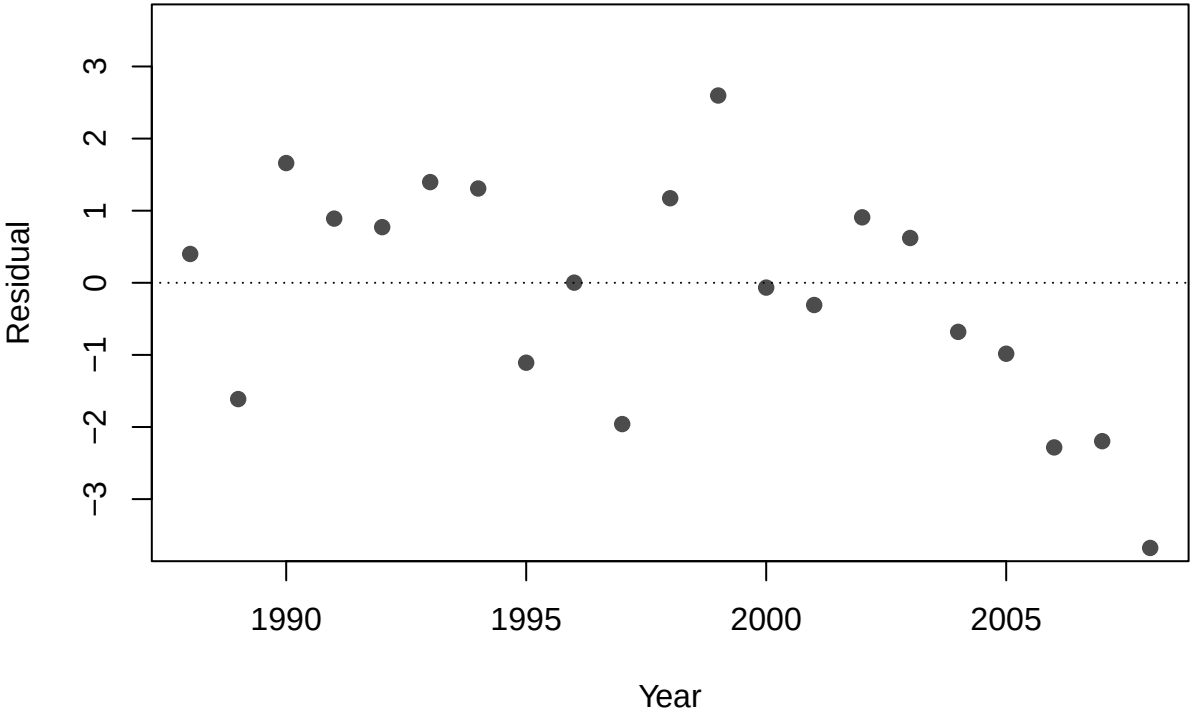

Index
0
5
10
15
20
25
1990
1995
2000
2005
Year

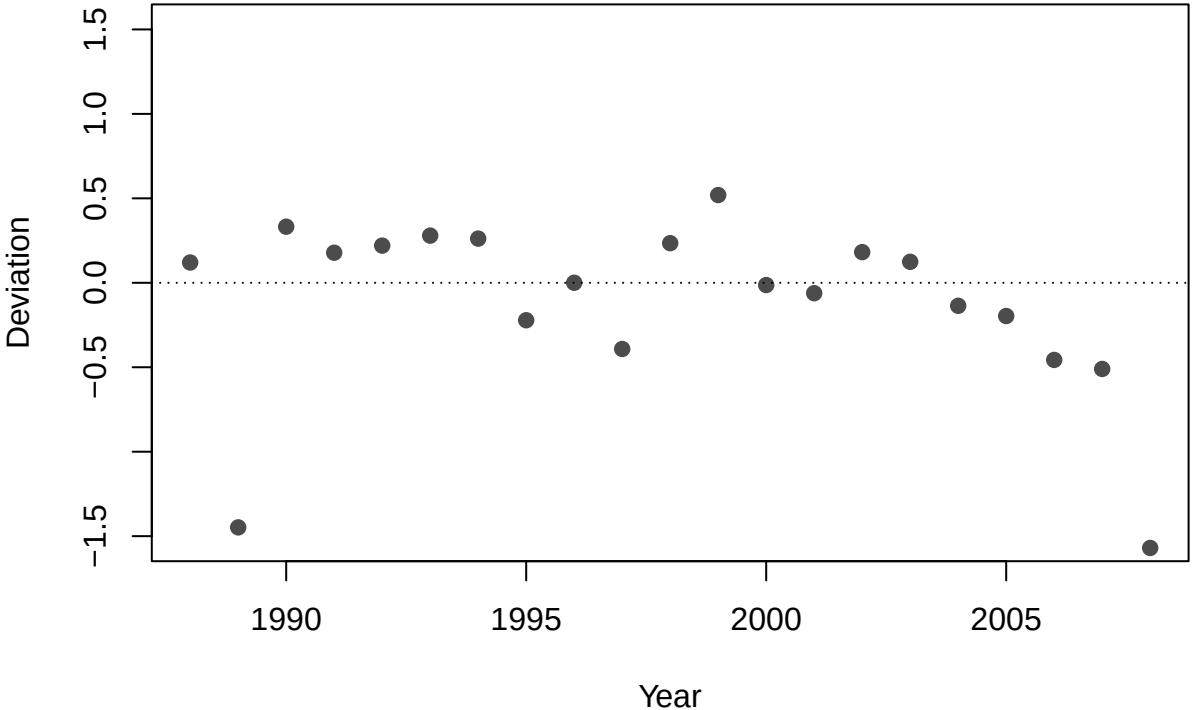

Expected index
0
2
4
6
8
10
12
0
5
10
15
Observed index

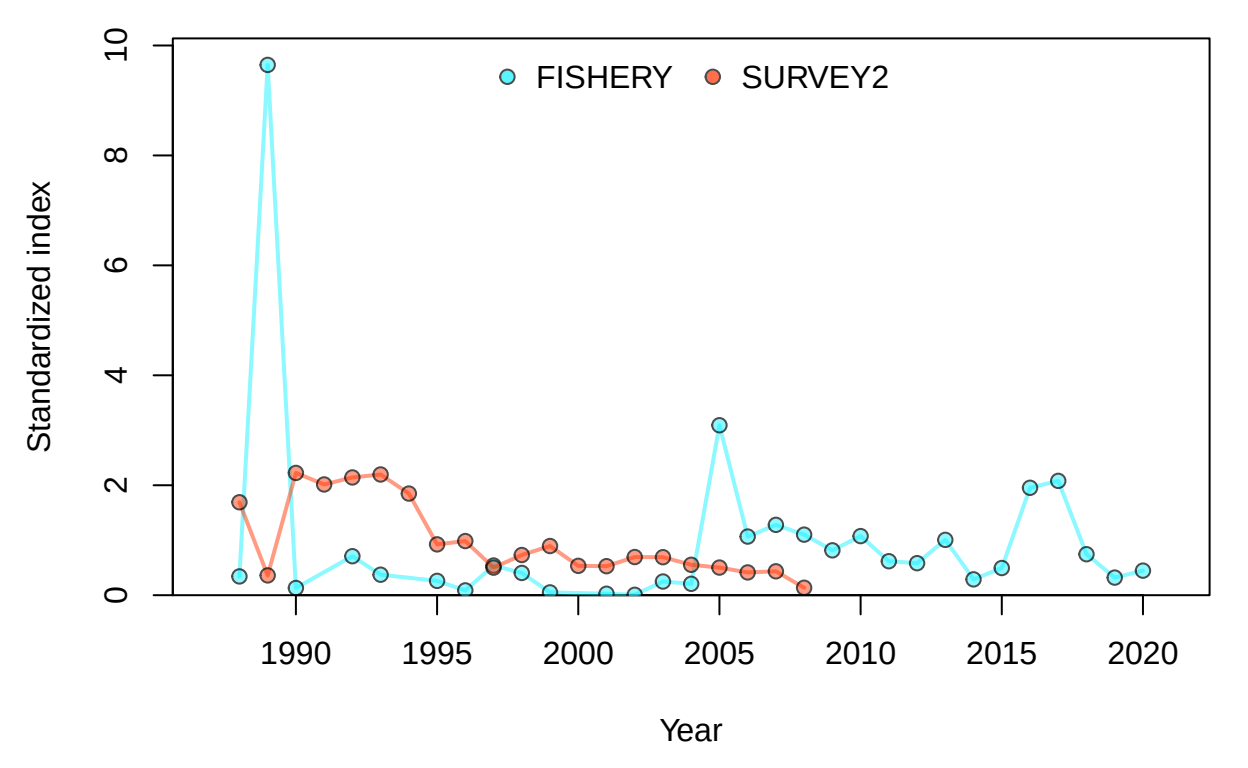

Log index
−1
0
1
