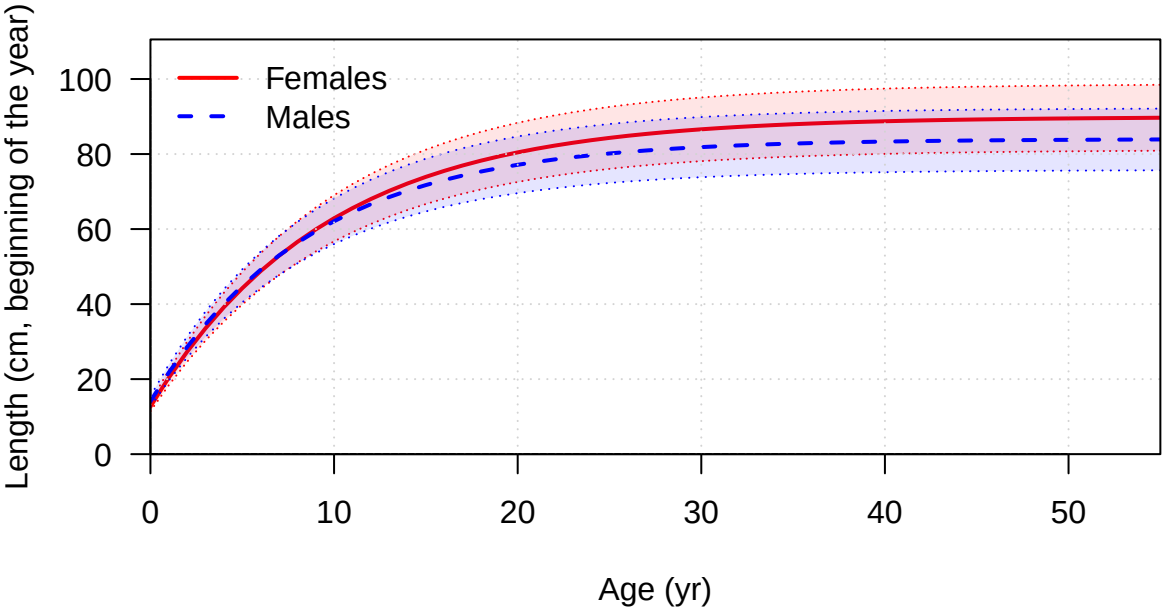
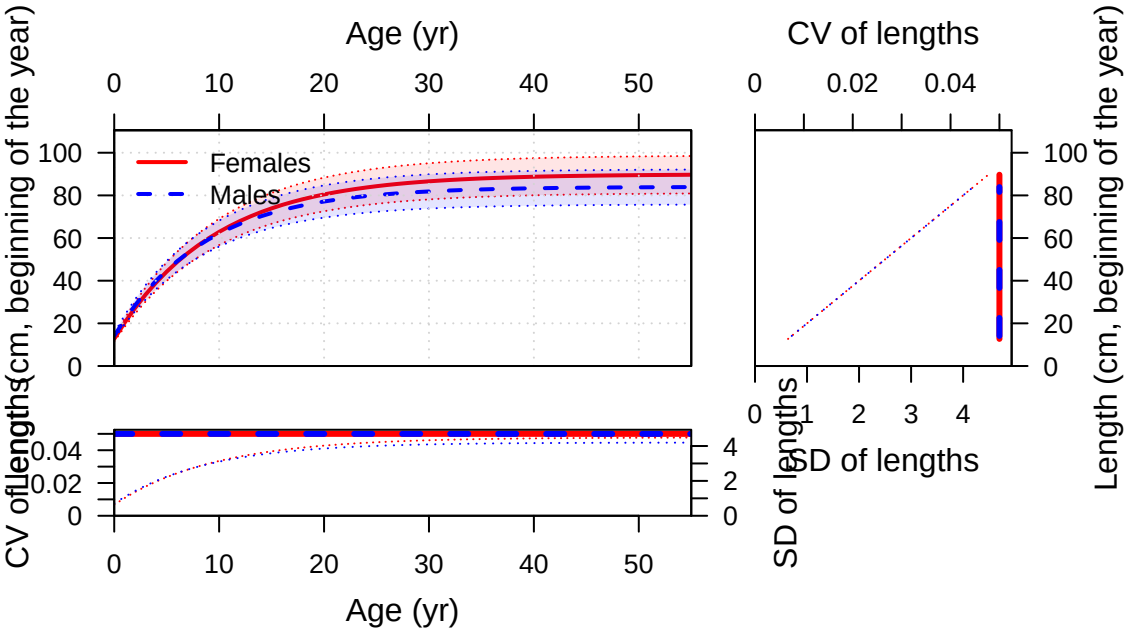
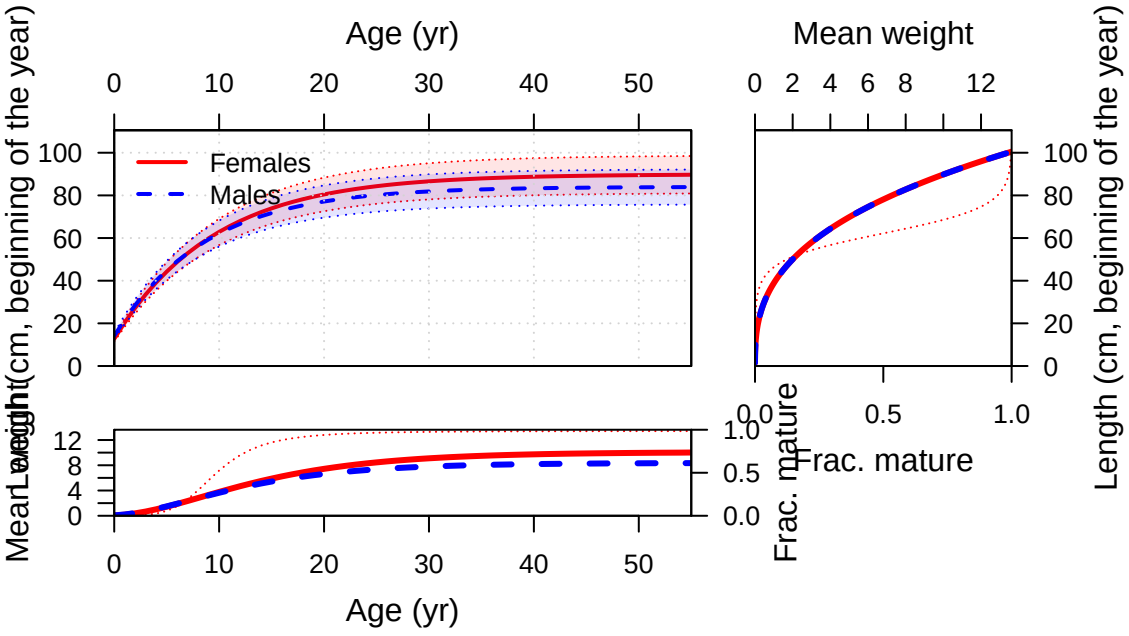
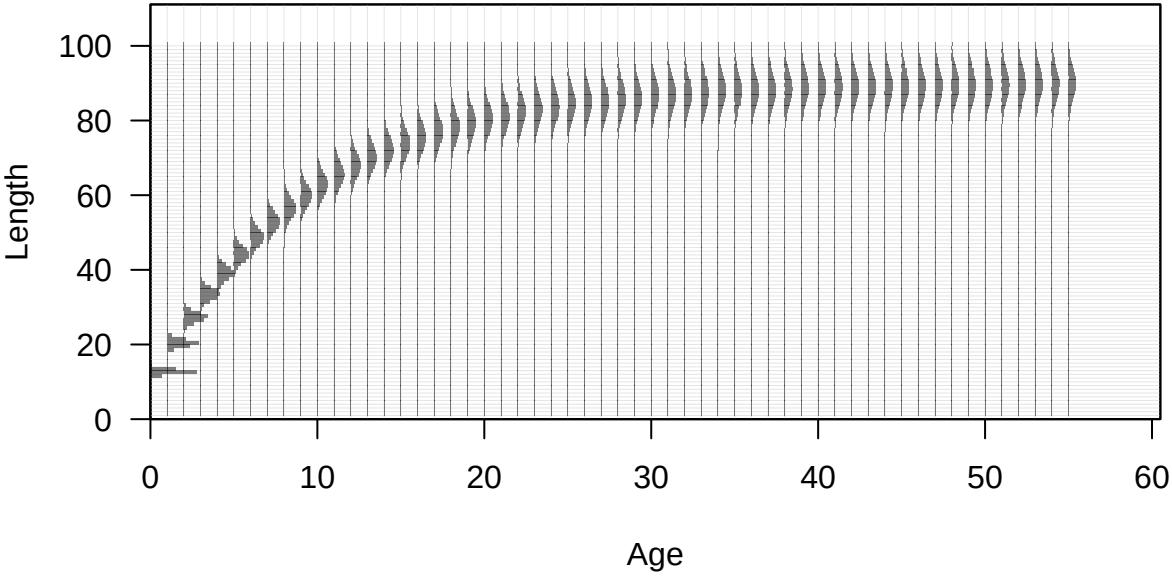
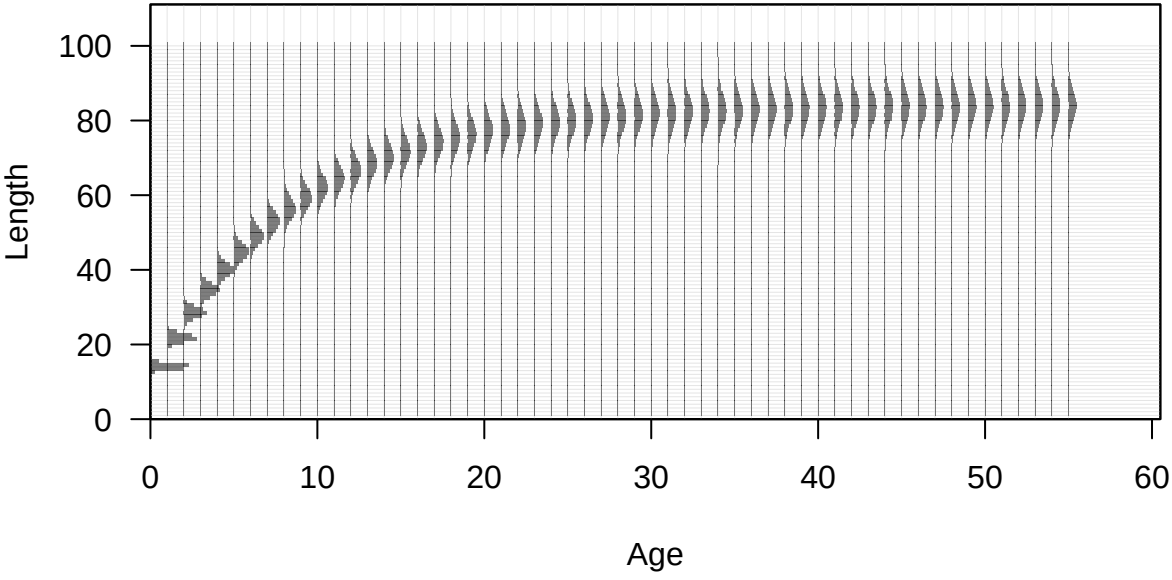
Plots created using the 'r4ss' package in R
Stock Synthesis version: 3.30.19.0
StartTime: Sat Jul 30 10:26:09 2022
Data_File: data.ss
Control_File: control.ss

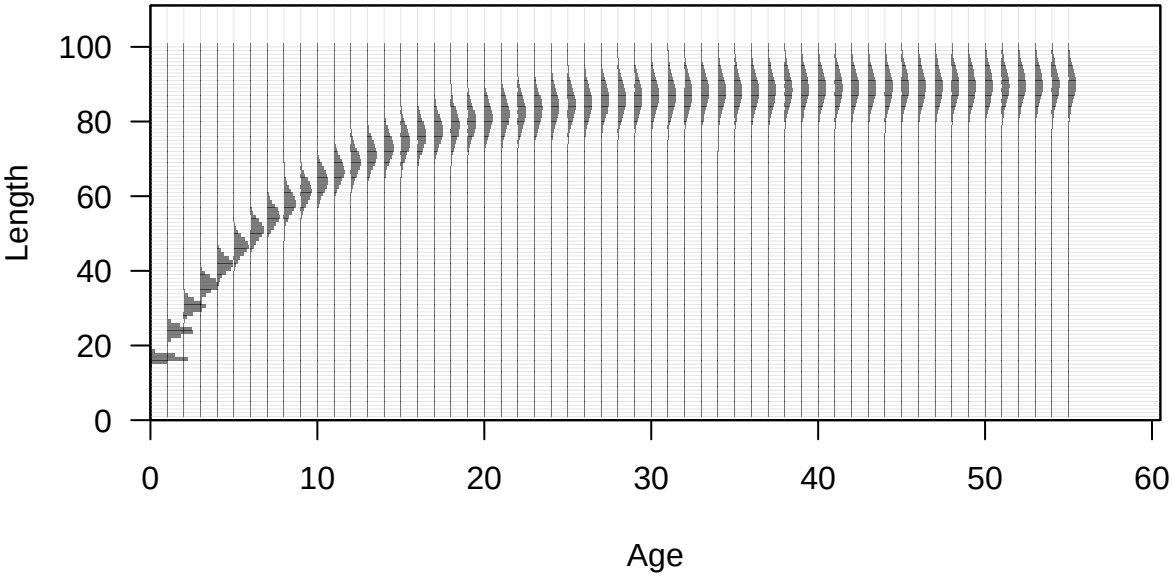

Females
Males
Length (cm, beginning of the year)
0
20
40
60
80
100
0
10
20
30
40
50
Age (yr)

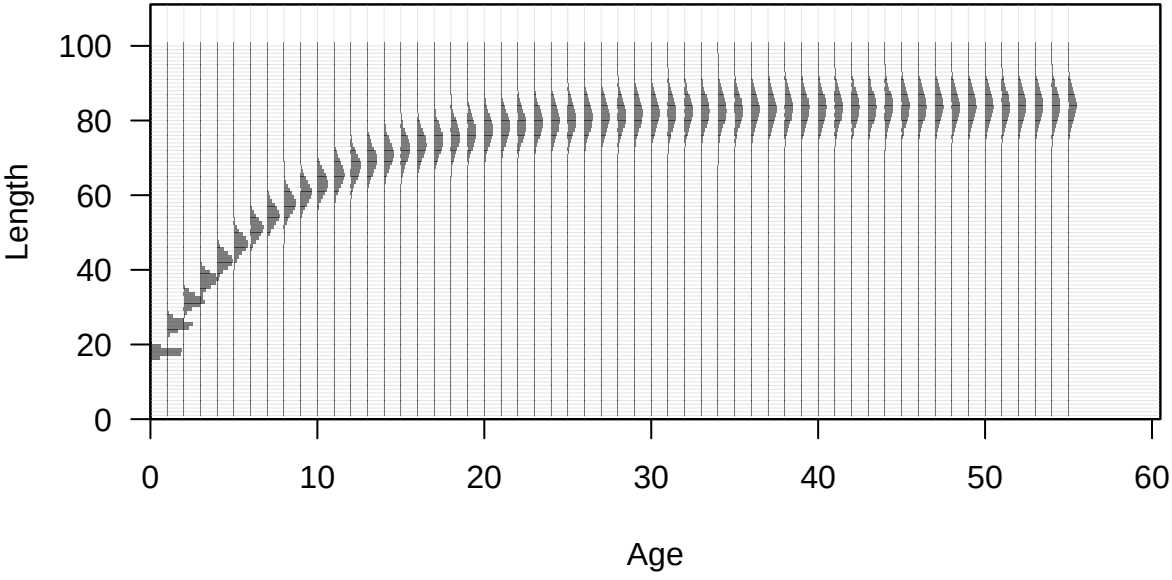

Age (yr)
0
10
20
30
40
50
100
80
60
40
20
0
Females
Males
Length (cm, beginning of the year)
CV of lengths
0.04
0.02
0
SD of lengths
4
2
0
Age (yr)
CV of lengths
0
0.02
0.04
0
1
2
3
4
SD of lengths
Length (cm, beginning of the year)

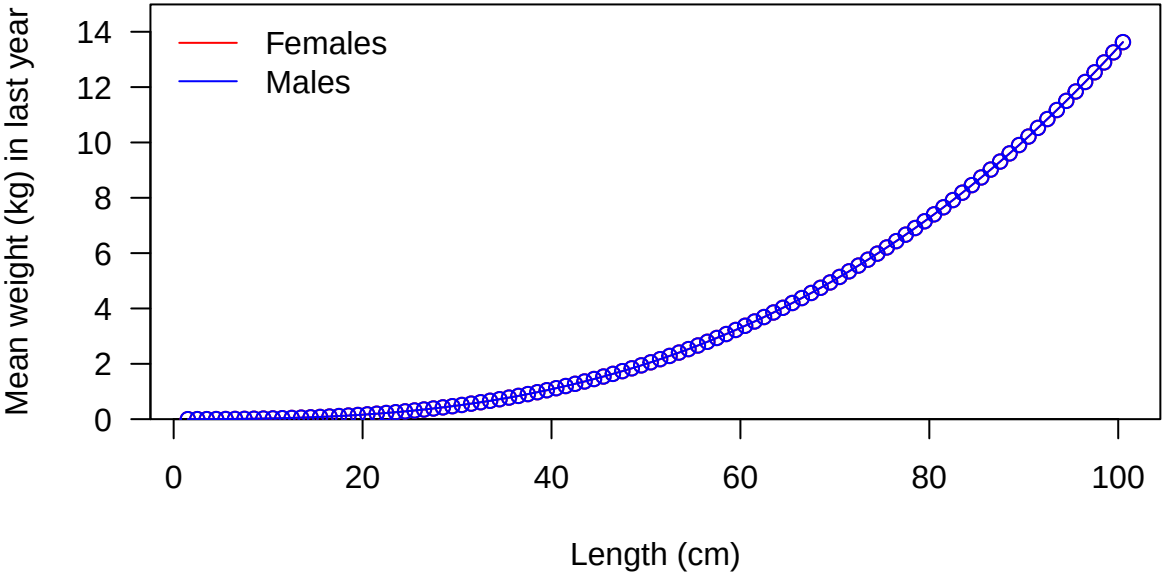

Age (yr)
Females
Males
Length (cm, beginning of the year)
Mean weight
Frac. mature
Age (yr)

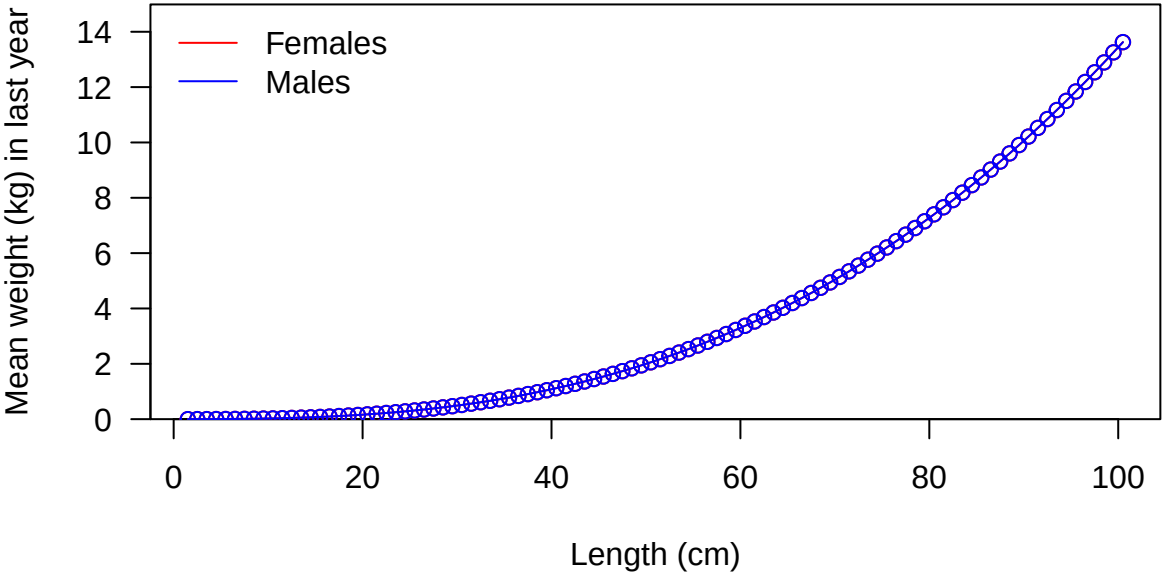

Length
100
80
60
40
20
0
0
10
20
30
40
50
60
Age

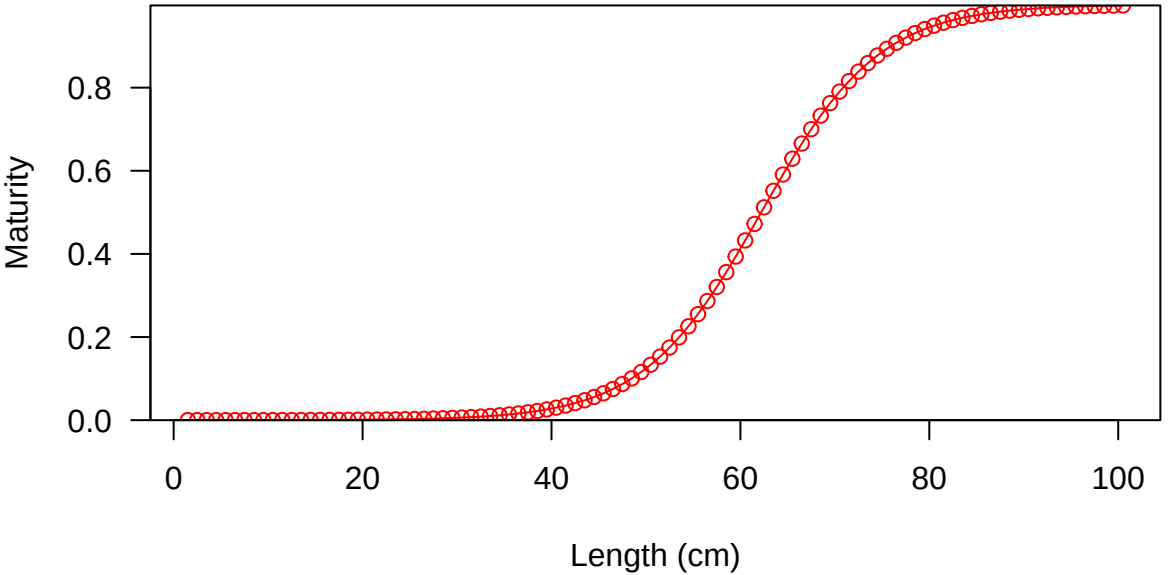

Length
100
80
60
40
20
0
0
10
20
30
40
50
60
Age

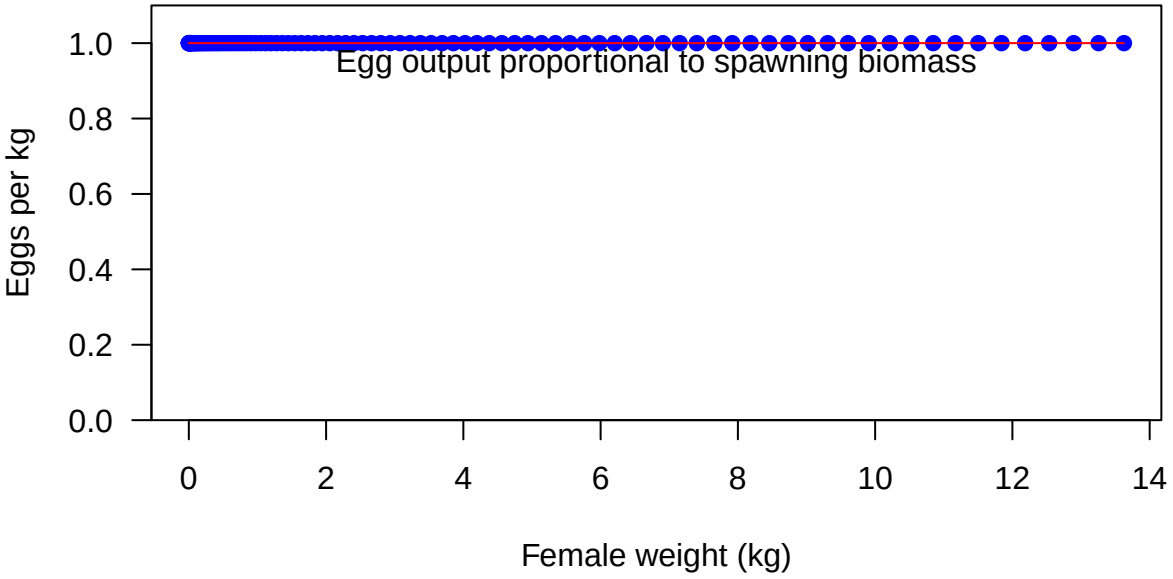

Length
100
80
60
40
20
0
0
10
20
30
40
50
60
Age

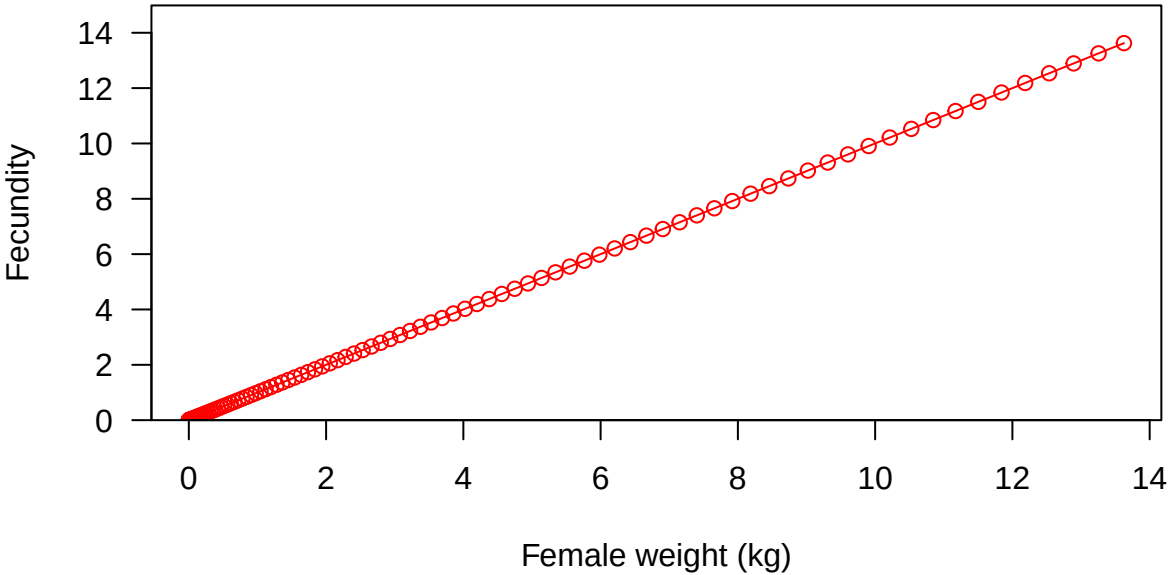

Length
100
80
60
40
20
0
0
10
20
30
40
50
60
Age

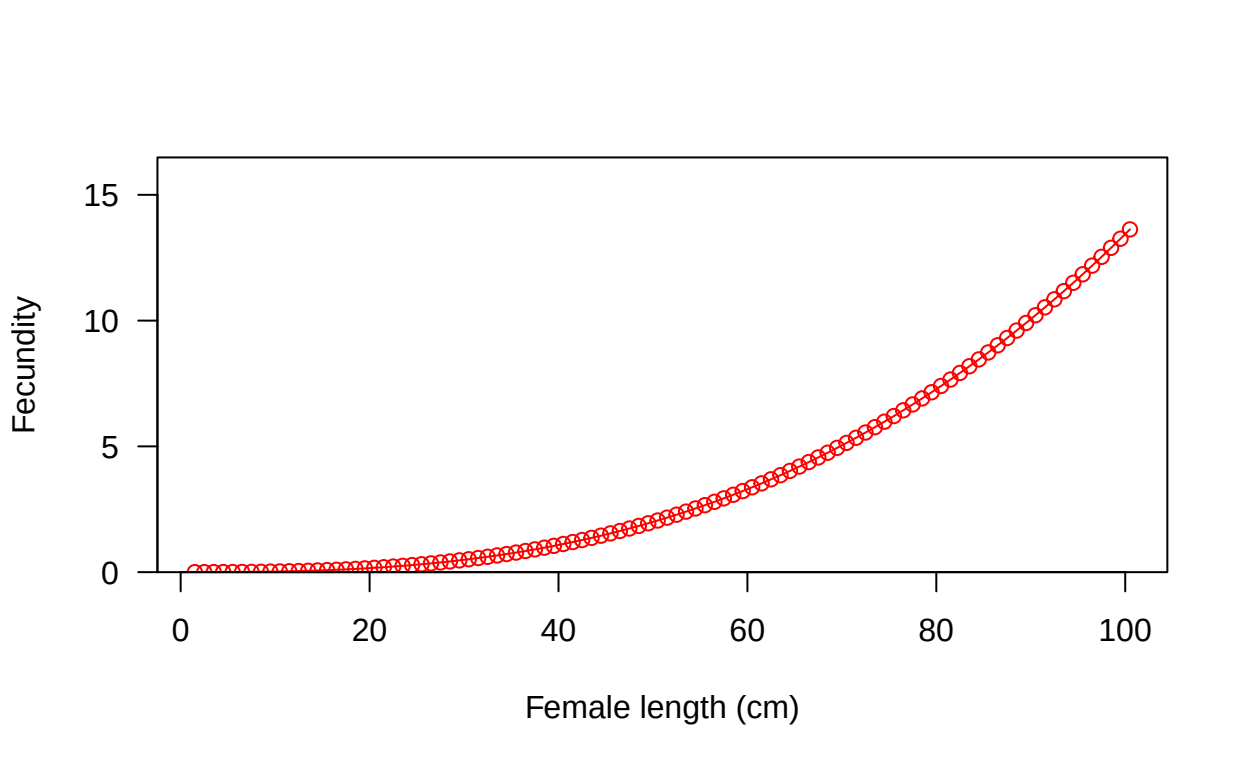

Females
Males
Mean weight (kg) in last year
0
2
4
6
8
10
12
14
0
20
40
60
80
100
Length (cm)

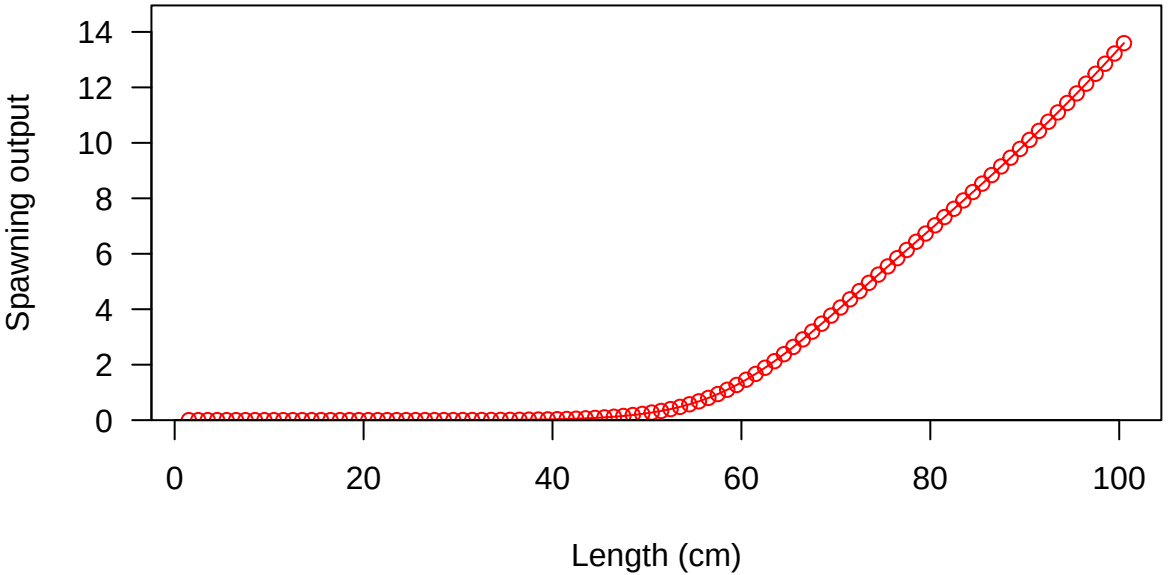

Females
Males
Mean weight (kg) in last year
0
2
4
6
8
10
12
14
0
20
40
60
80
100
Length (cm)

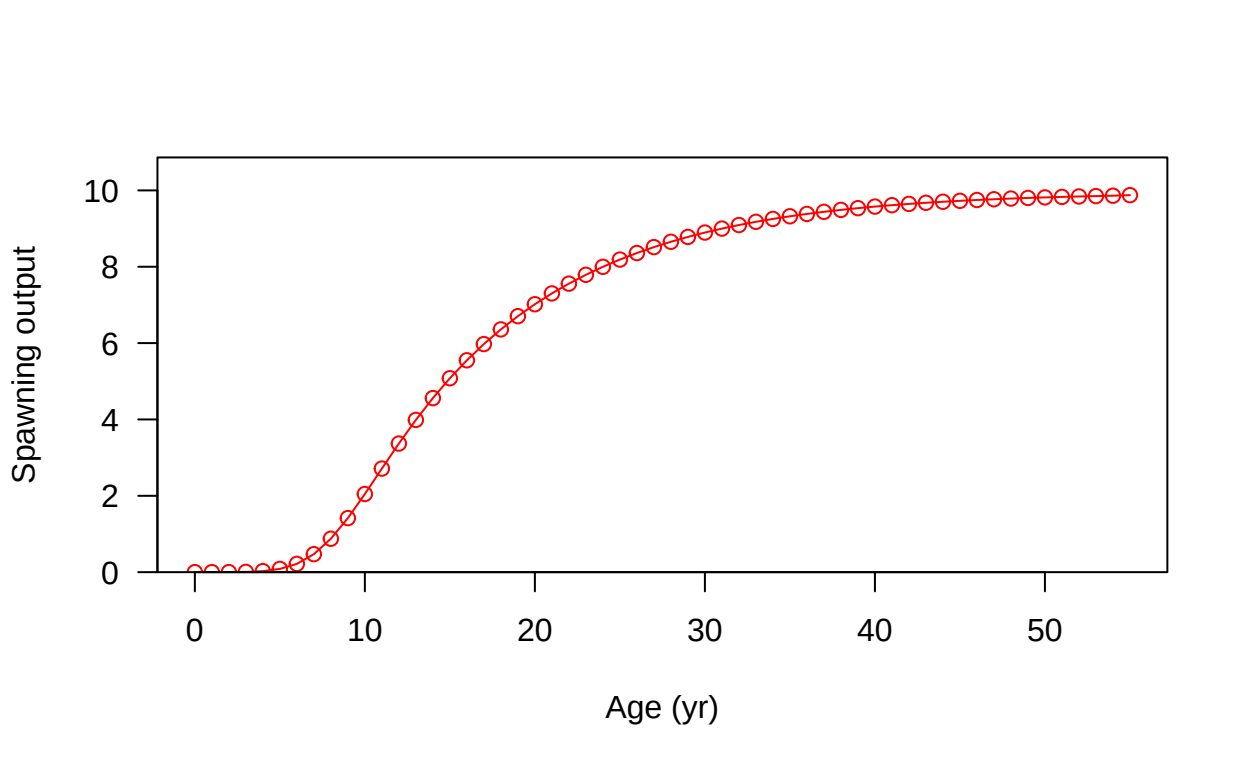

Maturity
0.0
0.2
0.4
0.6
0.8
0
20
40
60
80
100
Length (cm)

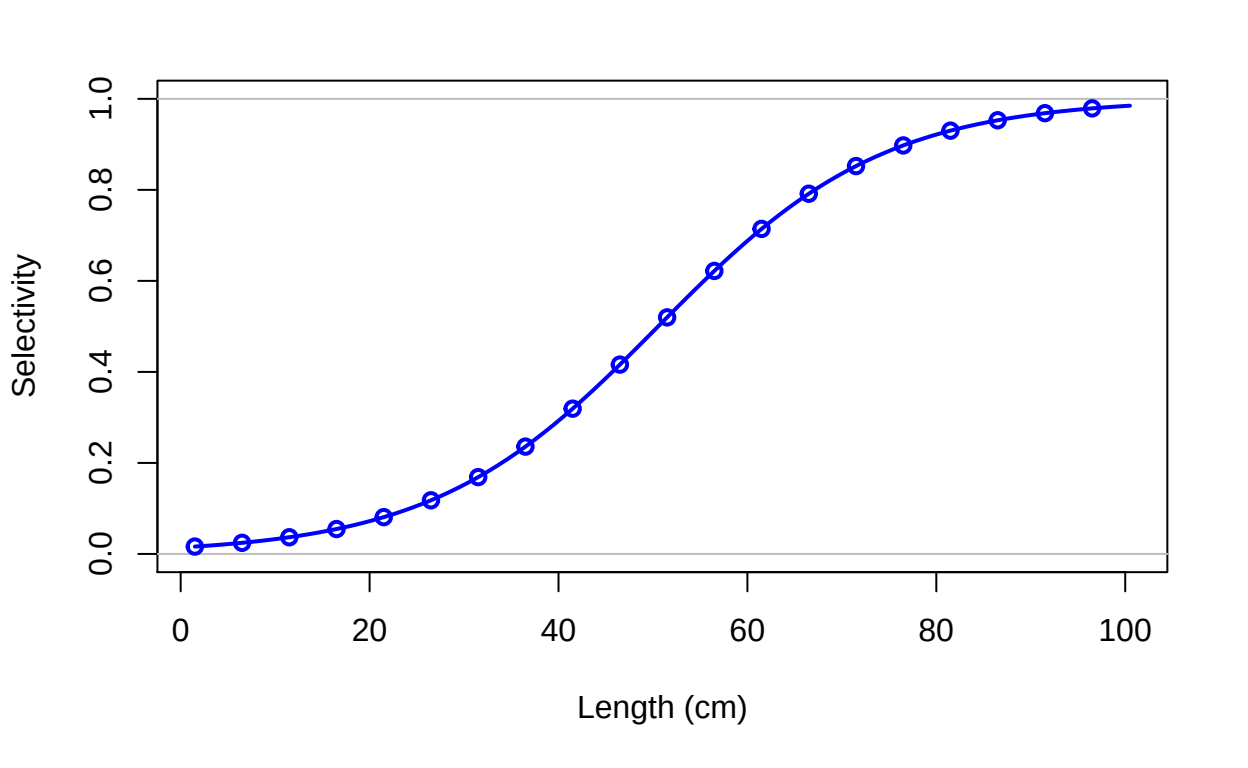

Egg output proportional to spawning biomass
Eggs per kg
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8
10
12
14
Female weight (kg)

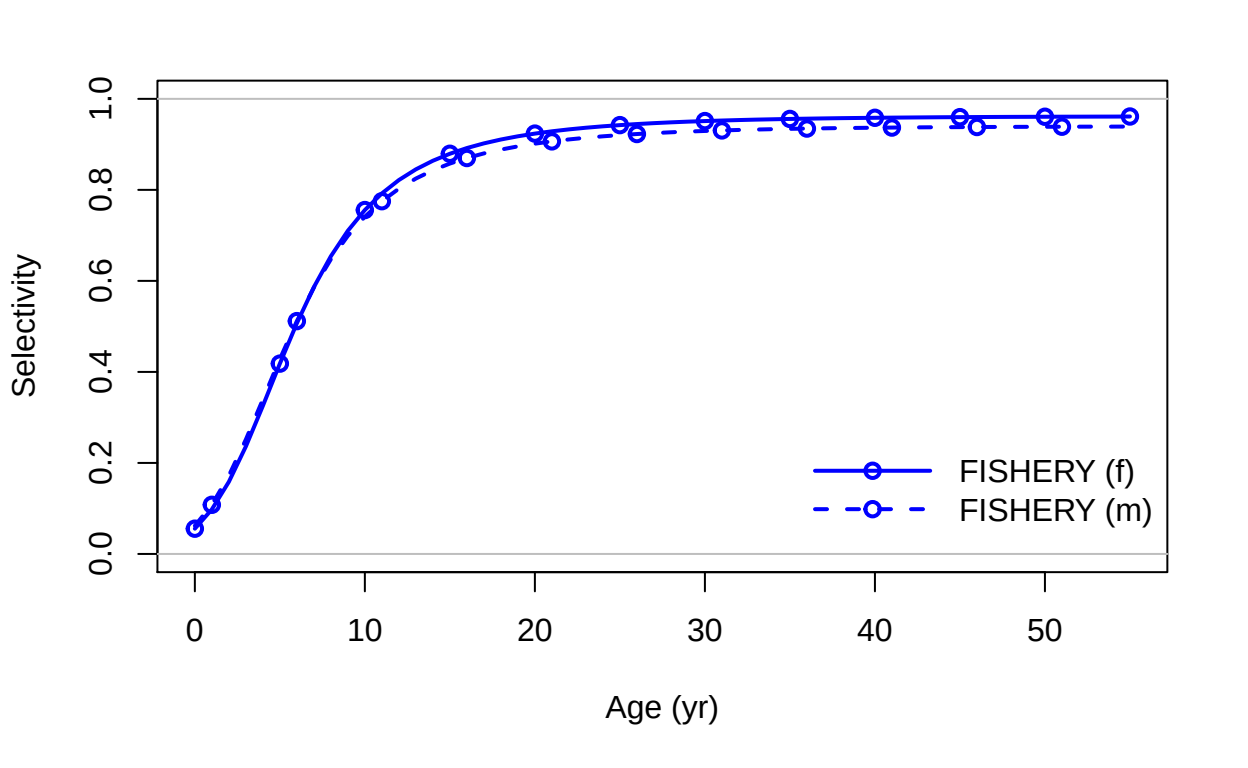

Fecundity
0
2
4
6
8
10
12
14
0
2
4
6
8
10
12
14
Female weight (kg)

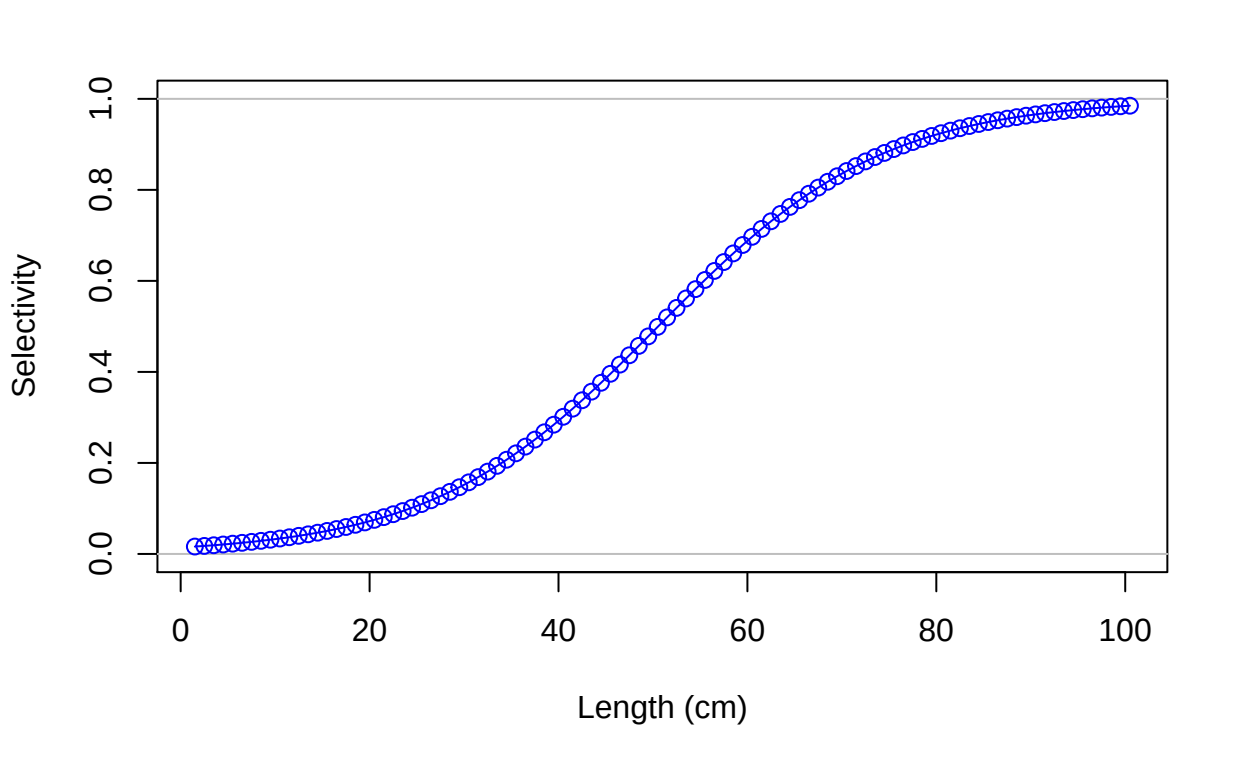

Fecundity
15
10
5
0
0
20
40
60
80
100
Female length (cm)

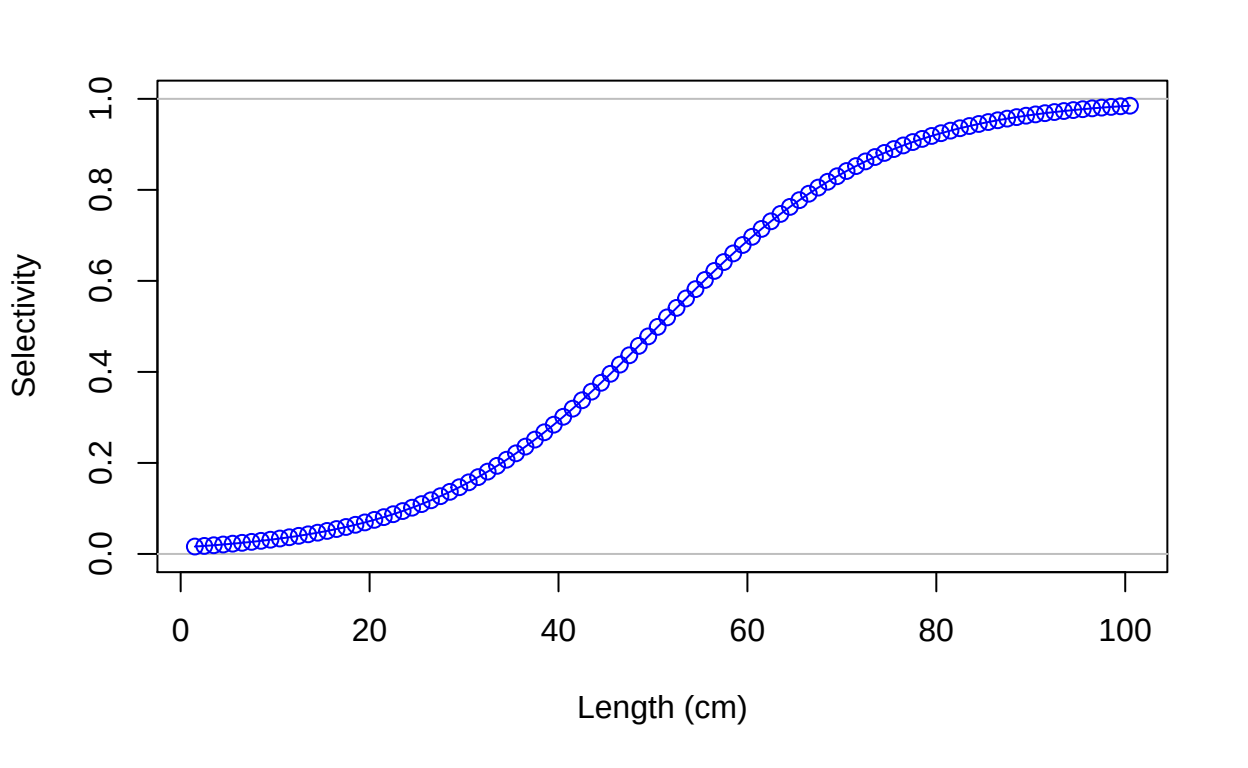

Spawning output
0
2
4
6
8
10
12
14
0
20
40
60
80
100
Length (cm)

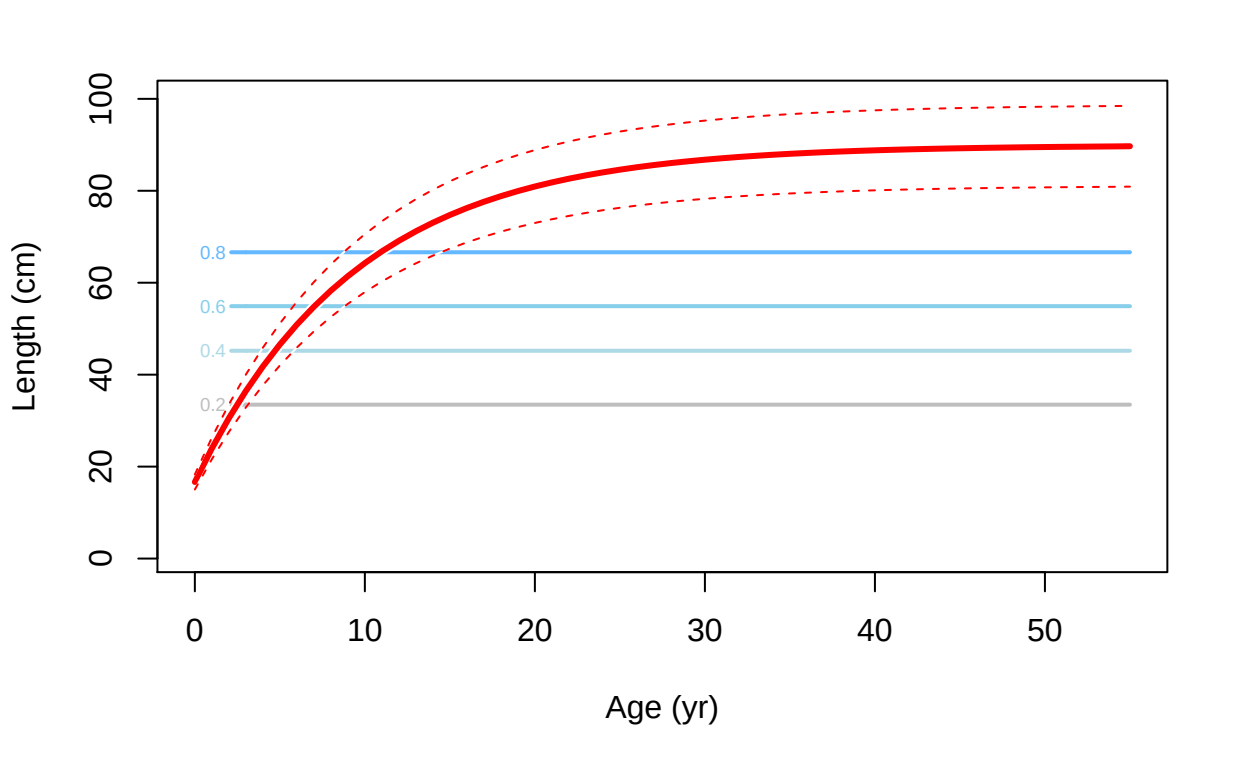

Spawning output
0
2
4
6
8
10
0
10
20
30
40
50
Age (yr)

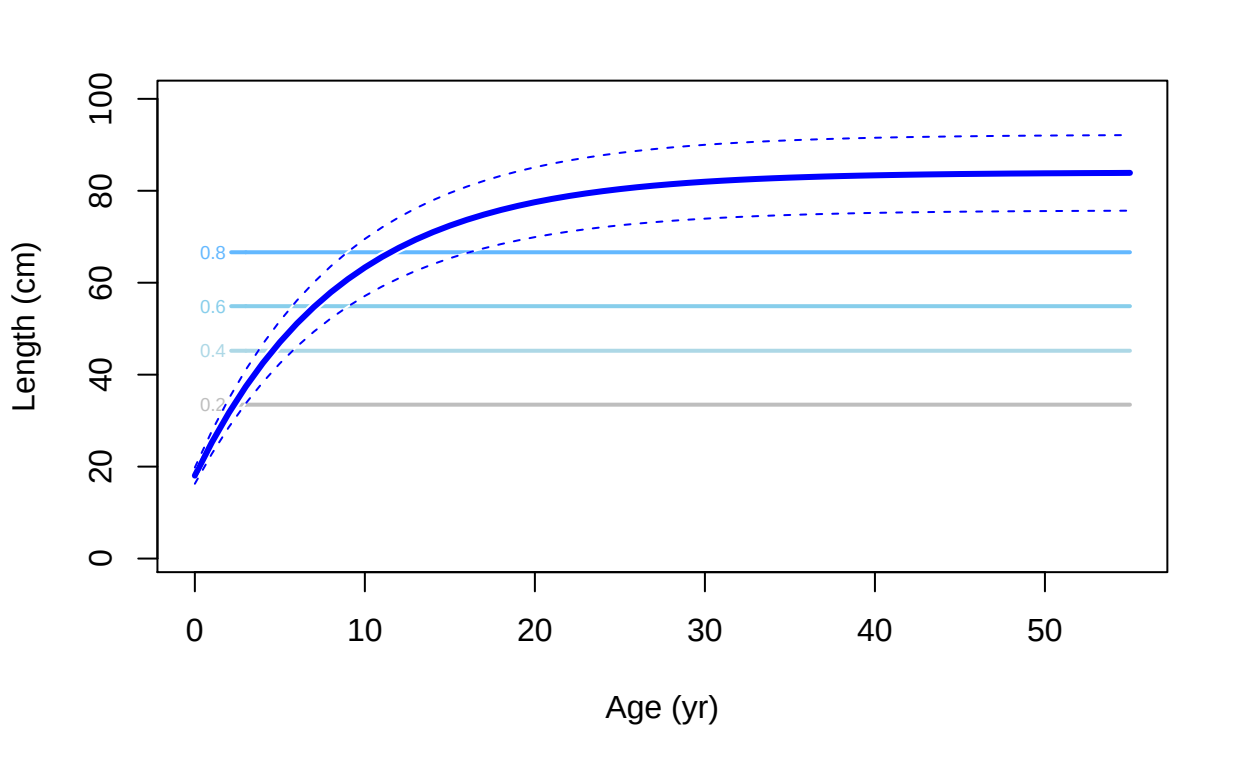

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Length (cm)

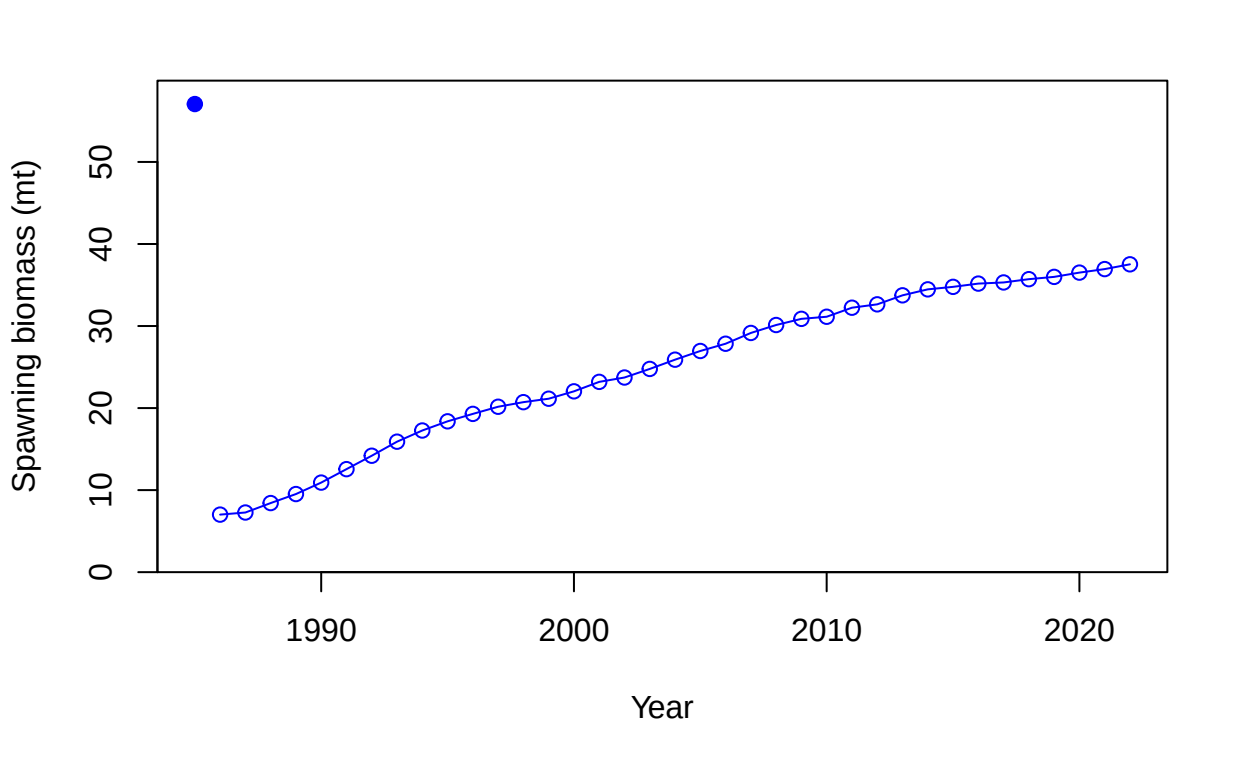

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
50
Age (yr)
FISHERY (f)
FISHERY (m)

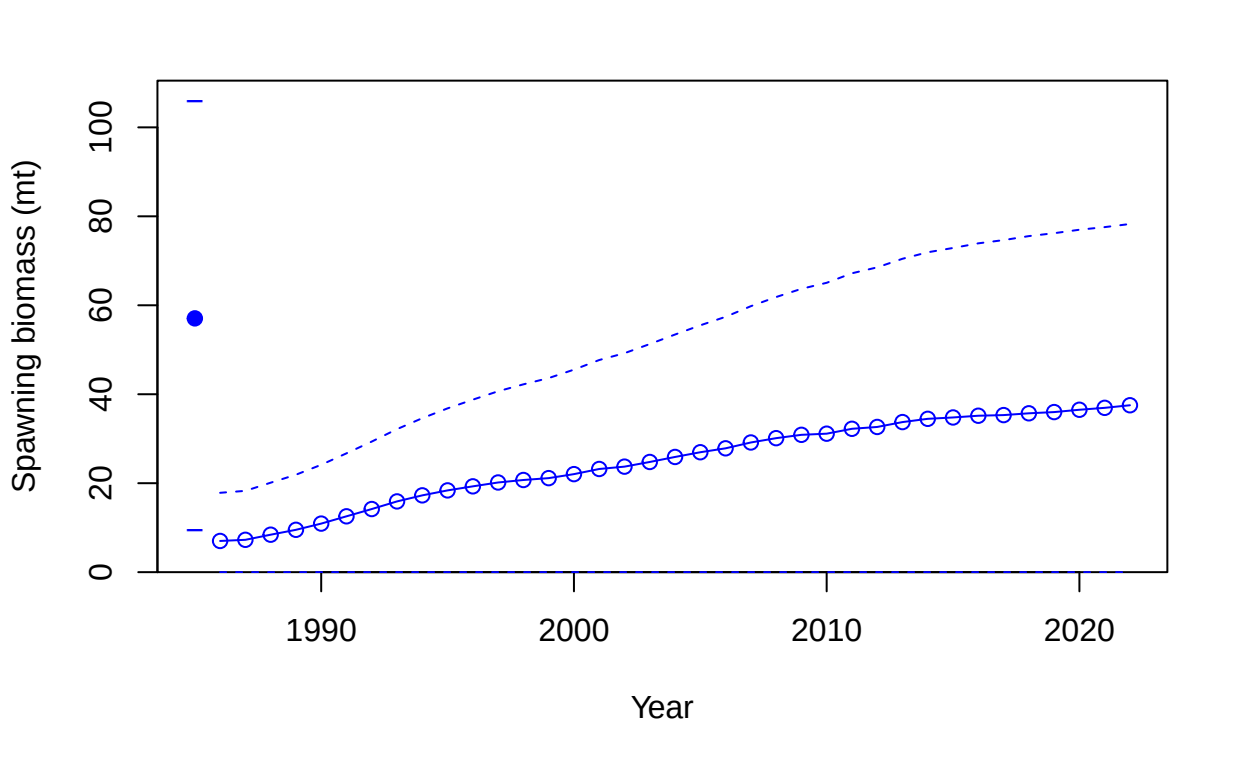

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Length (cm)