2
3
1990
1995
2000
2005
Year

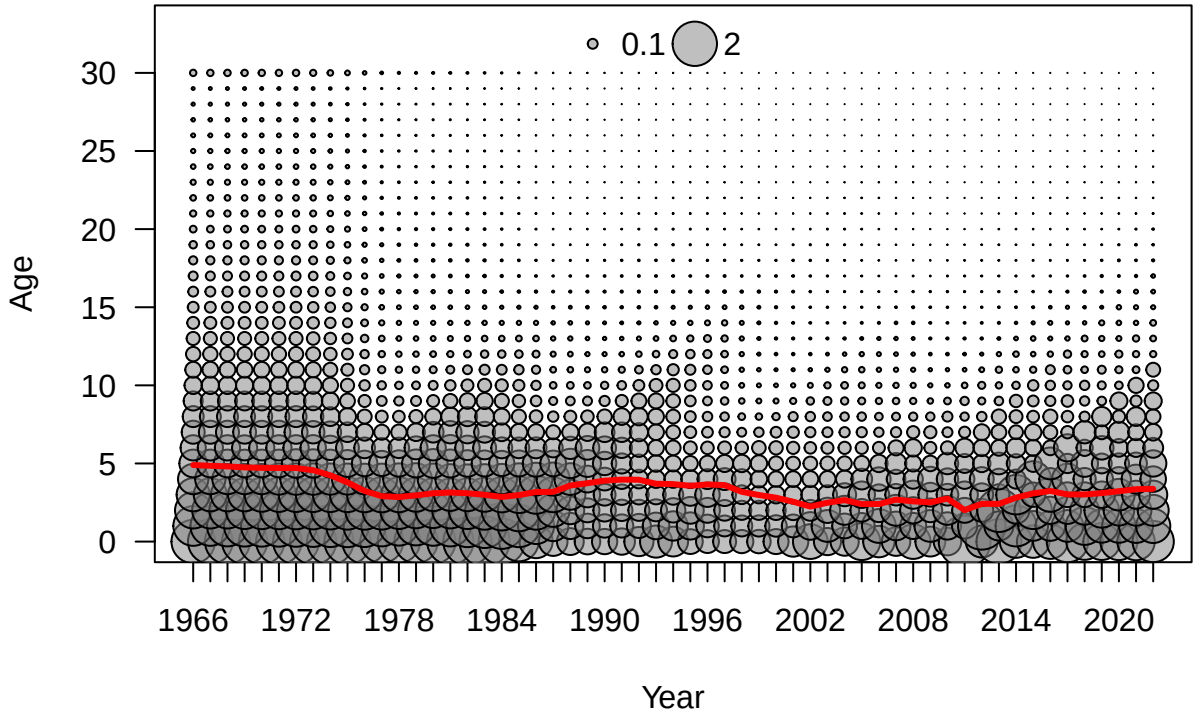

Log index
−1
0
1
2
3
1990
1995
2000
2005
Year

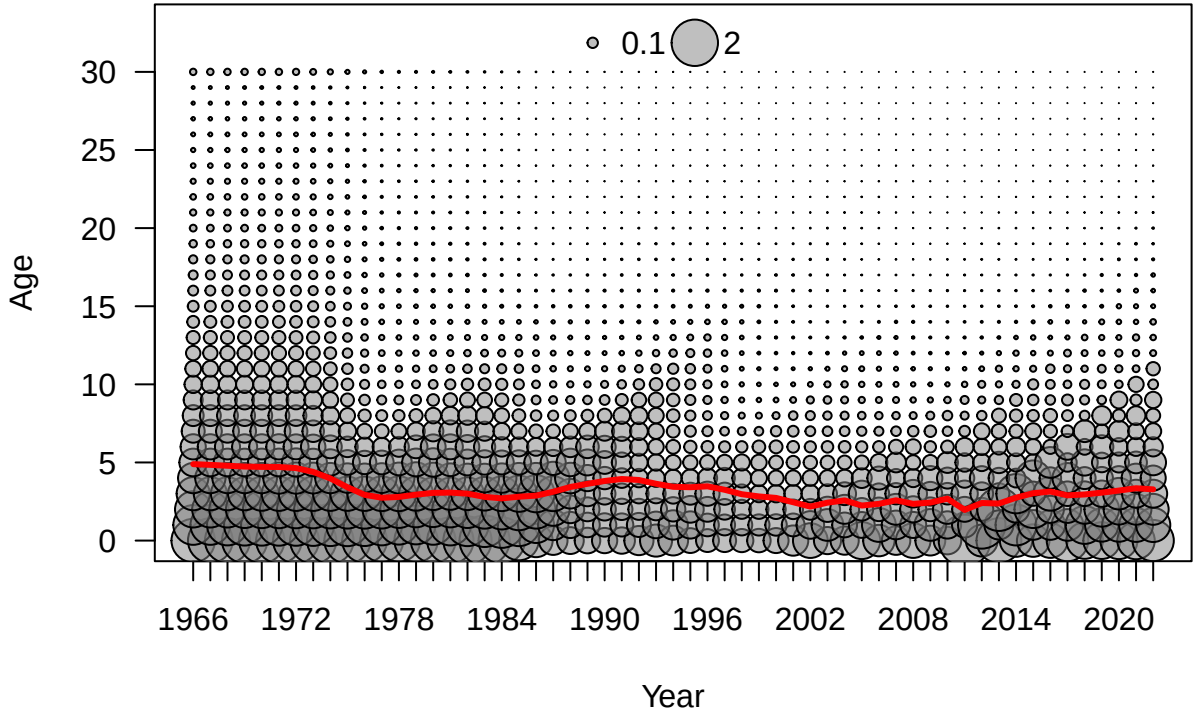

Log expected index
1.4
1.6
1.8
2.0
2.2
2.4
0.0
0.5
1.0
1.5
2.0
2.5
Log observed index