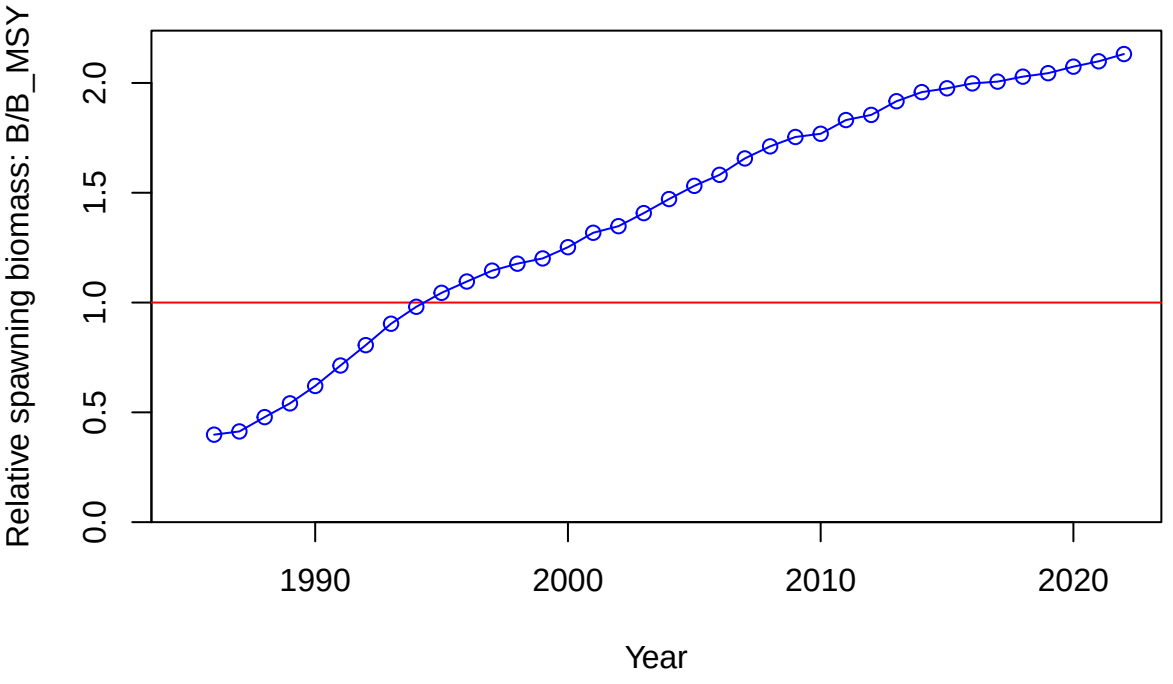

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Length (cm)

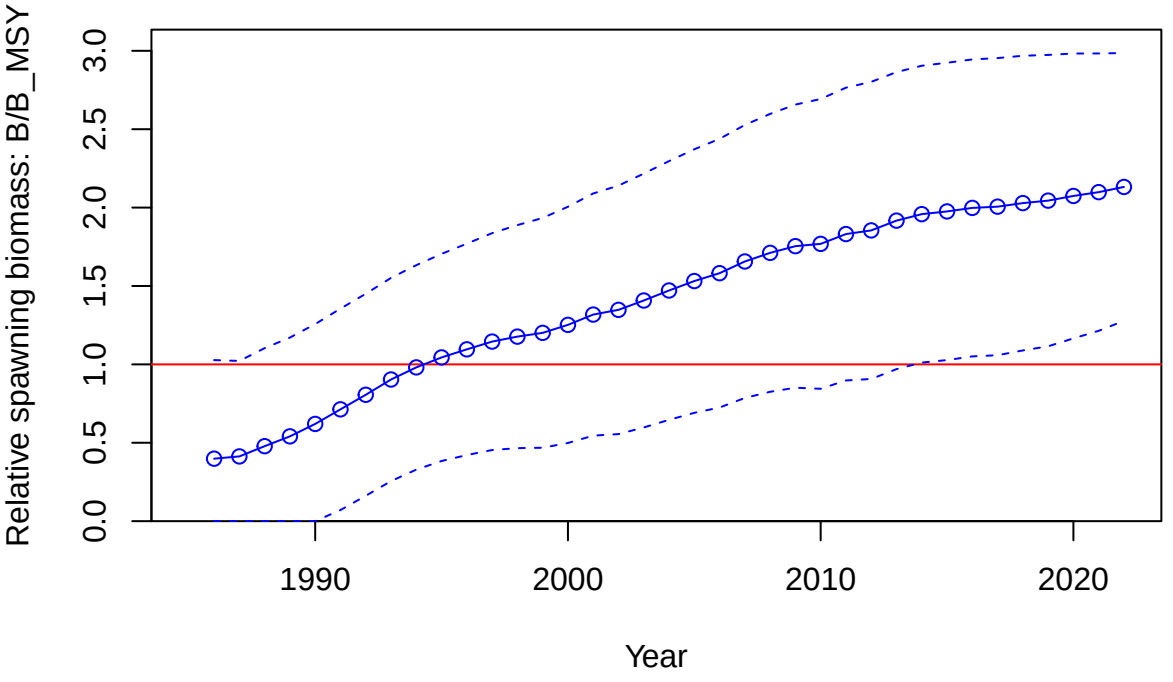

Length (cm)
0
20
40
60
80
100
0.8
0.6
0.4
0.2
0
10
20
30
40
50
Age (yr)

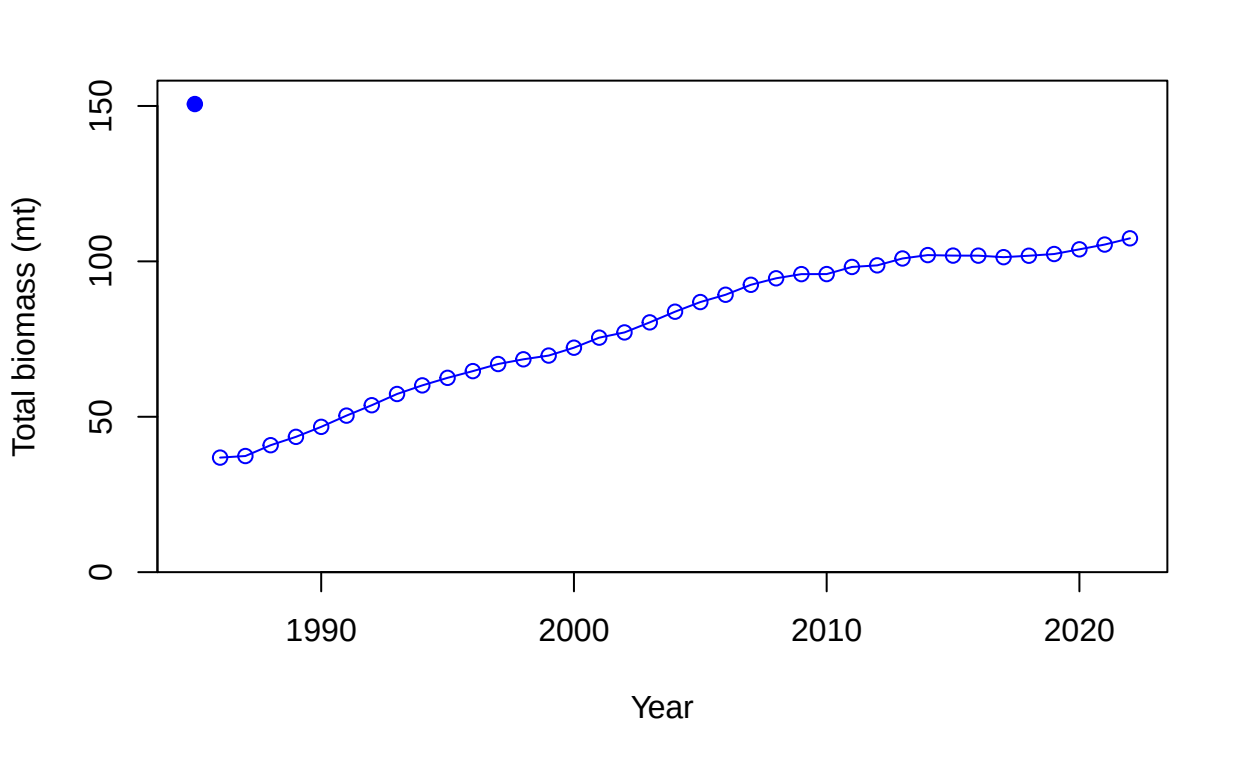

Length (cm)
0
20
40
60
80
100
0.8
0.6
0.4
0.2
0
10
20
30
40
50
Age (yr)

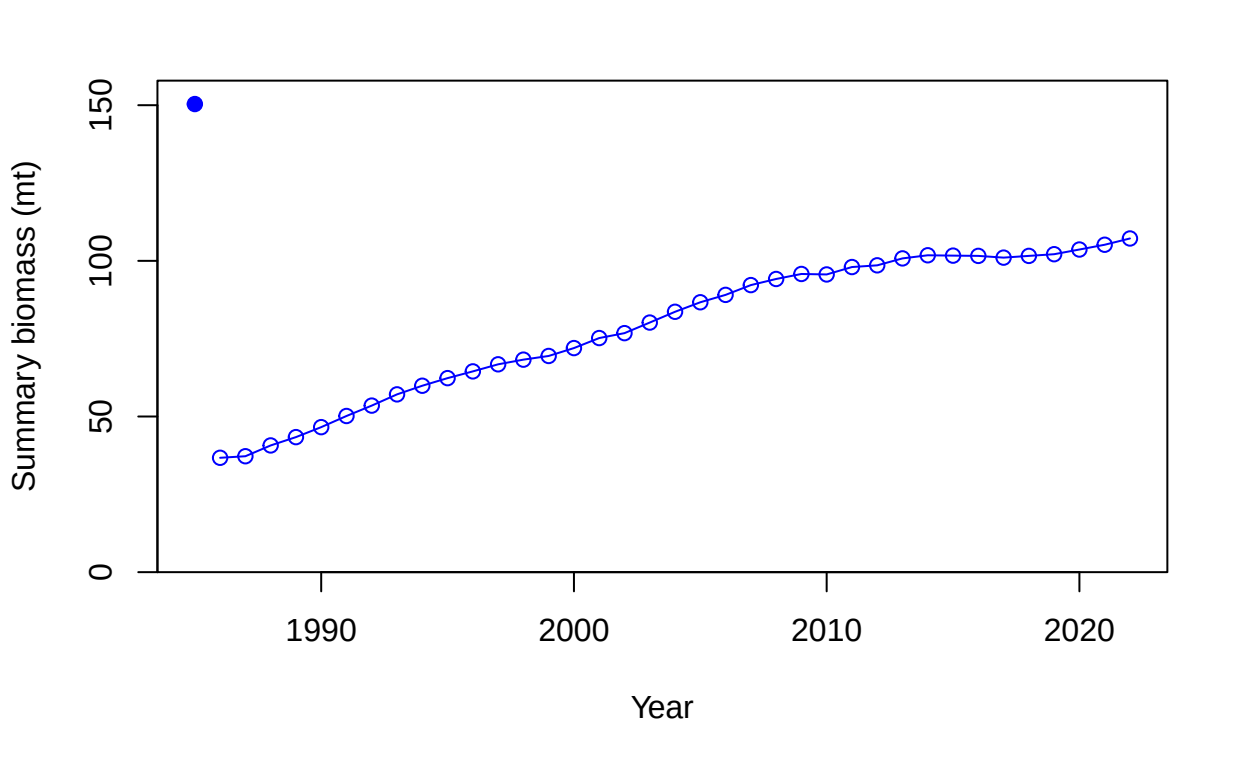

Spawning biomass (mt)
0
10
20
30
40
50
1990
2000
2010
2020
Year

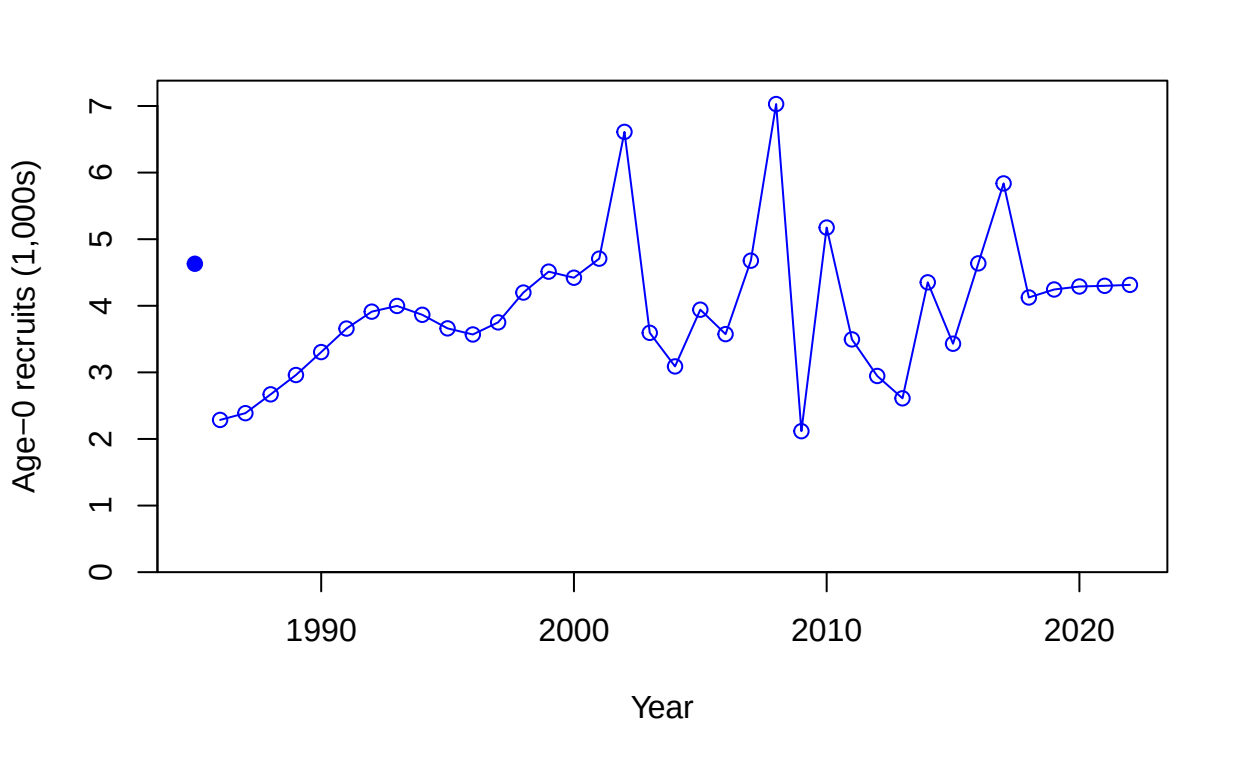

Spawning biomass (mt)
0
20
40
60
80
100
1990
2000
2010
2020
Year

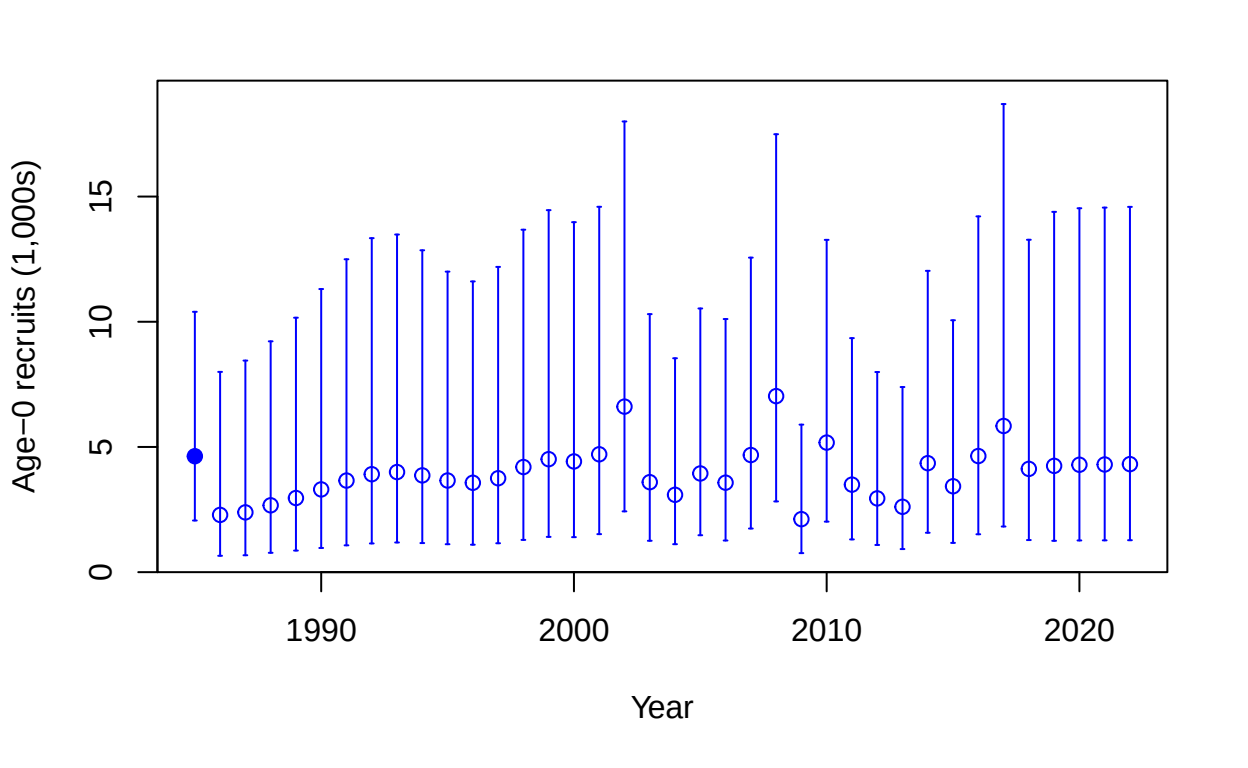

Relative spawning biomass: B/B_MSY
0.0
0.5
1.0
1.5
2.0
1990
2000
2010
2020
Year

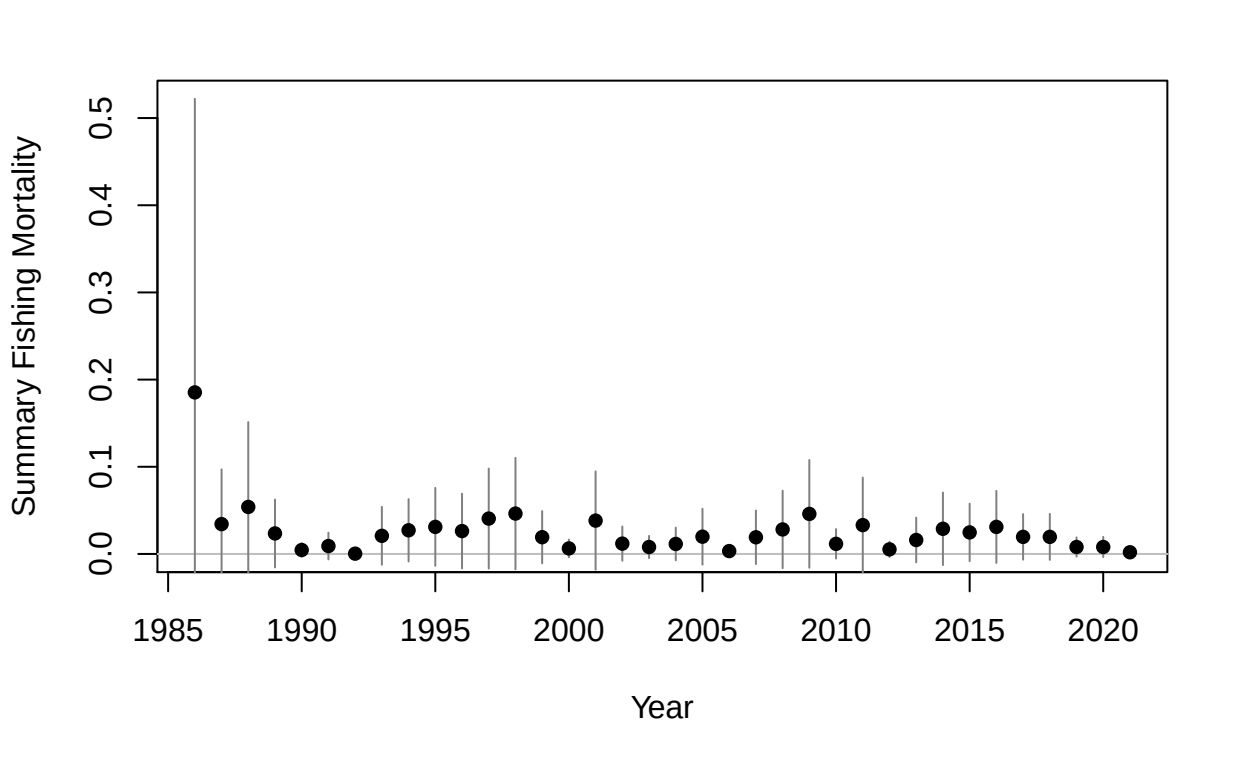

Relative spawning biomass: B/B_MSY
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1990
2000
2010
2020
Year

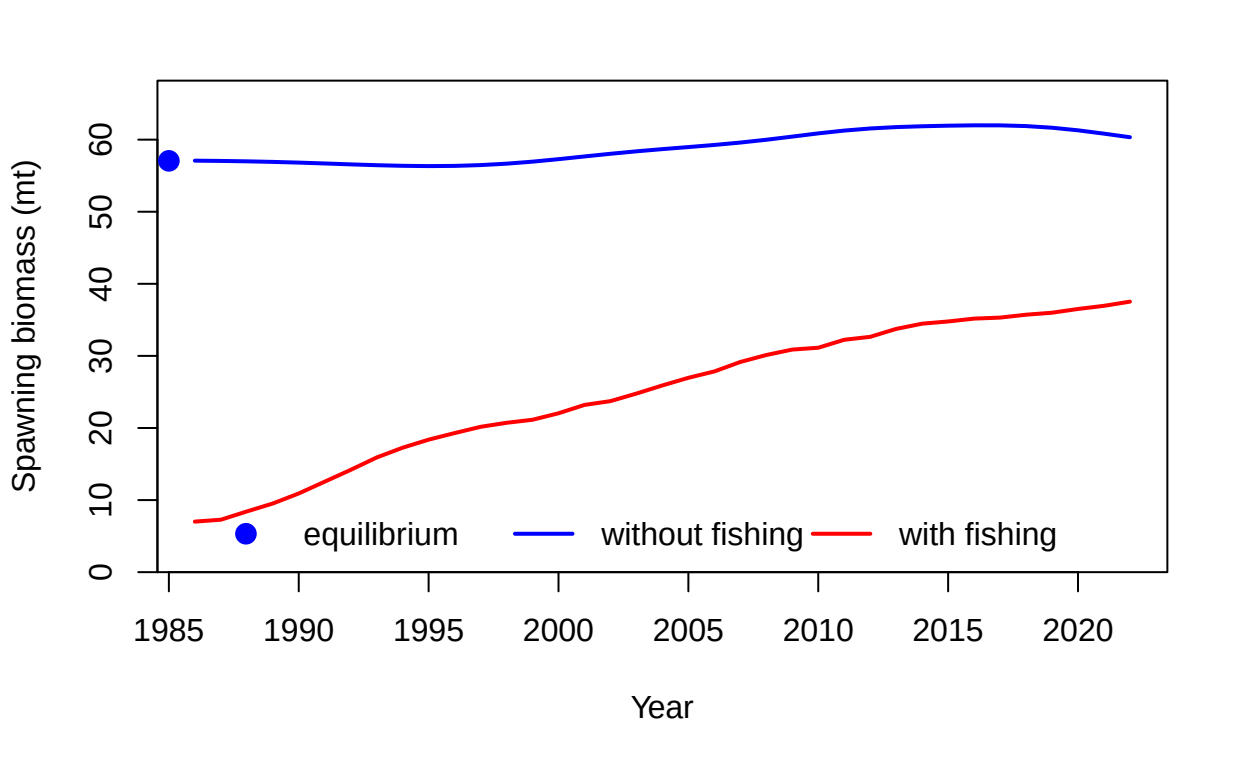

Total biomass (mt)
0
50
100
150
1990
2000
2010
2020
Year

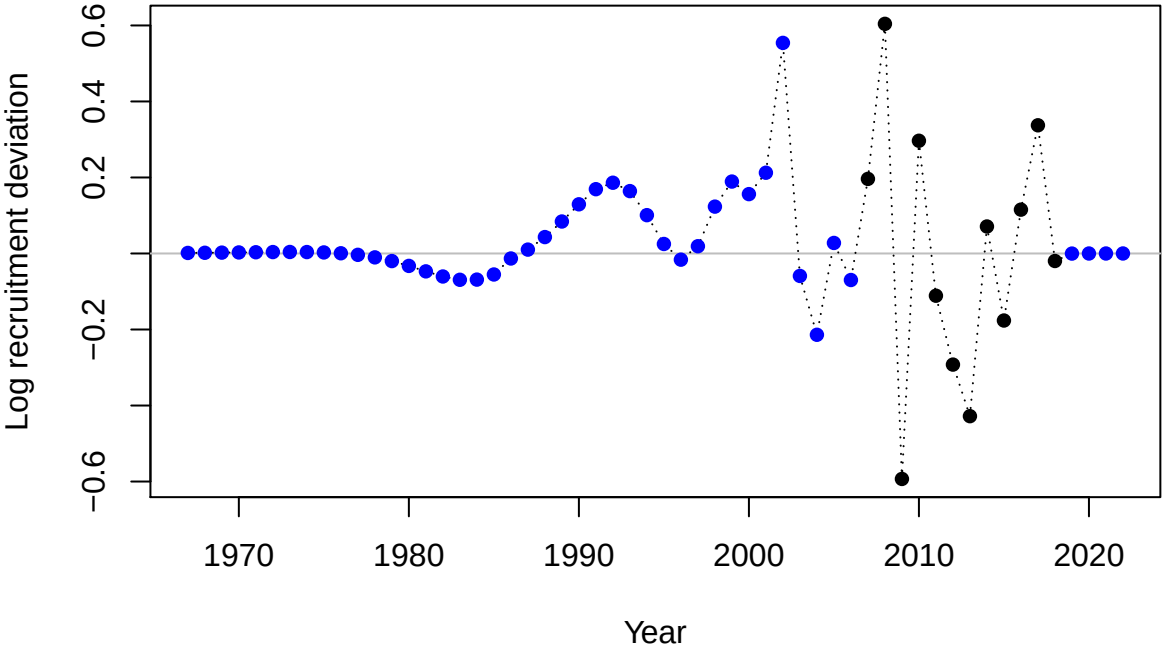

Summary biomass (mt)
0
50
100
150
1990
2000
2010
2020
Year

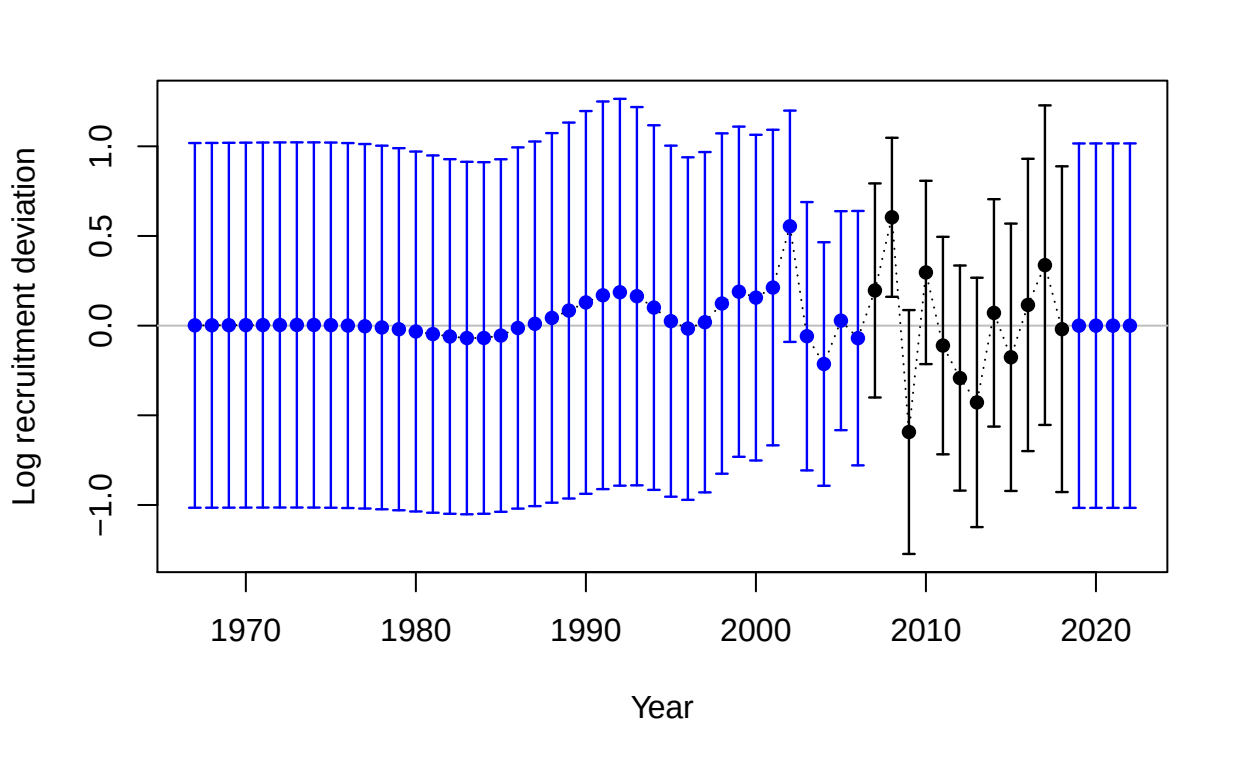

Age−0 recruits (1,000s)
0
1
2
3
4
5
6
7
1990
2000
2010
2020
Year

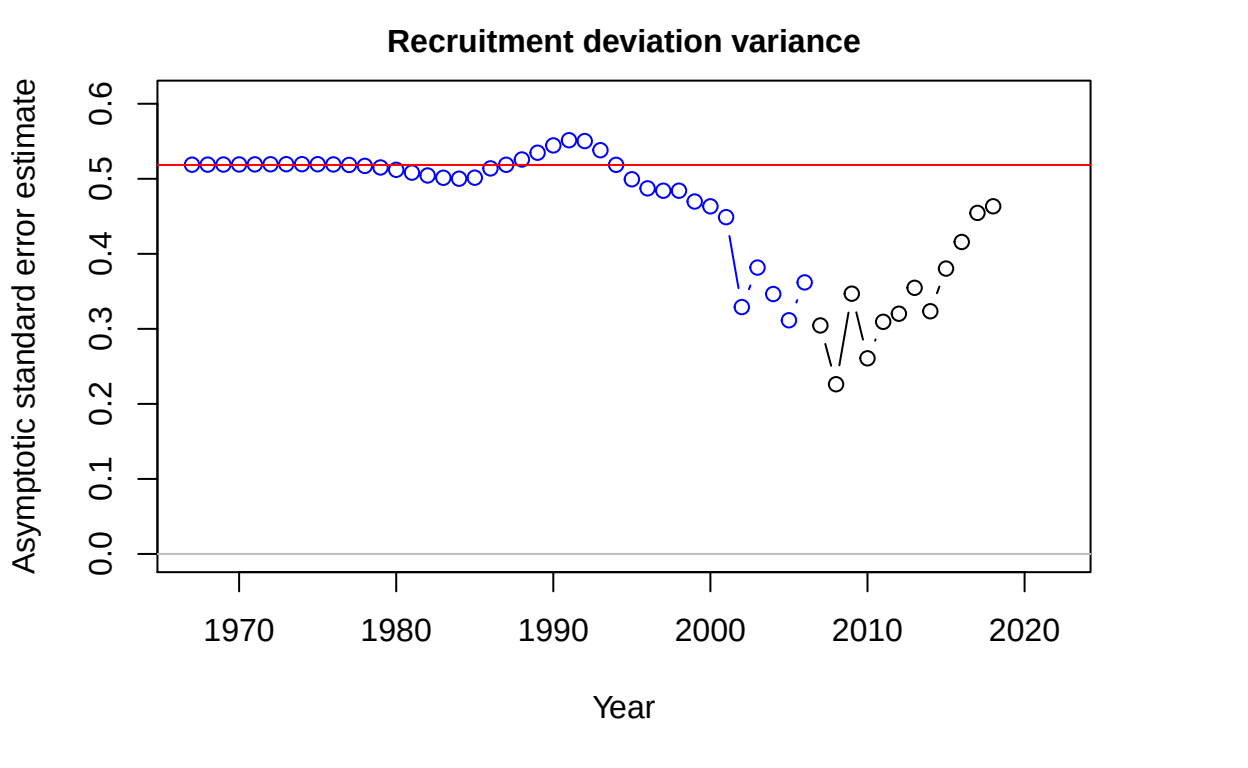

Age−0 recruits (1,000s)
0
5
10
15
1990
2000
2010
2020
Year

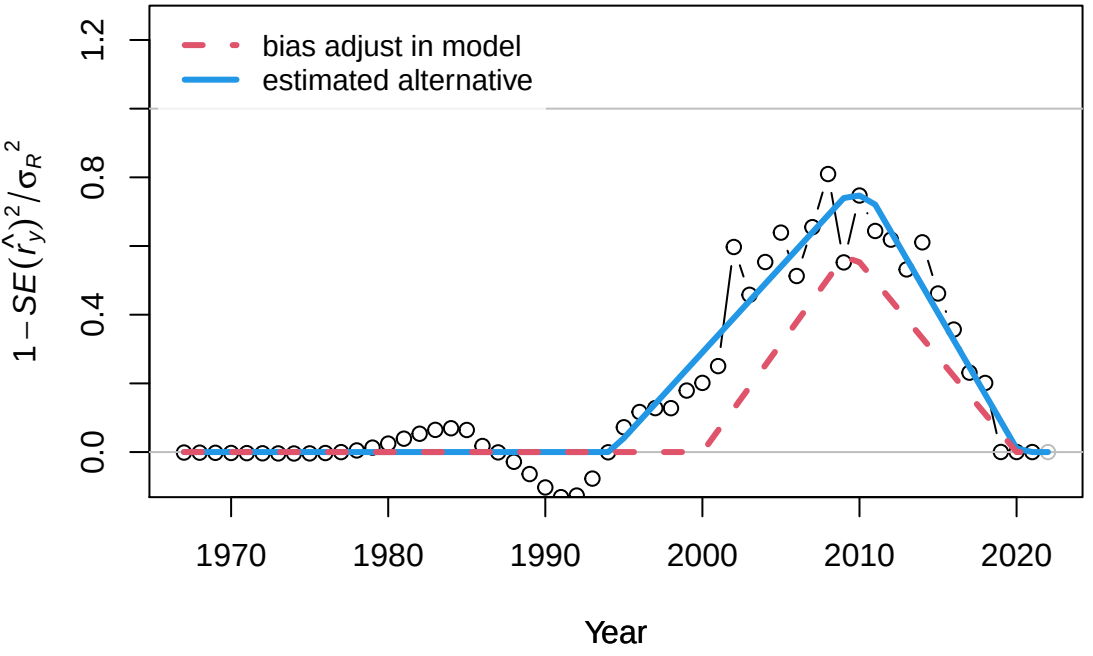

Summary Fishing Mortality
0.0
0.1
0.2
0.3
0.4
0.5
1985
1990
1995
2000
2005
2010
2015
2020
Year