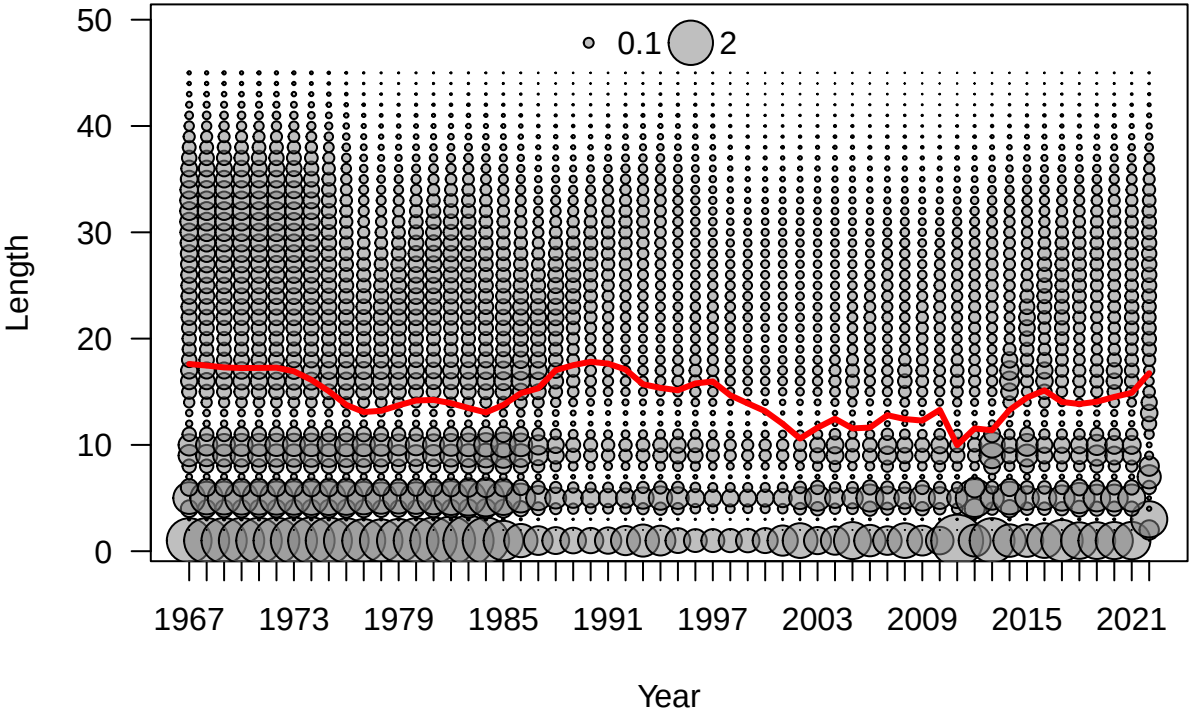

Residual
3
2
1
0
−1
−2
−3
1990
1995
2000
2005
Year

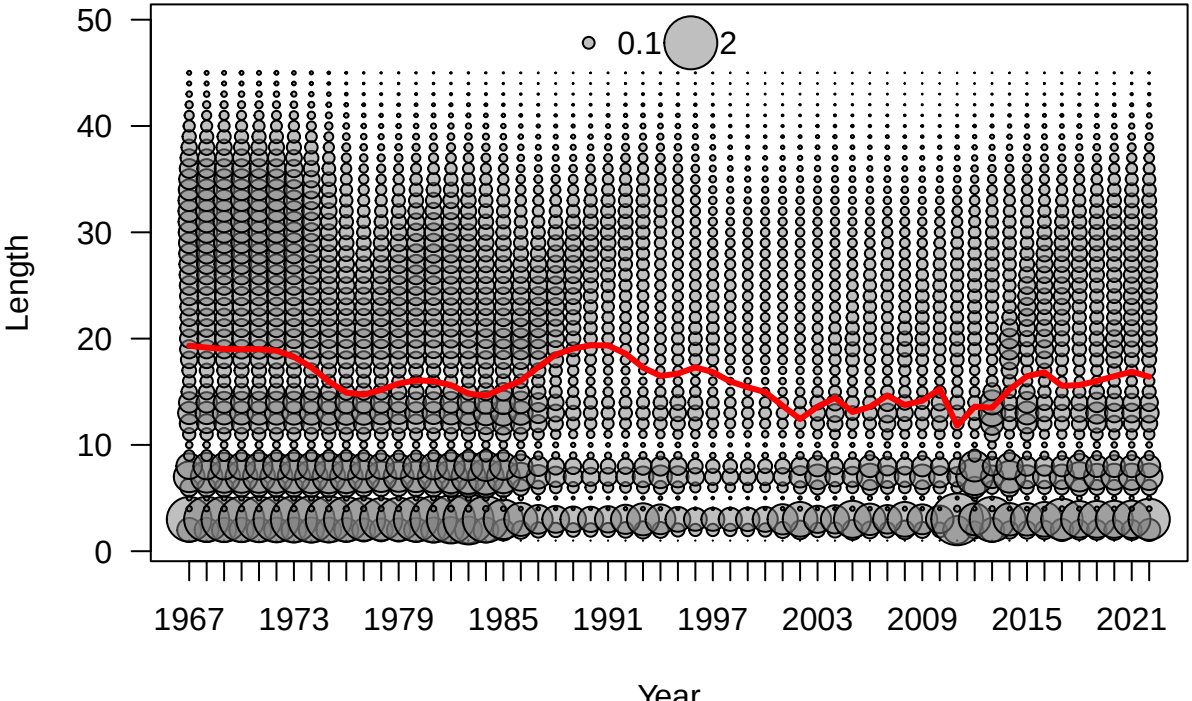

Deviation
1.5
1.0
0.5
0.0
−0.5
−1.5
1990
1995
2000
2005
Year

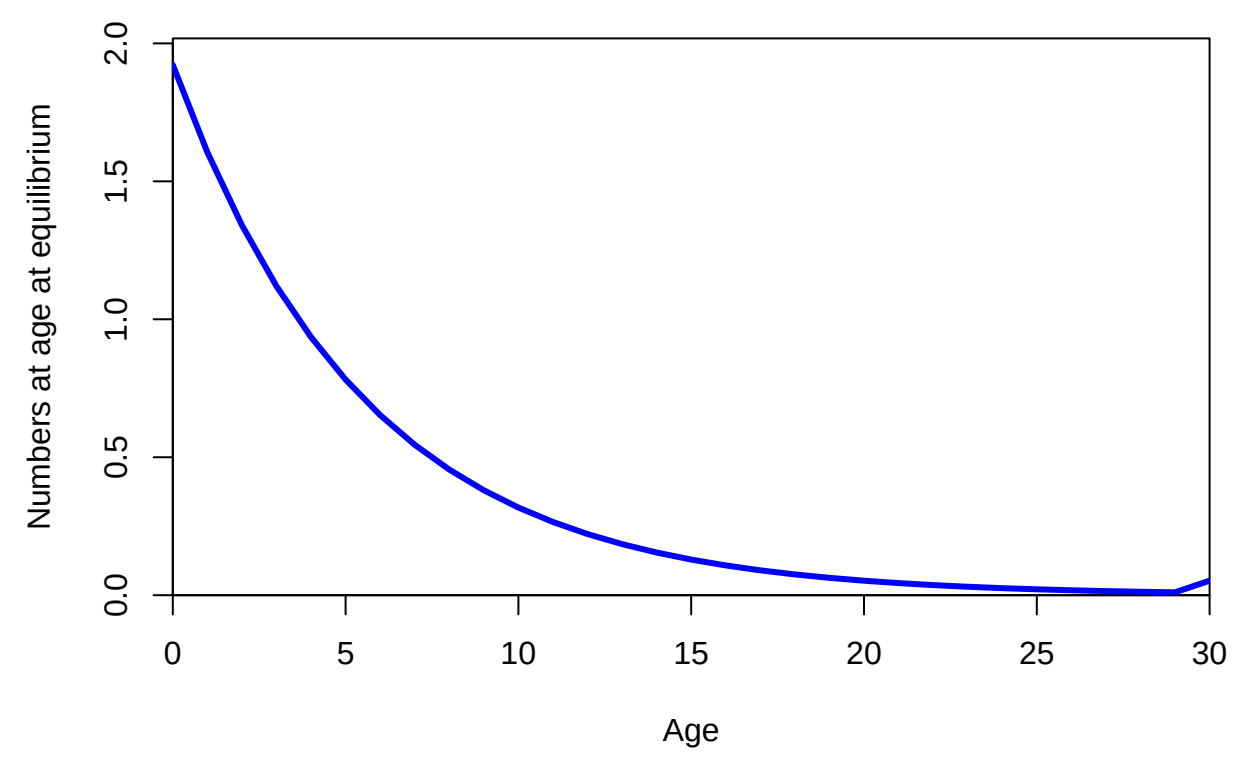

FISHERY
SURVEY2
Standardized index
Year
0
2
4
6
8
10
1990
1995
2000
2005
2010
2015
2020

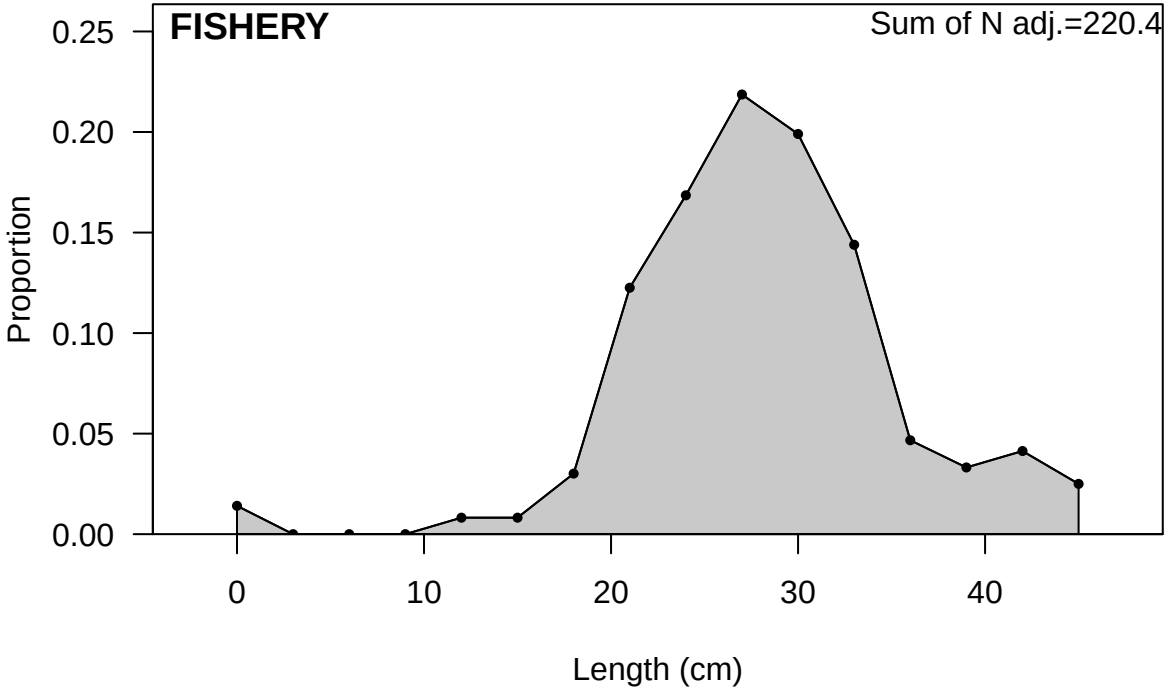

0.1
2
30
25
20
15
10
5
0
Age
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

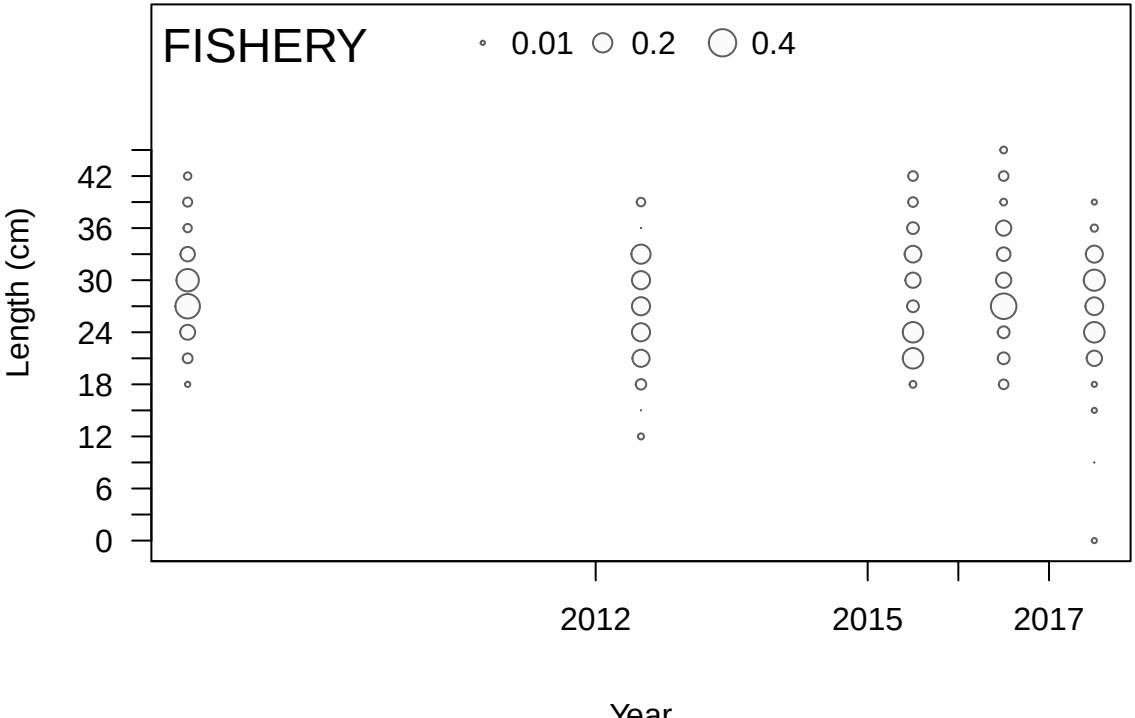

0.1
2
30
25
20
15
10
5
0
Age
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

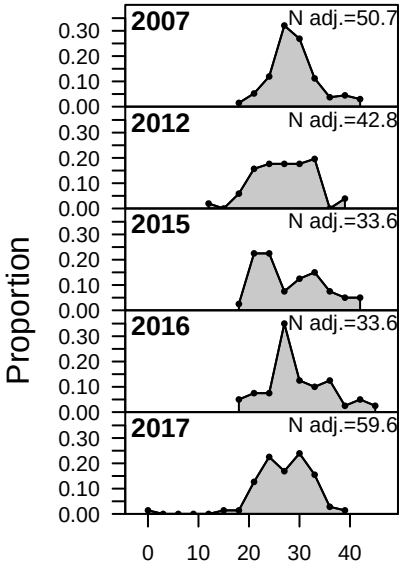

0.1
2
50
40
30
20
10
0
Length
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

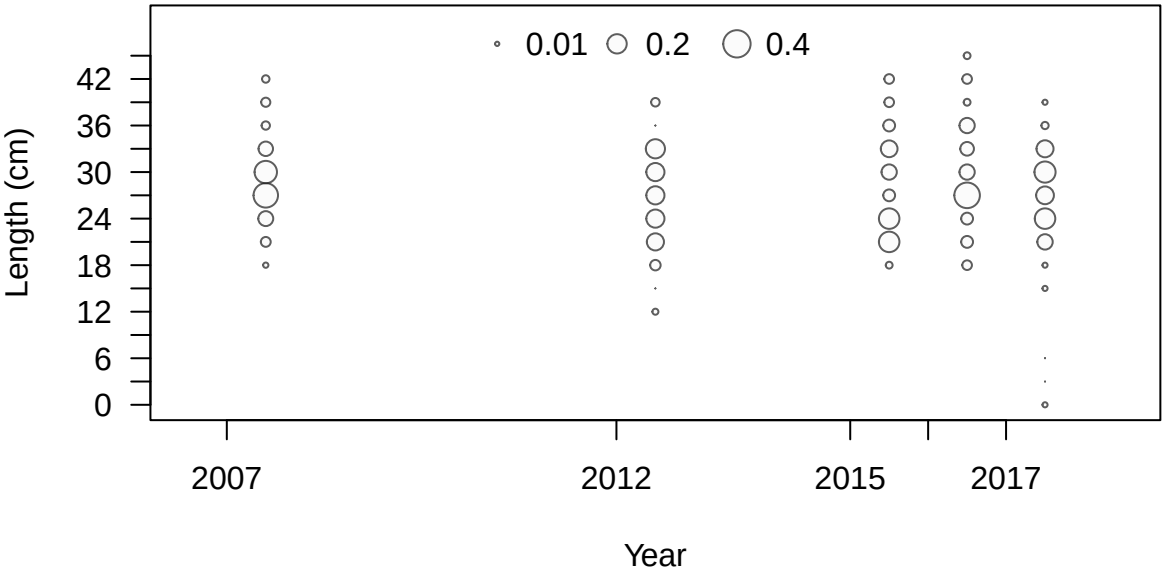

0.1
2
50
40
30
20
10
0
Length
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