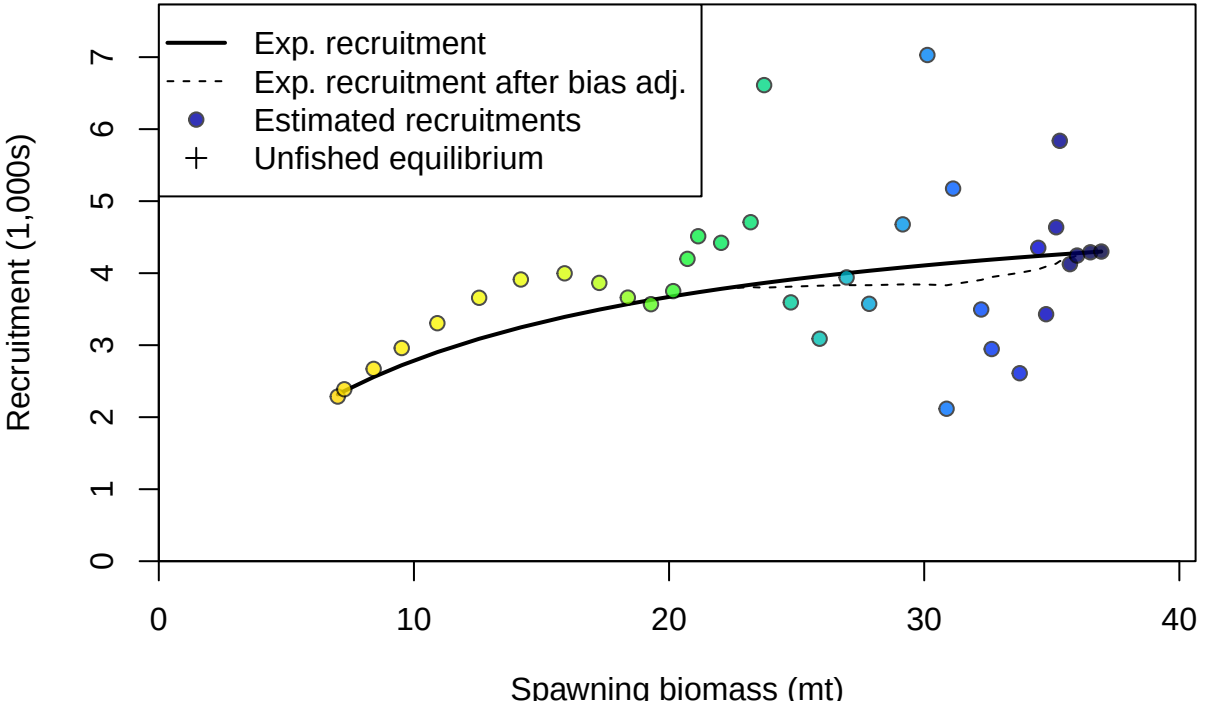

Spawning biomass (mt)
0
10
20
30
40
50
60
1985
1990
1995
2000
2005
2010
2015
2020
Year
equilibrium
without fishing
with fishing

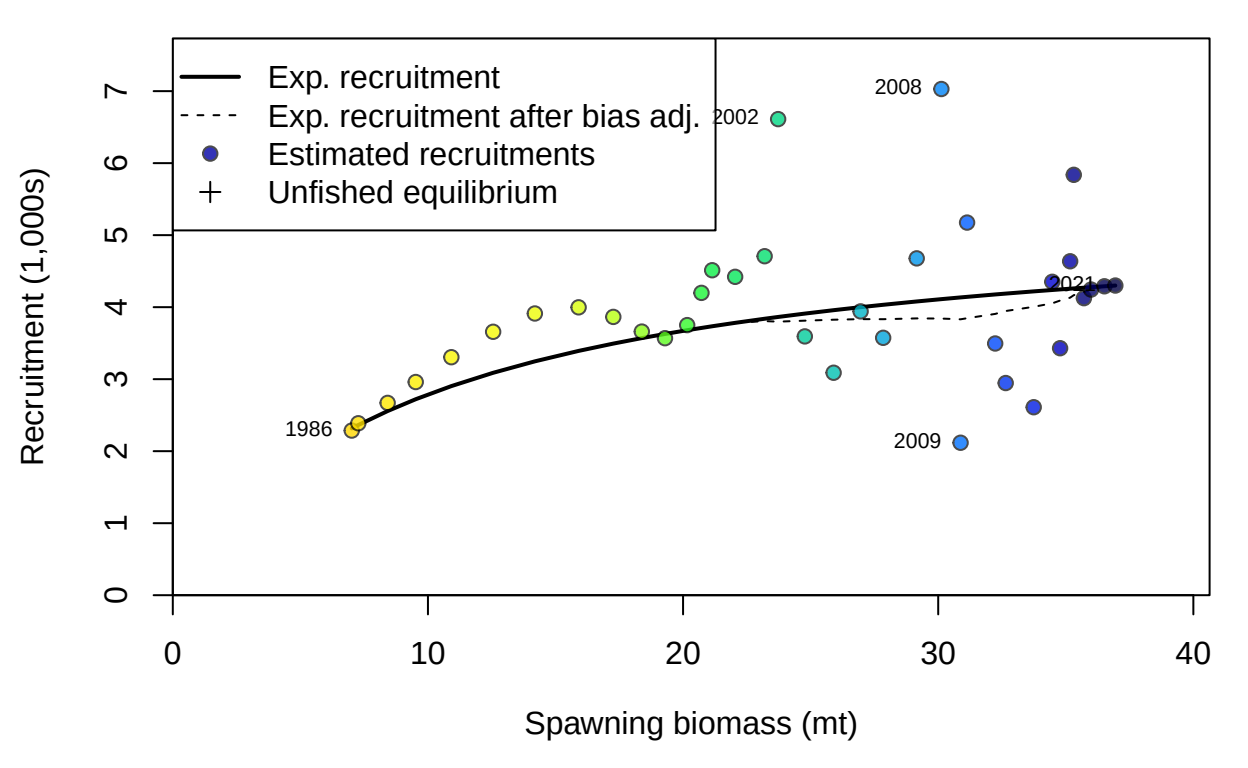

Log recruitment deviation
0.6
0.4
0.2
−0.2
−0.6
1970
1980
1990
2000
2010
2020
Year

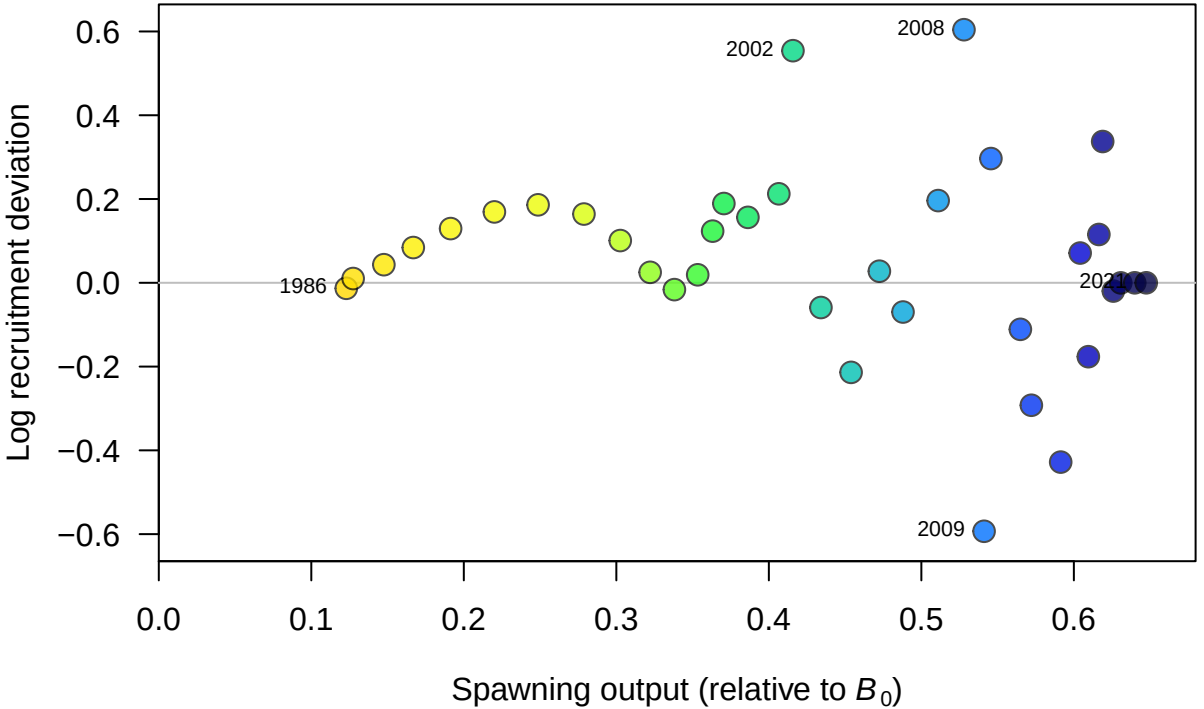

Log recruitment deviation
1.0
0.5
0.0
−1.0
1970
1980
1990
2000
2010
2020
Year

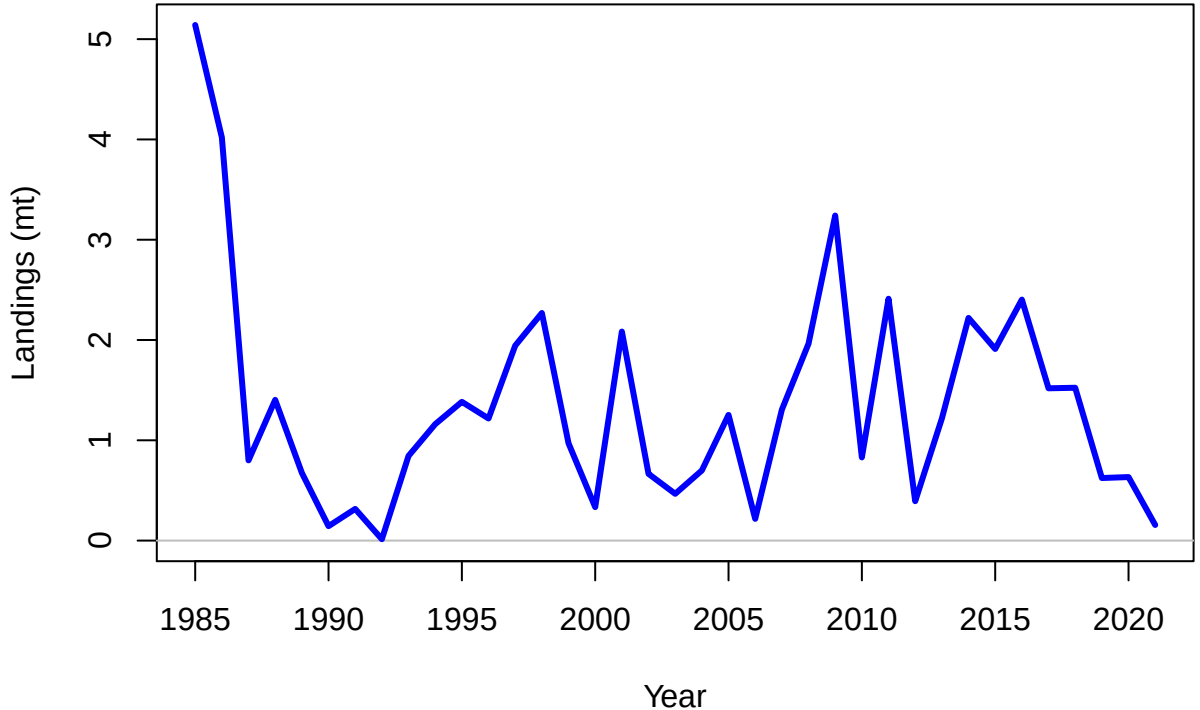

Recruitment deviation variance
Asymptotic standard error estimate
0.0
0.1
0.2
0.3
0.4
0.5
0.6
1970
1980
1990
2000
2010
2020
Year

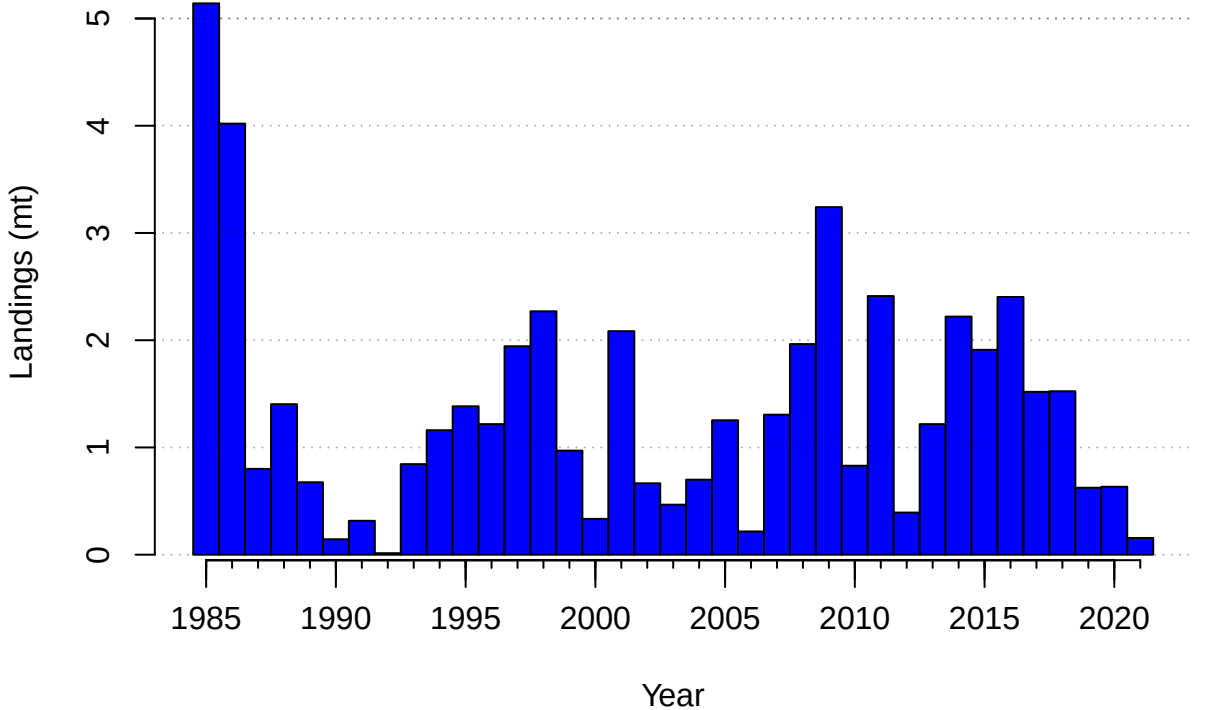

bias adjust in model
estimated alternative
$1-SE(\hat{r}_y)^2/\sigma_R^2$
0.0
0.4
0.8
1.2
1970
1980
1990
2000
2010
2020
Year

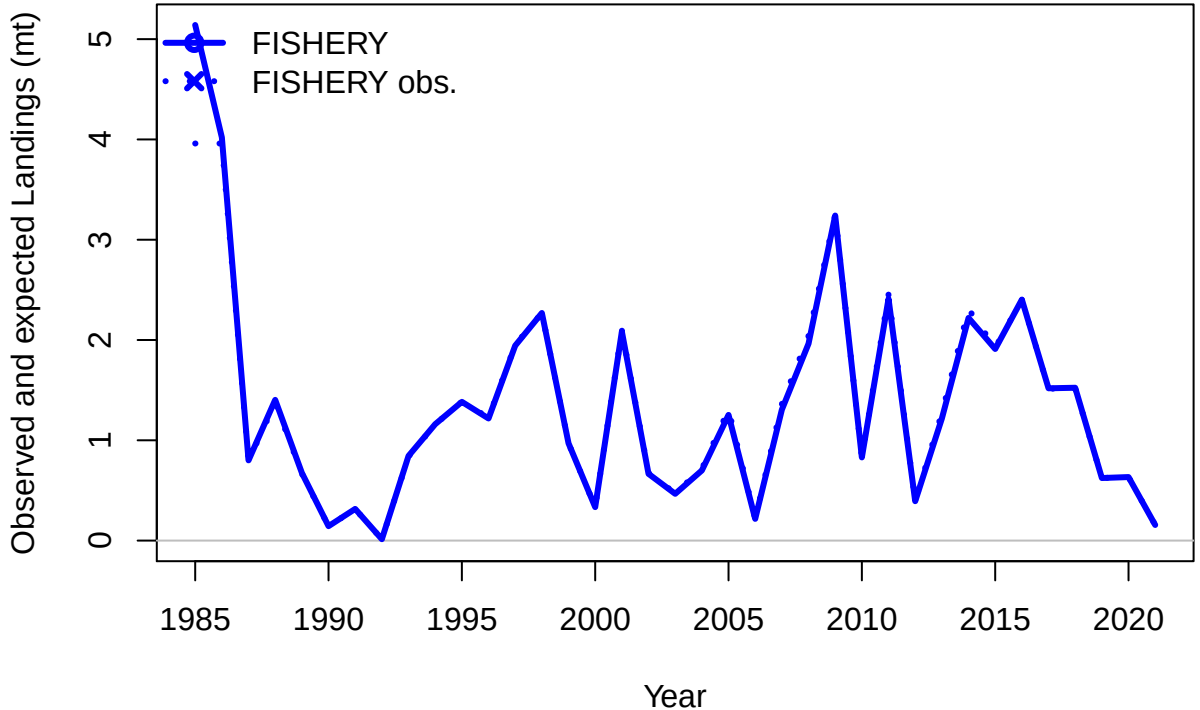

Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium
Recruitment (1,000s)
0
1
2
3
4
5
6
7
0
10
20
30
40
Spawning biomass (mt)

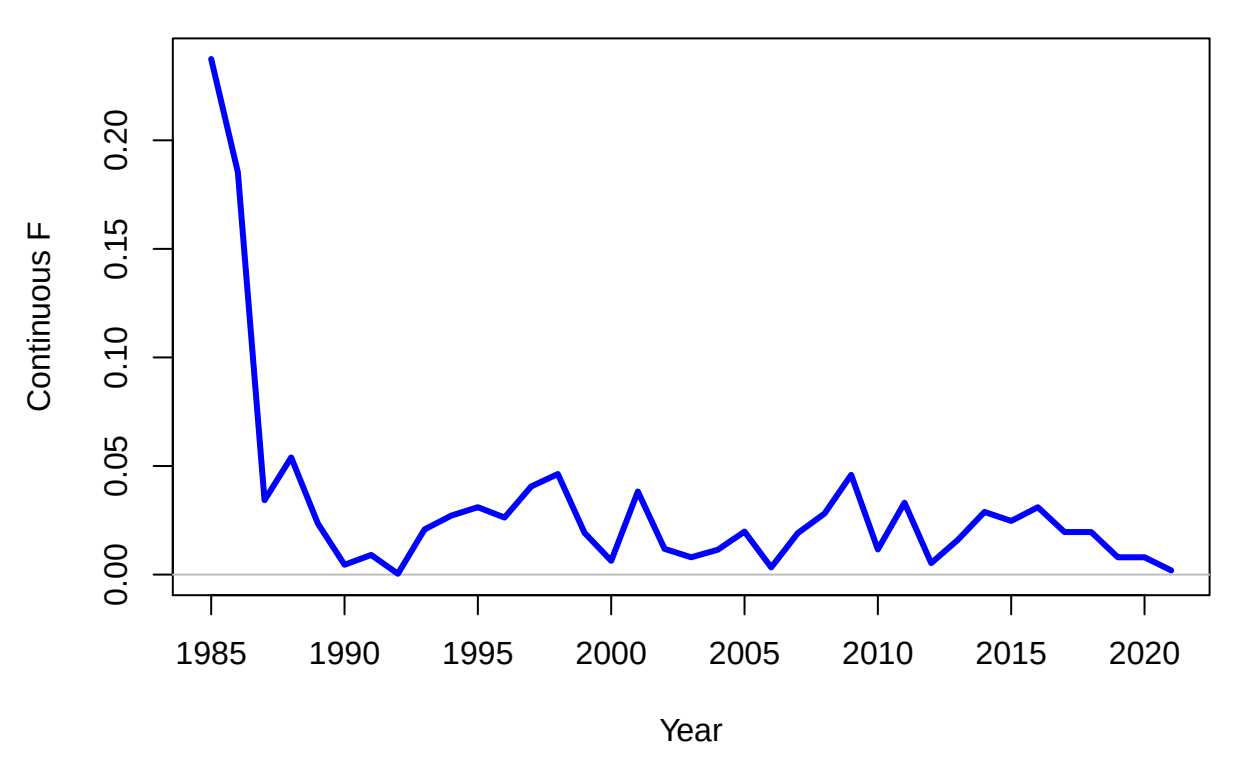

Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium
2008
2002
2021
1986
2009
Recruitment (1,000s)
0
1
2
3
4
5
6
7
0
10
20
30
40
Spawning biomass (mt)

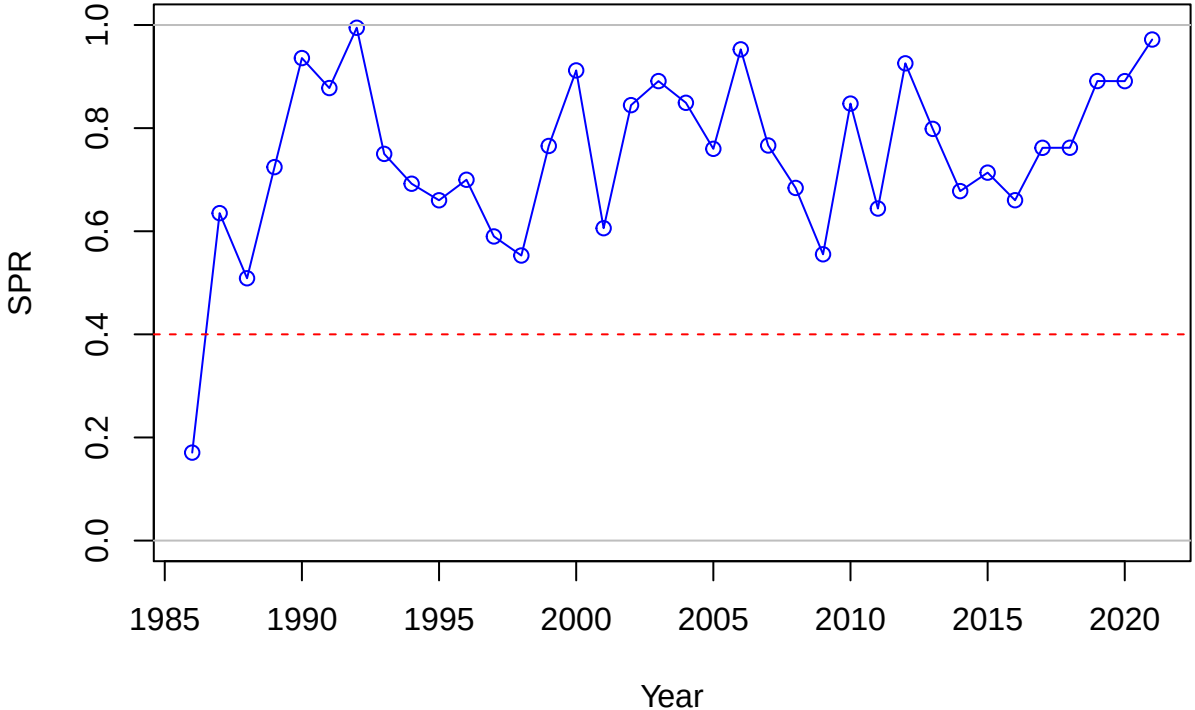

0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
Log recruitment deviation
2002
2008
1986
2021
2009
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Spawning output (relative to B_0)