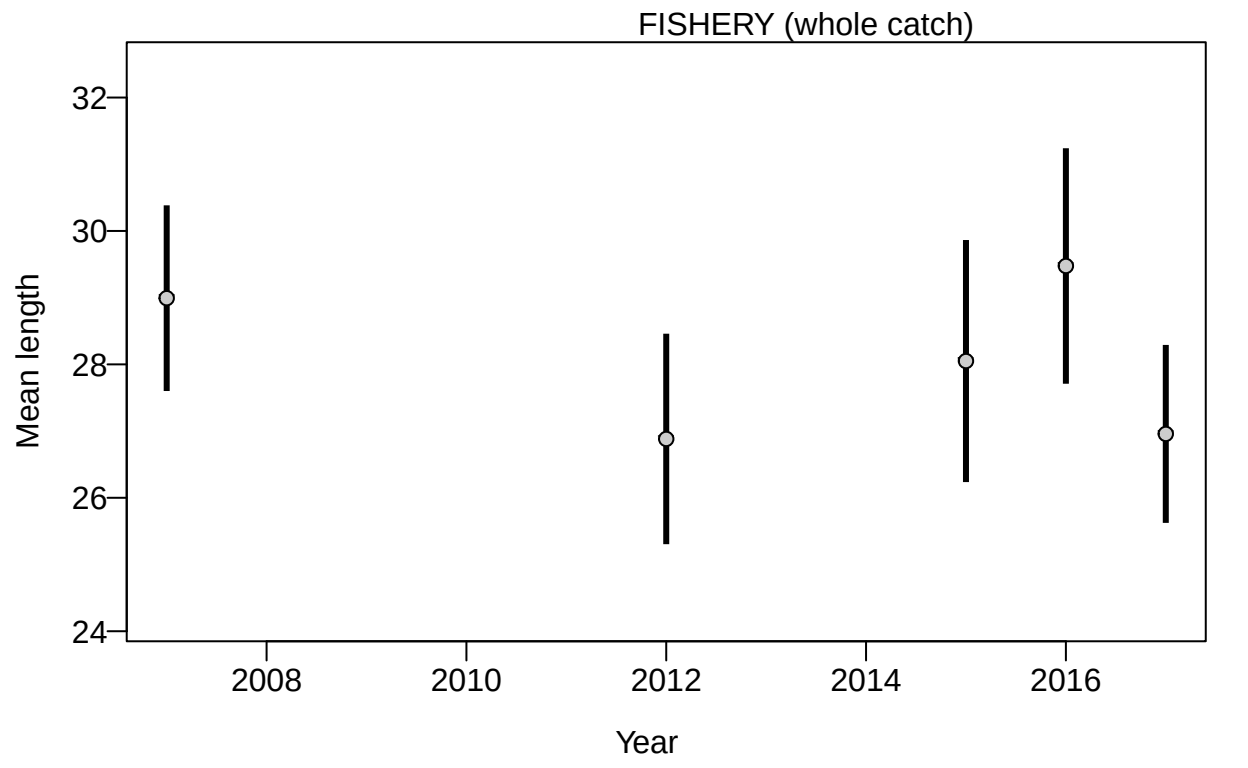

Numbers at age at equilibrium
0.0
0.5
1.0
1.5
2.0
0
5
10
15
20
25
30
Age

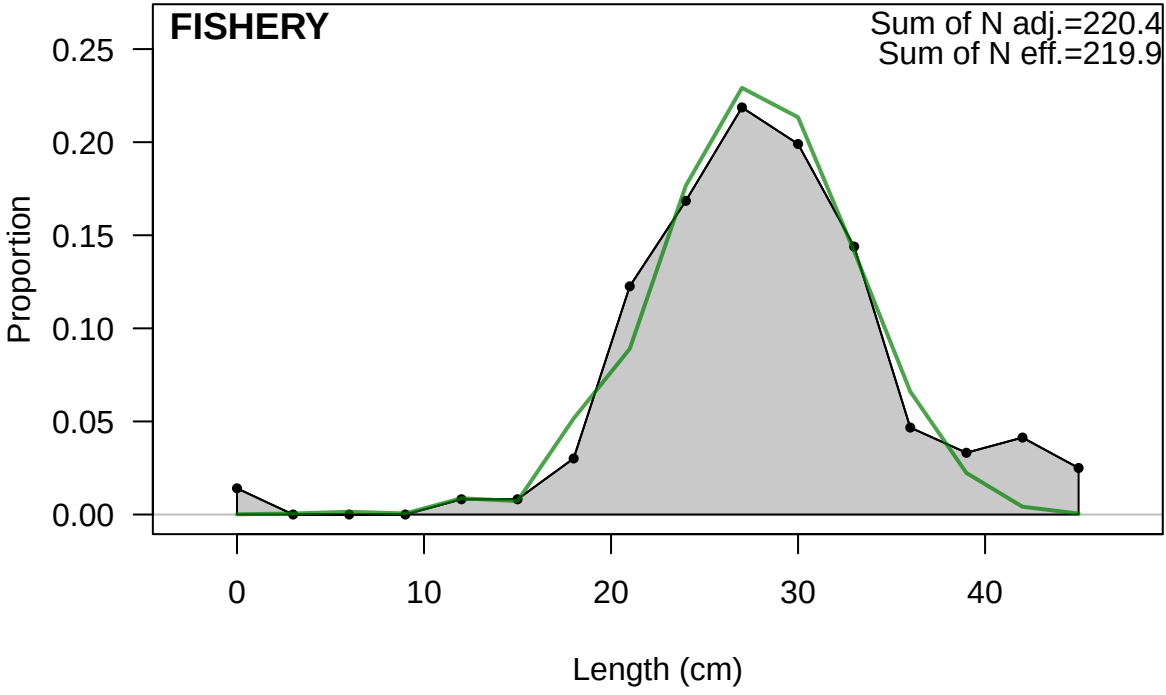

FISHERY
Sum of N adj.=220.4
Proportion
0.25
0.20
0.15
0.10
0.05
0.00
0
10
20
30
40
Length (cm)


FISHERY
0.01
0.2
0.4
Length (cm)
42
36
30
24
18
12
6
0
2012
2015
2017
Year

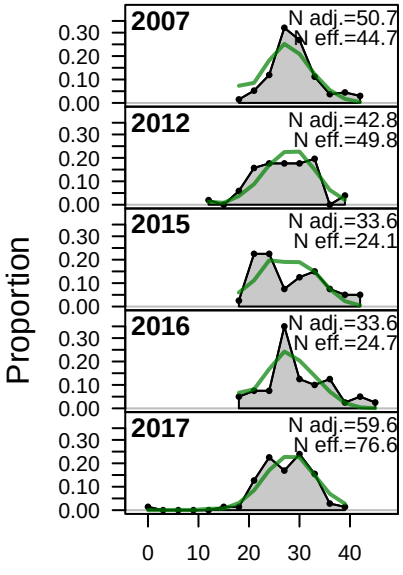

2007
N adj.=50.7
2012
N adj.=42.8
2015
N adj.=33.6
2016
N adj.=33.6
2017
N adj.=59.6
Proportion
0.00
0.10
0.20
0.30
0
10
20
30
40
Length (cm)

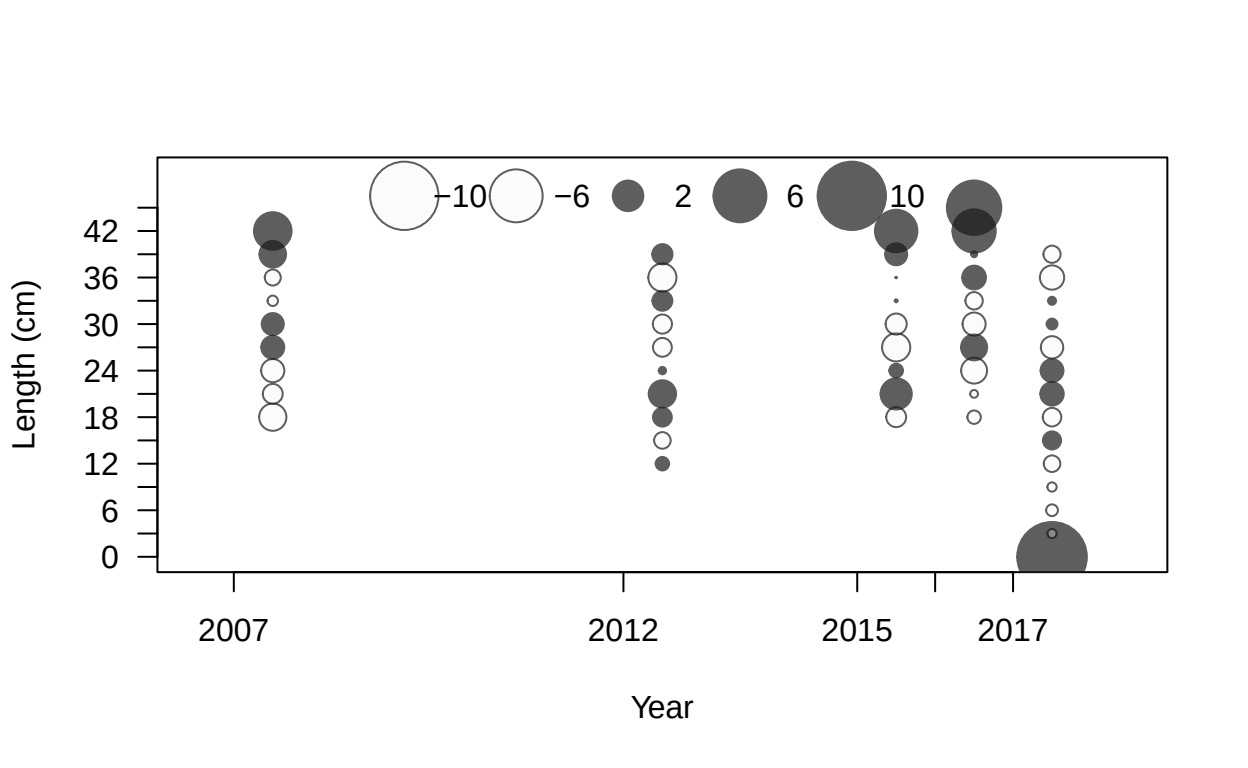

0.01
0.2
0.4
Length (cm)
0
6
12
18
24
30
36
42
2007
2012
2015
2017
Year

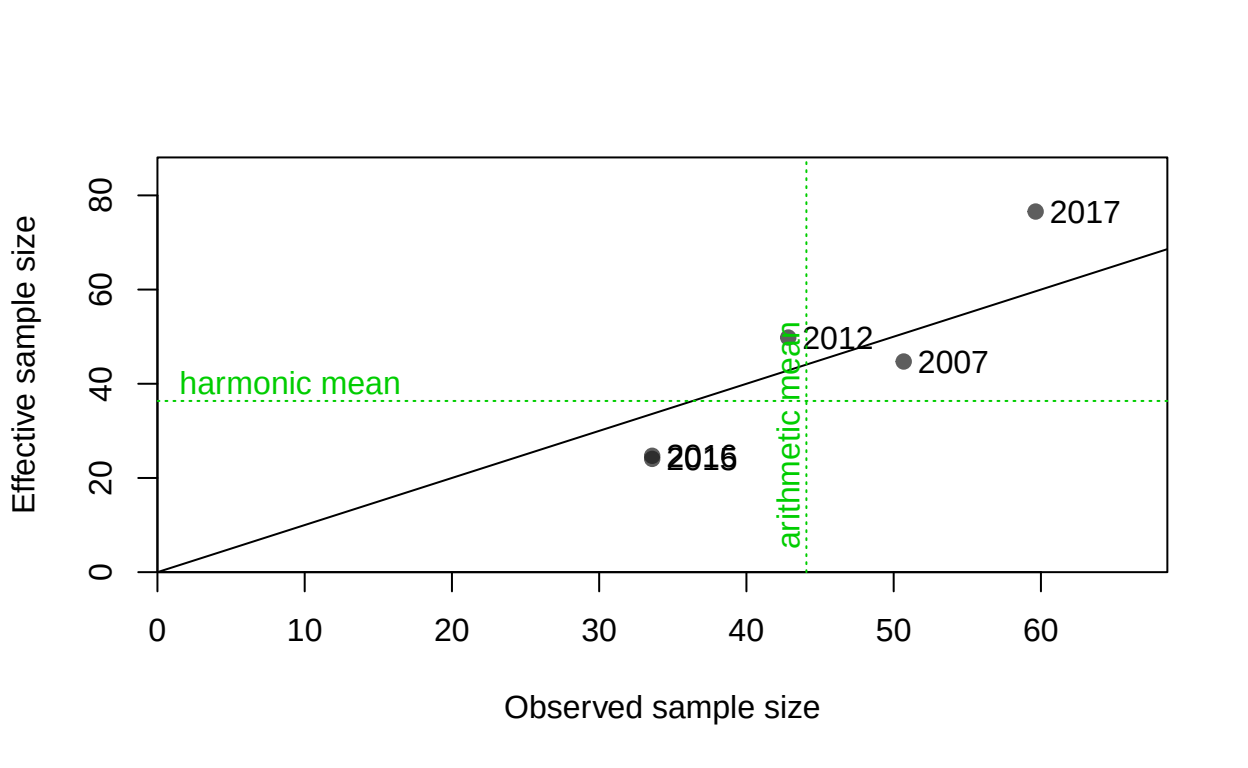

FISHERY (whole catch)
32
30
28
26
24
Mean length
2008
2010
2012
2014
2016
Year

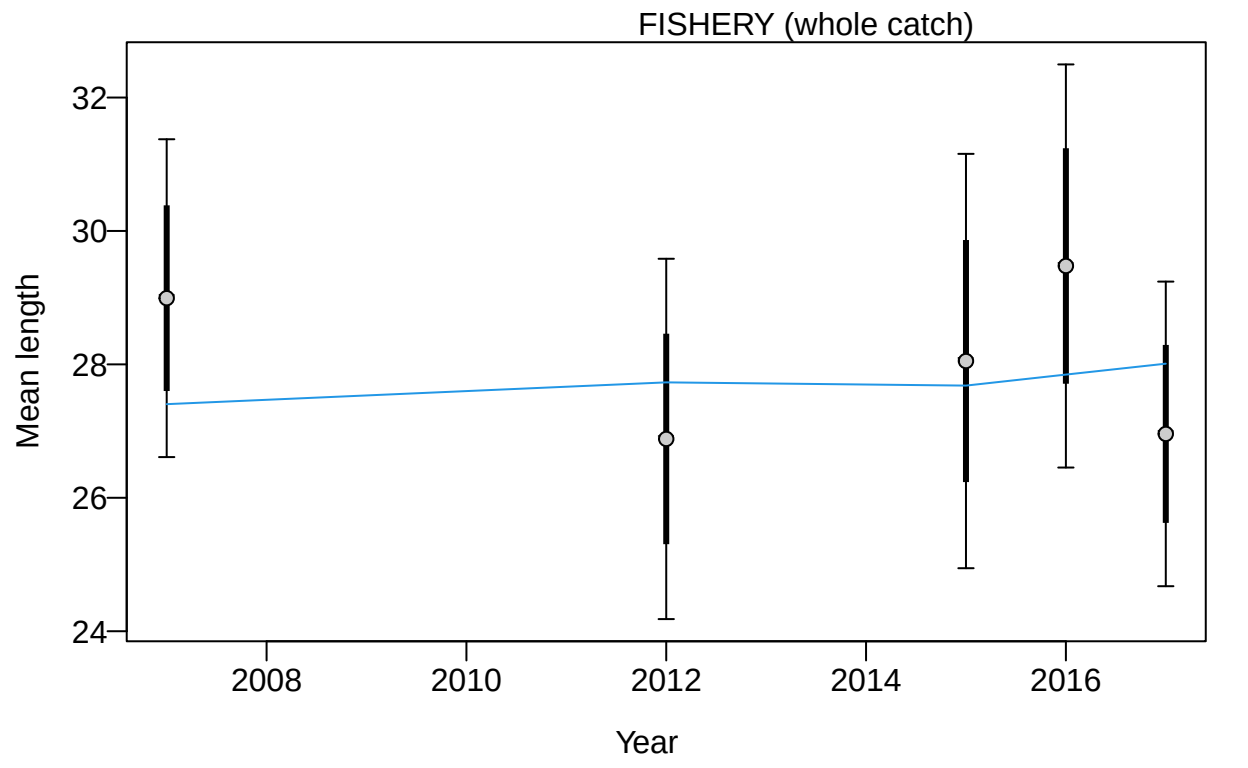

FISHERY
Sum of N adj.=220.4
Sum of N eff.=219.9
Proportion
0.25
0.20
0.15
0.10
0.05
0.00
0
10
20
30
40
Length (cm)