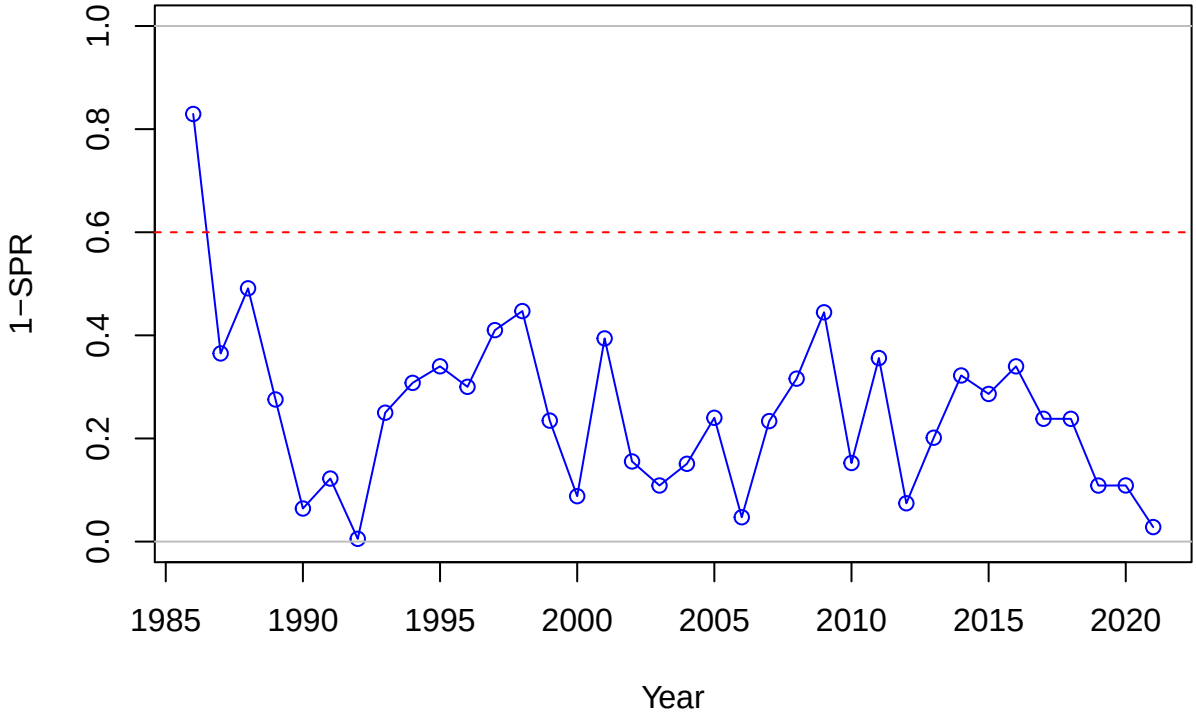

Landings (mt)
0
1
2
3
4
5
1985
1990
1995
2000
2005
2010
2015
2020
Year

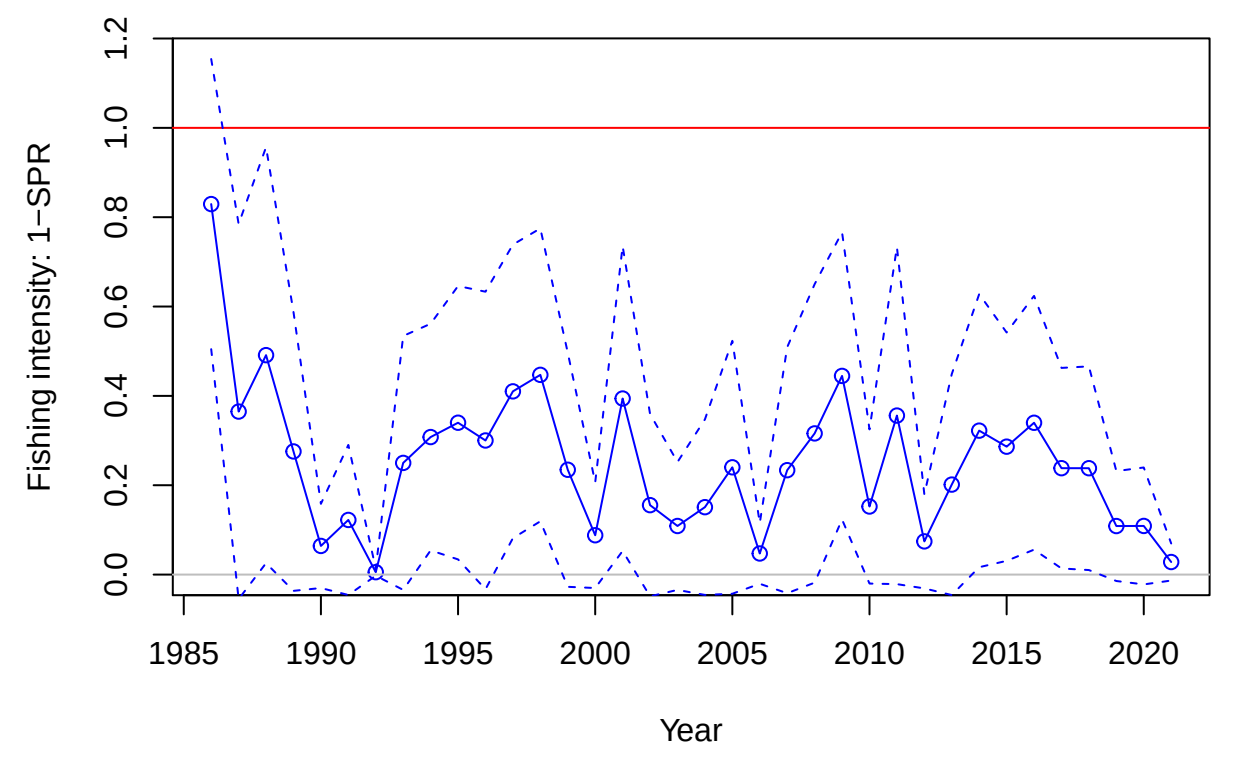

Landings (mt)
0
1
2
3
4
5
1985
1990
1995
2000
2005
2010
2015
2020
Year

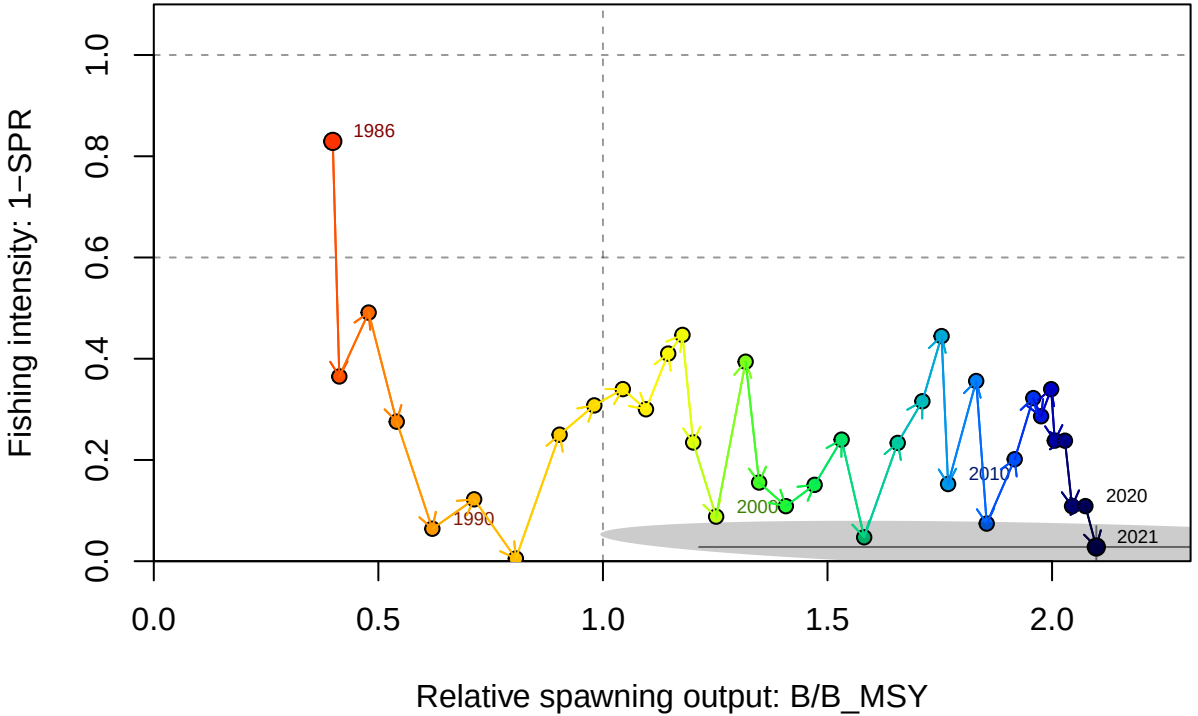

FISHERY
FISHERY obs.
Observed and expected Landings (mt)
0
1
2
3
4
5
1985
1990
1995
2000
2005
2010
2015
2020
Year

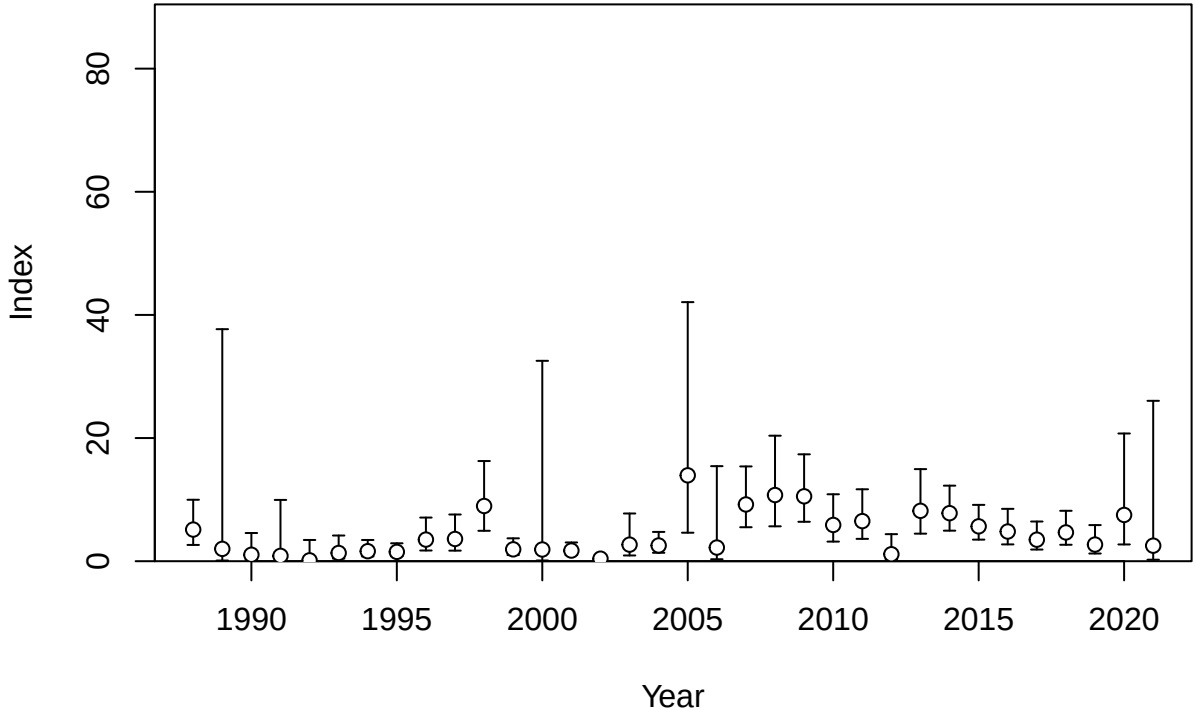

Continuous F
0.00
0.05
0.10
0.15
0.20
1985
1990
1995
2000
2005
2010
2015
2020
Year

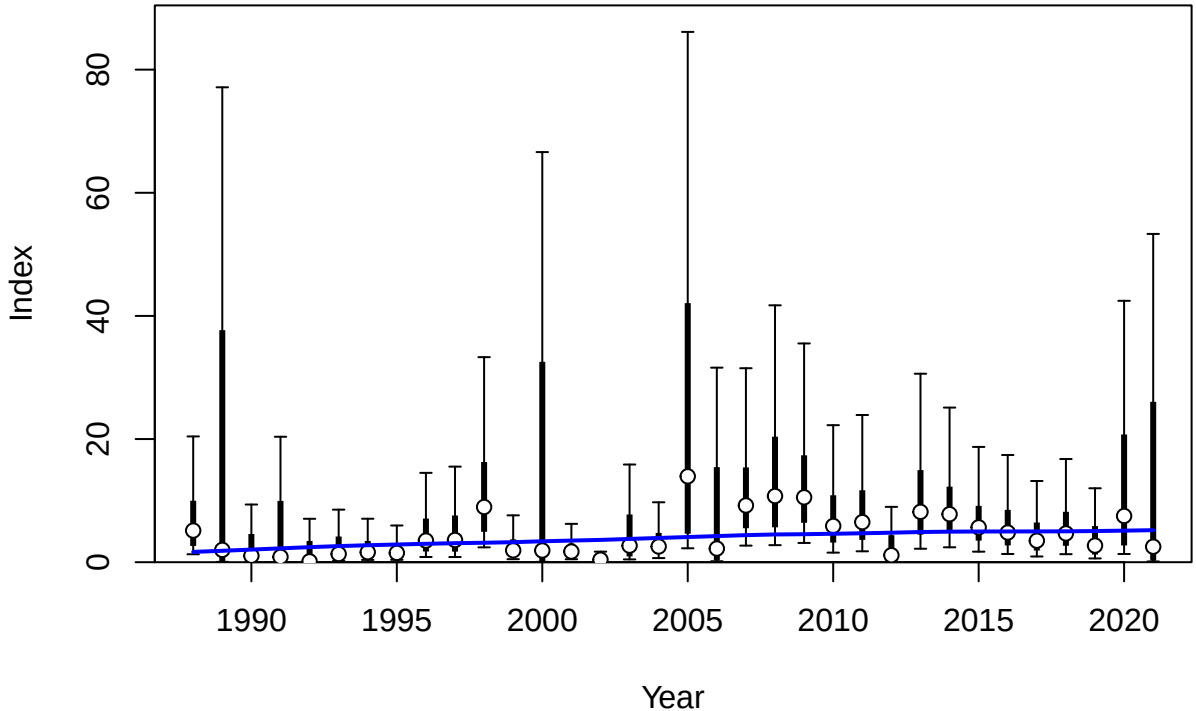

SPR
0.0
0.2
0.4
0.6
0.8
1.0
1985
1990
1995
2000
2005
2010
2015
2020
Year

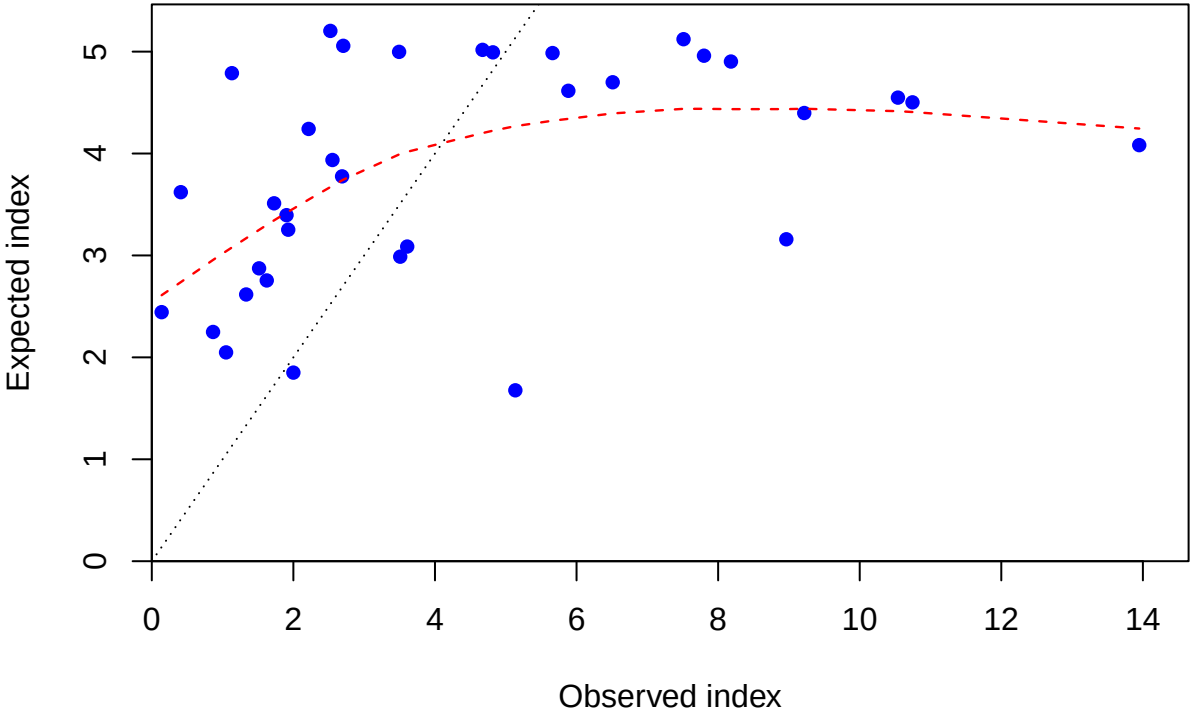

1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1985
1990
1995
2000
2005
2010
2015
2020
Year

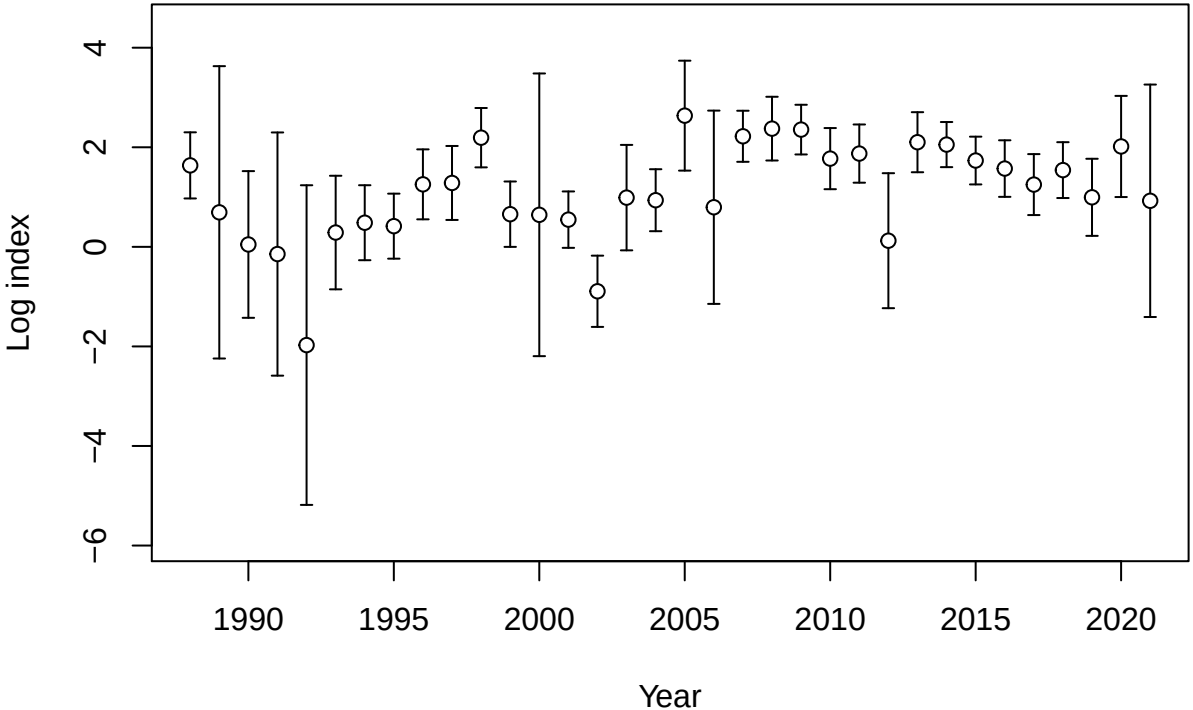

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1985
1990
1995
2000
2005
2010
2015
2020
Year

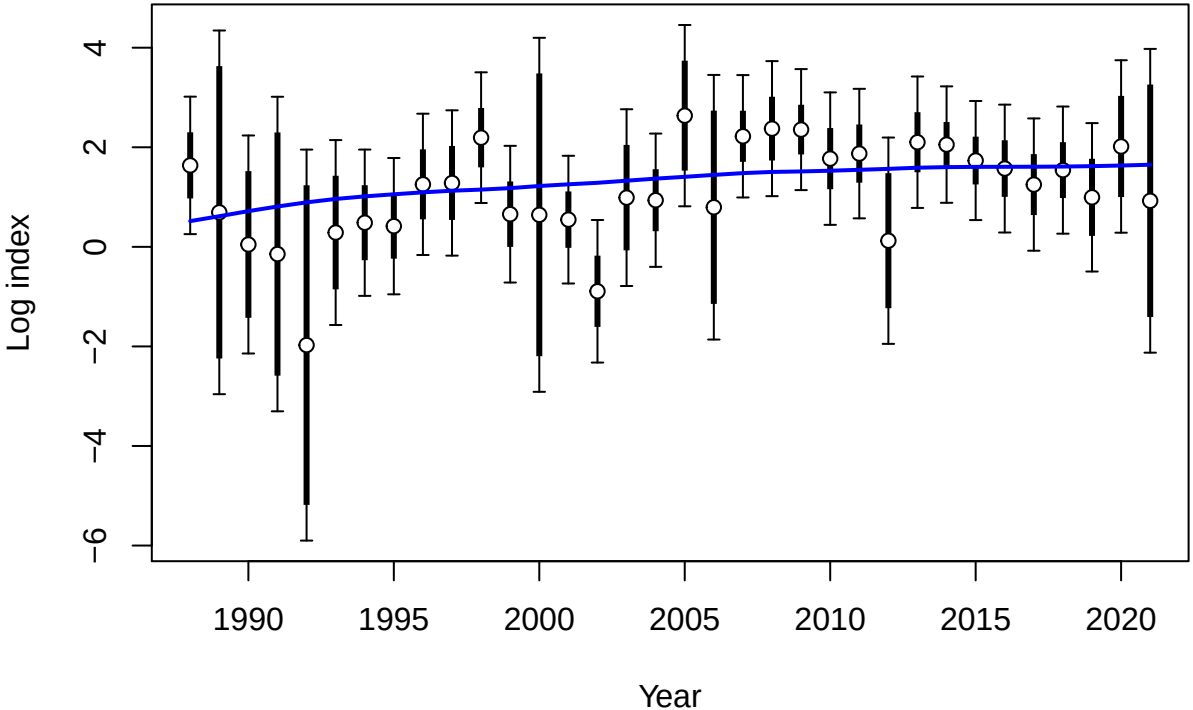

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
Relative spawning output: B/B_MSY
1986
1990
2000
2010
2020
2021