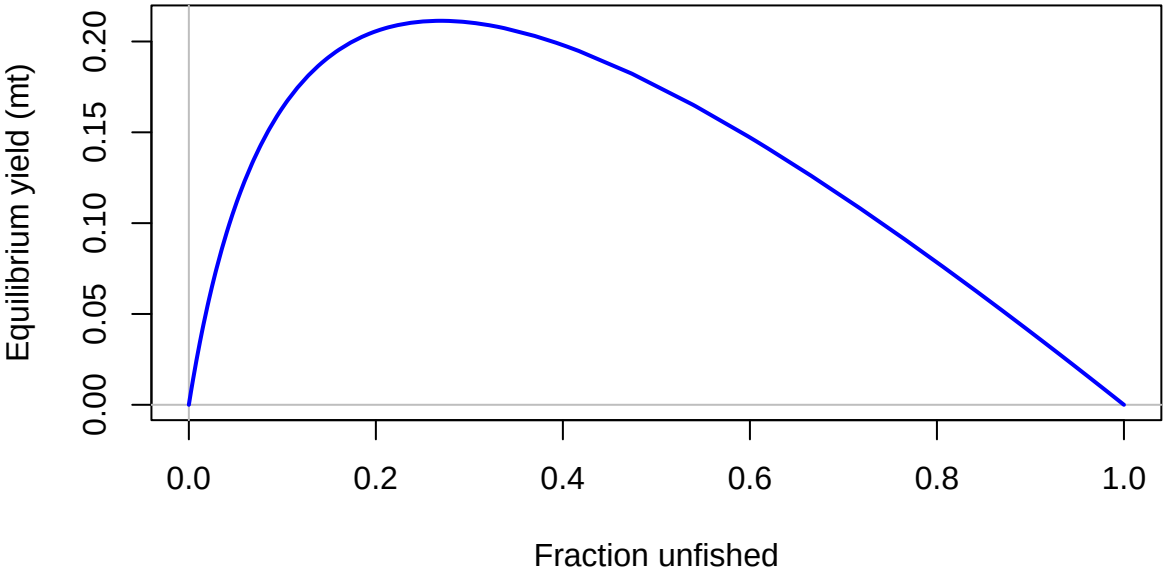

FISHERY
−10
−6
2
6
10
Length (cm)
0
6
12
18
24
30
36
42
2012
2015
2017
Year

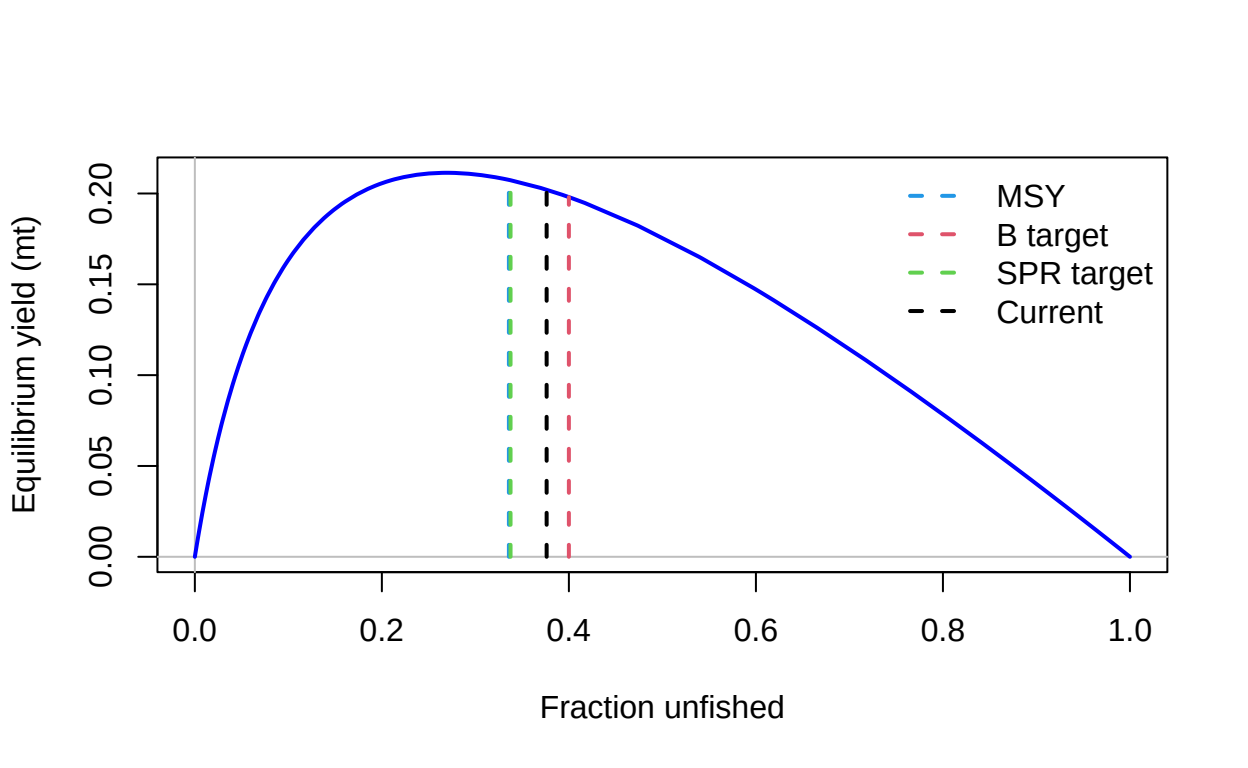

2007
N adj.=50.7
N eff.=44.7
2012
N adj.=42.8
N eff.=49.8
2015
N adj.=33.6
N eff.=24.1
2016
N adj.=33.6
N eff.=24.7
2017
N adj.=59.6
N eff.=76.6
Proportion
0.00
0.10
0.20
0.30
0
10
20
30
40
Length (cm)

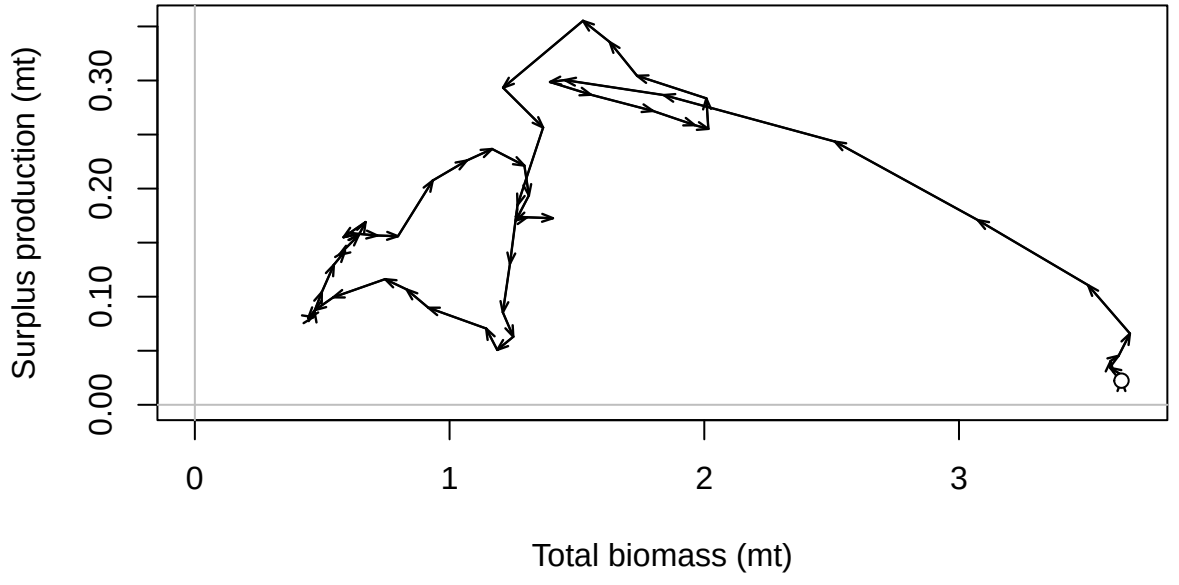

−10
−6
2
6
10
Length (cm)
0
6
12
18
24
30
36
42
2007
2012
2015
2017
Year

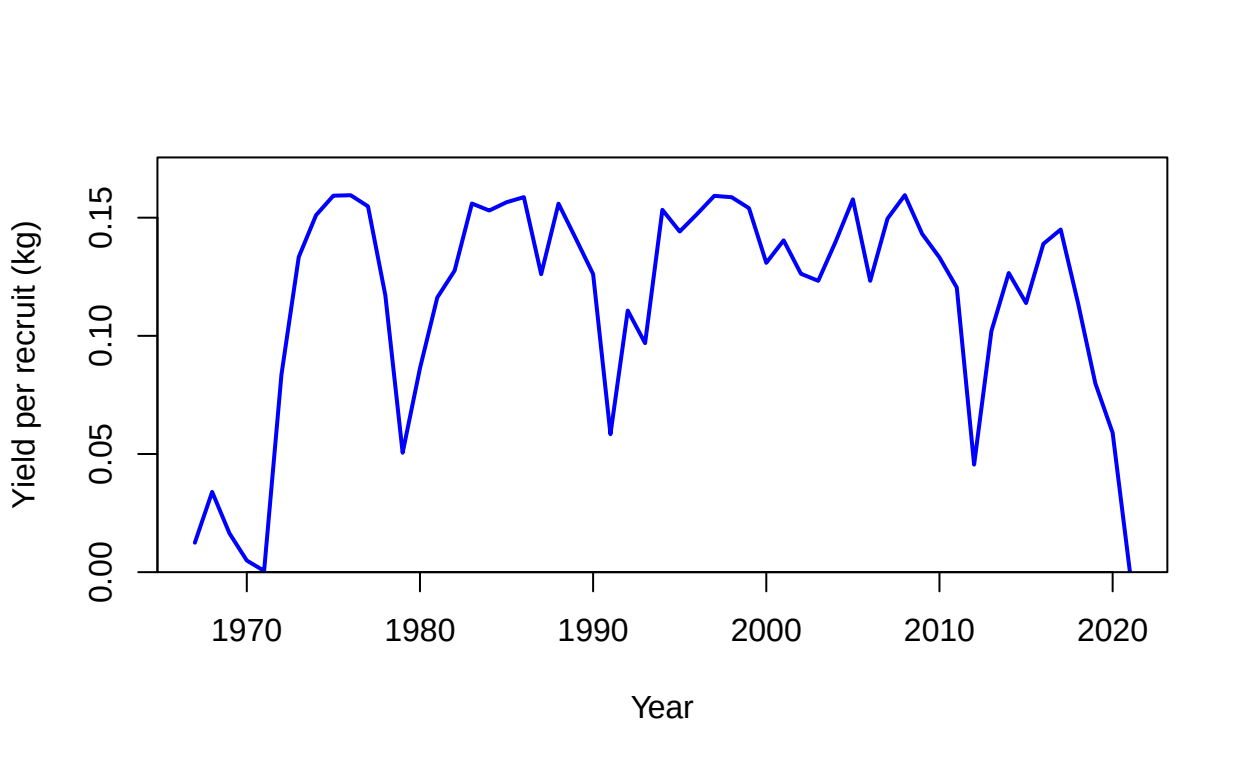

Effective sample size
0
20
40
60
80
0
10
20
30
40
50
60
Observed sample size
harmonic mean
arithmetic mean
2017
2012
2007
2016