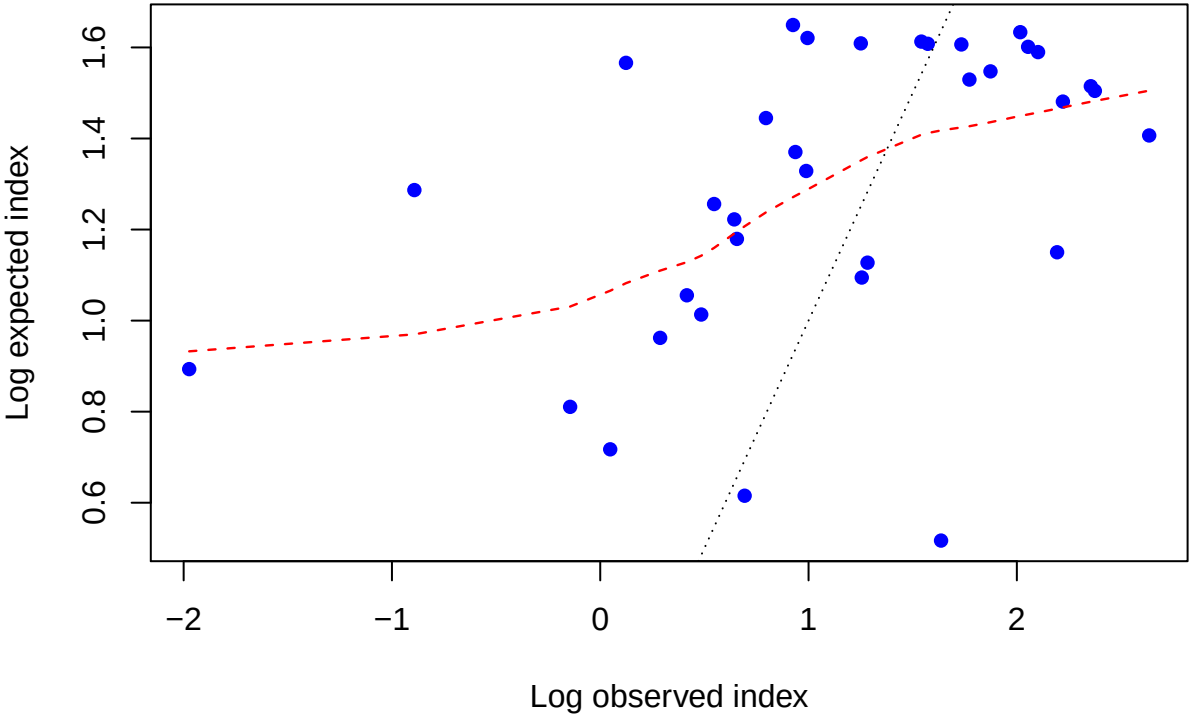

Index
0
20
40
60
80
1990
1995
2000
2005
2010
2015
2020
Year

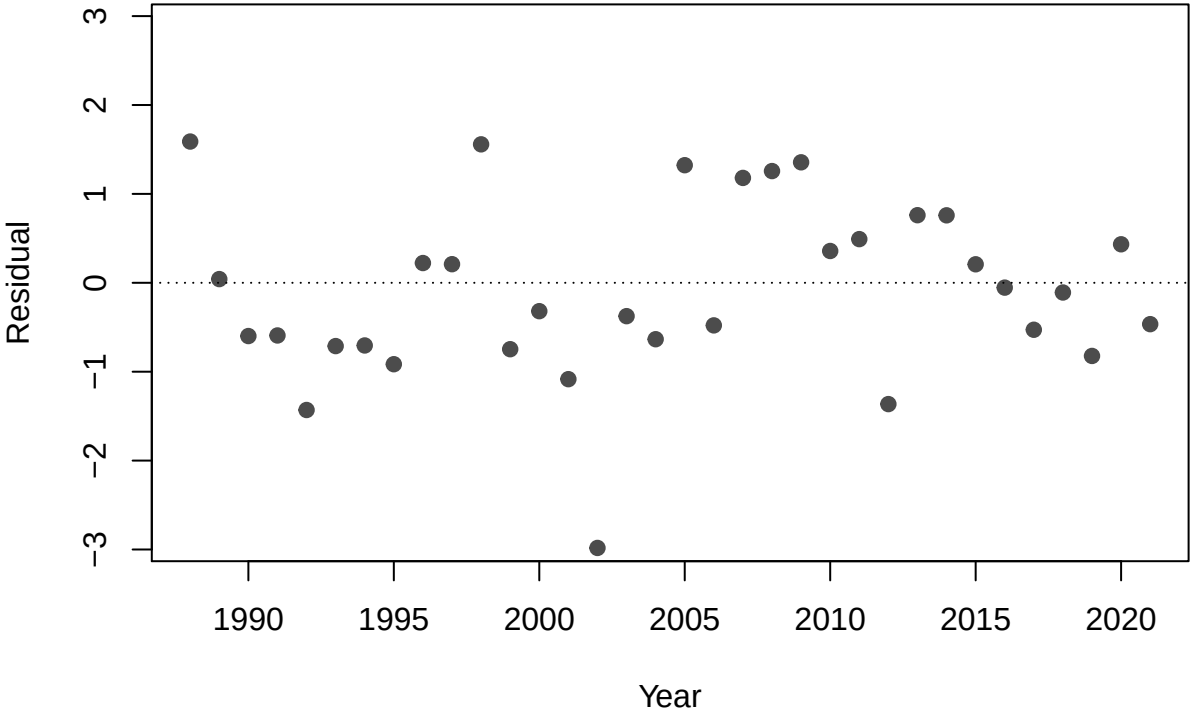

Index
0
20
40
60
80
1990
1995
2000
2005
2010
2015
2020
Year

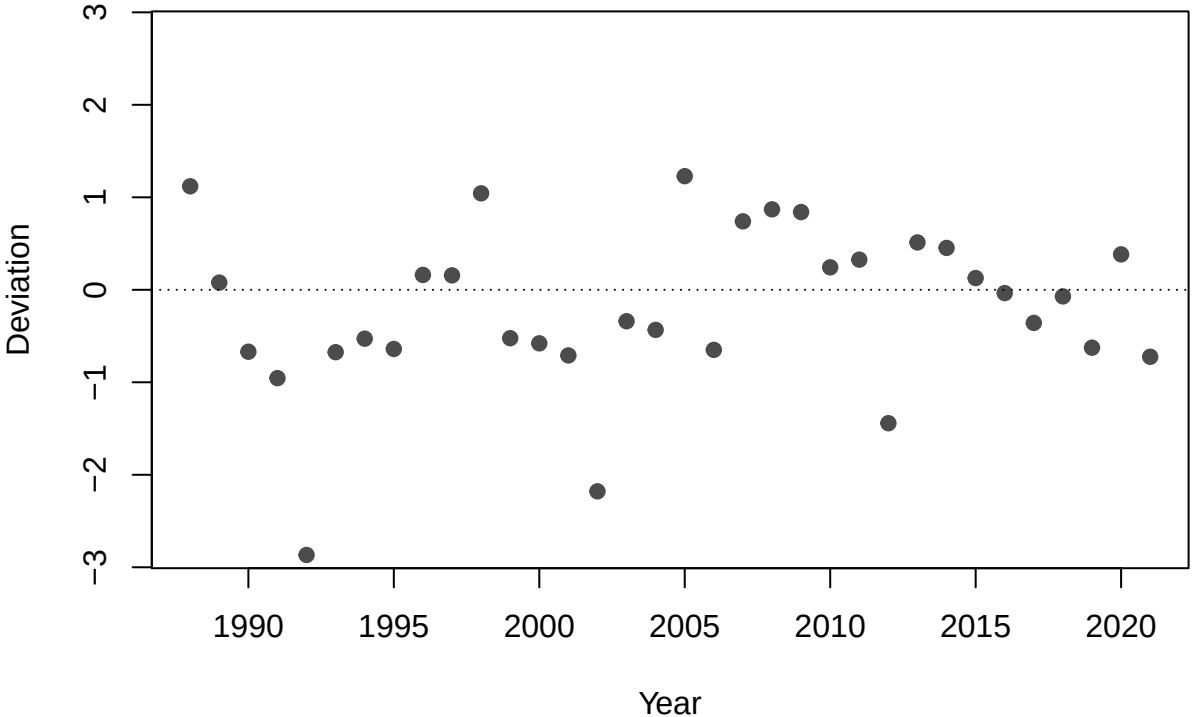

Expected index
Observed index
0
1
2
3
4
5
0
2
4
6
8
10
12
14

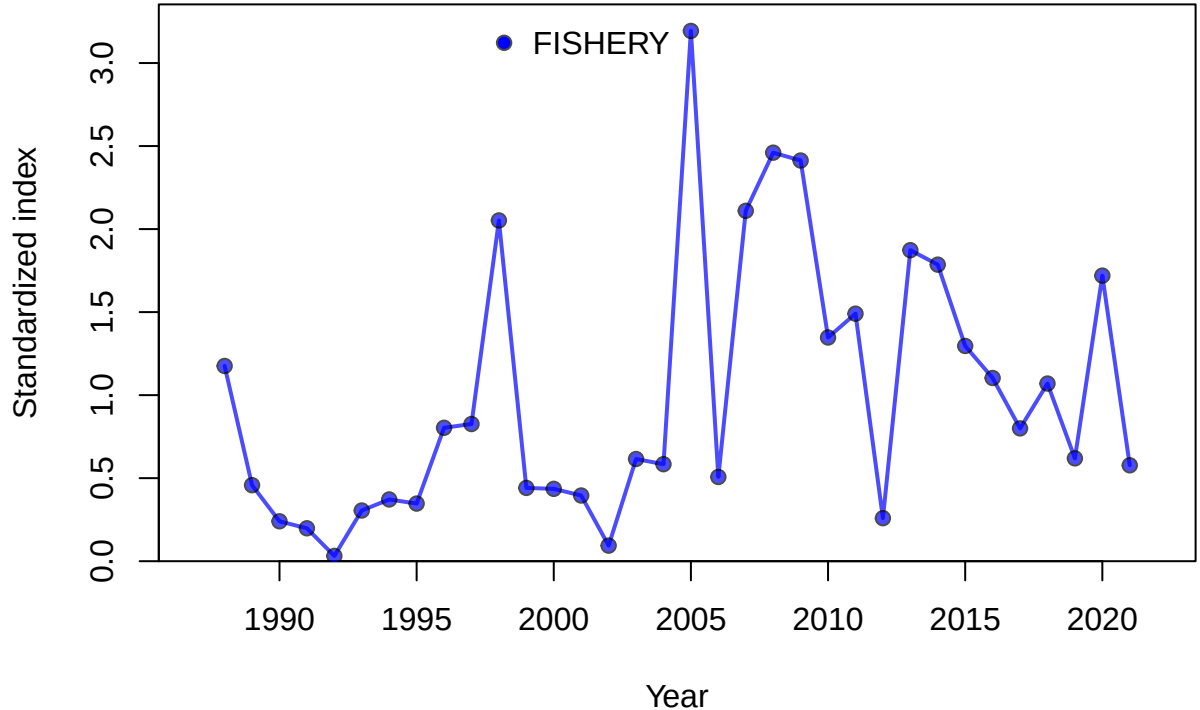

Log index
4
2
0
−2
−4
−6
1990
1995
2000
2005
2010
2015
2020
Year

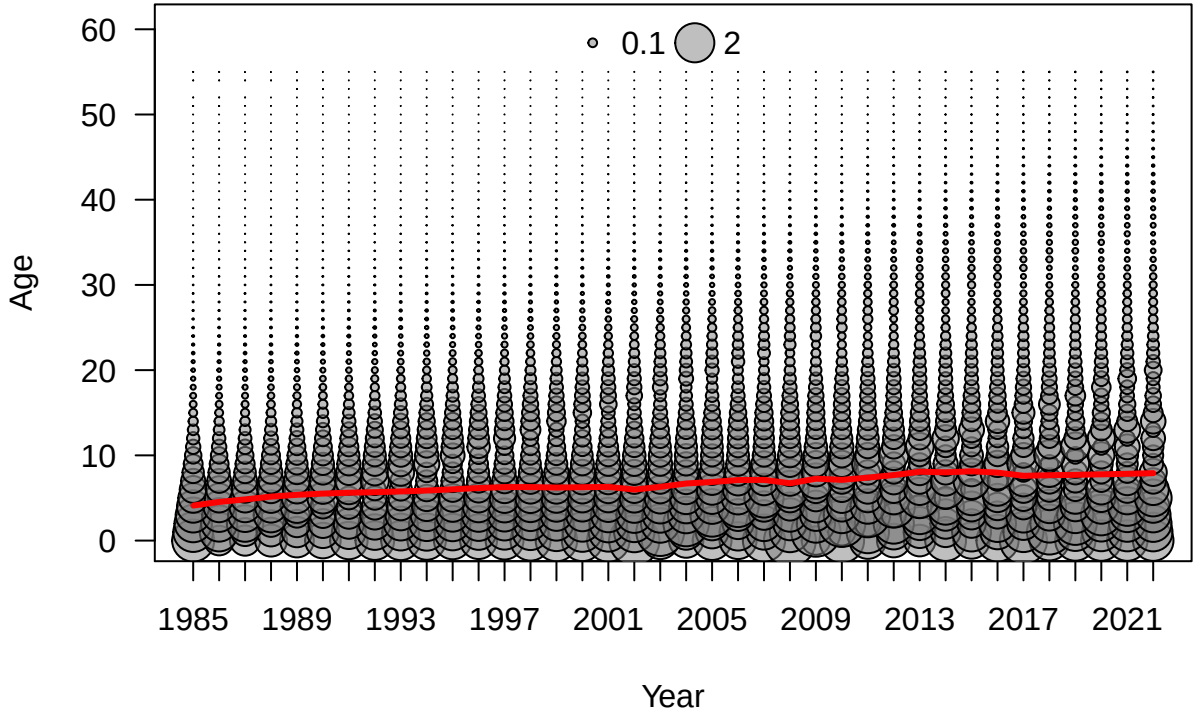

Log index
4
2
0
−2
−4
−6
1990
1995
2000
2005
2010
2015
2020
Year

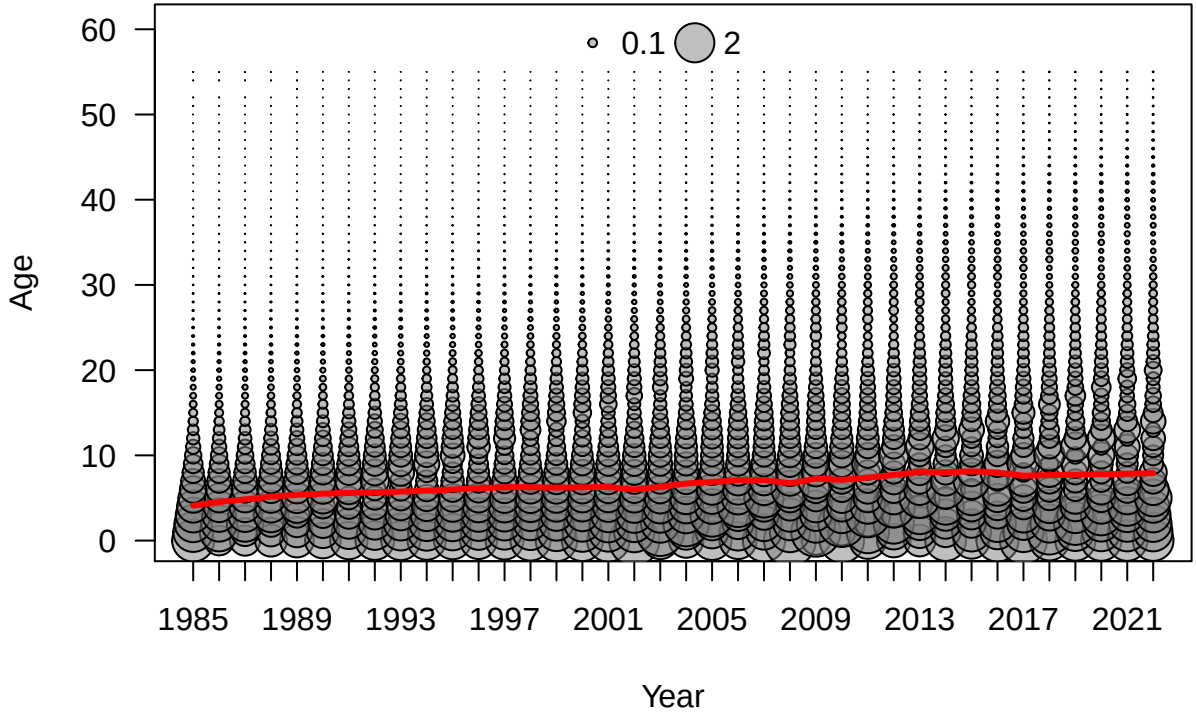

Log expected index
0.6
0.8
1.0
1.2
1.4
1.6
−2
−1
0
1
2
Log observed index

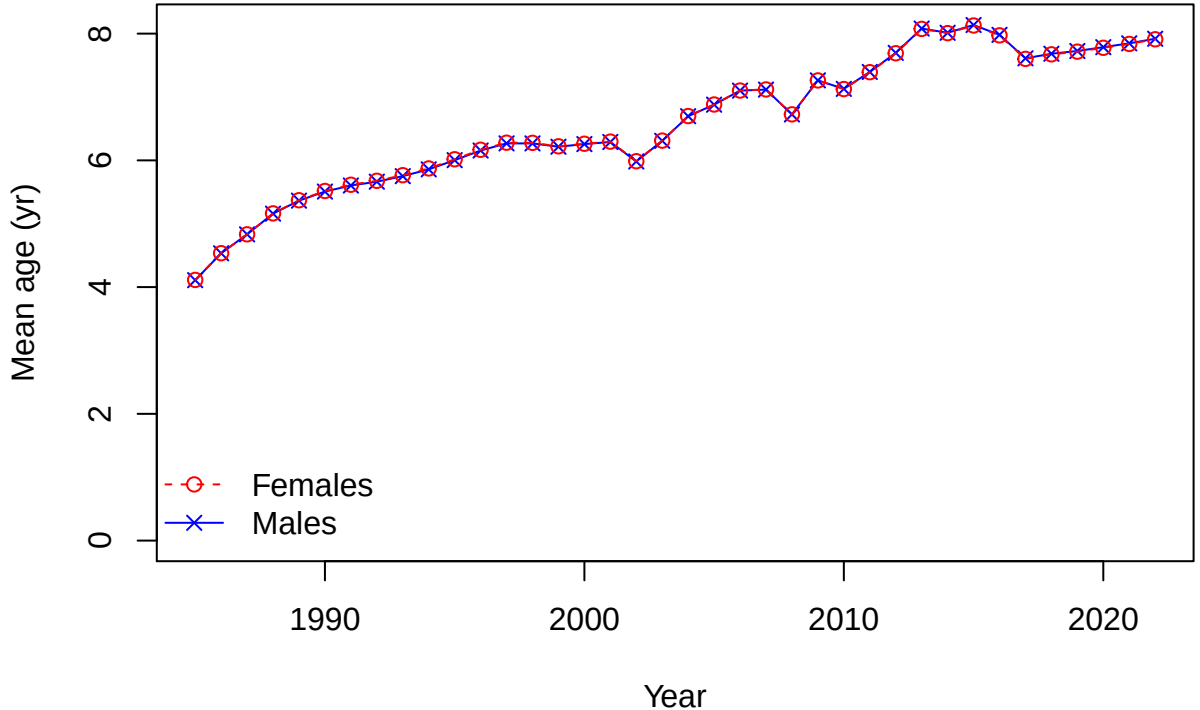

Residual
3
2
1
0
−1
−2
−3
1990
1995
2000
2005
2010
2015
2020
Year

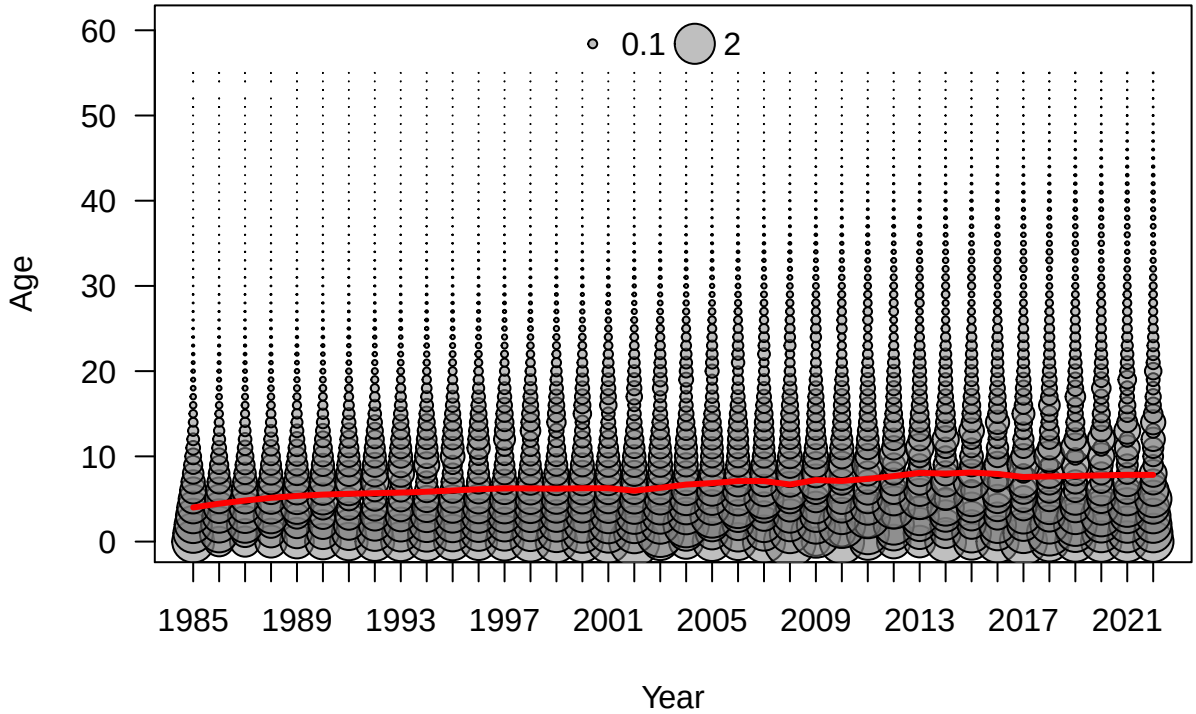

Deviation
3
2
1
0
−1
−2
−3
1990
1995
2000
2005
2010
2015
2020
Year

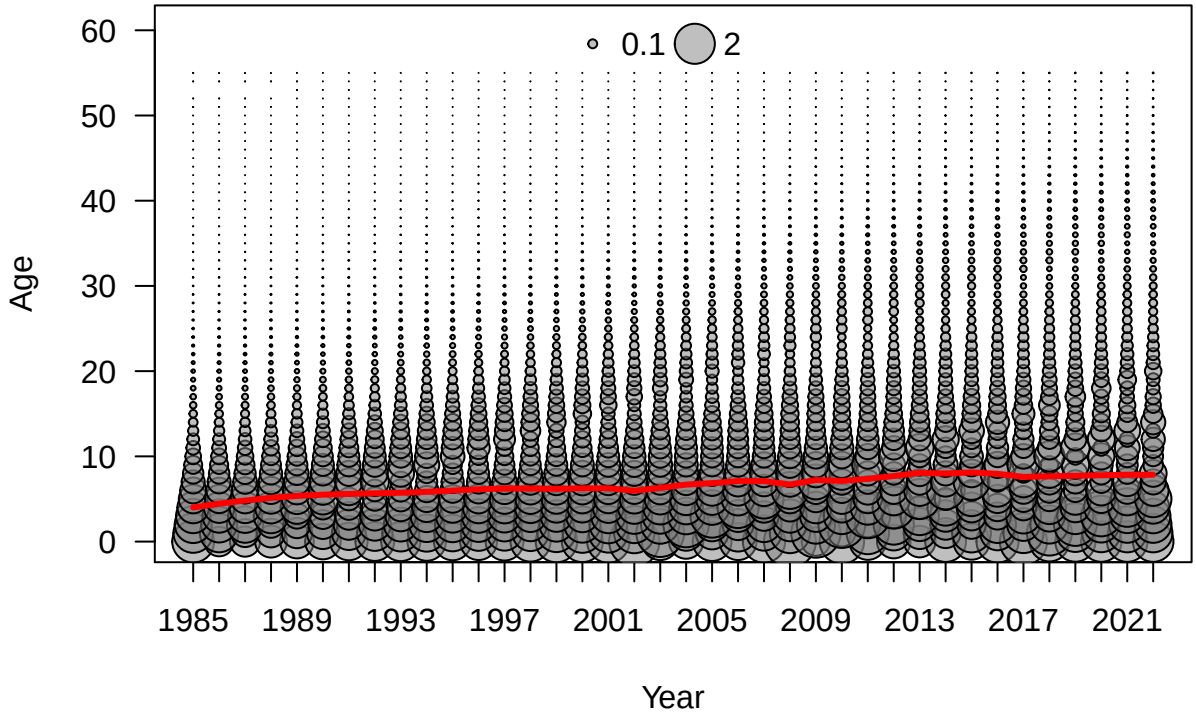

FISHERY
Standardized index
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1990
1995
2000
2005
2010
2015
2020
Year

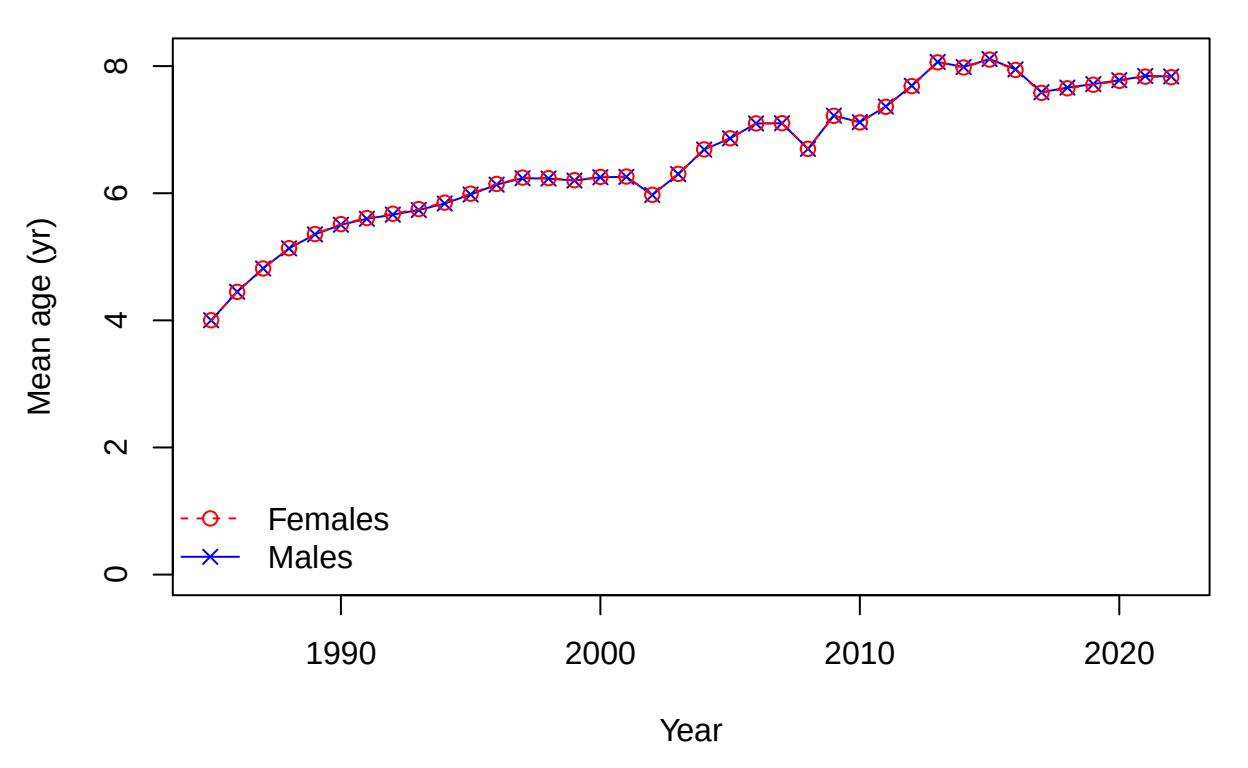

0.1
2
60
50
40
30
20
10
0
Age
1985
1989
1993
1997
2001
2005
2009
2013
2017
2021
Year

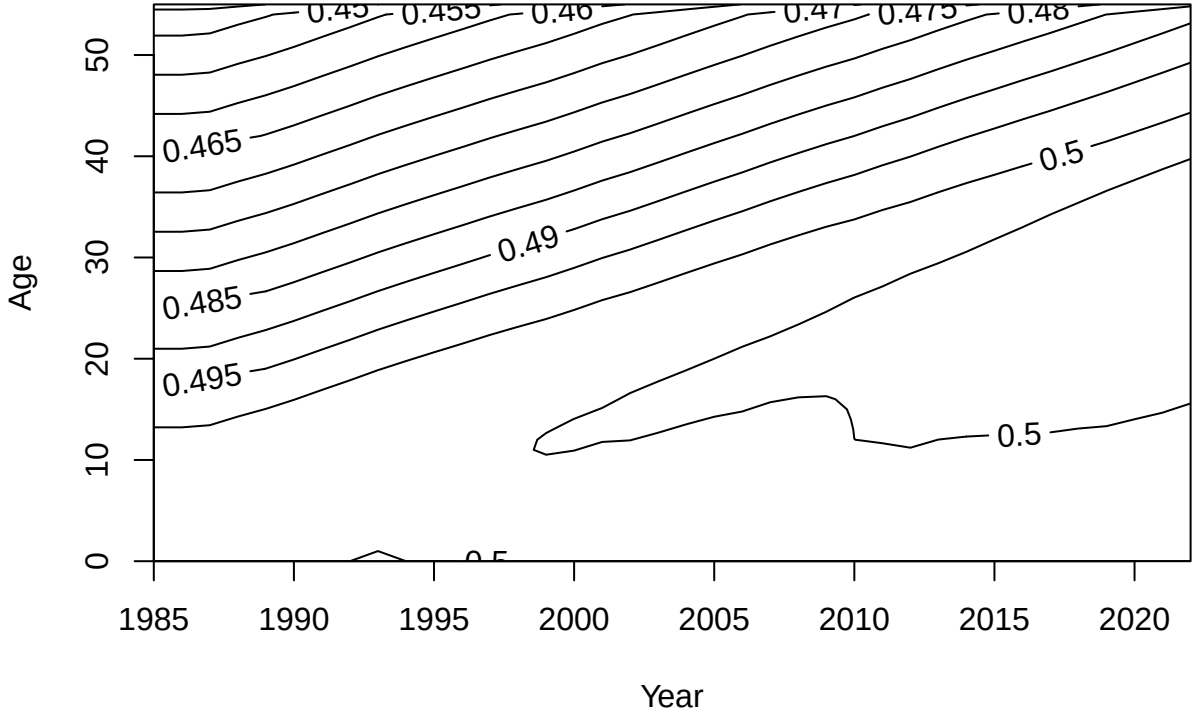

0.1
2
60
50
40
30
20
10
0
Age
1985
1989
1993
1997
2001
2005
2009
2013
2017
2021
Year

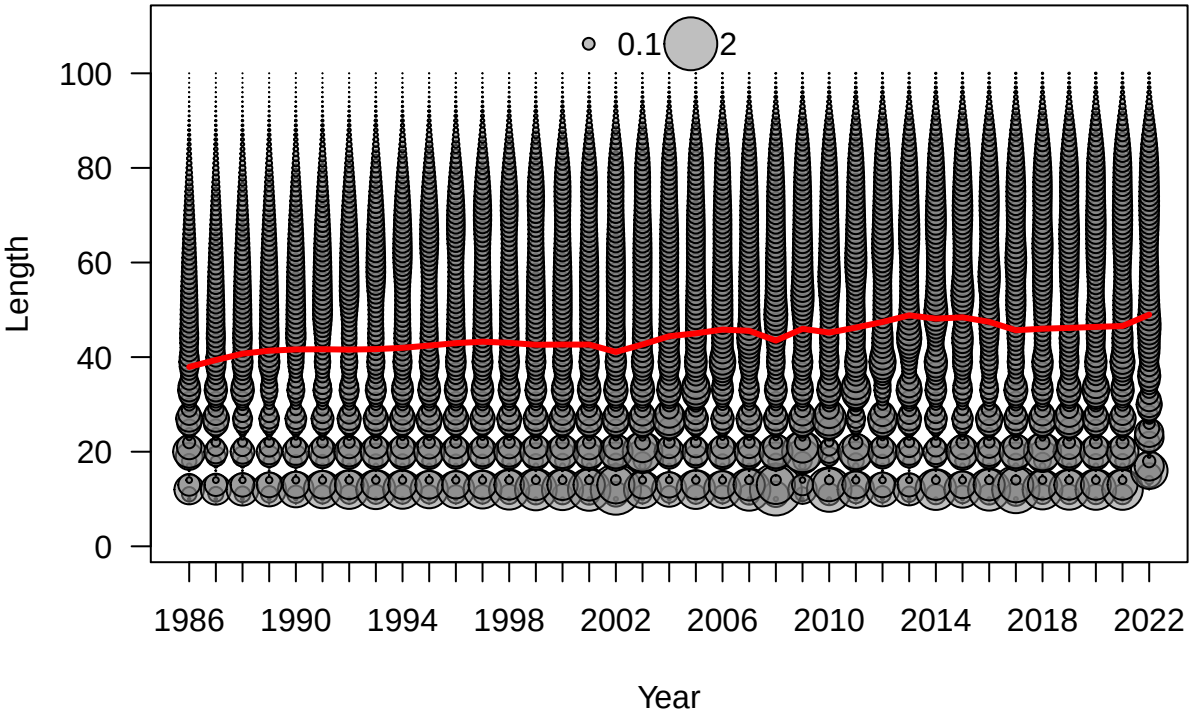

Mean age (yr)
0
2
4
6
8
1990
2000
2010
2020
Year
Females
Males

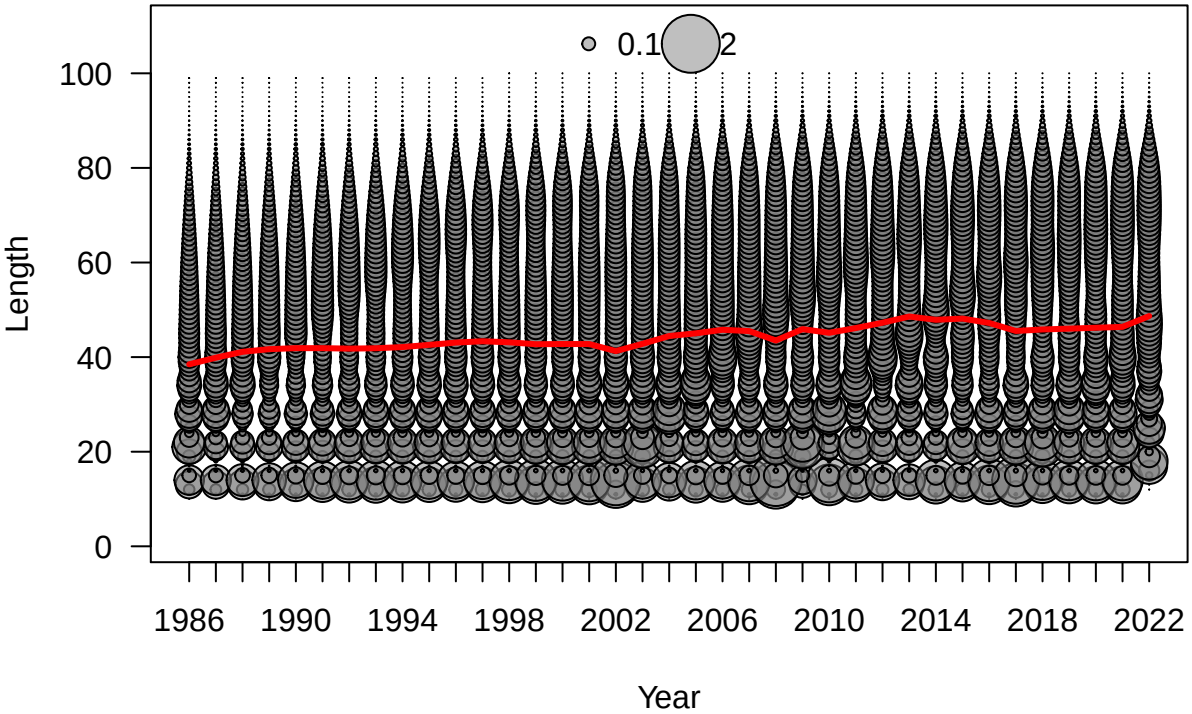

0.1
2
Age
Year
0
10
20
30
40
50
60
1985
1989
1993
1997
2001
2005
2009
2013
2017
2021

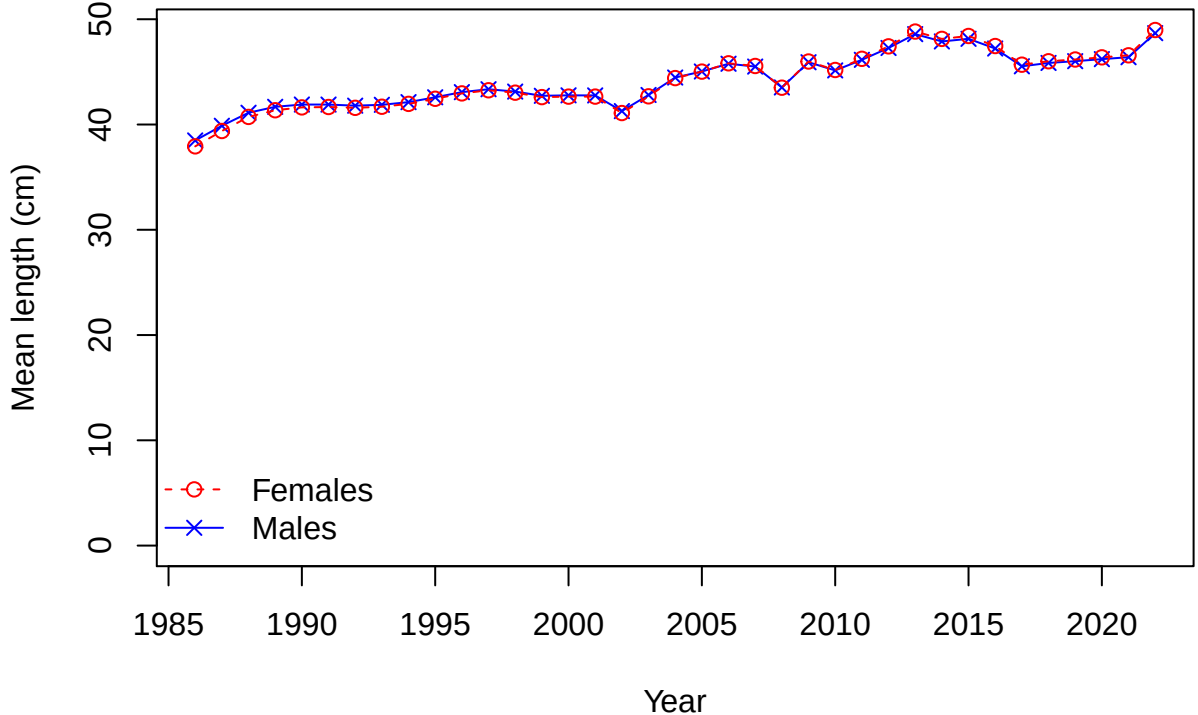

0.1
2
60
50
40
30
20
10
0
Age
1985
1989
1993
1997
2001
2005
2009
2013
2017
2021
Year