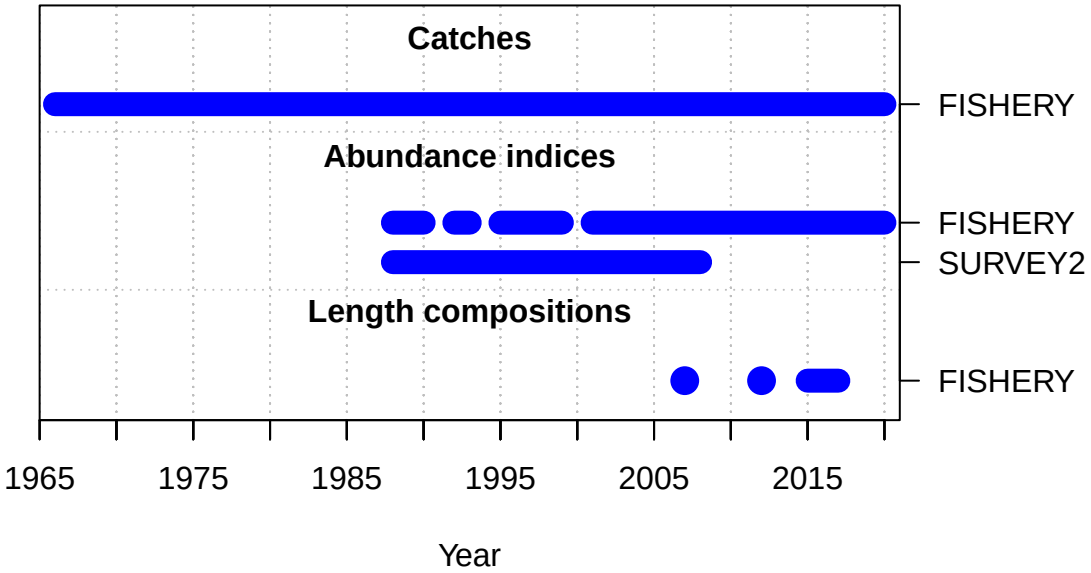

FISHERY (whole catch)
Mean length
32
30
28
26
24
2008
2010
2012
2014
2016
Year

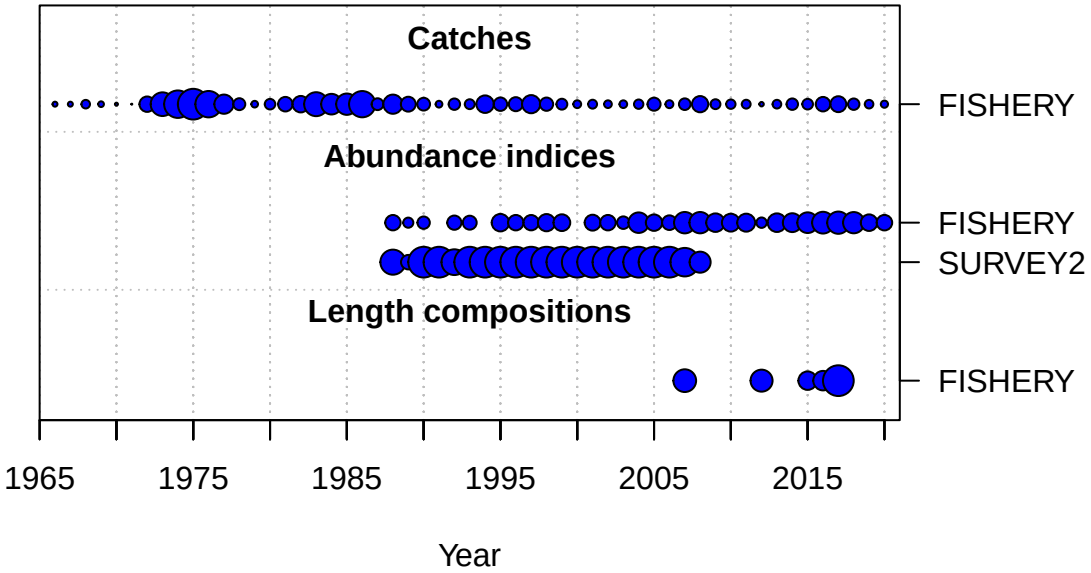

Equilibrium yield (mt)
0.00
0.05
0.10
0.15
0.20
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished

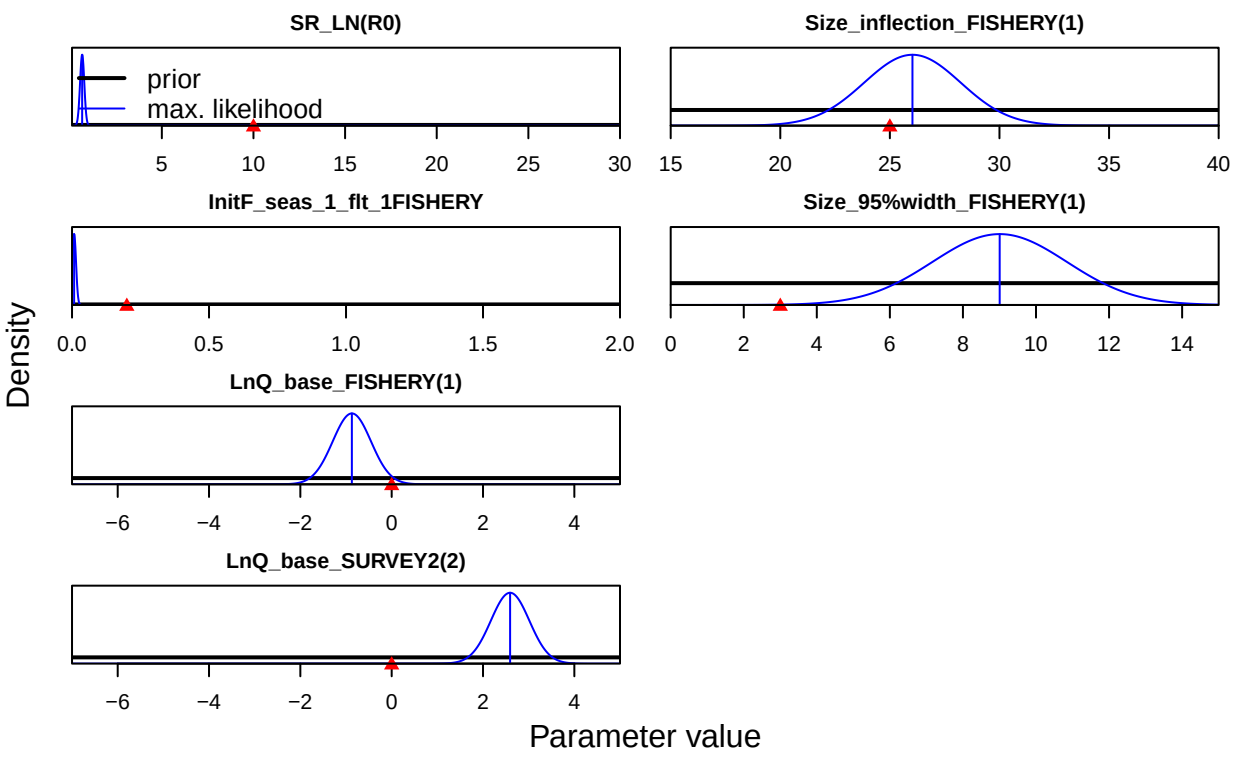

Equilibrium yield (mt)
0.00
0.05
0.10
0.15
0.20
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished
MSY
B target
SPR target
Current


Surplus production (mt)
0.00
0.10
0.20
0.30
0
1
2
3
Total biomass (mt)


Yield per recruit (kg)
0.00
0.05
0.10
0.15
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
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