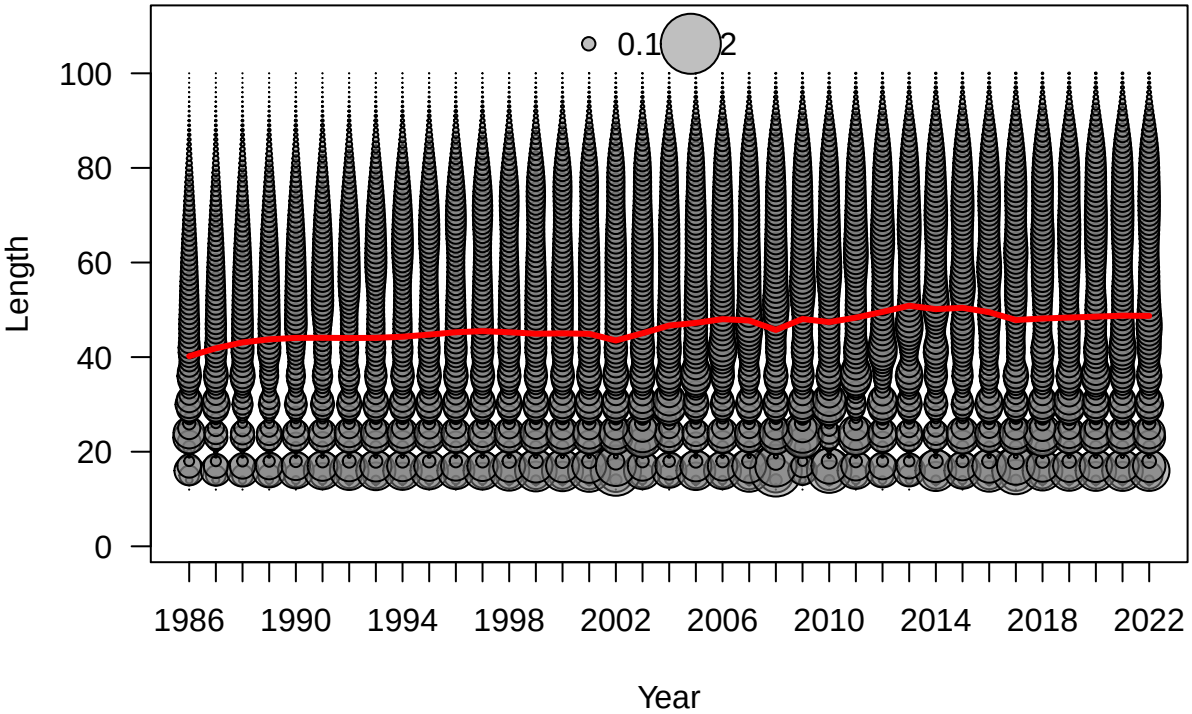

Mean age (yr)
0
2
4
6
8
1990
2000
2010
2020
Year
Females
Males

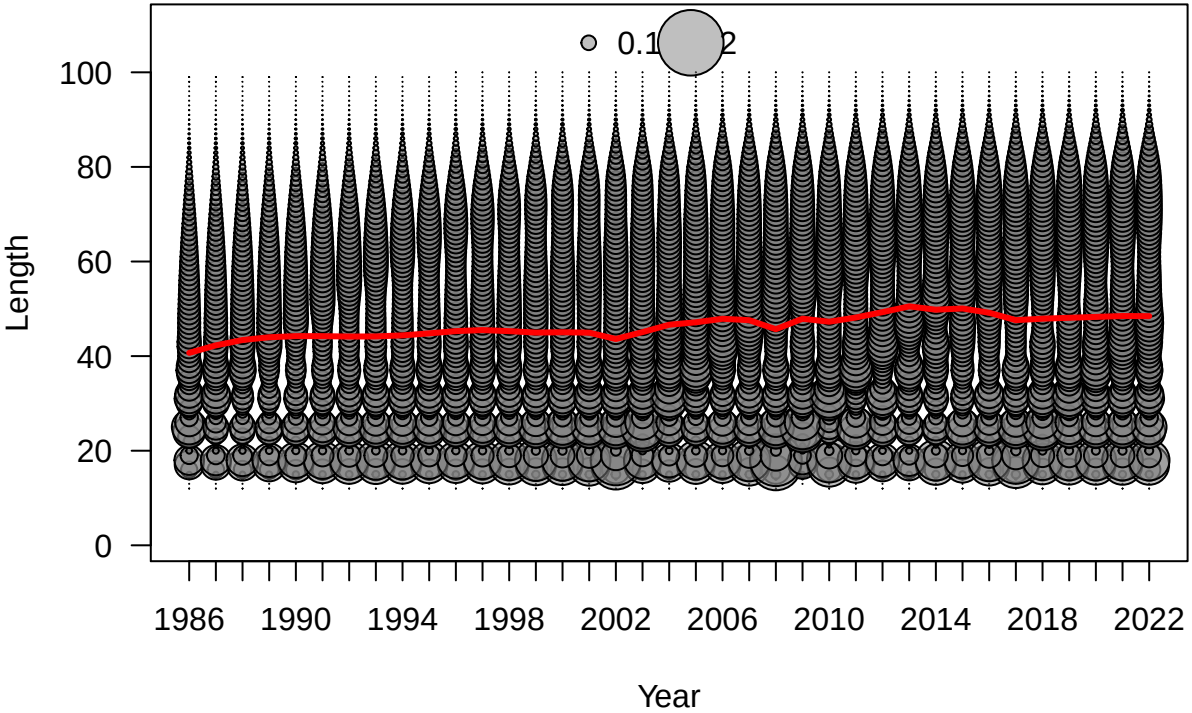

0.45
0.455
0.46
0.47
0.475
0.48
0.465
0.485
0.495
0.49
0.5
0.5
0.5
Age
0
10
20
30
40
50
1985
1990
1995
2000
2005
2010
2015
2020
Year

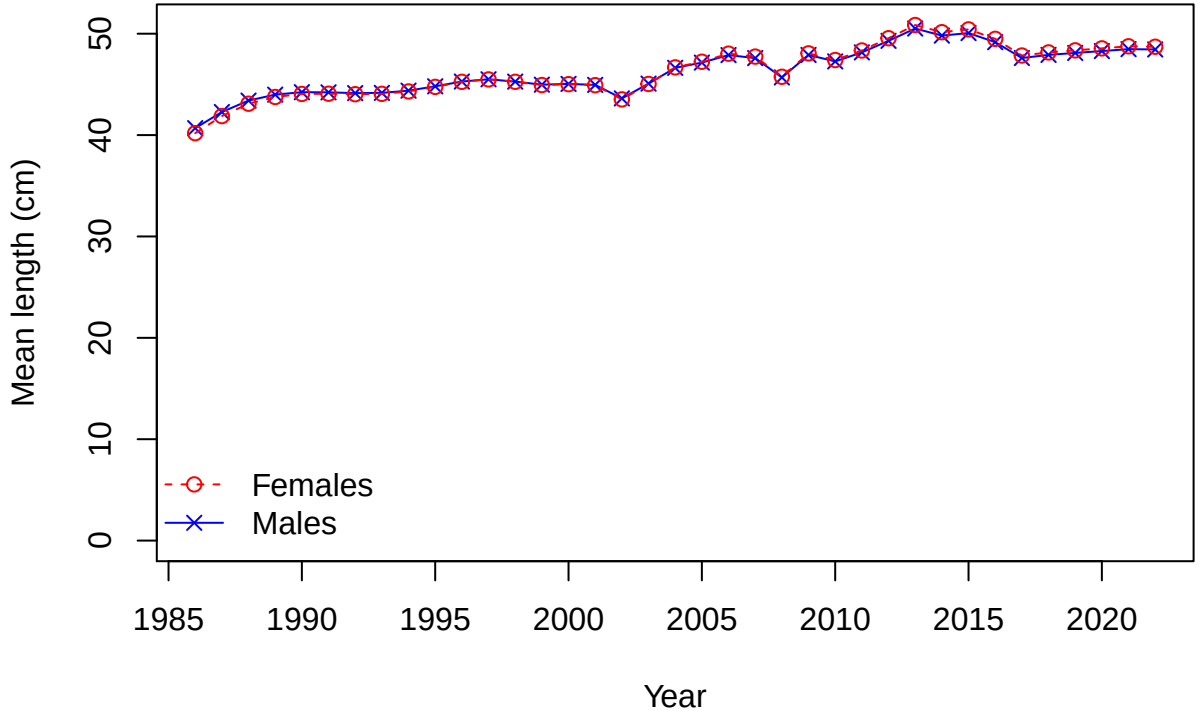

0.1
2
100
80
60
40
20
0
Length
1986
1990
1994
1998
2002
2006
2010
2014
2018
2022
Year

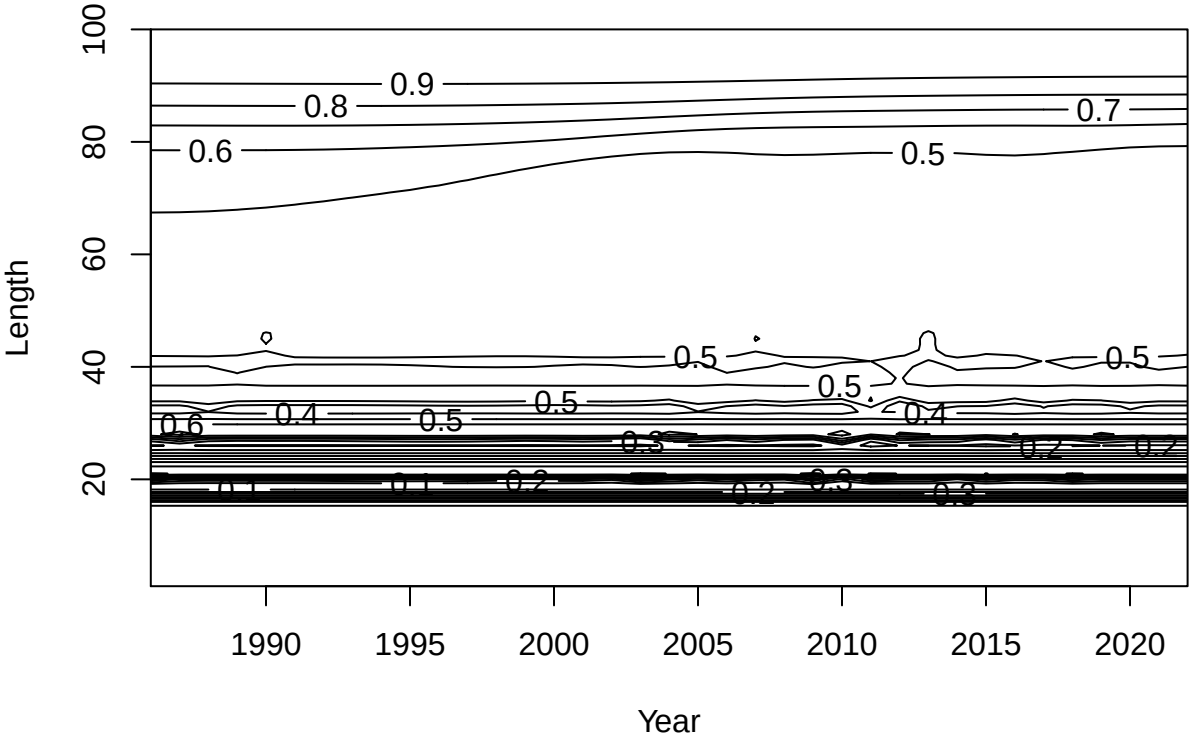

0.1
2
100
80
60
40
20
0
Length
1986
1990
1994
1998
2002
2006
2010
2014
2018
2022
Year

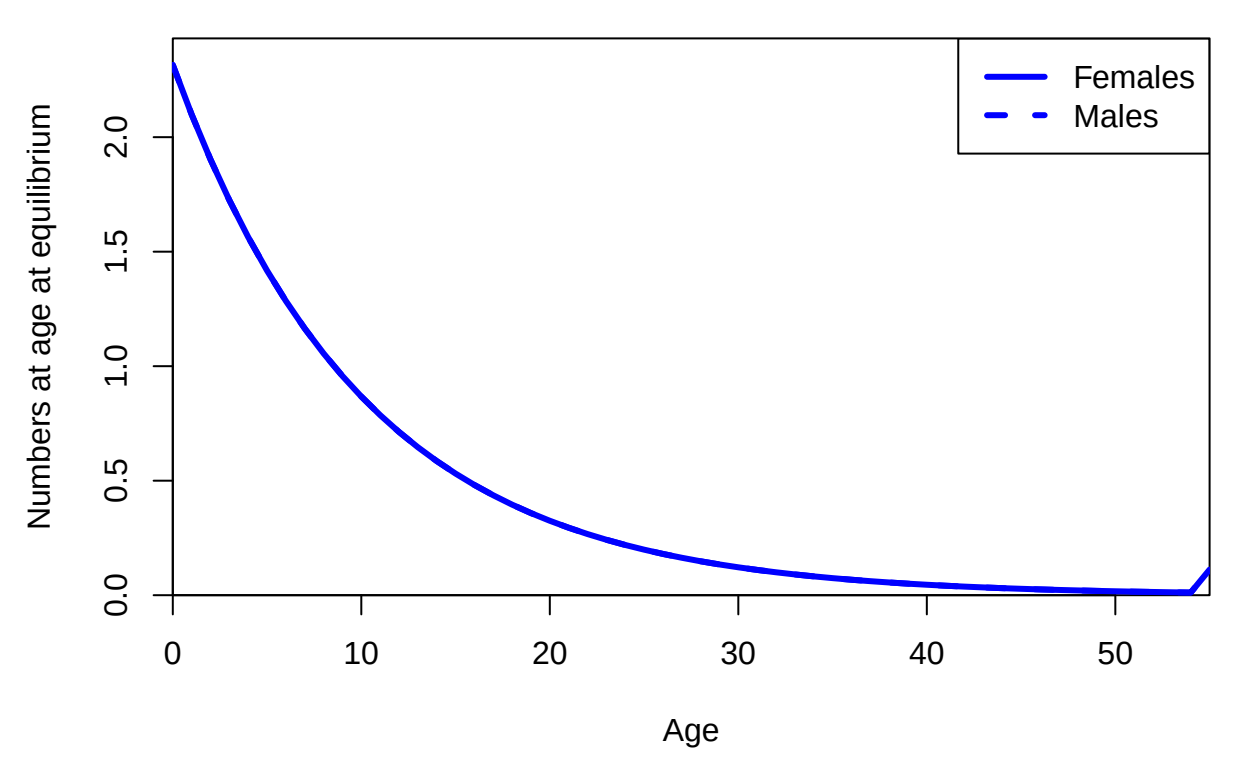

Mean length (cm)
0
10
20
30
40
50
1985
1990
1995
2000
2005
2010
2015
2020
Year
Females
Males

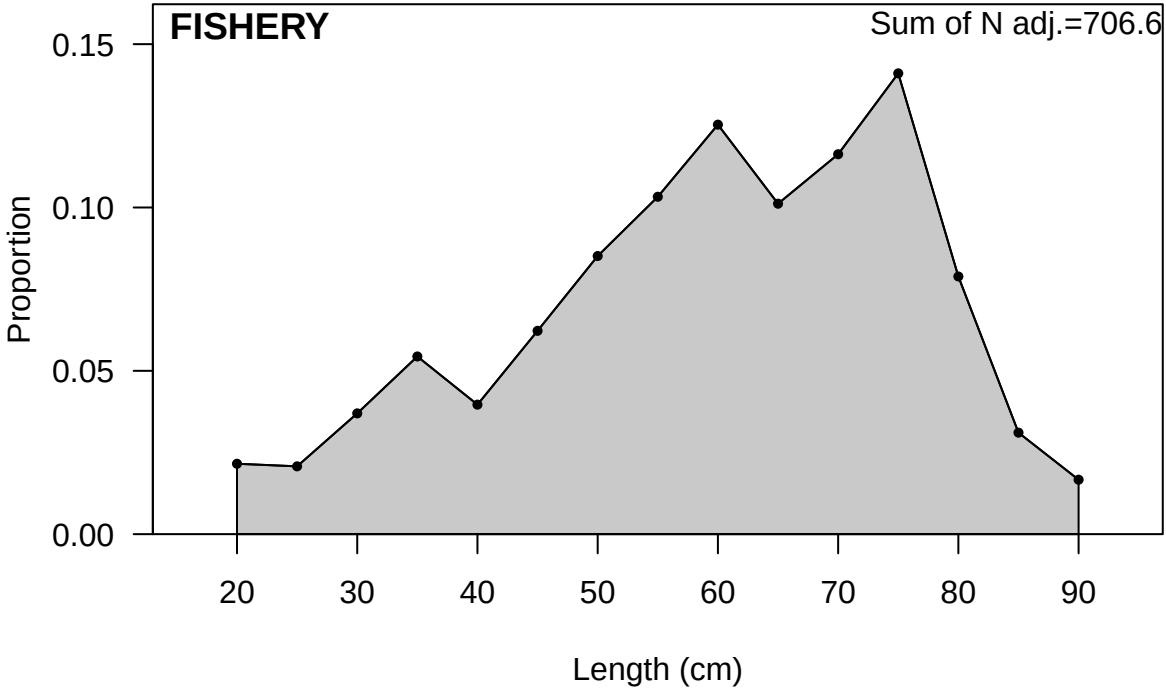

0.1
2
100
80
60
40
20
0
Length
1986
1990
1994
1998
2002
2006
2010
2014
2018
2022
Year

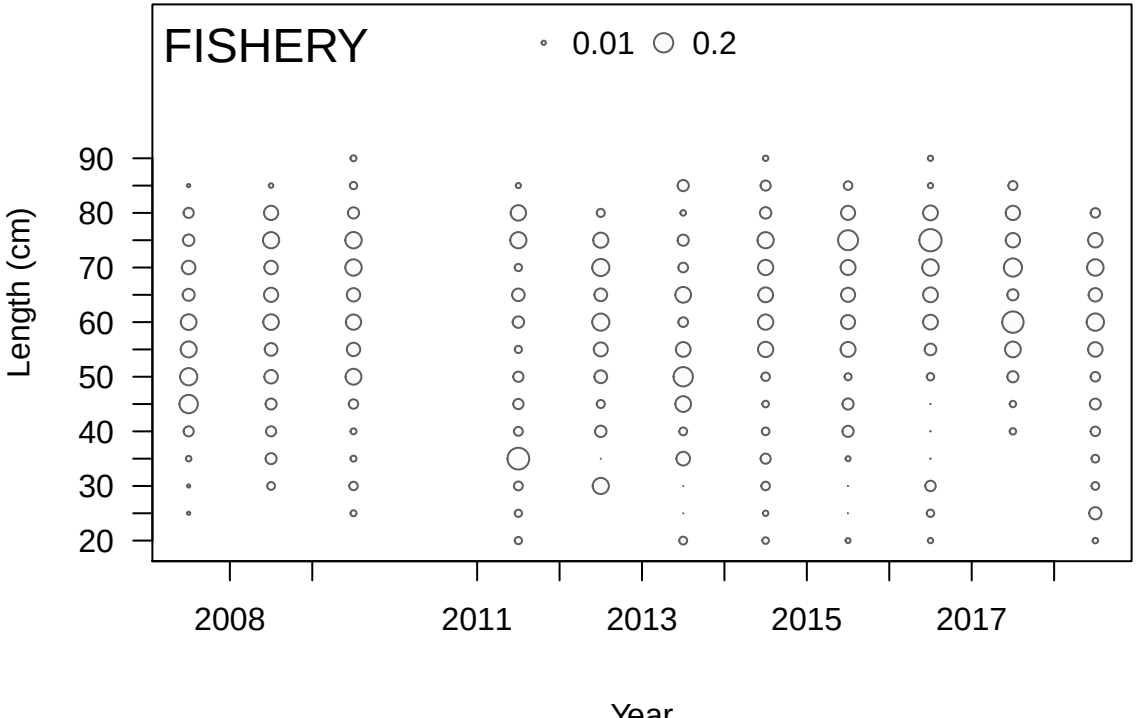

0.1
2
100
80
60
40
20
0
Length
1986
1990
1994
1998
2002
2006
2010
2014
2018
2022
Year

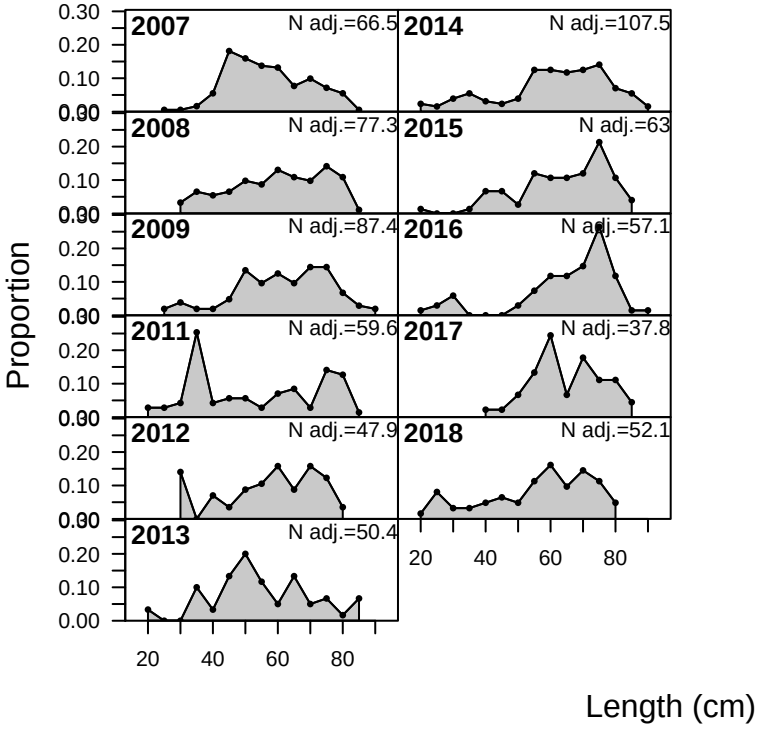

Mean length (cm)
0
10
20
30
40
50
1985
1990
1995
2000
2005
2010
2015
2020
Year
Females
Males

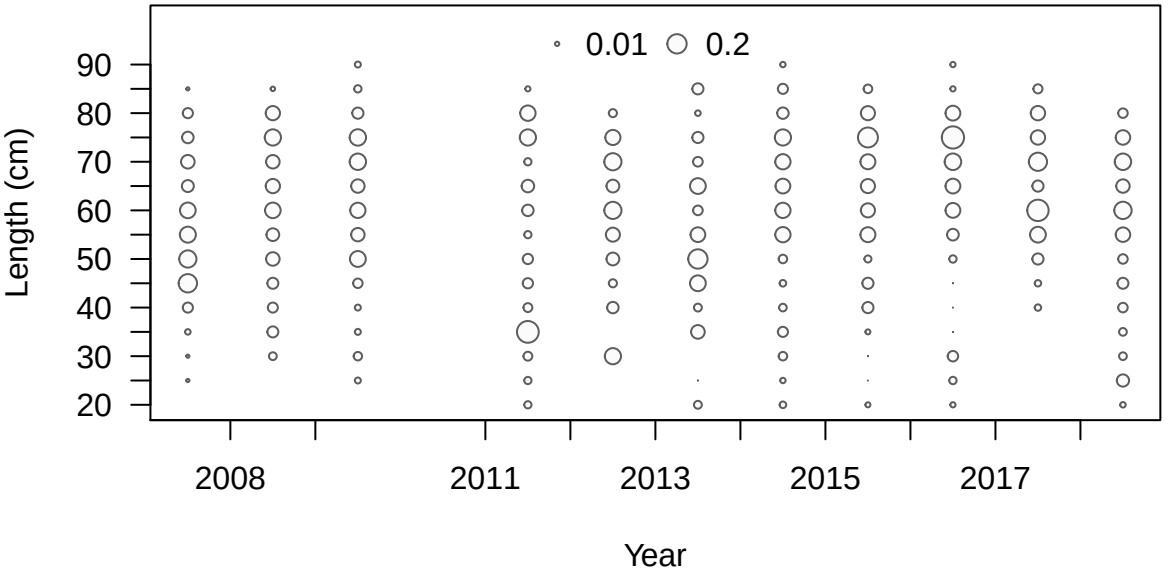

Length
Year
100
80
60
40
20
1990
1995
2000
2005
2010
2015
2020
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1

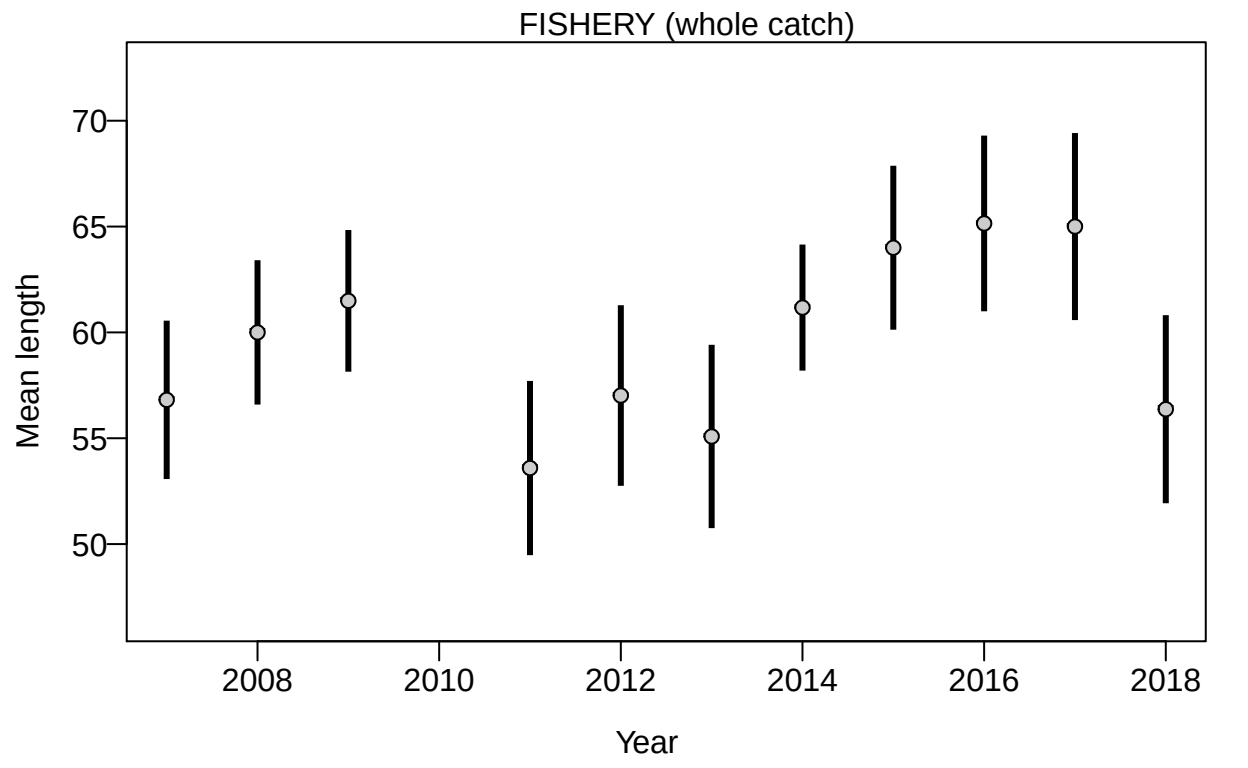

Numbers at age at equilibrium
0.0
0.5
1.0
1.5
2.0
0
10
20
30
40
50
Age
Females
Males

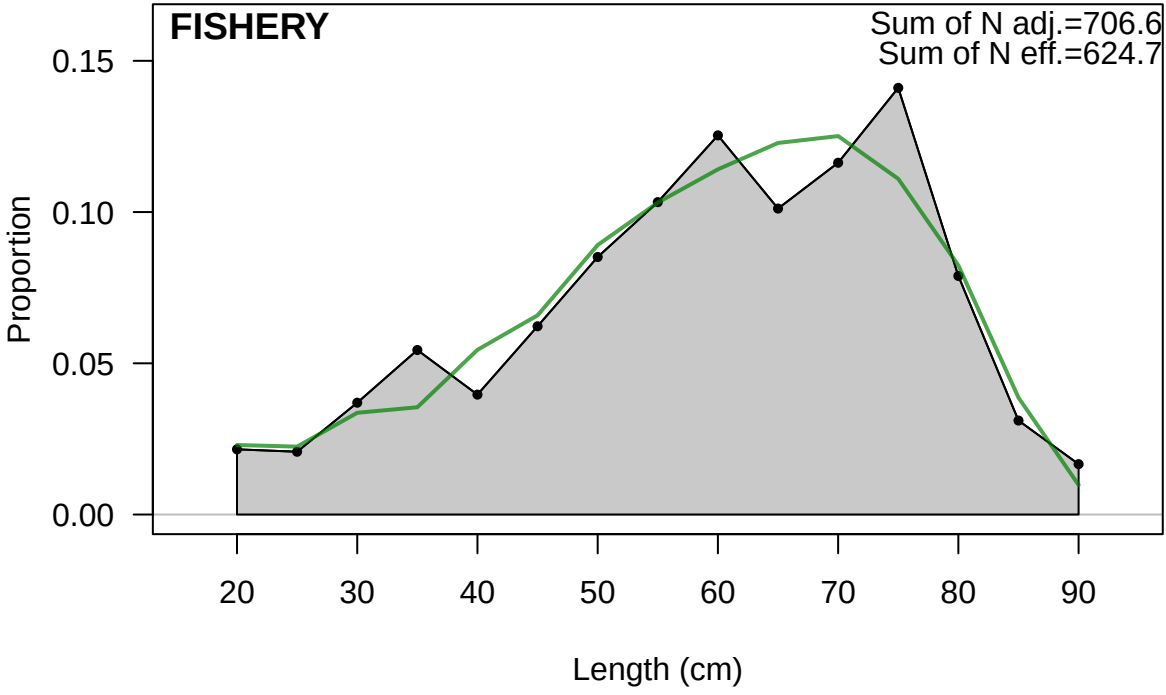

FISHERY
Sum of N adj.=706.6
0.15
0.10
0.05
0.00
Proportion
20
30
40
50
60
70
80
90
Length (cm)

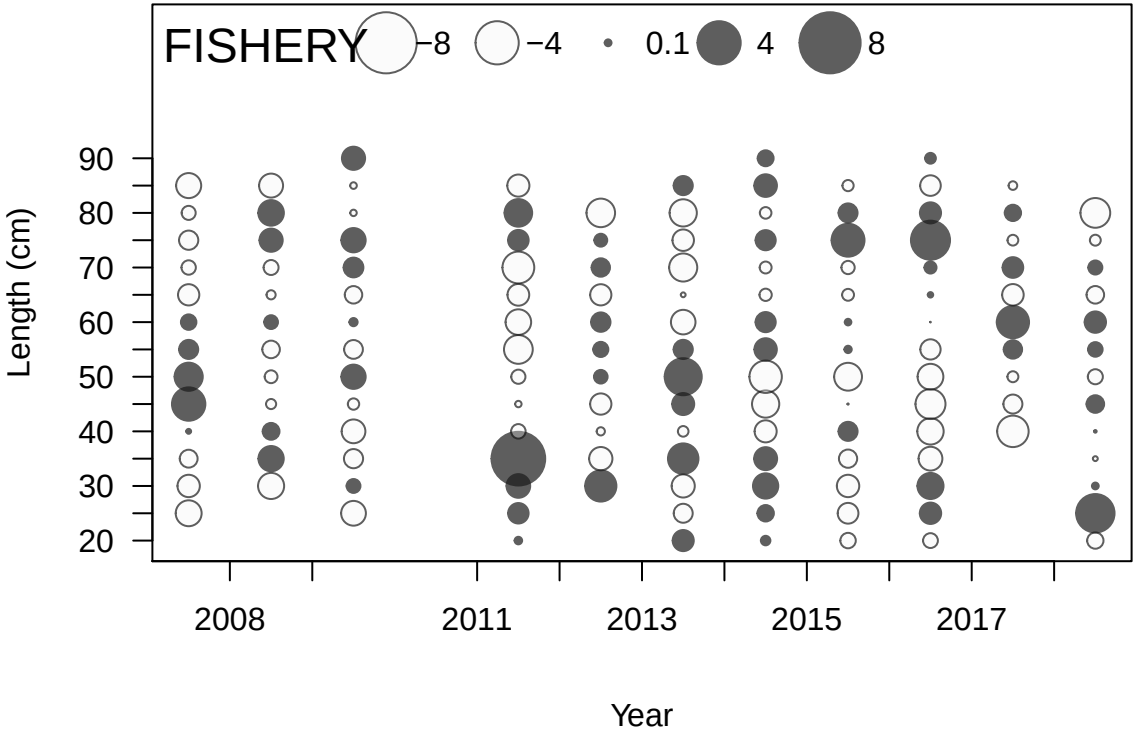

FISHERY
0.01
0.2
Length (cm)
90
80
70
60
50
40
30
20
2008
2011
2013
2015
2017
Year

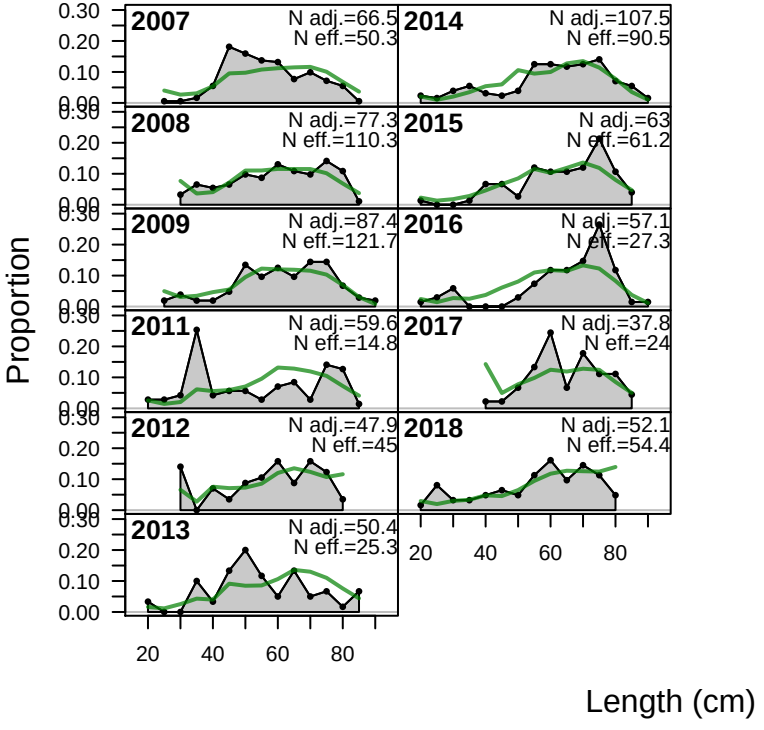

2007
N adj.=66.5
2014
N adj.=107.5
2008
N adj.=77.3
2015
N adj.=63
2009
N adj.=87.4
2016
N adj.=57.1
2011
N adj.=59.6
2017
N adj.=37.8
2012
N adj.=47.9
2018
N adj.=52.1
2013
N adj.=50.4
0.30
0.20
0.10
0.00
20
40
60
80
Proportion
Length (cm)

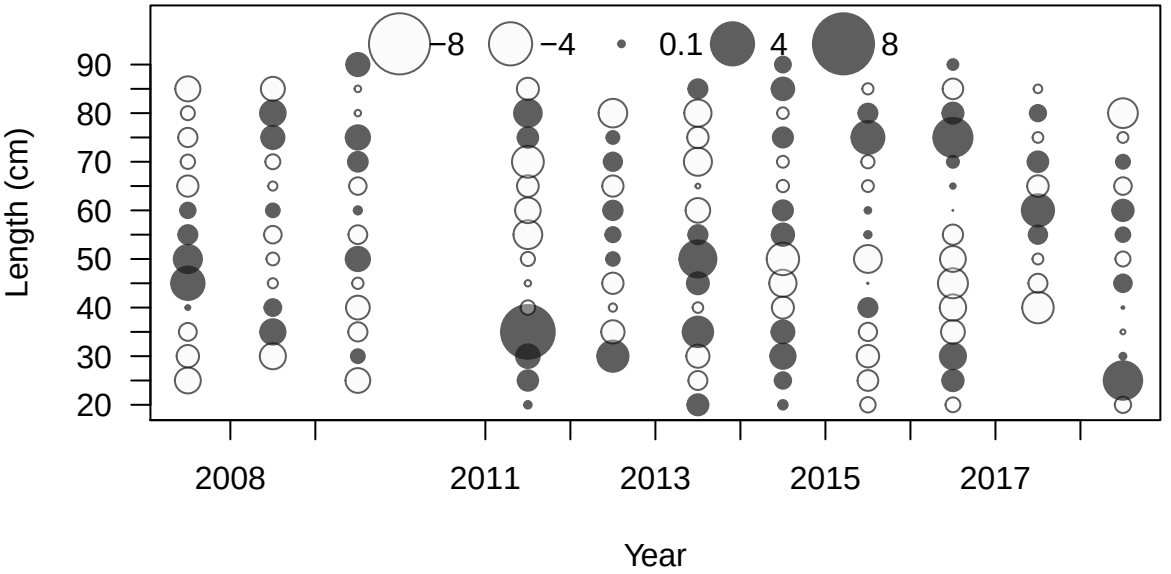

0.01
0.2
Length (cm)
90
80
70
60
50
40
30
20
2008
2011
2013
2015
2017
Year

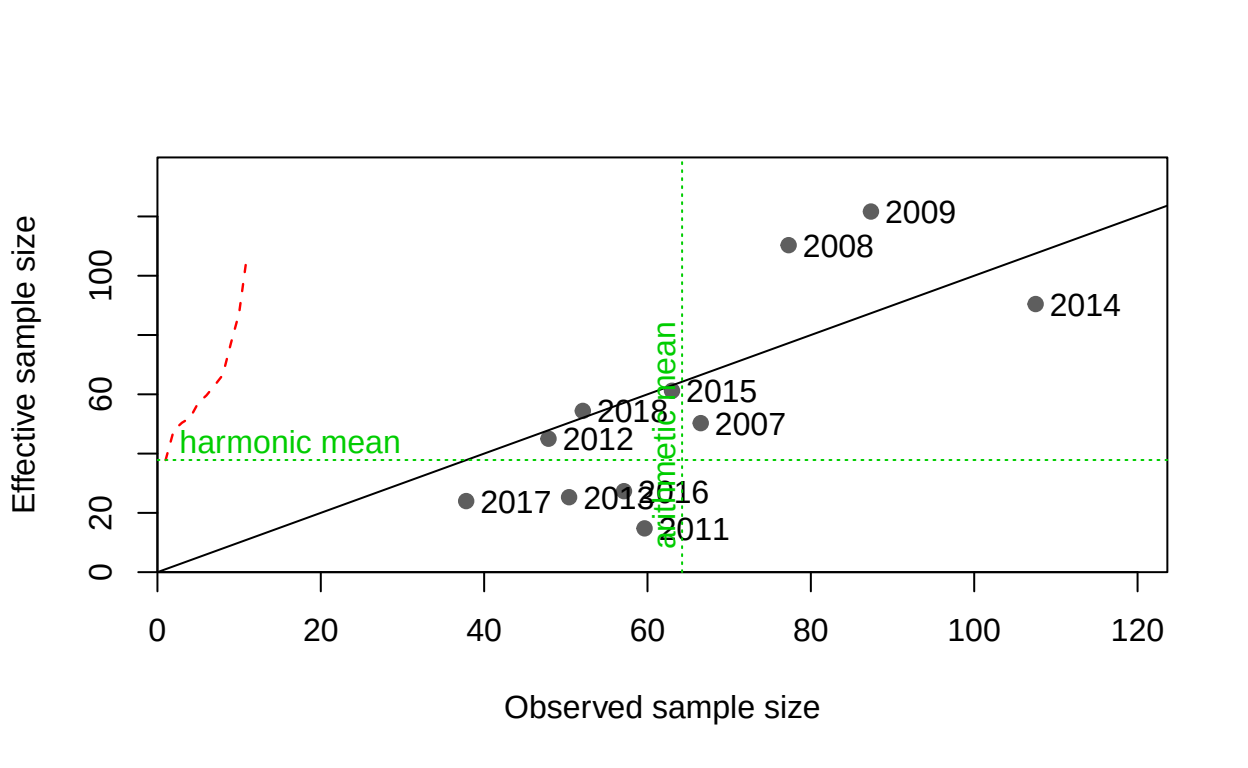

FISHERY (whole catch)
Mean length
70
65
60
55
50
2008
2010
2012
2014
2016
2018
Year

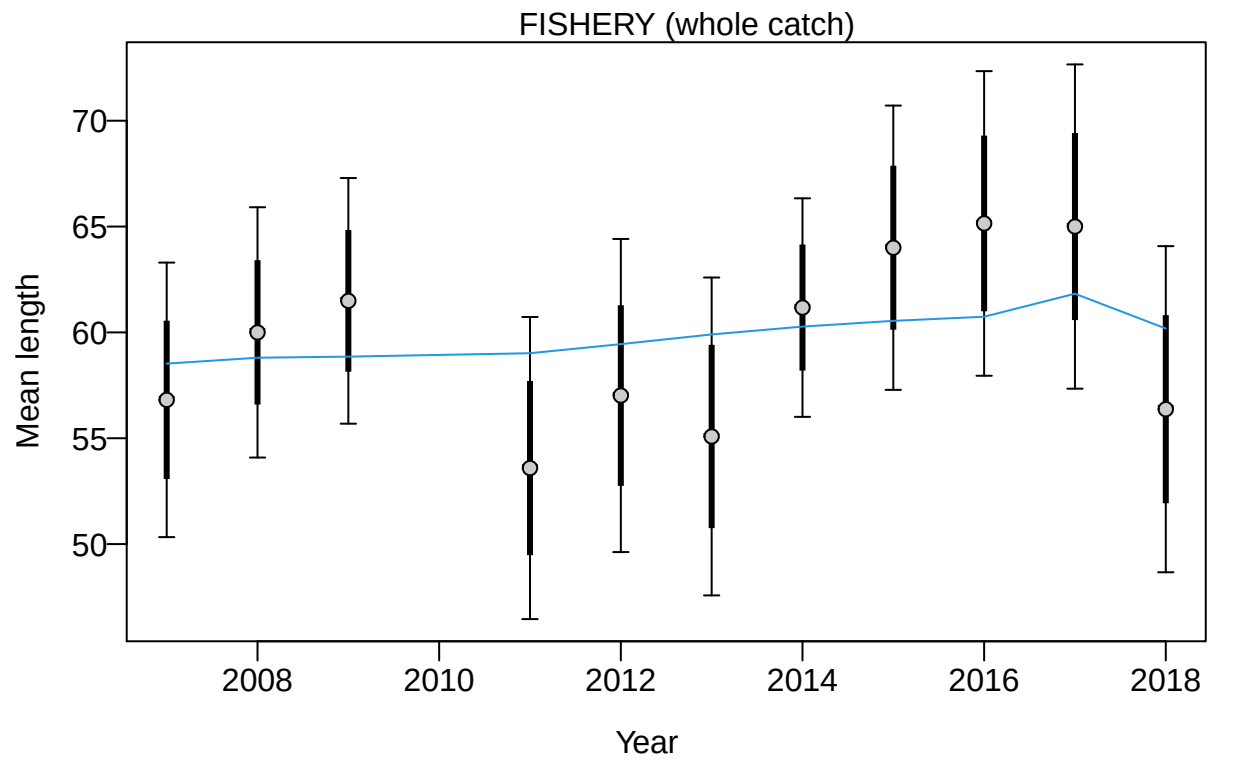

FISHERY
Sum of N adj.=706.6
Sum of N eff.=624.7
Proportion
0.15
0.10
0.05
0.00
20
30
40
50
60
70
80
90
Length (cm)

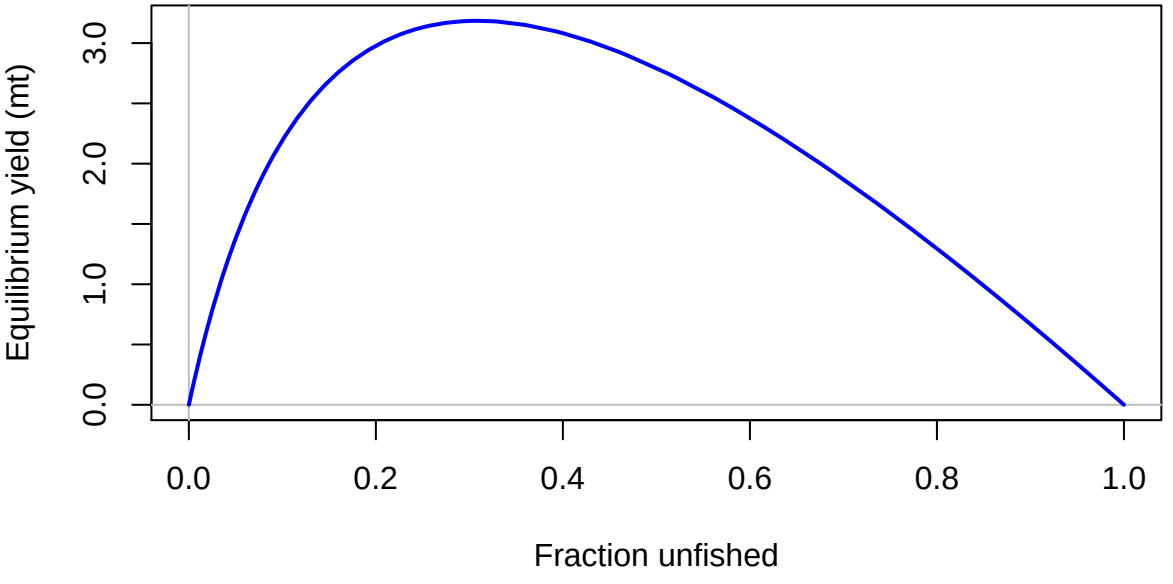

FISHERY
−8
−4
0.1
4
8
Length (cm)
90
80
70
60
50
40
30
20
2008
2011
2013
2015
2017
Year

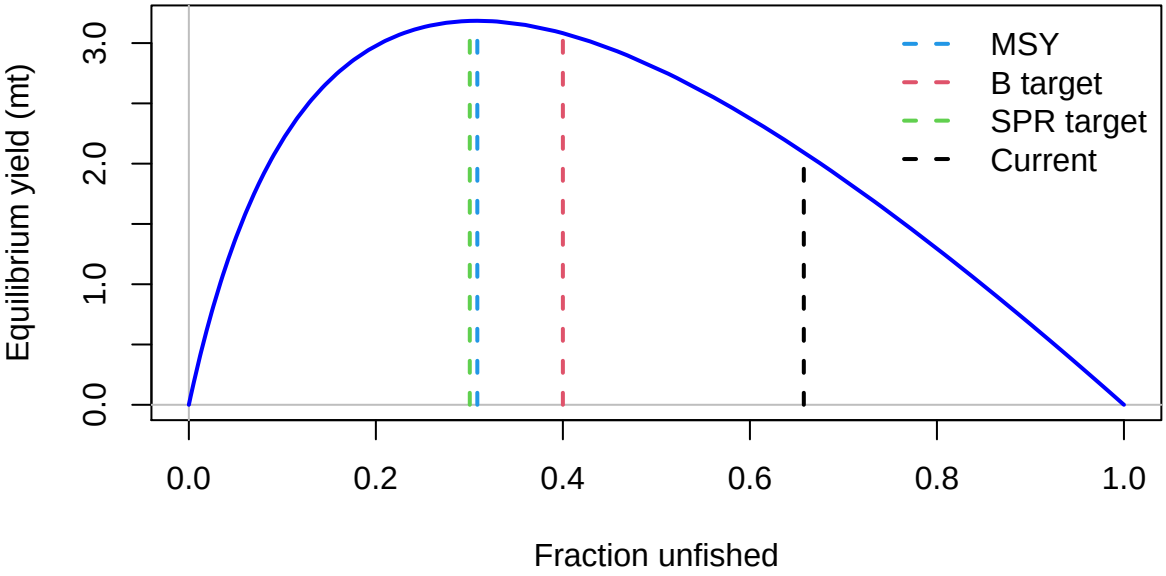

2007
N adj.=66.5
N eff.=50.3
2014
N adj.=107.5
N eff.=90.5
2008
N adj.=77.3
N eff.=110.3
2015
N adj.=63
N eff.=61.2
2009
N adj.=87.4
N eff.=121.7
2016
N adj.=57.1
N eff.=27.3
2011
N adj.=59.6
N eff.=14.8
2017
N adj.=37.8
N eff.=24
2012
N adj.=47.9
N eff.=45
2018
N adj.=52.1
N eff.=54.4
2013
N adj.=50.4
N eff.=25.3
Proportion
0.00
0.10
0.20
0.30
20
40
60
80
Length (cm)

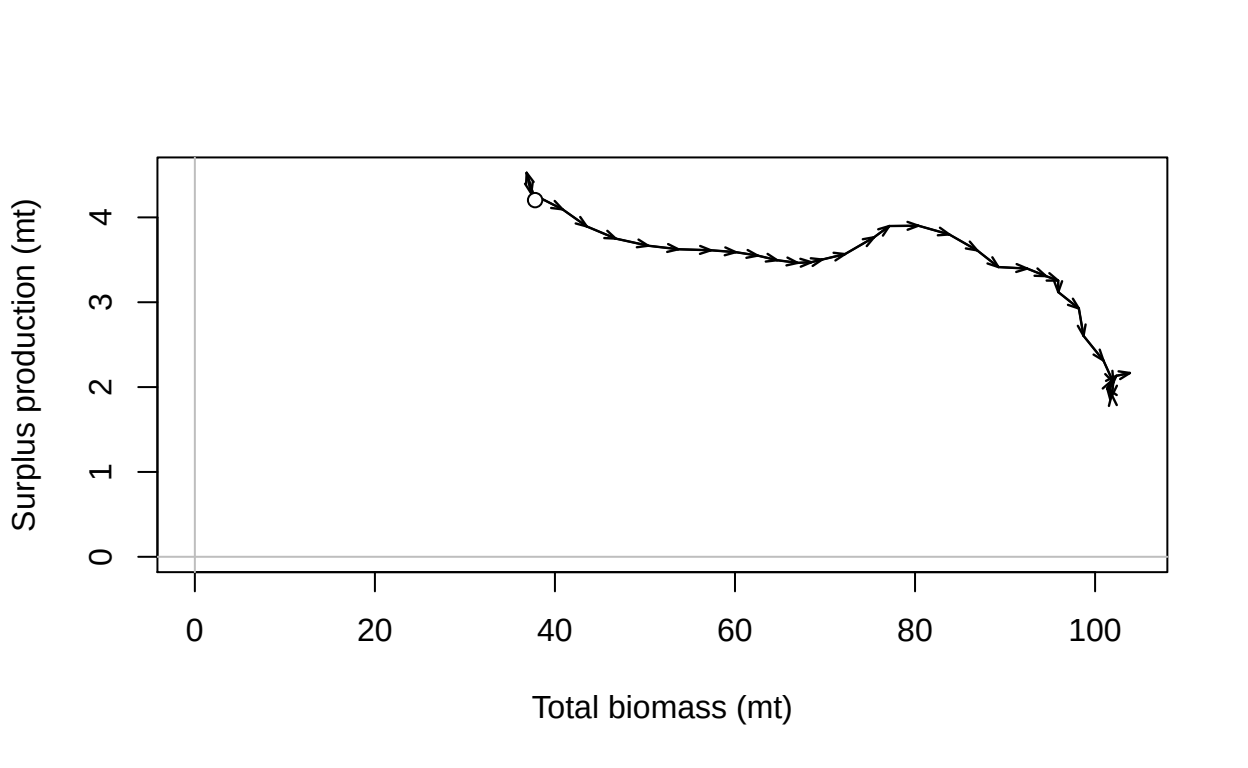

−8
−4
0.1
4
8
90
80
70
60
50
40
30
20
Length (cm)
2008
2011
2013
2015
2017
Year

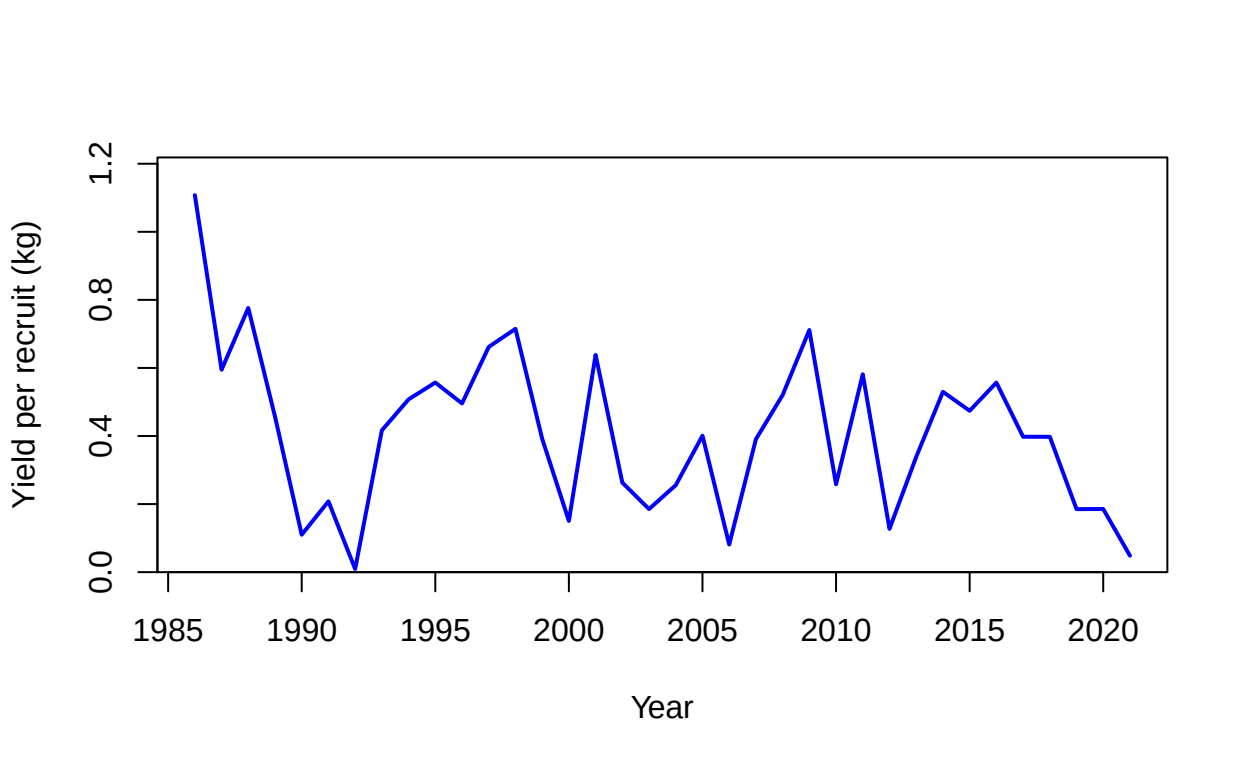

Effective sample size
0
20
60
100
0
20
40
60
80
100
120
Observed sample size
2009
2008
2014
2015
2018
2007
2012
2017
2013
2016
2011
harmonic mean
arithmetic mean

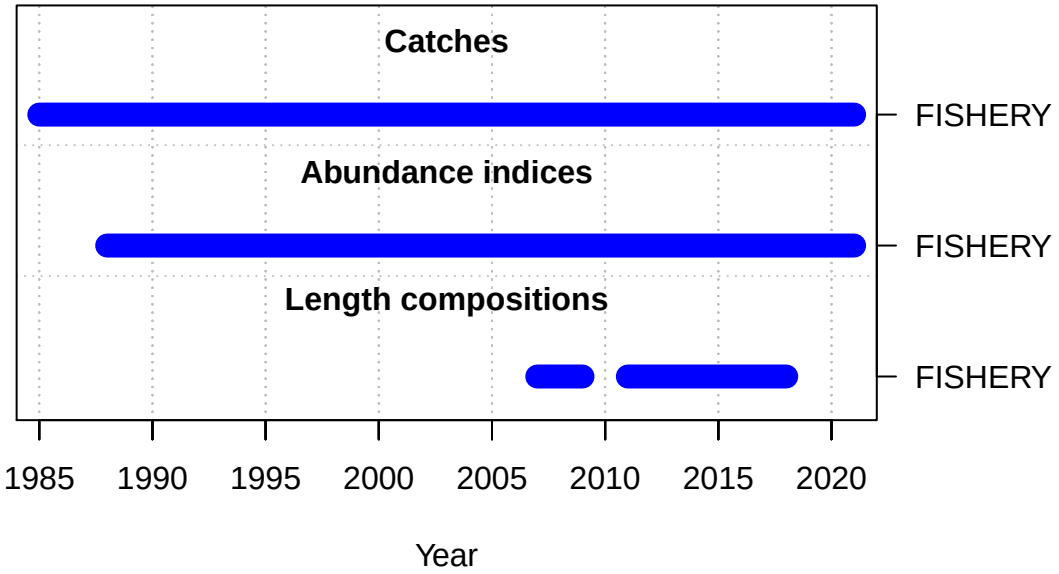

FISHERY (whole catch)
Mean length
70
65
60
55
50
2008
2010
2012
2014
2016
2018
Year

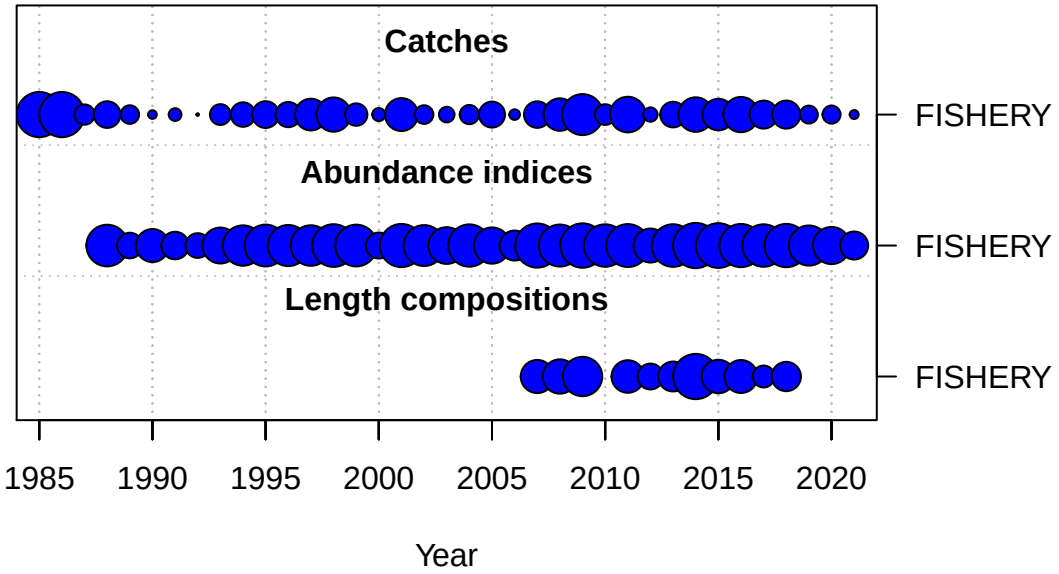

Equilibrium yield (mt)
0.0
1.0
2.0
3.0
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished

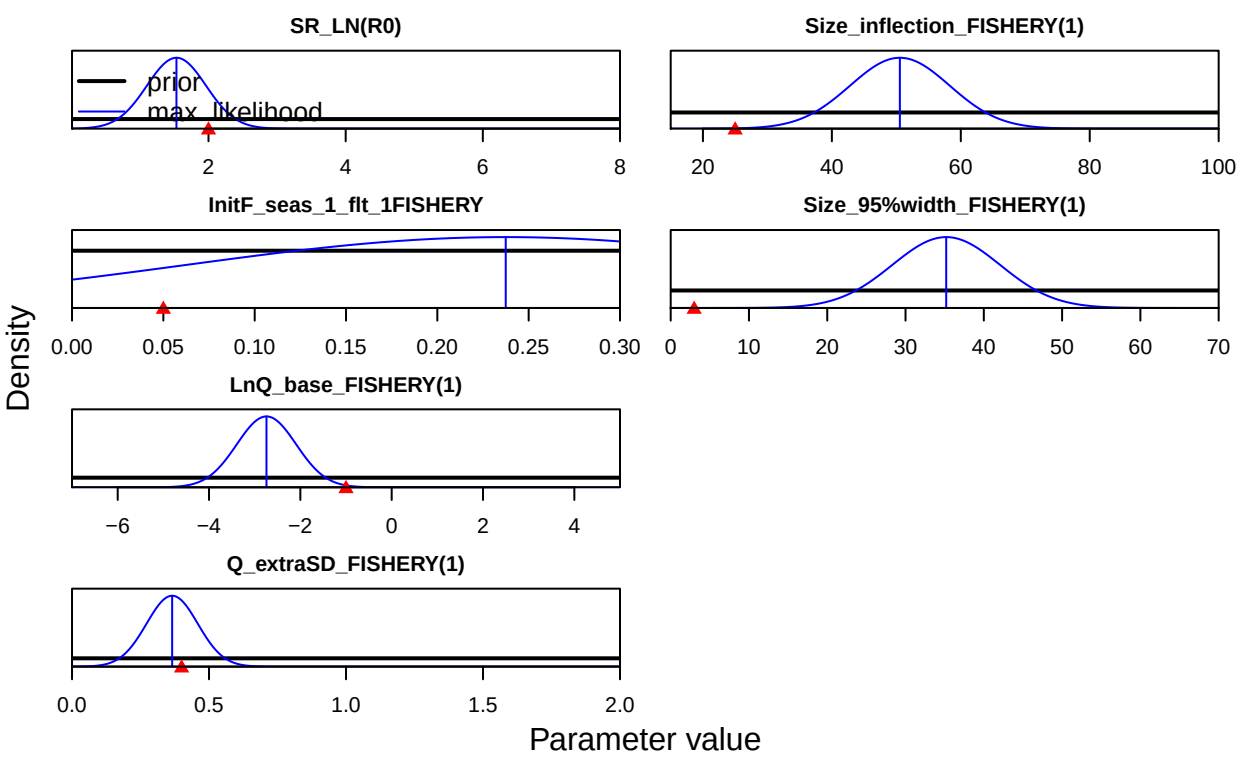

Equilibrium yield (mt)
0.0
1.0
2.0
3.0
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished
MSY
B target
SPR target
Current


Surplus production (mt)
0
1
2
3
4
0
20
40
60
80
100
Total biomass (mt)


Yield per recruit (kg)
0.0
0.4
0.8
1.2
1985
1990
1995
2000
2005
2010
2015
2020
Year


Catches
FISHERY
Abundance indices
FISHERY
Length compositions
FISHERY
1985
1990
1995
2000
2005
2010
2015
2020
Year


Catches
FISHERY
Abundance indices
FISHERY
Length compositions
FISHERY
1985
1990
1995
2000
2005
2010
2015
2020
Year


SR_LN(R0)
prior
max_likelihood
Size_inflection_FISHERY(1)
InitF_seas_1_flt_1FISHERY
Size_95%width_FISHERY(1)
LnQ_base_FISHERY(1)
Q_extraSD_FISHERY(1)
Density
Parameter value